Highlighted Employability Courses (B.Tech) for the Academic Year - 2016-2017

INDEX

CIVIL ENGINEERING

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SYLLABUS : ENGLISH (B16 ENG 1101)

(Common to all Branches)

Listening Skills

Conversations: Life in a Hostel – Eating Away those Blues – Meeting Carl Jung – ADocumentary on the Big Cat – A Consultant Interviewing Employees – A Conversation about a Business Idea.

Speaking Skills

Your Favorite Holiday Destination – Describe Yourself – Why we need to save our Tiger – A Dialogue – Your First Interview – Pair Work: Setting up a New Business.

Reading Skills

Reading Comprehension: Famous People – What is Personality, Personality based on Blood Groups – News Report, Magazine Article, Mobile Towers and Health – An Excerpt from a Short Story, An Excerpt from a Biography – Open Letter to Prime Minister, BusinessDilemmas: An Email Exchange – A Review of IPL: The Inside Story, Mark Zukerberg: World‟s Youngest Billionaire.

Writing Skills

Letter Writing, Essay Writing, Email Writing, Report Writing, Paragraph Writing, Drafting Pamphlet, Argument Writing, Dialogue Writing.

Grammar

Types of Sentences, Articles, Prepositions, Gerunds and Infinitives, Conjunctions, Tense, Quantifiers, Punctuations, Correction of Sentences, Fill-in the Blanks.

Vocabulary

Synonyms, Antonyms, Idioms, One Word Substitution.

Life Skills and Core Skills

Self Awareness and Self Motivation – Communication, Adaptability – Motivation, ProblemSolving – Personal Presentation Skills, Stress Management – Professionalism – Ethics.

Course Outcomes for First Year First Semester Course	
Course Code: B16 ENG 1101	
Course Title: ENGLISH	
CO-1	The overall performance of the students will be enhanced after the course; they will be ina position to make presentations on topics of current interests – politics, famous personalities, science and technology, tourism, work and business environment, with increased public speaking skills.
CO-2	Students will be able to read, listen, speak and write effectively in both academic and non-academic environment.
CO-3	The students will be updated with certain real life situations, which they can handle when come face to face.

SYLLABUS: MATHEMATICS-I (B16ENG1102)

(Common to all branches)

UNIT I: Partial Differentiation

Functions of two or more variables – Partial derivatives – Homogeneous Functions – Euler"s Theorem – Total Derivative – Change of Variables – Jacobians – Geometrical Interpretation: Tangent Plane and Normal to a Surface.

Applications of Partial Differentiation

Taylor"s Theorem for functions of two variables – Errors and Approximations – TotalDifferential – Maxima and Minima of functions of two variables – Lagrange"s Method of Undetermined Multipliers – Differentiation Under the Integral Sign – Liebnitz"s Rules.

Ordinary Differential Equations of First Order and First Degree

Formation of ordinary differential equations (ODEs) – Solution of an ordinary differential equation – Equations of the First Order and First Degree – Linear Differential Equation – Bernoulli"s Equation – Exact Differential Equations – Equations Reducible to exact equations.

Applications of Differential Equations of First Order

Orthogonal Trajectories – Simple electric (LR & CR) Circuits – Newton"s Law of Cooling – Law of Natural growth and decay.

Linear Differential Equations of Higher Order

Solutions of Linear Ordinary Differential Equations With Constant Coefficients – Rules for finding Complimentary Function – Rules for finding the particular integral – Method of variation of parameters – Cauchy"s linear equation – Legendre"s Linear Equation – Simultaneous linear equations.

Fourier series

Introduction - Euler"s Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity – Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series - Parseval"s Formula.

Course Outcomes for First Year First Semester Course	
Course Code: B16ENG1102	
Course Title: MATHEMATICS – I	
CO-1	Find partial derivatives, expand a function of more than one variable in a Taylor seriesand utilize them for errors and approximations, maxima and minima.
CO-2	Solve a first order ODE and also find orthogonal trajectories and solve problems related to simple applications.
CO-3	Solve a given higher order ODE, an equation with constant coefficients, a Cauchy's equation or a Legendre‟s equation.
CO-4	Utilize knowledge of Fourier series for solving partial differential equations and also in understanding courses like Signals & Systems

SYLLABUS: MATHEMATICS – II (B16ENG1103)

(Common to CIVIL, CSE & IT)

Matrices – I

Rank of a matrix - Normal Form – Solutions of Linear System of Equations- Consistency of Linear System of Equations – Rouche‟s Theorem(statement) - Direct Methods: Gauss Elimination Method, LU Factorization Method – Eigen Values and Eigen Vectors of a Matrix – Properties - Cayley – Hamilton Theorem – Inverse and Powers of a Matrix using Cayley – Hamilton Theorem.

Matrices – II

Diagonalization of a Matrix – Quadratic Forms – Reduction of Quadratic Form to Canonical Form – Nature of a Quadratic Form – Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

Laplace Transforms-I

Introduction – Existence Conditions – Transforms of Elementary Functions – Properties of Laplace Transforms – Transforms of Derivatives – Transforms of Integrals – Multiplication by „t‟ – Division by t – Evaluation of Integrals by Laplace Transforms – Laplace Transforms of Unit Step Function, Unit Impulse Function and Periodic Functions.

Laplace Transforms-II

Inverse Laplace Transform – different methods - Convolution Theorem – Applications of Laplace Transforms to Ordinary Differential Equations, Simultaneous Linear Differential Equations with Constant Coefficients.

Difference Equations

Definition - order and solution of a difference equation - Formation of difference equations - Linear difference equations - Rules for finding C.F. - Rules for finding P.I.- Simultaneous difference equations with constant coefficients. Application to deflection of a loaded string.

Z-transforms

Z-transforms – definition - some standard Z-transforms - Linear property, Damping rule - some standard results - shifting rules - initial and final value theorems - convolution theorem- Evaluation of inverse transforms - Applications of Z-transform to difference equation.

Course Outcomes for First Year First Semester Course	
Course Code: B16 ENG 1103	
Course Title: MATHEMATICS – II	
CO-1	Utilizing the knowledge of matrices for solving linear simultaneous equations, find Eigen values and Eigen vectors and handle quadratic forms
CO-2	Utilizing the knowledge of Laplace Transforms to find transforms of important functions that arise in applications and also solve ODE
CO-3	Also utilizing the knowledge of Laplace Transforms in courses like Net Works, Signals & Systems and Control Systems
CO-4	Utilizing the knowledge of difference equations and Z-transforms in understanding courses like Discrete Mathematical Structures and also Signals & Systems.

SYLLABUS: CHEMISTRY (B16ENG1104)

(Common to CIVIL, CSE & IT)

Water Chemistry

Source of water- impurities- Hardness and its determination by EDTA method- Boiler troubles and their removal. Water softening methods- lime soda, zeolite and ion exchange. Municipal water treatment- Break point chlorination. Desalination of sea water – electro dialysis and reverse osmosis methods.

Building Materials

Portland cement: Manufacture-Chemistry involved in setting and hardening of cement – Cement concrete -RCC – Decay of concrete. Refractories: Classification-Properties and Engineering applications. Ceramics: Classification-Properties and uses.

Solid State Chemistry

Classification of solids-Types of crystals-properties-Imperfections in crystals. Band theory of solids. Chemistry of semiconductors –Intrinsic, Extrinsic, compound and defect. Organic semiconductors Purification of solids by Zone refining-Single crystal growth – epitaxial growth. Elementary ideas on Liquid crystals.

Corrosion Chemistry

Definition of corrosion- Types of corrosion-chemical & electrochemical corrosion –Pitting, stress corrosion, Galvanic corrosion, Water line corrosion Factors affecting corrosion – Prevention of corrosion- Cathodic protection. Corrosion inhibitors Protective coatings- Metallic coatings, electro plating, electroless plating, chemical conversion coatings- phosphate coatings, chromate coatings, anodizing. Organic coatings-Paints.

Polymers and Plastics

Definition-Types of polymerization – mechanism of free radical polymerization. Plastics- Thermosetting and thermoplastic resins cellulose derivatives, vinyl resins, nylon 6, 6, Bakelite-Compounding of plastics-Fabrication of plastics. Fiber reinforced plastics – conducting polymers -Engineering applications of polymers.

Fuels and Lubricants

Solid fuels: Coal –Analysis of coal – Metallurgical coke- manufacture-Engineering applications. Petroleum-refining-Knocking and Octane number of gasolilne-Cetane number of diesel oil. Synthetic petrol – LPG-CNG–Applications. Rocket fuels – Propellants-classification. LUBRICANTS: Principles of lubrications, classification of lubricants and properties of lubricants (any five).

Course Outcomes for First Year First Semester Course	
Course Code: B16ENG1104	
Course Title: CHEMISTRY	
CO-1	Students learn in-depth about the topics of desalination of sea water, CNG, LPG Biogas, Semiconductors, Liquid crystals, Conducting polymers, fiber reinforced plastics, building materials
CO-2	Students understand the basic and advanced applied concepts.
CO-3	Students learn to interrelate the theory and with the relevant experiment.
CO-4	Students learn experimental techniques and understand the theory about experiments

SYLLABUS: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS (B16ENG1106)

(Common to CIVIL, CSE & IT)

Introduction to C

Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations, Formatted Input, Formatted Output.

Decision Making, Branching, Looping, Arrays & Strings: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else. If ladder, switch statement, the (? :) operator, the GOTO statement. The while statement, the do statement, The for statement, Jumps in Loops, One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

Functions

Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, the scope, visibility and lifetime of variables.

Pointers

Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures- Program Applications

Structure and Unions

Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

File handling

Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments- Program Applications.

Numerical Methods

Solutions of Algebraic and Transcendental Equations: Bisection Method, Newton Raphson Method.

Interpolation - Newton’s forward and backward Interpolation, Lagrange‟s Interpolation in unequal intervals.

Solutions of Linear Equations: Gauss Elimination Method, Jacobi and Gauss Seidel Methods. Numerical Integration: Trapezoidal rule, Simpson’s 1/3 rule.

Solutions of Ordinary First Order Differential Equations: Euler’s Method, Modified Euler’s Method and Runge-Kutta Method.

Course Outcomes for First Year First Semester Course	
Course Code: B16 ENG 1106	
Course Title: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS	
CO-1	Student can understand basic terminology used in C programming.
CO-2	Student can write programs by applying elementary algorithms to solve problems in C - Language.
CO-3	Student can write, compile and debug programs in C language
CO-4	Student can Write programs to solve numerical methods
CO-5	Student can be familiar with finite precision computation.

SYLLABUS: CHEMISTRY LAB (B16 ENG 1110)

(Common to CIVIL, CSE & IT)

LIST OF PRACTICAL EXPERIMENTS:

1. Estimation of Sodium hydroxide with HCl (Na_2CO_3 primary standard).
2. Estimation of Iron as Ferrous iron in an Ore Sample.
3. Estimation of Oxalic acid by a redox method
4. Estimation of Calcium in a sample of Portland cement.
5. Estimation of Volume strength of Hydrogen Peroxide.
6. Estimation of Mohr's salt by Potassium dichromate
7. Determination of Hardness of an underground water sample.
8. Estimation of Zinc by EDTA method.
9. Determination of Alkalinity of water sample.

DEMONSTRATION EXPERIMENTS:

1. Determination of Viscosity and Viscosity index of a lubricant.
2. Printed Circuit Board
3. Determination of dissolved oxygen in given water sample.
4. Potentiometric titrations.
5. P^H Determination by using P^H meter.

SYLLABUS: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS LAB (B16ENG1112)

LIST OF PROGRAMS:

1. Write a program to read x, y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line.

2. Write a program which generates 100 random numbers in the range of 1 to 100. Store them in an array and then print the array. Write 3 versions of the program using different loop constructs (e.g. for, while and do-while).

3. Write a set of string manipulation functions e.g. for getting a sub-string from a given position, copying one string to another, reversing a string and adding one string toanother.

4. Write a program which determines the largest and the smallest number that can be stored in different data types like short, int, long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?

5. Write a program which generates 100 random real numbers in the range of 10.0 to 20.0 and sort them in descending order.

6. Write a function for transporting a square matrix in place (in place means that your are not allowed to have full temporary matrix).

7. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their mean and standard deviation.

8. Implement bisection method to find the square root of a given number to a given accuracy.

9. Implement Newton Raphson Method to determine a root of polynomial equation.

10. Given a table of x and corresponding f(x) values, write a program which will determinef(x) value at an intermediate x value using Lagrange's Interpolation.

11. Write a function which will invert a matrix.

12. Implement Simpson's 1/3rd rule for numerical integration.

13. Implement Trapezoidal rule for numerical integration.

14. Write a program to solve a set of linear algebraic equations.

15. Write a program to solve a differential equation using Runge-Kutta Method.

CIVIL ENGINEERING

SYLLABUS: MATHEMATICS – III (B16 ENG 1201)

(Common to all Branches)

Solid Geometry

Equations of a plane, Normal form, Intercept form, Equations of Straight Line – Conditions for a line to lie in a Plane – Coplanar lines – Shortest distance between two skew lines - Intersection of three Planes – Equations of Sphere – Tangent Plane to a Sphere –Cone – Cylinder.

Multiple Integrals-1

Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

Multiple Integrals-2

Beta Function - Gamma Function - Relation between Beta and Gamma Functions-Error Function - Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of mass - Center of gravity of a plane lamina- Moment of inertia.

Fourier Transforms

Introduction – definition - Fourier integral - Sine and Cosine integrals - Complex form of Fourier integral - Fourier transform - Fourier Sine and Cosine transforms -Finite Fourier Sine and Cosine transforms - properties of Fourier transforms, Convolution theorem for Fourier transforms – Perceval’s identity for Fourier transforms - Fourier transforms of derivatives of a function.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1201	
Course Title: MATHEMATICS – III	
CO-1	Utilize knowledge of line, sphere etc. in his engineering subjects
CO-2	Utilize the knowledge of Beta and Gamma functions and multiple integrals to evaluate the integrals they come across in their applications
CO-3	Utilize the knowledge of Fourier Transform in courses like Signals and Systems and in the solution of partial differential equations at a later stage

SYLLABUS: PHYSICS (B16 ENG 1202)

(Common to CIVIL, CSE & IT)

Thermodynamics

Introduction, Heat and Work, First Law of Thermodynamics and applications, Reversible and Irreversible Process, Carnot Cycle and Efficiency, Second Law of Thermodynamics, Carnot's Theorem, Entropy, Second Law in terms of entropy, Entropy and disorder, Third Law of Thermodynamics (Statement Only).

Electromagnetism

Effect of Magnetic Field on – moving charges, current in long straight wire and rectangular Current Loop, Hall Effect, Biot-Savart's Law, B near a Long Wire, B for a Circular Current Loop, Ampere's Law, B for a Solenoid, Faraday's Law of electromagnetic induction, Lenz's law, Inductance of a solenoid, L-R Circuit, Displacement Current, Maxwell's Equations (integral form) and their significance (without derivation).

Interference

Principle of Super Position – Young's Experiment – Coherence – Inference in thin transparent films, Newton's Rings, Michelson Interferometer and its applications.

Lasers

Introduction, spontaneous and stimulated emissions, requirements of laser device, RubyLaser, Gas Laser (He-Ne Laser), Semiconductor diode Laser, Characteristics and applicationsof Lasers.

Optical Fibers

Introduction, Principles of light propagation in optical fiber, Acceptance angle, Numerical aperture, types of fiber, Applications of Optical Fibers, Optical Fiber in Communications, advantages.

Ultrasonics

Definition, Production of Ultrasonic by Magnetostriction and Piezoelectric methods, detection methods, acoustic grating, characteristics and applications of Ultrasonics.

Modern Physics

Introduction, de Broglie concept of matter waves, Properties of matter waves, experimental verification (Davisson-Germer experiment), Heisenberg uncertainty principle, Wave function and its physical significance, Schrodinger time independent wave equation, application to a particle in a box, Band theory of Solids, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semi conductors and insulators.

Nano phase Materials

Definition, Synthesis – Synthesis methods, Condensation and Ball milling, Chemical vapors deposition method – sol-gel methods, Characterization, analysis and applications of nano materials.

Course Outcomes for First Year Second Semester Course	
Course Code: B16ENG1202	
Course Title: PHYSICS	
CO-1	Students learn in depth about the topics of Lasers, fiber optics, quantum mechanical Theory and classical theories of thermodynamics and electromagnetism.
CO-2	Students understand the classical and modern concepts.

SYLLABUS: ENGINEERING GRAPHICS (B16 ENG 1204)

(Common to CIVIL, CSE & IT)

Introduction

Lines, Lettering and Dimensioning. Geometrical Constructions.

Curves

Conic sections: General construction of ellipse, parabola and hyperbola. Construction of involutes. Normal and Tangent.

Projections of Points

Principal or Reference Planes, Projections of a point situated in any one of the four quadrants

Projections of Straight Lines

Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of straight line inclined to both the reference planes.

Projections of Planes

Projection of Perpendicular planes: Perpendicular to both reference planes, perpendicular to one reference plane and parallel to other reference plane, perpendicular to one reference plane and inclined to other reference plane. Projection of Oblique planes. Introduction to Auxiliary Planes.

Projections of Solids

Types of solids: Polyhedra and Solids of revolution. Projection of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to other and axes inclined to both the reference planes.

Projections of Section of Solids

Section Planes: Parallel and inclined section planes, Sections and True shape of section, Sections of Solids: Prism, Pyramid, Cylinder and Cone.

Development of Surfaces

Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

Isometric Views

Introduction to Isometric projection, Isometric scale and Isometric view. Isometric views of simple planes. Isometric view of Prisms, Pyramids, cylinder and cone. Isometric view of a combination of solids.

Course Outcomes for First Year Second Semester Course

Course Code: B16 ENG 1204

Course Title: ENGINEERING GRAPHICS

CO-1	Apply principles of drawing to represent dimensions of an object.
CO-2	Construct polygons and engineering curves.
CO-3	Draw projections of points, lines, planes and solids.
CO-4	Represent sectional views of solids.
CO-5	Develop the surfaces of regular solids.
CO-6	Draw the isometric views of solids and combination of solids.

SYLLABUS: PROFESSIONAL ETHICS AND MORAL VALUES (B16 ENG 1206)

(Common to CIVIL, CSE & IT)

Ethics and Human Values

Ethics and Values, Ethical Vision, Ethical Decisions, Human Values – Classification of Values, Universality of Values.

Engineering Ethics

Nature of Engineering Ethics, Profession and Professionalism, Professional Ethics, Code ofEthics, Sample Codes – IEEE, ASCE, ASME and CSI.

Engineering as Social Experimentation

Engineering as social experimentation, Engineering Professionals – life skills, Engineers as Managers, Consultants and Leaders, Role of engineers in promoting ethical climate, balanced outlook on law.

Safety Social Responsibility and Rights

Safety and Risk, moral responsibility of engineers for safety, case studies – Bhopal gas tragedy, Chernobyl disaster, Fukushima Nuclear disaster, Professional rights, Gender discrimination, Sexual harassment at work place.

Global Issues

Globalization and MNCs, Environmental Ethics, Computer Ethics, Cyber Crimes, Ethical living, concept of Harmony in life.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1206	
Course Title: PROFESSIONAL ETHICS AND MORAL VALUES	
CO-1	By the end of the course student should be able to understand the importance of ethics and values in life and society.

SYLLABUS: BUILDING MATERIALS AND BUILDING CONSTRUCTION (B16 CE 1208)

(For Civil Engineering)

Bricks and Clay Products

Bricks: Classification of Bricks, Manufacture of Bricks, general qualities of Bricks as per IS code, tests for good bricks as per IS code, including field tests, special forms of Bricks and their uses. Clay Products: Various types of tile manufacturing and their uses, Earth-wares, Terra-cotta, stone ware, porcelain, glazing of tiles etc.

Wood, Wood Based Products

Wood: cross section details of trees, their general properties, various types of defects in wood and timber, Methods of seasoning and their importance, various Mechanical Properties of timber, Decay of timber, Wood based Products: Veneers, Plywood and its types, Manufacturing of Plywood, plywood grades as per IS code, Laminated wood, merits of plywood and laminated wood, Lamin Boards, Block Boards, Batten board, Hard board, Particle boards and Composite boards.

Paints, Varnishes

Paints and Varnishes: Constituents and characteristics of paints, types of paint, their uses and preparation on different surfaces, painting defects, causes and remedies. Constituents ofvarnishes, uses of varnishes, different kinds of varnish, polishes. Painting of interior walls, exterior walls, wooden doors and windows – steel windows – various types of paints (chemistry of paints not included) including distempers; emulsion paints etc., Varnisheswood work finishing types.

Plastic: definition, classification of plastic and modern development of plastic, chemistry of plastic, polymerization, manufacturing process and their uses. Glass: properties of glass, types of glass and manufacturing**.**

Asbestos & Asphalt Bitumen & Tar : Availability and uses of asbestos, properties of asbestos, various types of asbestos, difference between asphalt & bitumen, Types, uses and properties of Asphalt & Bitumen, composition of coal tar, wood tar, mineral tar and Naphtha.

Cements

Natural and artificial cements, types of various artificial cements and their uses. Wet and dry process of manufacturing ordinary Portland cement (OPC), Chemical and Physical analysisof OPC, various field and Laboratory Tests on OPC as per IS code. Storing of cement in the field and godowns.

Foundations

Types of Foundations : Strip, Isolated, Strap, Combined Footings, Raft – Mat –Slab and Beam Raft, Box Type Raft, inverted arch foundations, SHELL foundations, Grillage foundations – Minimum depth of Foundation – Bearing capacity of soils **Masonry:** Different types of Stone Masonry – Plan, Elevation, Sections of Stone Masonry Works – Brick Masonry – Different Types of Bonds – Plan, elevation and Section of Brick Bonds upto Two-Brick wall thickness – Partition walls – Different types of Block Masonry – Hollow concrete Blocks – FAL- G Blocks, Hollow Clay Blocks.

Roofing

Mangalore tiled Roof, RCC roof, Madras Terrace, Hollow Tiled Roof, Asbestos Cement, Fibre glass, Aluminium G.I. Sheet roofing’s. Form Work, Scaffolding: form work, Types of formwork, centering-scaffolding-types of scaffolding. Trusses: King Post & Queen Post Trusses – Steel roof Truss for 12m Span with details. Wooden Doors and Windows: Parallel – Glazed – Flush shutters, Plywood, Particle Board Shutters – Aluminium, PVC, Steel doors, windows and ventilators various types of windows, Glazing – different varieties. **Stair Cases:** Stair cases or Stairway design (Architectural design or planning only) various types such as, straight flight – dog legged, quarter landing, open spiral, spiral stairs etc.

Concrete Technology and Mix Design

Polymer Concrete, Types of cement concretes, Ingredients and their characteristics, Cement concrete properties and relevant tests, storage, batching, mixing & transporting, placing & vibrating and curing. Concrete grades & mix designs upto M 20 as per IS code. Introduction to polymer concrete and its uses.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 CE 1208	
Course Title: BUILDING MATERIALS AND BUILDING CONSTRUCTION	
CO-1	Learn and identify the relevant physical and mechanical properties pertaining to the construction industry.
CO-2	Demonstrate the relevant BIS testing procedure to be carried out to ascertain the quality of building materials.
CO-3	Develop ability to choose the modern construction material appropriate to the climate and functional aspects of the buildings.
CO-4	Ability to supervise the construction technique to be followed in brick, stone and hollow block masonry, concreting, flooring, roofing, plastering and painting etc.
CO-5	Learn about the causes of deterioration, crack pattern, and assessment of damages.
CO-6	Learn about the construction techniques in repairing of buildings.

SYLLABUS: PROBABILITY, STATISTICS AND QUEUING THEORY (B16 CS 1208)

(Common to CSE & IT)

Probability:

Various definitions of probability, Addition theorem, Conditional probability, Multiplication theorem, Bayes theorem of probability and Geometric probability.

Random Variables and Their Properties:

Definition, Distribution function, Properties of Distribution Function, Discrete Random Variable, Probability Mass Function, Discrete Distribution Function, Continuous Random Variable, Probability Density Function, Continuous Distribution Function. Mathematical Expectation of a Random Variable, Expected Value of function of a Random Variable, Addition Theorem and Multiplication Theorem of Expectation (without proofs), Statistical Measures like Mean ,Variance, Moments and Covariance in terms of Expectations, Moment generating Function, Characteristic Function and Probability generating Function of a Random Variable.

Distributions:

Discrete Distributions:

Binomial distribution and Poisson distribution (Definition, Mean, Variance, m.f.g., Characteristic function, p.g.f., fitting of distributions)

Continuous Distributions:

Uniform distribution, its Mean and Variance. Normal Distribution and its Properties (without proofs), Standard Normal Variate, Importance of Normal distribution. Exponential Distribution, Definition, Mean Variance Memory less property of Exponential distribution

Bivariate Analysis and Curve Fitting:

CORRELATION: Definition, Karl Pearson's Coefficient of Correlation, Limits for correlation coefficient, Rank Correlation, Spearman's formula for rank correlation coefficient.

CURVE FITTING, Method of least Squares, Fitting of a Straight line, fitting of a Parabola REGRESSION ANALYSIS: Regression Lines, Regression Coefficients and their properties (without proofs)

Sampling Theory:

Sample, population, statistic, parameter, Sampling distribution, standard error, interval estimation. Testing of Hypothesis: Formulation of Null hypothesis, Alternative hypothesis, Critical region, Critical value, level of significance, Statistical Inference, Type-I-error, Type- II-error, One-tailed/Two-tailed test.

Large Sample Theory:

Test of significance of single sample proportion, Test of significance for difference of proportions, Test of significance of single sample mean, Test of significance for difference ofmeans.

Small Sample Theory: Degrees of freedom, Student's-t-distribution: definition, t-test for single mean, t-test for difference of means, Paired t-test for difference of means.

F-distribution: definition, F-test for equality of two population variances. Chi-square distribution definition, Chi-square test for goodness of fit, Chi-square test for single Population Variance.

Queuing Theory: Queue description, Birth and Death Process, Distribution of Inter-arrival times, Distribution of service times, Kendal's representation of a queuing model, Operating characteristics of a queuing model, steady-state solutions of {M/M/1: ∞/FCFS} Model and {M/M/1 ; N/FCFS} Model.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 CS 1208	
Course Title: Probability, Statistics And Queuing Theory	
CO-1	Handle the situation of uncertainty in decision making in our day-to-day life.
CO-2	Identify the random variable as discrete/continuous and analyse it.
CO-3	Predict the distribution suitable for the given data from its moments.
CO-4	Measure the intensity of association between the variables and to fit a best suitable Curve for the given data
CO-5	Measure the intensity of association between the variables and to fit a best suitable Curve for the given data

SYLLABUS: PHYSICS LAB (B16 ENG 1209)

(Common to CIVIL, CSE & IT)

LIST OF EXPERIMENTS

1. Sonometer – verification of laws of transverse vibrations in stretched strings.
2. Melde's Experiment – Determination of the frequency of an electrically maintainedtuning fork.
3. Newton's Rings – Determination of radius of curvature of a convex lens.
4. Diffraction Grating – Determination of Wavelengths of lines of mercury spectrum usingspectrometer by normal incidence method.
5. Determination of Cauchy's constants of the material of the given prism using Spectrometer and mercury light.
6. Wedge Method – Determination of thickness of a paper by forming parallel interferencefringes.
7. Variation of magnetic field along the axis of current carrying circular coil – Stewart andGee's apparatus.
8. Carey Foster's bridge – Verification of laws of resistance.
9. Lee's Method – Determination of coefficient of thermal conductivity of a bad conductor.
10. Calibration of voltmeter using potentiometer.
11. Calibration of low range Ammeter using potentiometer.
12. Laser – Diffraction.

SYLLABUS: WORKSHOP (B16 ENG 1211)

(Common to CIVIL, CSE & IT)

Carpentry

Bench Work, tools used in carpentry.

Jobs for Class work – half lap joint, mortise and tenon joint, half – lap dovetail joint, corner dovetail joint, central bridle joint.

Sheet Metal

Tools used in sheet metal work, Laying development of the sheet metal jobs, soldering.

Jobs for class works – Square tray, taper tray (sides), funnel, elbow pipe joint, 60^0 pipe joint.

Fitting

Tools used in fitting work, Different files, chisels, hammers and bech vice.

Jobs for class work – Square, hexagon, rectangular fit, circular fit and triangular fit.

SYLLABUS: ENGLISH LANGUAGE LAB (B16 ENG 1213)

(Common to All Branches)

1. English Sound Pattern – Letters
2. Sounds of English
3. Pronunciation
4. Stress and Intonation

Laboratory Practice Sessions:

1. Letters and Sounds, Worksheet-1
2. Interactions-1, Worksheet-2
3. The Sounds of English, Worksheet-3
4. Interactions-2, Worksheet-4
5. Pronouncing Words-Some Important Patterns, Worksheet-5
6. Interactions-3, Worksheet-2
7. Stress and Intonation, Worksheet-2

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1213	
Course Title: ENGLISH LANGUAGE LAB	
CO-1	Students will be sensitized towards recognition of English sound pattern.
CO-2	The fluency in speech will be enhanced

CIVIL ENGINEERING

SYLLABUS: MATHEMATICS - IV (B16 ENG 2101)

(Common to CIVIL, ECE, EEE & ME)

Vector Calculus-1

Definitions of Scalar and Vector point functions, Differentiation of vectors, Vector differential operator del, Del applied to scalar point function – gradient, Del applied to vector point function- divergence and curl, physical interpretation of gradient, divergence and curl(without proof), Del applied twice to a point function, Del applied to product of two functions, Irrotational and Solenoidal Fields, scalar potential

Vector Calculus-2

Integration of vectors, line integral, circulation, work done, surface integral, Flux, Green's, Stokes and Gauss Divergence Theorems (Without proofs). Introduction to orthogonal curvilinear coordinates, cylindrical polar coordinates and spherical polar coordinates.

Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables, One –dimensional wave equation- vibrations of a stretched string (no derivation)-, one-dimensional heat equation – Heat flow along a long horizontal bar (no derivation) (problems on heat equation involving homogeneous end conditions only), two dimensional Laplace equation in Cartesian coordinates.

Complex Variables-1

Review- Cartesian form and polar form of a complex variable, Real and imaginary parts of z^n, e^z, sin z, sinh z and log z .

Limit and continuity of a function of the complex variable, derivative, analytic function, properties of Analytic functions, Cauchy- Riemann equations, Harmonic functions and Orthogonal system, application of analytic function to flow problems, geometric representation of w=f(z), conformal mapping – Bilinear transformation only.

Complex Variables-2

Integration of complex functions, Cauchy's theorem, Cauchy's integral formula (statements only). Taylor and Laurent series expansions of functions (statement of theorems only), zeros and singularities, Residue, calculation of residues, Cauchy's Residue theorem (without proof), Evaluation of real and definite integrals- integration around a unit circle

Course Outcomes for Second Year First Semester Course	
Course Code: B16 ENG 2101	
Course Title: MATHEMATICS – IV	
CO-1	Apply the concepts of Gradient, Divergence, Curl, Directional derivative, solenoidal and Irrotational fields
CO-2	Determine scalar potential, circulation and work done
CO-3	Evaluate integrals using Green's, Stokes and Divergence theorems
CO-4	Obtain the solution of 1-D wave equation and 1-D heat equation
CO-5	Determine the zeroes and poles of functions and residues at poles
	Evaluate certain real definite integrals that arise in applications by the use of Residue theorem

SYLLABUS: ENGINEERING MECHANICS (B16 CE 2101)

Basic Concepts:

Introduction to Engineering Mechanics – Scalar and Vector quantities – Forces – Characteristics of a force – Definitions and examples of various types of force systems – Definition of resultant – Composition and resolution of forces – Moment of a force – Principles of moments of force – Couples – characteristics of a couple – on Transformations of a couple – Resolution of a force into a force and couple.

Forces in plane only:

Concurrent forces in plane – principles of statics –composition and resolution of forces – equilibrium of concurrent forces in a plane – method of projections − equilibrium of three forces in a plane –method of moments – friction.

Parallel forces in plane:

Two parallel forces – general case of parallel forces in a plane –Centre of parallel forces and center of gravity – centroids of composite plane figures and curves – distributed force in a plane.

General case of forces in a plane:

Composition of forces in a plane – equilibrium of force in a plane – Analysis of statically determinate trusses by (a) Method of joints and (b) Method of sections.

Virtual work:

Introduction – concept of virtual work −Equilibrium of ideal system – application of virtual work on beams (simply supported, cantilever, continuous beams) carrying point load and uniformly distributed loads.

Kinematics of particles:

Introduction of dynamics – rectilinear motion of particles – curvilinear motion of particles. Kinetics of particles – introduction – Newton's second law of motion – linear momentum of a particle – equations of motion – dynamic equilibrium –equations of motion in terms of radial and transverse components

Energy and momentum methods – introduction – kinetic energy of a particle – principle of work and energy – conservation of energy – principle of impulse and momentum – impulsive motion – impact−direct central impact– problems solving energy and momentum.

Kinematics of rigid bodies:

Introduction – translation – rotation about a fixed axis – equation of rotation of fixed body about a fixed axis – general plane motion –plane motion of rigid bodies –equation of motion for a rigid body – Alembert's principle of plane motion.

Energy and momentum methods – introduction – principle of work and energy for a rigid body – forces acting on rigid body – kinetic energy of rigid body in plane motion – conservation of energy – principle of impulse and momentum for the plane motion of a rigid body.

Course Outcomes for Second Year First Semester Course	
Course Code: B16 CE 2101	
Course Title: ENGINEERING MECHANICS	
CO-1	Analyse 2-D and 3-D force systems by scalar and vector approaches.
CO-2	Analyse for forces in different types of determinate trusses by 'Method of sections' And Method of joints'.
CO-3	Apply method of virtual work to statically determinate structures
CO-4	Distinguish between rectilinear, curvilinear motion of particles and plane motion of Rigid bodies.
CO-5	Utilize the principles of kinematics and kinetics for physical bodies.
CO-6	Solve engineering problems.

SYLLABUS: MECHANICS OF SOLIDS (B16 CE 2102)

Simple stresses & Strains:

Definitions of stress and strain – types of stresses and strains – Elasticity – Hooke's law – Stress – Strain diagram for Mild steel – working stress- factor of safety- Lateral strain – Poisson's ratio and volumetric strain – Elastic Moduli and the relationship between them – Bars of varying section – composite bars – temperature stresses.

Strain Energy:

Definition – Resilience – SE due to gradually applied; suddenly applied and impact loads – simple applications.

Shear Force & Bending Moment Diagrams:

Definition of beam – Types of beams – concept of SF and BM – SF &BM diagrams for cantilever, SS and overhanging beams subjected point loads, UDL, Uniformly varying loads and combination of these loads – point of contraflexune – Relationship b/w S.F, BM and rate of loading.

Flexural Stresses:

Theory of simple Bending – Assumptions–Derivation of Bending equation – $\left(\frac{T}{J} = \frac{r\,max}{R} = \frac{G\theta}{l}\right)$ Torsional Neutral axis – Determination of bending stresses – section modulus of rectangular, & Circular sections (Solid and Hollow), I, T, channel sections – Design of simple beam sections.

Shear Stresses

Derivation of shear stress formula – shear stress distribution across various beam sections like rectangular, circular, Triangular, I, T, angle sections, built up beams, Definition of shear Centre.

Deflections of Beams: (i) Cantilever (ii) Simply supported and (iii) Over hanging beams using (a) Double integration and (b) Macaulay's method.

Principal Stresses and strains:

Introduction-stresses on an inclined section of a bar under axial loading- compound stresses- Normal and tangential stresses on an inclined plane for biaxial stresses-Two perpendicular normal stresses accompanied by a state of simple shear-Mohr's circle of stress-Principal planes and principal stresses- Construction of Mohr's Circle (graphical Method)

Torsion of Circular Shafts:

Theory of pure Torsion – Derivation of Torsion equation $\left(\frac{T}{J} = \frac{r\,max}{R} = \frac{G\theta}{l}\right)$ Torsional moment of Resistance – polar section Modulus – power transmitted by a shaft – combined bending and torsion.

Buckling of columns:

Introduction – short, medium and long columns – axially loaded compression members – crushing load – Buckling load (or) critical load (or) crippling load – Euler's theory for long columns – Assumptions – Derivations of Euler's critical load formula for various end conditions – Effective length of column – slenderness ratio – limitations of Euler's Theory – Rankin formula – for both long and short columns – column subjected to Eccentric loading– Euler's Method and prof. Perry's formula.

Course Outcomes for Second Year First Semester Course	
Course Code: B16 CE2102	
Course Title: MECHANICS OF SOLIDS	
CO-1	Summarize the behavior of basic materials under the influence of different external loading conditions and support conditions.
CO-2	Determine shear Force and Bending moments in statically determinate Beams and draw the Diagrams.
CO-3	Examine the different methods to find slope and deflection of beams subjected to loads
CO-4	Estimate the principal stresses & strains and torsional stresses in structural members
CO-5	Evaluate the crippling load for columns with different end conditions.

SYLLABUS: FLUID MECHANICS-I (B16 CE 2103)

Fluid Properties and Fluid Statics:

Introduction & Physical Properties of Fluids – Definition of Fluid, Fluid as Continuum; Mass Density, Specific Weight, Specific Gravity, Specific Volume, Bulk Modulus, Compressibility, Vapor Pressure, Cavitation, Viscosity – Newton's Law of Viscosity, Rheological Diagram ; Capillarity and Surface Tension.

Fluid Statics, Pressure and its measurement

Forces Acting on a Fluid Element – Pascal's law; Variation of Pressure in Static Fluid; Absolute, Gauge and Total Pressure; Pressure Measurement – Piezometers, Manometers, Micro-manometers, Mechanical Gauges and Pressure Transducers.

Forces on Immersed Bodies in Static Fluids –

Force on a Plane Surface – Centre of Pressure; Pressure Diagram; Forces on Curved Surfaces; Forces on radial Crest Gates and Lock Gates. Buoyancy & Floatation – Archimedes Principle; Stability of Floating Bodies – Centre of Buoyancy, Metacentric Height and its Determination.

Liquids in Relative Motion

Pressure of Liquids in a Container Subjected to Linear Acceleration and Rotation.

Fluid Kinematics and Conservation of Mass:

Types of Fluid Flow & Methods of Fluid Flow Analysis – Methods of Describing Fluid Motion; Types of Flow – Steady & Unsteady Flows, Uniform & Non-uniform Flows, free and forced vortex motions, Laminar & Turbulent Flows; Streamline, Path line, Streak line; Stream Surface – Stream Tube.

Fluid Kinematics

Translation, Deformation and Rotation of a Fluid Element in Motion; Local, Convective and Total Accelerations; One, Two & Three Dimensional Analysis of Flows.

Ideal Fluid Flow – Stream Function, Velocity Potential; Rotational & Irrotational Flows – Vorticity & Circulation; Laplace Equation in terms of Stream Function and Velocity Potential; Flow Nets.

Principle of Conservation of Mass –

Concepts of System and Control Volume; Continuity Equation in three dimensional Cartesian coordinates; Continuity Equation for flow through a Stream tube.

Fluid Dynamics:

Principle of Conservation of Energy – Equation of Motion for Ideal Fluids, Euler's Equation in Streamline Coordinates, Derivation of Energy Equation through integration of Euler's Equation, Bernoulli's Equation, Energy Correction Factor. Flow measuring devices – Flow Measurement in Pipes – Measurement of Static, Stagnation and Dynamic Pressures and Velocity – Pitot Tube, Prandtl Pitot Tube; Measurement of Discharge through a Pipe using Flow Meters – Venturimeter, Flow Nozzle meter and Orifice meter.

Flow through Tanks and Reservoirs

Measurement of Discharge from Tanks and Reservoirs – Steady and Unsteady Flow through Orifices and Mouthpieces – Small & Large Orifices – Different types of Mouthpieces; Discharge from tanks through Drowned Orifices, Time of Emptying Tanks, Discharge from a Tank with Inflow.

Flow Measurement in Channels

Flow Measurement in Open Channels, Flow Past Weirs and Notches, Sharp Crested and Broad Crested Weirs, Weirs with and without end contractions, Ventilation of Weirs, Triangular Notches, Cipolletti Weir.

Principle of Conservation of Momentum

Momentum of Fluids in Motion, Impulse Momentum Equation, Momentum Correction Factor. Application of Momentum Principle – Forces on Pipe Bends and Reducers, Flow through a Nozzle; Angular Momentum of fluid flow – Sprinkler Problems.

Flow through Pipes:

Introduction to Pipe Flow and Laws of Friction – Reynolds Experiment; Steady Turbulent Flow through Pipes; Laws of Friction; Darcy-Weisbach Equation.

Total Energy and Hydraulic Gradient

Energy and Hydraulic Gradient Lines; Minor Losses in Pipes; Pipes in Series and Parallel – Equivalent Length of Pipe.

Flow between Two reservoirs;

Three Reservoir Problems; Distribution Mains; Working Pressures, Design Pressure and Test Procedures; Choice of Pipe Material; Siphon; Pipe Network Analysis by Hardy-Cross Method; Hydraulic Power Transmission through Pipes and Nozzles, Water hammer (only concept).

Course Outcomes for Second Year First Semester Course	
Course Code: B16 CE 2103	
Course Title: FLUID MECHANICS- I	
CO-1	Define fundamental concepts of fluid mechanics as applied to civil engineering and environmental problems
CO-2	Discuss and derive the fundamental mathematical equations of fluid mechanics
CO-3	Solve the problems of water conveyance in pipes, orifices, mouthpieces, notches and weirs
CO-4	Apply conservation laws to derive governing equations of fluid flows
CO-5	Compare hydrostatic and hydrodynamic forces
CO-6	Analyze and design simple pipe systems

SYLLABUS: SURVEYING – I (B16 CE 2104)

Introduction:

Classification and principles of surveying. Triangulation and Trilateration Earth as spheroid, datum, geoid, Azimuth, latitude, longitude, Map projections, scales, plans, & Maps. Chain surveying: Instrumentation for chaining – Errors due to incorrect chain-Chaining on uneven and sloping ground-Errors in chaining-Tape corrections – Problems: Base line measurement- chain Triangulation-Check lines, Tie lines, Offsets. Basic problems in chaining, obstacles in chaining-Problems-Conventional signs

Compass Survey:

(a) Introduction to compass survey Definitions of Bearing. True bearing, True meridian, Magnetic Meridian, Magnetic bearing – Arbitrary Meridian, R.B. & B.B of lines – Designation of bearings – W.C.B. & R.B. – Conversion of bearings from one system to the other Related problems – Calculation of angles for bearings, Calculation of bearing for angles, Related problems – Theory of Magnetic compass (i.e. Prismatic compass) – Magnetic dip-Description of Prismatic compass. Temporary adjustments of compass-Magnetic Declination – Local attraction-Related Problems-Errors in compass survey.

(b) Traverse Surveying : Chain and compass traversing-Free or loose needle method – Fast needle method-Checks in closed and open traverse-Plotting methods of traverse Survey - Closing error-Balancing the traverse-Bowditch’s method-Transits method, Gale’s Travers table.

Plane table surveying:

Introduction-Advantages, Accessories-Working operations such as fixing the table to tripod, levelling-centering-orientation by back-sighting. Methods of plane tabling-Plane table traversing-Three point problem – Mechanical method – Graphical method – Two point problem-Errors in plane tabling.

Levelling:

Definitions of terms-Methods of levelling-Uses and adjustments of dumpy level-Temporary and permanent adjustments of dumpy level levelling staves-Differential leveling, Profile levelling-Cross sections-Reciprocal levelling. Precise levelling-Definition of BS, IS, FS, HI, TP-Booking and reduction of levels, H.I. methods-Rise and fall method-Checks-Related problems-Curvature and Refraction Related Problems-Correction-Reciprocal levelling-Related problems-L.S & C.S Levelling-Problems in levelling-Errors in levelling.

Minor instruments:

Uses and adjustments of the following minor instruments:

Line Ranger, Optical Square, and Abney level, Clinometer, Ceylon Ghattracer, Pantograph, Sextant and Planimeter.

Contouring:

Definitions-Interval, Characteristics of contours-methods of locating contours. Direct and indirect methods-interpolation of contours-Contour gradient-Uses of contour maps. Contours mapping using computer techniques (surfer, CAD)

Course Outcomes for Second Year First Semester Course

Course Code:B16 CE 2104

Course Title: SURVEYING

CO-1	Appreciate the importance of preparation of Map and Plan for required site with Suitable scale.
CO-2	Prepare contour Map and Estimate the Quantity of earthwork required for formation level for Road and Railway Alignment.
CO-3	Judge on which type of instrument to be used for carrying out survey for a specific work
CO-4	Describe different modern instruments used in surveying.

SYLLABUS: STRENGTH OF MATERIALS LABORATORY (B16 CE 2105)

LIST OF EXPERIMENTS

1. Tension test on Mild/ HYSD bars.

2. Compression test on wood parallel and perpendicular to grains).

3. Tests on springs for the determination of rigidity of modulus and spring constant.

4. Brunel's and Rockwell hardness tests.

5. Charpy and Izod impact tests.

6. Double shear test on mild steel specimen.

7. Bending test: Load deflection test for the determination of young's modulus on simply supported and cantilever beam for wood and steel.

8. Verification of Maxwell's reciprocal theorem.

Course Outcomes for Second Year First Semester Course	
Course Code: B16 CE2105	
Course Title: STRENGTH OF MATERIALS LABORATORY	
CO-1	Illustrate the stress strain relationship for Mild steel/ HYSD bars
CO-2	Inspect wood samples for compressive strength
CO-3	Determine modulus of rigidity of spring
CO-4	Measure the hardness of metals by BHN, Rockwell & Vicker's
CO-5	Relate bolts subjected to double shear
CO-6	Estimate the Impact resistance of materials by Charpy & Izod tests
CO-7	Distinguish simply supported beam and cantilever beam and determine the young's modulus of beam material
CO-8	Solve coplanar force system

SYLLABUS: ENGLISH PROFICIENCY (B16 ENG 2104)

(Common to All Branches)

Speaking Skills

PPT

Describing event/place/thing Picture Description Extempore

Debate Telephonic Skills

Analyzing Proverbs

Vocabulary

Affixes

Pairs of Words

Reading Skills

Reading Comprehension Reading/Summarizing News Paper Artic

Writing Skills

Designing Posters

Essay writing

Resume Writing

(***Note: Sessional Marks will be evaluated based on Continuous Comprehensive Evaluation of the students" Performance - 40M, Attendance – 10M and External Marks will be evaluated based on Presentation Skills – 30M, Project 20M)

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 ENG 2104	
Course Title: ENGLISH PROFICIENCY	
CO-1	Students enhance their vocabulary and use it in the relevant contexts.
CO-2	They improve speaking skills.
CO-3	They learn and practice the skills of composition writing.
CO-4	They enhance their reading and understanding of different texts.
CO-5	They enrich their communication both in formal and informal contexts.
CO-6	They strengthen their confidence in presentation skills.

CIVIL ENGINEERING

SYLLABUS: ANALYSIS OF STRUCTURES (B16CE2201)

Deflections of Beams using (i) Moment area method, (ii) Conjugate beam method, (iii) Unit load method, (iv)Castiglione's theorem-1.

Strain- energy due to (i) Axial load (ii) Bending Moment (iii) Shear force and (iv) Torque

Deflections of Statically Determinate Structures: (a) Single storey, single bay rectangular portal frames using (i) Unit load method, (ii) Castiglione's theorem-1. (b) Trusses (having 9 members or less) using (i) Unit load method, (ii) Castiglione's theorem-1.

Propped Cantilevers:

Analysis of propped cantilever by method of consistent deformation.

Fixed Beams:

Fixed end moments for beams of uniform section for different types of loading; Effect of sinking of support; effect of Rotation of a support; BMD for fixed beam.

Analysis of continuous beams by

1. Theorem of three moments

2. Slope deflection method

3. Moment distribution method

4. Kani"s method.

Influence Lines:

Definition – Influence line for Reaction, SF and BM-Load position for Max SF at a section – Load position for max BM at a section- Single point load, U.D.L longer than the span, U.D.L. shorter than the span- Focal length.

Moving Loads:

Introduction – Max SF and BM at a given section and absolute Max SF and BM due to single concentrated load, U.D.L. longer than the span, U.D.L. shorter than the span, two point loads with fixed distance between them and several point loads, Maximum Bending moment at a section under a wheel load and absolute maximum Bending moment in the case of several wheel loads- Equivalent uniformly Distributed load.

Thin cylinders:

Calculation of longitudinal and hoop stresses in thin cylinders subjected to internal pressure, Wire wound thin cylinders.

Thick cylinders- Lame's theory, Compound tubes.

Theories of failures (i) Maximum Principal stress theory, (ii) Maximum Principal strain theory, (iii) Maximum shear theory (iv) Maximum strain energy theory and (v) Maximum distortion theory.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 CE2201	
Course Title: ANALYSIS OF STRUCTURES	
CO-1	Determine deflections in determinate beams by different methods
CO-2	Evaluate the strain energy for structural members subjected to different loads
CO-3	Analyse different indeterminate beams for BM and SF by different methods of analysis
CO-4	Determine reactions, BM & SF in beams subjected to moving loads.
CO-5	Distinguish between thin and thick cylinders and understand different failure theories.

SYLLABUS: REINFORCED CONCRETE STRUCTURES (B16CE 2202)

General: Loading standards as per IS 875, Grades of steel and cement, Stress- Strain characteristics of concrete and steel, Introduction to working stress method and Limit State Method (L.S.D.) of design.

Limit State of Collapse of in Flexure: Introduction and Principles of L.S.D., Characteristic load and strengths, Design values, Partial safety factors, Factored loads.

Limit State of Collapse: Under reinforced, Balanced and over reinforced sections. Compression stress block, Analysis of singly reinforced rectangular section, doubly reinforced rectangular section and singly reinforced flanged sections. Guide lines for choosing width, depth and percentage of reinforcements in beams. Design of singly reinforced rectangular section, Doubly reinforced rectangular section and singly reinforced flanged sections. Curtailment of flexural tension reinforcement.

Shear, Torsion and Bond: Limit state of collapse in shear, Modes of cracking, shear transfer mechanisms, shear span - depth ratio, shear failure modes. Nominal shear stress, critical sections for shear design, types of shear reinforcement. Truss analogy. General procedure for design of rectangular beams for shear. Limit state of collapse in torsion, Torsional shear stress in rectangular and flanged sections. Reinforcement in member subjected to torsion in RC beams. Design of RC beams subjected to combined effect of bending, shear and torsion. Concept of bond, development length, anchorage, bond, flexural bond.

Design of slabs: One way and Two-way action of slabs, Choosing slab thickness. Design of one way slab. Design of restrained and unrestrained two way slabs as per I.S. code provision. Shear forces in uniformly loaded Two-way slabs.

Columns: Define short and long columns, estimation of effective length of a column. Code requirements on slenderness limits, minimum eccentricity and reinforcement. Design of short column under axial compression with lateral ties and helical reinforcement. Design of short columns subjected to combined axial load and uniaxial moment. Design of short columns subjected to combined axial load and biaxial moment. Design of isolated square and rectangular footing.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 CE2202	
Course Title: REINFORCED CONCRETE STRUCTURES	
CO-1	Student should be able to understand and Design the Super structure and sub structure elements.

SYLLABUS: REINFORCED CONCRETE STRUCTURES (B16CE 2202)

General: Loading standards as per IS 875, Grades of steel and cement, Stress- Strain characteristics of concrete and steel, Introduction to working stress method and Limit State Method (L.S.D.) of design.

Limit State of Collapse of in Flexure: Introduction and Principles of L.S.D., Characteristic load and strengths, Design values, Partial safety factors, Factored loads.

Limit State of Collapse: Under reinforced, Balanced and over reinforced sections. Compression stress block, Analysis of singly reinforced rectangular section, doubly reinforced rectangular section and singly reinforced flanged sections. Guide lines for choosing width, depth and percentage of reinforcements in beams. Design of singly reinforced rectangular section, Doubly reinforced rectangular section and singly reinforced flanged sections. Curtailment of flexural tension reinforcement.

Shear, Torsion and Bond: Limit state of collapse in shear, Modes of cracking, shear transfer mechanisms, shear span - depth ratio, shear failure modes. Nominal shear stress, critical sections for shear design, types of shear reinforcement. Truss analogy. General procedure for design of rectangular beams for shear. Limit state of collapse in torsion, Torsional shear stress in rectangular and flanged sections. Reinforcement in member subjected to torsion in RC beams. Design of RC beams subjected to combined effect of bending, shear and torsion. Concept of bond, development length, anchorage, bond, flexural bond.

Design of slabs: One way and Two-way action of slabs, Choosing slab thickness. Design of one way slab. Design of restrained and unrestrained two way slabs as per I.S. code provision. Shear forces in uniformly loaded Two-way slabs.

Columns: Define short and long columns, estimation of effective length of a column. Code requirements on slenderness limits, minimum eccentricity and reinforcement. Design of short column under axial compression with lateral ties and helical reinforcement. Design of short columns subjected to combined axial load and uniaxial moment. Design of short columns subjected to combined axial load and biaxial moment. Design of isolated square and rectangular footing.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 CE2202	
Course Title: REINFORCED CONCRETE STRUCTURES	
CO-1	Student should be able to understand and Design the Super structure and sub structure elements.

SYLLABUS: FLUID MECHANICS-II – II (B16CE 2203)

Viscous Effects on Fluid Motion:

Equation of Motion for Real Fluids – Modifications in Equation of Motion, Stress Strain Relationships, Tangential Stress Terms.

Navier-Stokes Equations (No Derivation) – N.S. equations for standard cases of Plane two Dimensional and Axisymmetric Flows.

Plane Two- dimensional Flows – Steady Flow between Parallel Plates, Couette and Poiseuille Flows; Axisymmetric Flows – Flow through a Circular Annulus, Flow without and with Pressure Gradient – Hagen-Poiseuille Equation; Relationship between Friction factor and Reynolds Number for Laminar Flow through Pipes; Stokes‟ law.

Boundary Layer Theory: Theory of Boundary Layer – Characteristics of Laminar Boundary Layer – Boundary Layer growth over a Flat Plate (without pressure gradient) – Boundary Layer Thickness and its Characteristics – Displacement, Momentum and Energy Thicknesses; Stability Parameter; Laminar and Turbulent boundary layers.

Boundary Layer Separation – Mechanism of Separation, Control of B.L. Separation; Boundary Layer on rough surfaces - Laminar Sublayer, Shear friction velocity; Friction Drag.

Turbulent Flow: Critical Reynolds Number – Characteristics of Turbulent Flow – Mean and Fluctuating Components of Velocity, Quantitative Description of Turbulence, Statistical Nature of Turbulent Flow, Isotropic and Homogeneous Turbulence.

Analysis of Turbulent Flows – Shear Stress due to turbulence – Semi-empirical Theories, Boussinesq Eddy Viscosity Model, Prandtl Mixing Length Concept; Velocity distribution for hydro dynamically smooth and rough pipes; Variation of Friction Factor in turbulent flow; Friction Factor for commercial pipes – Moody diagram.

Drag, Lift & Propulsion:

Concepts of Drag and Pressure Distribution over Immersed Bodies – Drag and Lift – Deformation Drag, Friction Drag, Form Drag – Drag coefficient.

Distribution of Fluid Pressure on immersed bodies – Pressure Distribution for flow past a circular disk, sphere; Effects of eddy pattern in two dimensional flow –Distribution of pressure for two dimensional flow past a cylinder – von Kármán vortex trail, Eddy shedding; Drag of immersed bodies – Variation of Drag Coefficient with Reynolds Number – Drag on Cylinder – Resistance diagram for bodies of revolution; Drag Coefficient of Practical Bodies.

Lift & Propulsion

Effect of Circulation in Irrotational Flow, Generation of Lift around a Cylinder, Magnus Effect, Computation of Lift Force; Lift on Airfoil – Lift Coefficient and its Variation with Angle of Attack, Joukowsky Profile, Polar Diagram, Stall; Induced Drag.

Open Channel Flows:

Basic Concepts – Introduction, Classification of Open Channels – Classification of Flow; Channel Geometry – Geometric Elements of a Channel Section; Velocity Distribution in a Channel Section; Wide Open Channel; Measurement of Velocity; Velocity Distribution Coefficients; Pressure Distribution in a Channel Section – Effect of Slope on Pressure Distribution; Basic Equations – Chezy’s Equation, Manning’s Equation.

Uniform Flow Computation;

Conveyance of a Channel Section – Section Factor and Hydraulic Exponent. Flow Characteristics in a Closed Conduit with Open Channel Flow; Determination of Normal Depth and Velocity; Design of Channels for Uniform Flow; Design of Non-erodible Channels; Best Hydraulic Section; Determination of Section Dimensions for Uniform Flow; Most Economical Channel Sections – Rectangular, Trapezoidal, Circular and Triangular Channel Sections; Critical Flow – Computation of Critical Flow, Section Factor for Critical Flow.

Application of Energy Principle in Open channels –

Definition of Specific Energy, Specific Energy Diagram, Critical depth, Critical Velocity, Conjugate or Alternate Depths, Sub-critical, Critical and Super- critical Flows, Froude Number, Relationship between Critical depth and Specific Energy for Rectangular, Trapezoidal Sections; Application of Momentum Principle in Open channels –

Specific Force; Canal Transitions – Change of Depth in Channels with Change in Cross-section and Hump in the Bed; Control Sections; Venturi Flume and Parshall Flume.

Varied Flow in Open Channels:

Analysis & computation of G.V.F: Definition of G.V.F. and Derivation of Governing Equation – Mild, Steep, Critical, Horizontal and Adverse Slopes – Backwater and Drawdown Curves – G.V.F. Profiles for Channels with Changing Slopes; Computation of G.V.F. Profiles

– Method of Direct Integration (Procedures Only), Direct Step Method – Computation of

G.V.F. Profiles in rectangular channels using Direct and Single Step methods (Simple Slope cases only).

Rapidly Varied Flow – Hydraulic jump, Types of jump, Hydraulic jump in horizontal rectangular

Channels; Surges.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 CE 2203	
Course Title: FLUID MECHANICS-II	
CO-1	Solve Turbulent Flow problems.
CO-2	Explain development of boundary layer in external and internal flows
CO-3	Identify variation of lift and drag coefficients with variation in flow
CO-4	Develop an expression for the discharge of uniform flow in open channels
CO-5	Interpret the specific energy diagram for a free surface flow
CO-6	Analyse practical problems in varied flow

SYLLABUS: BUILDING PLANNING & DESIGN (B16 CE 2204)

Residential Buildings: Different types of Residential Buildings Selection of Site for Residential Building. Brief Information of Housing Colonies for Different Income Groups in India-Sizes of Plots - Public Spaces, Evolutionary Housing Concept.

Climatology: Elements of Climate: Sun, Wind, Relative Humidity, Temperature effects, Comfort Conditions for House, various types of Macro Climatic Zones. Design of Houses and Layouts with Reference to Climatic Conditions. Orientation of Buildings. Solar Charts, Ventilation. Principles of Planning Anthropometric Data

Preliminary Drawings: (a) Conventional signs of materials various equipment used in a Residential Building (copying exercise) (b) Plan section and Elevation of a small House (one room and varandah) (copying exercise) (c) Plan section and Elevation of Two Bed Room House (copying exercise) (d) (e) (f) Plan section and Elevation of three bed room house in Hot and Humid zone, Hot and Arid zone, cold zone (copying exercises)

(a) Design of Individual rooms with particular attention to functional and furniture requirements. Building regulations and Byelaws of Residential Buildings;

(b) Auto Cad drawing of residential building (only for internal assessment)

Drawing the Plan Section and Elevation of Houses with given Functional requirements and climatic data. (Emphasis may be given to Hot and Humid zones.)

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 CE 2204	
Course Title: BUILDING PLANNING & DESIGN	
CO-1	Use the Conventional Signs in Design
CO-2	Design Different Types of Residential Buildings
CO-3	Appreciate influencing parameters in the design of Residential Building
CO-4	Develop Site Plan, Dimensional Plan, Front Elevation and Cross Section Elevations.
CO-5	Use the Auto Cad in the Design of Residential Buildings

SYLLABUS: ADVANCED SURVEYING METHODOLOGIES – II
(B16 CE 2205)

Theodolite- Types of Theodolite – Temporary Adjustments, Measurement of horizontal angle – Method of repetition, Method of reiteration – Uses of theodolites – Errors in theodolite or Permanent adjustments of a theodolite – Identification – Rectifying the errors.

Theodolite traversing – Open and closed traverse – Closing errors, Balancing the error – Bowditch method – Transit method, Omitted measurements – Gales traverse table or Trigonometric levelling – Elevation of top of the tower - same plane - Different planes – Axis signal correction.

Tacheometry – Principle of techeometry – Stadia methods – Fixed hair method – Movable hair method – Tangential method – Substance bar – Beamon's stadia, Arc – Reduction diagrams or Triangulation – Classification-intervisibility of station – Signals and towers-base line measurements – Corrections – Satellite station and Reduction to centre – Basenet.

Curves – Simple curves – Elements of simple curves – Methods of setting simple curves – Rankins method – Two theodolite method – Obstacles in curve setting – Compound curves– Elements of compound curves or Reverse curves – Elements of reverse curve – Determination of various elements – Transition curves – Ideal shape – Spiral transition curves - length of transition curve - Setting out methods.

Total Station Surveying: Electronic Theodolite, Electronic Distance Measurements, Total Station, Errors in measurements, Advantages, Disadvantages, Applications; Contour mapping, determination of height of remote point, position of hidden point, free station, Area measurement, volume measurement.

Modern surveying and mapping: GPS survey's – Introduction, Errors in GPS, Positioning methods, classification of GPS surveying, applications, advantages and disadvantages, photogrammetric surveying; sensors & platforms, aerial photogrammetry, Satellite images resolution, concept of stereo models, photogrammetric products, rectified images, orthophotography, topographic map, digital maps, DEM, GIS, Advantages & Disadvantages of photogrammetric surveying.

Course Outcomes for Second Year Second Semester Course	
Course Code:B16 CE 2205	
Course Title: ADVANCED SURVEYING METHODOLOGIES	
CO-1	Appreciate the importance of Theodolite in Surveying
CO-2	Apply Concepts of Tachometry in Surveying.
CO-3	Construct the Curves in Highways, road construction and canal works.
CO-4	Use the RS and GIS in designing
CO-5	Use the Total Station in Surveying.

SYLLABUS: ENGINEERING GEOLOGY (B16 CE 2206)

Introduction to General Geology:

Importance of geology from civil engineering point of view. Branches of Geology. Weathering – types and its engineering importance; Erosion, Soils: Soil profile, soil formation, types of Indian soils. Land forms produced by, running water and glaciers. Land forms produced by Wind, Sea Waves and Currents. Ground Water: origin, groundwater table, porosity and permeability. Aquifers, Groundwater Moment and Water, Bearing Properties of Rocks.

Mineralogy &Petrology:

Mineralogy: Mineral definition, physical properties of minerals. Study of important rock forming minerals: Silicate structures, Quartz, Feldspars, Pyroxenes, Amphiboles, Micas and Clays.

Petrology: Definition of rock. Types of rocks - Ingenious rocks: Granite, Synite, Dolerite, Gabro, Diorite, Basalt. Sedimentary rocks: Breccia, Conglomerate, Sandstone, Shale, Limestone. Metamorphic rocks: Gneiss, Khondalite, Schist, Slate, Marble, Quartzite, Charnokite. Engineering properties of rocks.

Statigraphy & Structural Geology:

Statigraphy: Geological Time scale, Major geological formations of India and their geological importance - Achaeans, Cuddapahs, Vindyans, Gondwanas and Deccan Traps. Mineral resources of Andhra Pradesh.

Structural Geology: Elements of Structural Geology- Strike, Dip, Plunge. Working principles of Clinometer compass and Brunton Compass and their use in Civil Engineering. Study of Geological Structures - Folds, Faults and Joints.

Remote Sensing and Geophysical Methods:

Remote Sensing: Introduction, Electromagnetic Spectrum, Aerial Photographs: types of aerial photos and flight planning. Aerial mosaics. Elements of photo interpretation. Satellite Remote Sensing: Satellites, Sensors and Data Products. Principles of Geographical Information Systems. RS and GIS applications to Civil Engineering.

Geophysical Methods: Principles of Geophysical Methods, Electrical, Seismic, Gravity and Magnetic. Principle of Resistivity method and configurations. Applications of Resistivity Method: Soil Profile, Hard rock and Ground Water Table. Principles of Seismic refraction and reflections methods and their applications to Civil Engineering problems.

Geological Investigations:

Role of Engineering Geologist in planning, design and construction and post construction stages in Civil Engineering works. Geological investigations for Dams and Reservoirs and Tunnels, Case Studies – Nagarjuna Sagar, Bhakra Nangal, Jawahar Tunnel. Geological investigations for bridges and multistoried structures. Geological investigations for highways, air fields and railway lines. Geological investigations for Coastal structures and Environmental Geology.

Course Outcomes for Second Year Second Semester Course	
Course Code:B16 CE 2206	
Course Title: ENGINEERING GEOLOGY	
CO-1	Elucidate the mega-scopic identification of rocks
CO-2	Categorize the rocks according to mega-scopic description
CO-3	Interpret geological maps
CO-4	Estimate the types of subsurface formation by using geophysical methods

SYLLABUS: TOTAL STATION AND GEOMATICS LAB (B16CE 2207)

LIST OF EXPERIMENTS

1. Measurement of Horizontal Angles by Repetition & Reiteration, Measurement of VerticalAngles, Heights & Distances
2. Distance between two in-accessible points by theodolite
3. Tachometry
4. Setting out curve by deflection angle method by two theodolites
5. Point positioning using GPS
6. Contour mapping using total station
7. Height of remote point using total station
8. Position of hidden point using total station
9. Area & volume measurement using total station
10. GIS related surveying applications

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 CE2207	
Course Title: TOTAL STATION AND GEOMATICS LAB	
CO-1	Relate the importance of Theodolite in Surveying
CO-2	Apply Concepts of Tachometry in Surveying.
CO-3	Construct the Curves in Highways, road construction and canal works.
CO-4	Use the RS and GIS in designing
CO-5	Use the Total Station in Surveying.

SYLLABUS: **ENGINEERING GEOLOGY LAB** (B16CE2208)

LIST OF EXPERIMENTS:

1. Study of physical properties and identification of minerals
2. Identification of rocks and their Engineering properties
3. Description and Identification of Geomorphological models
4. Description and Identification of Structural models
5. Geophysical methods – Electrical Resistivity & Seismic Methods
6. Simple Structural Geology problems

Lab Examination Pattern:

1. Description and identification of SIX minerals
2. Description and identification of SIX rocks (Igneous, Sedimentary and Metamorphic rocks)
3. Problem on geophysical method
4. Problem on Strike and Dip

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 CE2208	
Course Title: ENGINEERING GEOLOGY LAB	
CO-1	Elucidate the mega-scopic identification of rocks
CO-2	Categorize the rocks according to mega-scopic description
CO-3	Interpret geological maps
CO-4	Estimate the types of subsurface formation by using geophysical methods

SYLLABUS: FLUID MECHANICS LAB-I (B16 CE 2209)

LIST OF EXPERIMENTS

1. Study of Small orifice, by constant head method and Time of emptying a tank through asmall orifice.
2. Study of Cylindrical mouthpiece by constant head method and Time of emptying a tankthrough a cylindrical mouthpiece.
3. Study of floating body and determination of Meta -centric Height.
4. Study of surface profiles in Free and Forced Vortex motions.
5. Study of Venturimeter.
6. Study of Orifice meter.
7. Study of Flow nozzle meter.
8. Study of Sharp – crested full width and contracted weirs.
9. Study of V-notch and Trapezoidal notch.
10. Study of Broad-crested weir.
11. Study of Frictional Resistance in pipes.
12. Study of types of flow in pipes

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 CE2209	
Course Title: **FLUID MECHANICS LAB-I**	
CO-1	Define and Measure Fluid Properties.
CO-2	Illustrate Flow Measuring Devices used in pipes, channels and Tanks
CO-3	Analyze characteristics of broad crested weir.
CO-4	Illustrate the characteristics of surface profiles in free and forced vibrations.
CO-5	Compare sharp crested full width and contracted weirs

SYLLABUS: ADVANCED COMPUTATION SURVEYING / GEOINFORMATICS / GEOMATICSENGINEERING

(B16 CE 2210)

(Common to All Branches)

LIST OF EXPERIMENTS

1. Transferring and Drafting the collected raw data from total station survey using AutoCAD
2. Computation on drafted data using AutoCAD.
3. Developing Contour using raw data from total station using surfer software.
4. Visual Interpretation of standard FCC (False color composite).
5. Digitization of physical features on a map / image using GIS software.
6. Coordinates measurement using GPS.
7. Field data collection under national land use / land cover mapping on 1:120000 scale using temporal AWIFS data.
8. Asset Mapping of village using Bhuvans Panchayat Moblie App.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 CE 2210	
Course Title: INDUSTRY ORIENTED TECHNOLOGY LAB	
CO-1	Fully equipped with various surveying concepts and methods using advanced Ground survey equipment’s.
CO-2	Carry out profiling and grid levelling, for generation of profiles, contour maps, and earthworks Computations.
CO-3	Handle the Satellite images and interpret the satellite data.
CO-4	The interpret data can be used to prepare plan for urban development/town planning.
CO-5	Prepare the candidates with National Global employability.

CIVIL ENGINEERING

SYLLABUS: STRUCTURAL ANALYSIS (B16CE3101)

Analysis of statically indeterminate trusses (having not more than 7 members and 3 supports) containing (a) external redundant supports (b) internal redundant members using (i) method of consistent deformation of unit load method (ii) Castigliano's theorm – II.

Analysis of statically indeterminate frames (single storey, single bay portal frames only) using (i) slope-deflection method (ii)moment distribution method (iii) Kani's method

Arches: Introduction, Geometrical properties, Arch action, Normal thrust, radial shear and bending moment in three hinged and two hinged parabolic and segmental arches. Effects of yielding of supports, rib-shortening and temperature changes.

Cables and Suspension Bridges: Stresses in loaded cables with supports at the same and different levels. Length of cable; three hinged stiffening girders.

Introduction to matrix methods of structural analysis (very elementary treatment only) static indeterminacy, kinematic indeterminacy, Stiffness and flexibility method for two span continuous beams only.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE3101	
Course Title: STRUCTURAL ANALYSIS	
CO-1	Analyze indeterminate trusses and frames
CO-2	Evaluate indeterminate trusses and its application in the field.
CO-3	Analyze two and three hinged arches and its application.

SYLLABUS: REINFORCED CONCRETE STRUCTURES-II (B16CE3102)

Retaining Walls: Types of retaining walls, forces on retaining walls, Rankine and Coulomb earth pressure theories (c and φ soils). Passive earth pressure, Drainage of retaining walls, Stability requirements, Preliminary proportioning of cantilever retaining walls, Design of cantilever and counterfort retaining walls.

Water Tanks: Stress in concrete and steel in water tanks, Modular ratio, Impermeability requirements, Underground rectangular tanks, Elevated circular tanks, Design of these tanks for strength and cracking, Design of staging of circular tanks.

Bridges: Components of a bridge in sub structure and super structure. Classification of bridges. Highway loading standards, kerbs, footpaths, railings, parapet loadings, Impact, wind, longitudinal forces. Design of solid slabs (casual reference to MOST drawings)

Piles and Pile caps: Design of bored cast in situ piles (bearing and friction types), under reamed piles. Pile Caps design by bending action and truss action methods.

Bunkers and silos (sessional sonly): Difference between bunker and silos, Design of square or rectangular bunkers, Design of a battery of bunkers; Design of silos (circular).

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE 3102	
Course Title: REINFORCED CONCRETE STRUCTURES-II	
CO-1	Distinguish between behaviour of cantilever and counter fort retaining walls and analyse for maximum bending moment and shear force.
CO-2	Determine the stresses in various parts of underground and overhead water tanks including design.
CO-3	Analyze and design solid slab and T-beam bridges
CO-4	Importance of pile foundations and their design
CO-5	Importance of Bunker& Silos and their design.
CO-6	Apply IS 456 and bridge codal provisions to RC structures.

SYLLABUS: STEEL STRUCTURES (B16CE3103)

Fundamental Concepts of limit state design of structures, Different types of rolled steel sections available to be used in steel structures. Stress – Strain relationship for mild steel.

Bolted connections: Behaviour of bolted joints, Design strength of ordinary black bolts, high strength friction grip bolts, and Simple connections.

Welded Connections: Advantages of welding, Types and properties of welds, Types of joints,weld specifications, Design of welded joints subjected to axial load.

Tension members: Types of tension members, slenderness ratio, displacement of tension members, behaviour of tension members, modes of failure, factors affecting strength of tension members, design of tension members, Lug angles.

Compression members: Possible failure modes, behaviour of compression members, Effective length, radius of gyration and slenderness of compression members, Allowable stresses in compression, Design of axially loaded compression members, built upcompression members with Laced and Battened columns.

Column bases: Allowable stress in bearing, Design of Slab base, Design of Gusset base.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE 3103	
Course Title: STEEL STRUCTURES	
CO-1	Know the properties and fundamentals of steel sections.
CO-2	Know the connections in steel structures
CO-3	Identify the possible failure modes in compression members
CO-4	Importance of roof trusses and their design

SYLLABUS: GEOTECHNICAL ENGINEERING – 1 (B16CE3104)

Introduction: Historical development, Soil Formation, Minerals in clays and sand, Soil Structure, Physical properties of Soil: Void ratio, Porosity, Degree of Saturation, Water content, Unit Weights, Specific Gravity, weight –volume Relationships, Relative density, and Consistency limits: Determination and consistency indices, Activity.

Mechanical analysis and Soil Classification: Sieve analysis, stoke‘s law, hydrometer and Pipette Analysis. Unified soil classification and Indian Standard Soil Classification Systems, Field Identification of Soils.

Soil Hydraulics: Types of soil water, capillary rise and surface tension, Darcy‘s law and its limitations, constant head and variable head permeability tests, pumping tests, Factors effecting Coefficient of permeability, permeability of stratified soils. Total, neutral and effective stresses, Effective Stress Principle, Upward flow conditions, quick sand conditions, critical hydraulic gradient.

Stress Distribution in Soils: Bousinesq‘s theory for determination of vertical stress, assumptions and validity, rectangular and circular loaded areas, Pressure Bulb and Influence diagrams, westergaard‘s theory, Newmarks influence chart - construction and use, 2:1approximate method, contact pressure distribution beneath footings.

Compaction: Mechanism of compaction, Factors effecting compaction: water content, compactive effort, Type of soil. IS Light and IS Heavy compaction tests, Effect of compaction on soil Properties, Field compaction: compaction Equipment and Evaluation of field Compaction.

Consolidation: Basic Definitions: compression index, coefficient of compressibility and coefficient of volume decrease. Terzaghi‘s one dimensional consolidation theory - assumption, Derivation of differential equation and Solution, Odometer Test, Determination of coefficient of consolidation by time fitting methods, initial compression, primary compression and secondary compression, determination of preconsolidation pressure. Normally consolidated, over consolidated and under consolidated clays.

Shear Strength of Soils: Stress at a point, Mohr circle of stress, Mohr coulomb failure theory, shear parameters, laboratory shear tests – shear box, triaxial and unconfined compression tests, laboratory and field vane shear tests, Sensitivity of clays, Types of shear tests on drainage conditions, shear strength of sands, critical void ratio and dilatancy, Factors affecting shear strength of clays and sands, Total stress analysis and Effective stress analysis.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE 3104	
Course Title: GEOTECHNICAL ENGINEERING-I	
CO-1	Know the fundamental relationships between different parameters of a soil mass.
CO-2	Classify different types of soils and identify their properties.
CO-3	Appreciate the processes of compaction and consolidation and apply them to field problems.
CO-4	Estimate stress distribution and settlement of different soils in different conditions.
CO-5	Identify shear strength parameters for field conditions.
CO-6	Apply the knowledge of Soil Mechanics in solving the engineering problems

SYLLABUS: CONCRETE TECHNOLOGY (B16CE3106)

(Elective-I)

Cements &Admixtures: Portland cement – Chemical composition –Hydration, Setting of cement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements –Admixtures – Mineral and chemical admixtures – accelerators, retarders, airentrainers, plasticizers, super plasticizers, fly ash and silica fume.

Aggregates: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand –Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Gap graded and well graded aggregate as per relevant IS code – Maximum aggregate size.

Fresh Concrete: Steps in Manufacture of Concrete–proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of fresh concrete- Workability – Factors affecting workability – Measurement of workability by different tests, Setting times of concrete, Effect of time and temperature on workability – Segregation &bleeding – Mixing and vibration of concrete, Ready mixed concrete, Shotcrete.

Hardened Concrete: Water / Cement ratio – Abram‘s Law –Gelspaoe ratio – Nature of strength of concrete – Maturity concept – Strengthin tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength –Flexure tests –Splitting tests – Non-destructive testing methods – codal provisions for NDT.

Elasticity, Creep & Shrinkage– Modulus of elasticity –Dynamic modulus of elasticity – Poisson‘s ratio – Creep of concrete –Factors influencing creep – Relation between creep & time – Nature of creep– Effects of creep – Shrinkage –types of shrinkage.

Mix Design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Concepts Proportioning of concrete mixes by various methods –BIS method of mix design.

Special Concretes: Ready mixed concrete, Shotcrete -Light weight aggregate concrete – Cellular concrete – No-fines concrete, High density concrete, Fibre reinforced concrete – Different types of fibres – Factors affecting properties of F.R.C, Polymer concrete – Types of Polymer concrete– Properties of polymer concrete, High performance concrete – Self consolidating concrete, SIFCON, self-healing concrete.

Course Outcomes for Third Year First Semester Course	
Course Code:B16 CE 3106	
Course Title: CONCRETE TECHNOLOGY	
CO-1	Understand the basic concepts of concrete.
CO-2	Realise the importance of quality of concrete.
CO-3	Familiarize the basic ingredients of concrete and their role in the production of concrete and its behaviour in the field.
CO-4	Test the fresh concrete properties and the hardened concrete properties.
CO-5	Evaluate the ingredients of concrete through lab test results.
CO-6	Design the concrete mix by BIS method.
CO-7	Familiarize the basic concepts of special concrete and their production and applications.
CO-8	Understand the behaviour of concrete in various environments.

SYLLABUS: GIS & REMOTE SENSING (B16CE3107)

(Elective-I)

Introduction to remote sensing : Introduction, A brief history of RS, Energy sources and radiation principles, sensor systems used in RS, RS satellites, land sat, spot, IRS etc., RS data products, RS analysis examples – measurement analysis – classification.RS in civil engineering projects : Topographic mapping : Geometric characteristics, digital elementary model, Cartographic requirements of satellite data, Mapping using SLAR.

Resource Mapping: Geometric and hydrographic features. Soil mapping and characteristics. Application in water resource engineering. Environmental pollution monitoring. Regional and urban mapping, planning systems and waste disposal sites.

Introduction to GIS: Introduction, GIS overview, engineering of GIS applications, GIS components. Data Structures in Thematic maps: Data structures for GIS, Data base structures, Data models, H, N, R query languages for data models. The nature of geographic data, spatial data models, Raster data models, Vector data models, Data base management for GIS, Data structures for thematic maps. The choice between Raster and vector.

Digital Elevation Models: Importance of DEM, Methods of DEM, Image methods, Data sources and sampling methods for DEM.DATA INPUT, VERIFICATION, STORAGE AND OUTPUT :Data input, Data verification, Classification, and storage data output.

Data Quality, Errors and Natural Variation: Components of data quality, sources of errors, nature of boundaries, statical nature of boundaries, combining attributes from overland maps.

GIS Analysis Functions: Introduction, Organization of data analysis, Classification of functions, maintenance and analysis of spatial data, Maintenance& analysis of nonspatial attribute data, integrated analysis of spatial & non-spatial data, output formatting, and cartographic modeling.

Choosing and Implementing a GIS - Awareness, need for GIS, Developing system requirements, evaluation of alternative systems, system justification and development of an implementation plan, operational system.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE3107	
Course Title: GIS & REMOTE SENSING	
CO-1	Understand the basic concepts of GIS.
CO-2	Explain the sensor systems used in remote sensing
CO-3	Realize the importance of remote sensing in civil engineering.
CO-4	Classify the GIS analysis functions.
CO-5	Apply the knowledge in solving engineering issues by using GIS

SYLLABUS: PRESTRESSED CONCRETE (B16CE3108)

(Elective-I)

Introduction, Basic concepts of prestressing, need for high strength steel and concrete, advantages of prestressed concrete. Materials for prestressed concrete, high strength concrete and high strength steel. Prestressing systems (1) Fressinet System (2) Gifford Udall (3) Magnel Blatan System, Tensioning devices, anchoring devices. (d) Pre tensioning and Post tensioning.

Prestressing losses, Elastic shortening, loss due to shrinkage, loss due to creep, loss due tofriction, loss due to curvature etc.I.S. code provisions.

Analysis of pre stress members, assumptions, pressure, or thrust line concept of loadbalancing, cable profile, kern distance, stress in tendons as per IS 1343, cracking moment.

Limit state design of flexural members, stress, I.S. code provisions, design of symmetricalbeams, design of pre stressed concrete poles, design for shear, I.S. code provisions.

Transfer of prestress (Pretensioned members), Transmission length, bond stress, Transversetensile stress, End Zone reinforcement, flexural bond stress, I.S. Code Provisions.

Anchorage zone in post tensioned members, stress distribution in end block, Guyon‘s methodof approach of analysis of end block (Not more than 2 cables).

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE3108	
Course Title: PRESTRESSED CONCRETE	
CO-1	Understand the general mechanical behavior of prestressed concrete.
CO-2	Analyze and design prestressed concrete flexural members.
CO-3	Analyze and design for vertical and horizontal shear in prestressed concrete.
CO-4	Analyze transfer and development length as well as prestress losses.
CO-5	Analyze and design for deflection and crack control of prestressed concrete members.
CO-6	Analyze and design simple connections of prestressed concrete members.

SYLLABUS: BUILDING SERVICES AND MAINTENANCE (B16CE3109)

(Elective-I)

Maintenance of Building: Introduction, various problems occurs in buildings, White washing, colour washing and distempering, painting, replacement of glass panels, re- polishing of terrazo and mosaic, replacement of decayed timber, easing of doors and windows, repairs to damaged part of the flooring, cleaning of fire chimneys and gutters, removal of stains from concrete and terrazzo floor, anti-termite treatment (in building, foundations, floors and wood work), repairing of plumbing, drain and sanitary works. Repair of water storage sumps and tanks, repair of any joints i.e. wall-beam joint leak, beam-column,slab-beam, etc.

Special Repairs: Strengthening of foundation and foundation soils, rectification of leaking roof and concrete cover spalled roof, repairs to crack in masonry wall, repairs to leakage at window sill, special repairs to joinery work at roof level, providing D.P.C. to the exciting buildings, repairs to expansion and contraction joints, repairs to ramped floors. Repair of electrical installation system, repair of fire services system, repair of gas supply system. Repair of broad cast reception installation system, repair of security system, etc.

Repairs of Multistory Structures: Cracks in concrete, possible damages to the structural element-beams, slab, Column, Footings, etc., Repairing techniques like Jacketing, Grouting, External prestressing

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE3109	
Course Title: BUILDING SERVICES AND MAINTENANCE	
CO-1	Understand the basic issues occurring in the buildings.
CO-2	Realise the importance of maintenance of buildings.
CO-3	Apply the knowledge of repair techniques for rehabilitation of structures.

SYLLABUS: WATERSHED MANAGEMENT (B16CE3110)

(Common to all Branches)

Principles of Watershed Management: Basics concepts, Hydrology and water availability, Surface water, Groundwater, Conjunctive use, Human influences in the water resources system, Water demand, Integrated water resources system

River basins Watershed Management Practices in Arid and Semi-arid Regions, Watershed management through wells, Management of water supply - Case studies, short term and long term strategic planning

Conservation of Water: Perspective on recycle and reuse, Waste water reclamation Social Aspects of Watershed Management: Community participation, Private sector participation, Institutional issues, Socio-economy, Integrated development, Water legislation and implementations, Case studies

Sustainable Watershed Approach: Sustainable integrated watershed management, natural resources management, agricultural practices, integrated farming, Soil erosion and conservation.

Water Harvesting: Rainwater management - conservation, storage and effective utilisation of rainwater, Structures for rainwater harvesting, roof catchment system, check dams, aquifer storage

Applications of Geographical Information System and Remote Sensing in Watershed Management, Role of Decision Support System in Watershed Management.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE 3110	
Course Title: WATERSHED MANAGEMENT	
CO-1	Calculate watershed parameters and analyse watershed characteristics to take appropriate management action.
CO-2	Quantify soil erosion and design control measures.
CO-3	Apply land grading techniques for proper land management.
CO-4	Suggest suitable harvesting techniques for better watershed management.
CO-5	Apply appropriate models for watershed management.

SYLLABUS: GEOTECHNICAL ENGINEERING LAB - I (B16 CE 3112)

1. Atterberg limits
2. Field density by Core Cutter and Sand replacement method.
3. Grain size analysis
4. Hydrometer/pipette analysis.
5. Specific gravity by pycnometer/density bottle method.
6. Permeability of soil – Constant and variable head tests.
7. IS light compaction.

DEMONSTRATION EXPERIMENTS:

1. Consolidation test.
2. Quick sand model and others if any.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE 3112	
Course Title: GEOTECHNICAL ENGINEERING LAB - I	
CO-1	Determine physical properties of soil.
CO-2	Classify various types of soil.
CO-3	Determine the permeability of soil.
CO-4	Determine compaction characteristics of soils.
CO-5	Estimate in-situ density of soil.

SYLLABUS: VERBAL & QUANTITATIVE APTITUDE – I (B16CE3102)

(Common to all Branches)

Grammar: (VA**)**

Parts of speech(with emphasis on appropriate prepositions, co-relative conjunctions, pronouns-number and person, relative pronouns), articles(nuances while using definite and indefinite articles), tenses(with emphasis on appropriate usage according to the situation), subject – verb agreement (to differentiate between number and person) , clauses(use of the appropriate clause , conditional and relative clauses), phrases(use of the phrases, phrasal verbs) to-infinitives, gerunds, question tags, voice, direct & indirect speech, degrees of comparison, modifiers, determiners, identifying errors in a given sentence, correcting errors in sentences.

Vocabulary: (VA)

Synonyms and synonym variants (with emphasis on high frequency words), antonyms and antonym variants(with emphasis on high frequency words), contextual meanings with regard to inflections of a word, frequently confused words, words often mis-used, multiple meanings of the same word (differentiating between meanings with the help of the given context), foreign phrases, homonyms, idioms, pictorial representation of words, word roots, collocations.

Reasoning: (VA)

Critical reasoning (understanding the terminology used in CR- premise, assumption, inference, conclusion), Analogies (building relationships between a pair of words and then identifying similar relationships), Sequencing of sentences (to form a coherent paragraph, to construct a meaningful and grammatically correct sentence using the jumbled text), odd man (to use logical reasoning and eliminate the unrelated word from a group), YES-NO statements (sticking to a particular line of reasoning Syllogisms.

Usage: (VA)

Sentence completion (with emphasis on signpost words and structure of a sentence), supplying a suitable beginning/ending/middle sentence to make the paragraph coherent, idiomatic language (with emphasis on business communication), and punctuation depending on the meaning of the sentence.

Soft Skills:

Introduction to Soft Skills – Significance of Inter & Intra-Personal Communication – SWOT Analysis –Creativity & Problem Solving – Leadership & Team Work - Presentation Skills Attitude – Significance – Building a positive attitude – Goal Setting – Guidelines for Goal Setting – Social Consciousness and Social Entrepreneurship – Emotional Intelligence - Stress Management, CV Making and CV Review.

Course Outcomes for Third Year First Semester Course	
Course Code: B16ENG3102	
Course Title: VERBAL & QUANTITATIVE APTITUDE – I	
CO-1	Detect grammatical errors in the text/sentences and rectify them while answering their competitive/ company specific tests and frame grammatically correct sentences while Writing.
CO-2	Answer questions on synonyms, antonyms and other vocabulary based exercises while attempting CAT, GRE, GATE and other related tests.
CO-3	Use their logical thinking ability and solve questions related to analogy, syllogisms and other reasoning based exercises.
CO-4	Choose the appropriate word/s/phrases suitable to the given context in order to make the sentence/paragraph coherent.
CO-5	Apply soft skills in the work place and build better personal and professional relationships making informed decisions.

Part-B: Quantitative Aptitude –I

Numbers, LCM and HCF, Chain Rule, Ratio and Proportion

Importance of different types of numbers and uses of them: Divisibility tests, Finding remainders in various cases, Problems related to numbers, Methods to find LCM, Methods to find HCF, applications of LCM, HCF. Importance of chain rule, Problems on chain rule, introducing the concept of ratio in three different methods, Problems related to Ratio and Proportion.

Time and work, Time and Distance

Problems on man power and time related to work, Problems on alternate days, Problems on hours of working related to clock, Problems on pipes and cistern, Problems on combination of the some or all the above, Introduction of time and distance, Problems on average speed, Problems on Relative speed, Problems on trains, Problems on boats and streams, Problems on circular tracks, Problems on polygonal tracks, Problems on races.

Percentages, Profit Loss and Discount, Simple interest, Compound Interest, Partnerships, shares and dividends

Problems on percentages-Understanding of cost price, selling price, marked price, discount, percentage of profit, percentage of loss, percentage of discount, Problems on cost price, selling price, marked price, discount. Introduction of simple interest, Introduction of compound interest, Relation between simple interest and compound interest, Introduction of partnership, Sleeping partner concept and problems, Problems on shares and dividends, and stocks.

Introduction, number series, number analogy, classification, Letter series, ranking, directions

Problems of how to find the next number in the series, Finding the missing number and related sums, Analogy, Sums related to number analogy, Ranking of alphabet, Sums related to Classification, Sums related to letter series, Relation between number series and letter series, Usage of directions north, south, east, west, Problems related to directions north, south, east, west.

Data sufficiency, Syllogisms

Easy sums to understand data sufficiency, frequent mistakes while doing data sufficiency**,** Syllogisms Problems.

Course Outcomes for Third Year First Semester Course	
Course Title: PART-B: QUANTITATIVE APTITUDE -I	
CO-1	To familiarize students with basic problems on numbers and ratio‘s problems.
CO-2	To enrich the skills of solving problems on time, work, speed, distance and also measurement of units.
CO-3	To enable the students to work efficiently on percentage values related to shares, profit and loss problems.
CO-4	To inculcate logical thinking by exposing the students to reasoning related questions.
CO-5	To expose them to the practice of syllogisms and help they make right conclusions.

SYLLABUS: GEO ENVIRONMENTAL ENGINEERING (B16 CE 3113A)

(MOOCS-I)

1. Introduction, Sources & Impact of Contamination and Soil-Waste Interaction
2. Concepts of Integrated SWM &Geo environmental Engineering
3. Principles and Planning of Landfills
4. Liners for Landfills
5. Landfill Covers, Generation and Control of Leachate and Gas from Landfills
6. Stability of Slopes and Settlement of Landfills
7. Solved examples, Monitoring and Detection of Subsurface Contamination
8. Costs, Construction Aspects and Site Selection of Landfills
9. Control, Rehabilitation of Old Dumps and Contaminated Sites 10 Slurry Deposited Waste and their Geotechnical Properties
10. Planning & Design, Incremental Raisings and Failures of Slurry Ponds
11. Environmental Control Measures at Slurry Ponds, Geotechnical Reuse of Waste.

WEB LINK:

https://onlinecourses.nptel.ac.in/noc18_ce33/preview

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE 3113A	
Course Title: GEO ENVIRONMENTAL ENGINEERING	
CO-1	Understand the concepts of Integrated SWM & Geo environmental Engineering
CO-2	Learn the Principles and Planning of Landfills
CO-3	Explain Geotechnical Properties of Slurry Deposited Waste
CO-4	Learn Environmental Control Measures at Slurry Ponds, Geotechnical Reuse of Waste

SYLLABUS: HIGHER SURVEYING (B16 CE 3113B)

(MOOCS-I)

1. What is Higher Surveying? Need and pre-requisites for Higher Surveying, Connection of Basic Surveying with Higher Surveying, detailed course content, books, notes, and other sources. Fundamental requirements of higher surveying: platform requirements, type of surveys, type of sensors, scanning mechanisms, scale and resolution of survey, planning of survey, data acquisition and data management Coordinate systems in mapping for Earth surface.
2. Coordinate and datum transformations for 3D coordinates on Earth surface; Introduction to Adjustments Computations.
3. Methods of Adjustments Computations Accuracy assessment of parameters using Adjustments Computations.
4. Positioning and direction survey for navigation. Introduction to Photogrammetric survey.
5. Physical models of photogrammetry Collinearity and coplanarity equations. Space resection, space intersection, and aerial triangulation for photogrammetry . Bundle adjustment, camera calibration, relative and absolute orientation, direct geo referencing
6. Mathematical models of photogrammetry Affine, Conformal, Rational functional model(RFM), and direct linear transformations. Close range and terrestrial photogrammetry for mapping.
7. Introduction to LiDAR survey and fundamental concepts Flight planning for airborne LiDAR data acquisition.
8. Geolocation process Error propagation and accuracy assessment for LiDAR 3. LiDAR data processing for DTM, DSM, BEM, and DEM generation.
9. LiDAR data processing for DTM,DSM, BEM, and DEM generation Introduction to Sounding and Bathymetry survey and fundamental concepts.
10. Data acquisition planning and execution for Sounding surveys Introduction to Radar interferometry survey and fundamental concepts Mapping with RADAR technique.
11. Mapping with RADAR technique Compatibility of various Higher Surveying techniques Applications of Higher Surveying techniques for Archeological Surveys.
12. Applications of Higher Surveying techniques for Cadastral survey and building detection and extraction Applications of Higher Surveying techniques for forestry Applications of Higher Surveying techniques for measurements of surface deformation and plate tectonic movement Applications of Higher Surveying techniques for 3D mapping and virtual model development. Applications of Higher Surveying techniques for Geomorphological features mapping.

WEB LINK:

https://onlinecourses.nptel.ac.in/noc18_ce37/preview

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE 3113B	
Course Title: HIGHER SURVEYING	
CO-1	Understand Need and pre-requisites for Higher Surveying
CO-2	Be aware of Coordinate and datum transformations for 3D coordinates on Earth surface
CO-3	Recognize Geolocation process
CO-4	Learn Mapping with RADAR technique
CO-5	Know about the Applications of Higher Surveying techniques for Archeological Surveys,forestry, etc.

SYLLABUS: INTEGRATED WASTE MANAGEMENT FOR A SMART CITY (B16 CE 3113C)
(MOOCS-I)

1. Introduction to Solid Waste Management
2. Municipal Solid Waste Characteristics and Quantities
3. MSW Rules 2016, Swachh Bharat Mission and Smart Cities Program
4. Municipal Solid Waste Collection, Transportation, Segregation and Processing Disposal of Municipal Solid Waste: Landfill
5. Biochemical Processes and Composting
6. Energy Recovery from Municipal Solid Waste
7. Current Issues in Solid Waste Management and Review of MSW Management Status inFirst List of 20 Smart Cities in the Country
8. Construction and Demolition (C&D) Waste Management - Overview
9. C&D Waste – Regulation, Beneficial Reuse of C&D Waste Materials
10. Electronic Waste (E-Waste) Management – Issues and Status in India and Globally
11. E-Waste Management Rules 2016 and Management Challenges

WEB LINK:

https://onlinecourses.nptel.ac.in/noc18_ce25/preview

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE 3113C	
Course Title: INTEGRATED WASTE MANAGEMENT FOR A SMART CITY	
CO-1	Understand The environmental impact of waste management and its relationship on the sustainable development and smart city development
CO-2	Familiarize the role of MSW management within the various initiatives of the Govt. of India
CO-3	Recognize the challenges of waste management for smart cities
CO-4	Make acquainted with the Construction and Demolition (C&D) Waste and Electronic Waste (E-Waste) management issues in India in general and for the smart cities in particular.

SYLLABUS: INTRODUCTION TO ACCOUNTING AND FINANCE FOR CIVIL ENGINEERS (B16CE113D)

(MOOCS-I)

1. Basic Accounting and concepts in finance Book keeping: definitions, objectives, elements, journal and ledger
2. Accounting & Concepts in Finance I: definitions, objectives, characteristics, limitations, basic terms, GAAP(Generally Accepted Accounting Principles)
3. Accounting & Concepts in Finance II: Systems of accounting, cash book, bankbook, depreciation, provisions, reserves, accounting equation, journal & ledger entries, trial balance, profit & loss account, balance sheet, cash flow statement)
4. Analysis of financial statements I:Financial leverage, financial ratios
5. Analysis of financial statements II: Significance and applications
6. Financial planning including capital budgeting I: Definition, financial planning options and objectives, time value of money
7. Financial planning including capital budgeting II: simple and compound interest, rule of72, methods of capital budgeting - payback period
8. Financial planning including capital budgeting III: Accounting rate of return(ARR), netpresent value (NPV),internal rate of return (IRR)

WEB LINK: https://onlinecourses.nptel.ac.in/noc18_ce39/preview

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE 3113D	
Course Title: INTRODUCTION TO ACCOUNTING AND FINANCE FOR CIVIL ENGINEERS	
CO-1	Learn the Basics of accounting and terminology related to financing
CO-2	Understand the Concepts of finance and general Principles of accounting
CO-3	Know the Concepts of Balancing sheet, ledgers, journal
CO-4	Analyze the financial statements-financial ratios

SYLLABUS: Fire Protection, Services and Maintenance Management for Building (B16 CE 3114A)

(MOOCS-II)

1. Fire Protection: Process of combustion in fire, Effect of fire load & ventilation conditionon enclosure fire, growth and decay of fire in enclosure.
2. Concepts of fire resistant and severity, Effect of fire on materials. Simple Design of elements for given fire resistance.
3. Planning, Fire detection & suppression systems, Smoke venting
4. Lifts & Vertical Transportation: arrangement of lifts and Design for optimum servicecondition.
5. Building Services as a system, Capacity of storage and sizing, control systematic. &intelligent building.
6. HVAC System: Design Consideration. Basic psychometrics, Air conditioning process &system. Methods of Air Conditioning.
7. Water Supply, Hydraulic design, Storage Distribution, Component of cold & hot watersupply system.
8. Waste water & Drainage systems: Fixture units & Design of system and elements ofelectrical services.
9. Definition, Role of building maintenance in construction process Maintenance generators, Expression of Standards, selection of level of maintenance and fixing standards.
10. Planned maintenance: Planning vis-a-vis adhoc maintenance, schedule& contingencymaintenance, levels of planning, planned inspection, etc
11. Maintenance cycle, maintenance profile, repair & replacement models, statisticalmethods, decision models, optimal renewal cycle, budgeting etc
12. Effect of design on maintenance, Diagnosis, appraisal, structural defects& variousmethods of repair.

WEB LINK: https://onlinecourses.nptel.ac.in/noc18_ce30/preview

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE 3114A	
Course Title: FIRE PROTECTION, SERVICES AND MAINTENANCE MANAGEMENT FOR BUILDING	
CO-1	Understand the Concepts of fire resistant and severity, Effect of fire on materials
CO-2	Be aware of Building Services as a system and HVAC System
CO-3	Recognize role of building maintenance in construction process Maintenance generators
CO-4	Know the effect of design on maintenance, Diagnosis, appraisal, structural defects & various methods of repair.

SYLLABUS: MODERN CONSTRUCTION MATERIALS (B16 CE 3114B)

(MOOCS-II)

Prologue – Intro. to the course, Science, Engineering and Technology of Materials- 1&2, Atomic Bonding-1, Atomic Bonding-2, Structure of Solids-1, Structure of Solids-2&3, Movement of Atoms, Development of Microstructure-1, Development of Microstructure-2, Surface Properties, Response to Stress-1, Response to Stress-2&3, Failure Theories, Fracture Mechanics-1, Fracture Mechanics-2, Rheology & Thermal properties, Review of Const. Materials & Criteria for Selection, Wood and Wood Products-1,Wood and Wood Products-2, Wood and Wood Products-3, Polymers, Fibre Reinforced Polymers-1&2,Metals-1, Metals-2, Metals-3, Bituminous Materials-1, Bituminous Materials-2, Concrete-1&2, Concrete-3, Concrete-4, Concrete-5, Glass, Social Perception of Const. Materials, Waterproofing Materials, Polymer Floor Finishes, Anchors.

WEB LINK: https://onlinecourses.nptel.ac.in/noc18_ce22/preview

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE 3114B	
Course Title: MODERN CONSTRUCTION MATERIALS	
CO-1	Learn about atomic bonding and structure of solids
CO-2	Understand about the Movement of Atoms, Development of Microstructure
CO-3	Study the Failure Theories, Fracture Mechanics
CO-4	Familiarize with wood products, metals, bituminous materials, concrete and polymers.

SYLLABUS: PRINCIPLES OF CONSTRUCTIONMANAGEMENT (B16 CE 3114C)

(MOOCS-II)

1: General overview and project organization

2: Estimation of project cost

3: Construction Economics

4: Planning and scheduling: part-1

5: Planning and scheduling: part-2

6: Quality management

7: Safety Management

8: Legal aspects of a construction project

WEB LINK: https://onlinecourses.nptel.ac.in/noc18_ce15/preview

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE 3114C	
Course Title: PRINCIPLES OF CONSTRUCTION MANAGEMENT	
CO-1	Learn about the Estimation of project cost and construction economics.
CO-2	Understand about the Planning scheduling and Execution phases of a project.
CO-3	Study the Safety management and Quality management aspects.
CO-4	Learn various legal aspects of a construction project.

SYLLABUS: REINFORCED CONCRETE ROAD BRIDGES (B16 CE 3114D)

(MOOCS-II)

1. Introduction, design considerations, loads and IRC codes
2 Flexural and shear strength of reinforced concrete members
3. Solid slab bridge design
4. T-beam bridge design

Web Link: https://onlinecourses.nptel.ac.in/noc18_ce23/preview

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CE 3114D	
Course Title: REINFORCED CONCRETE ROAD BRIDGES	
CO-1	Familiarize with design considerations, loads and IRC codes
CO-2	Design Solid slab bridge
CO-3	Design T-beam bridge

SYLLABUS: ADVANCED STEEL STRUCTURES (B16CE3201)

Beams: Beam types, section classifications, lateral stability of beams, Allowable stress in bending, Shear and Bearing stresses, Effective length of compression flange, laterally supported and unsupported beams.

Plate Girders (Bolted and Welded): Components of a plate girder, Economical depth, proportioning of web and flanges, shear buckling resistance of web by simple post critical and tension field methods, connection of flange angles to web and flange angles to flange plates.

Web stiffeners: Design of bearing stiffeners. End panel design, design of intermediate stiffeners, connections.

Water tanks: Introduction, permissible stresses in water tanks, Design of circular steel water tank: forces acting over the tanks, stresses in elevated circular tanks, stresses in segmental and spherical bottoms, stresses in conical bottom, Design of circular girder (ring beam), staging for circular steel tanks, stresses in columns, wind bracings.

Eccentric shear connections: Introduction, beam-columns connections, connections subjected to eccentric shear: welded seat connections: unstiffened seat angle connection and stiffened seat angle connections.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 CE 3201	
Course Title: ADVANCED STEEL STRUCTURES	
CO-1	Understand the behavior of steel structures, in particular the various forms of failure for members and connections under tension, compression, bending and combined actions.
CO-2	Apply the principles, procedures and current code requirements to the analysis and Design of steel tension members, beams, plate girders and water tanks
CO-3	Understand eccentric shear connections.

SYLLABUS: GEOTECHNICAL ENGINEERING – II (B16CE3202)

Subsoil Exploration: Methods of subsoil exploration Direct, semi direct and indirect methods, Soundings by Standard, Dynamic cone and static cone penetration tests, Types of Boring, Types of samples, Criteria for undisturbed samples, Transport and preservation of samples, Bore logs, planning of exploration programmes, report writing.

Bearing Capacity: Safe bearing capacity and allowable bearing pressure, General and local shear failures, Terzaghi's bearing capacity equations its modifications for square, rectangular and circular foundations, Factors affecting bearing capacity of Soil, Effect of water table on bearing capacity, IS Code method for Bearing capacity of footings, Allowable bearing pressure based on N-values. Bearing capacity from plate load tests.

Shallow Foundations: Factors effecting locations of foundation and design considerations of shallow foundations, choice of type of foundations.

Settlement Analysis: Causes of settlement, Computation of immediate and consolidation settlement, allowable settlement. Measures to reduce settlement.

Pile Foundations: Types, Construction, load carrying capacity of single piles in sands and clays (α-method) Dynamic Formula, Static formula, Pile load tests, Load carrying capacity of pile groups.

Caissons: Types of caissons, pneumatic caissons, Different shapes of well foundations, Relative advantages and disadvantages, Different Components of well and their function, Grip length, problems in well sinking and remedial measures.

Stability Analysis of Slopes : Infinite and Finite Slopes, Stability Analysis of Infinite Slopes, different factors of safety, Types of Slope Failures – Toe slope and Base failure, , Stability Analysis of Finite slopes – Swedish Circle method, Friction Circle method, Fellineous method for location of Critical Slip Circle, Taylor's stability number.

Earth Pressure: Types of Earth pressure, Rankines Active and passive earth pressure, Smooth Vertical wall with horizontal and inclined backfills. Coloumbs wedge theory, Culmans and Rebhanns graphical method for active earth pressure, Retaining walls: Types and Stability Analysis.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 CE3202	
Course Title: GEOTECHNICAL ENGINEERING-II	
CO-1	Plan a detailed soil exploration programme.
CO-2	Apply various methods for estimating bearing capacity of different types of foundations.
CO-3	Perform the settlement analysis of footings.
CO-4	Estimate load capacity of single piles and groups of piles.
CO-5	Know the theory aspects of well foundations.
CO-6	Analyze stability of finite and infinite slopes.
CO-7	Calculate earth pressures on retaining walls following Rankine's and Coulomb's theories

SYLLABUS: FLUID MECHANICS - III (B16CE3203)

Dimensional Analysis and Similitude: Fundamental Concepts of Dimensional Analysis – Importance of Dimensional Analysis & Model Study; Units and Dimensional Formulae for Various Engineering Quantities; Fourier Concept of Dimensional Homogeneity.

Methods of Arriving at Dimensionless Groups – Non-dimensional Parameters; Rayleigh‘s Method; Buckingham π method – Buckingham modified method; Omitted and Superfluous variables.

Examples in Dimensional Analysis – Capillary Rise, Drag on Cylinder, Resistance of a Ship, Discharge over a Sharp Crested Weir, Fall Velocity of a Sphere, Head Characteristics of a Pump, Thrust on a Propeller,

Similarity and Similarity Laws – Concepts of Similarity – Geometric, Kinematic and Dynamic Similarities; Modeling Criteria; Similarity Laws – Important Dimensionless Numbers – Reynolds Number, Froude Number, Mach Number, Euler Number, Weber Number.

Application of Similarity Laws to Practical Problems – Bodies Completely Submerged in Fluids, Bodies subjected to Gravity and Viscous Forces, River Models – Manning‘s Law; Distorted Models – Depth distortion and slope distortion; Problems related to Modeling of Spillways, Ships and Pumps & Turbines.

Impact of jets: Force exerted by fluid jet on stationary and moving flat and curved vanes, Torque and Work done by series of Moving Vanes.

Hydraulic Machines– Turbines: Introduction and Classification of Turbines – Function of Prime movers and Pumps, Hydraulic Turbines, Classification Based on Head, Discharge, Hydraulic Action – Impulse and Reaction Turbines, Differences between Impulse and Reaction Turbines; Choice of Type of Turbine – Specific Speed.

Working of Impulse Turbines & Design Principles – Components & Working Principles of a Pelton Turbine – Work Done; Hydraulic and Overall Efficiencies; Design of Pelton Turbine – Working Proportions; Governing Mechanism for a Pelton Turbine.

Working of Reaction Turbines & Design Principles – Components & Working Principles of a Francis Turbine – Work Done; Hydraulic and Overall Efficiencies; Design of Francis Turbine– Working Proportions; Governing Mechanism for a Francis Turbine. Draft Tube Theory – Functions and Types of Draft Tubes in Reaction Turbines, Efficiency of Draft Tube; Kaplan turbine and working proportions of Kaplan turbine.

Performance & characteristics of Turbines: Unit Quantities, Specific Speed and its importance; Model Relationships; Operating Characteristic Curves; Cavitation problem in Turbines – Thoma‘s Cavitation Factor.

Hydraulic Machines – Centrifugal Pumps Functions of a Pump – Types of Pumps – Selection Criterion – Roto dynamic and Positive Displacement Pumps – Comparison between Centrifugal & Reciprocating Pumps.

Centrifugal Pumps – Components & Working principles of Centrifugal Pumps; Classification of Centrifugal Pumps – Impellers based on Shape and Type of Casing, Pump with Volute Casing, Pump with Vortex Chamber & Pump with Guide vanes, Closed, Semi-closed & Open Impellers, Axial, Radial & Mixed Flow Impellers; Working Head and Number of Stages, Single & Double Suction. Work done by Centrifugal Pumps – Pressure Change in a Pump, Manometric and Static Head – Velocity triangles – Effect of Vane Shape; Pump Losses and Efficiency – Pressure Rise in the Impeller – Minimum Starting Speed of pump – Multistage Pumps; Pumps in Parallel and Series.

Performance Characteristics of Pumps – Similarity Relations and Specific speed of Pumps – Dimensionless characteristics – Constant efficiency curves of Centrifugal Pumps

Hydraulic Machines – Reciprocating Pump & Hydraulic Ram: Reciprocating Pumps – Fundamental concepts, Component Parts and Working principle of Single Acting and Double Acting Reciprocating Pumps – Discharge Coefficient, Volumetric Efficiency and Slip; Work done by Reciprocating pumps – Work Done and Power Input – Indicator Diagram – Effect of Acceleration and Friction on Indicator Diagram – Maximum Speed of Rotation of Crank; Air Vessels and their principles – Modified Indicator Diagram in the presence of Air Vessels, Work Saved due to Presence of Air Vessel, Flow into and from Air Vessel. Hydraulic Ram – Working Principle of Hydraulic Ram.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 CE3203	
Course Title: FLUID MECHANICS - III	
CO-1	Apply the concepts of Gradient, Divergence, Curl, Directional derivative, solenoidal and Irrotational fields
CO-2	Determine scalar potential, circulation and work done
CO-3	Evaluate integrals using Green's, Stokes' and Divergence theorems
CO-4	Obtain the solution of 1-D wave equation and 1-D heat equation
CO-5	Determine the zeroes and poles of functions and residues at poles
CO-6	Evaluate certain real definite integrals that arise in applications by the use of Residue theorem

SYLLABUS: ESTIMATION AND QUANTITY SURVEYINGI (B16CE3204)

UNIT-I

Highway Planning and Alignment: Highway development in India; Classification of Roads; Road Network Patterns; Necessity for Highway Planning; Different Road Development Plans – First, second, third road development plans, road development vision 2021, Rural Road Development Plan – Vision 2025; Planning Surveys; Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

UNIT-II

Highway Geometric Design: Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements-Stopping sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment-Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical alignment-Gradients- Vertical curves.

UNIT-III

Traffic Engineering: Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies; Speed studies –spot speed and speed & delay studies; Parking Studies; Road Accidents- Causes and Preventive measures - Condition Diagram and Collision Diagrams; PCU Factors, Capacity of Highways – Factors Affecting; LOS Concepts; Road Traffic Signs; Road markings; Types of Intersections; At-Grade Intersections – Design of Plain, Flared, Rotary and Channelized Intersections; Design of Traffic Signals –Webster Method –IRC Method.

UNIT-IV

Highway Materials: Subgrade soil: classification –Group Index – Subgrade soil strength – California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Desirable properties – Tests for Road Aggregates – Bituminous Materials: Types – Desirable properties – Tests on Bitumen – Bituminous paving mixes: Requirements – Marshall Method of Mix Design. **Design Of Pavements:** Types of pavements; Functions and requirements of different components of pavements; Design Factors

Flexible Pavements: Design factors – Flexible Pavement Design Methods – CBR method – IRC method – Burmister method – Mechanistic method – IRC Method for Low volume Flexible pavements.

Rigid Pavements: Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses – Combination of stresses – Design of slabs – Design of Joints – IRC method

– Rigid pavements for low volume roads – Continuously Reinforced Cement Concrete Pavements – Roller Compacted Concrete Pavements.

UNIT-V

Highway Construction and Maintenance: Types of Highway Construction – Earthwork; Construction of Earth Roads, Gravel Roads, Water Bound Macadam Roads, Bituminous Pavements and Construction of Cement Concrete Pavements.

Pavement Failures, Maintenance of Highways, pavement evaluation, strengthening of existing pavements

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 CE 3204	
Course Title: ESTIMATION AND QUANTITY SURVEYING	
CO-1	List out the various components and units of measurements of different works.
CO-2	Explain various types of estimates and general, detailed specifications of various items of work
CO-3	Apply the method of building estimate to find out the quantities of various items of work
CO-4	Determine the rate per unit of various items of work
CO-5	Select various methods to find out the valuation of a property

SYLLABUS: ENVIRONMENTAL ENGINEERING – II (B16CE3205)

Sanitation – systems of sanitation– sewerage systems – Estimation of sewage flow and storm water – design of sewers –sewer types – Layout of sewer network – materials for sewers – cleaning and ventilation methods – sewer appurtenances

Pumping – necessity– pumping station – its location – functions – types of pumps- sewage and water pumping requirements- House drainage systems – traps – classification – drain pipes – plumbing systems – Layout of building drainage – Storm water drainage

Quality of sewage – Sampling and analysis - decomposition- cycles of decomposition – BOD

– COD – Layout of sewage treatment plant – F/M importance – preliminary treatment – screens – grit chamber – skimming tanks – Primary treatment – Sedimentation tanks

Secondary treatment – Attached growth process – contact beds – intermittent sand filters – trickling filters – Suspended growth process – activated sludge process- Miscellaneous methods for sewage treatment – oxidation ponds - oxidation ditches - RBC's - sewage lagoons- extended aeration process – septic tanks – imhoff tanks

Sewage disposal methods – natural and artificial methods –Sludge generation- characteristics- treatment- sludge disposal methods.

Course Outcomes for Third Year Second Semester Course	
Course Code:B16 CE 3205	
Course Title: ENVIRONMENTAL ENGINEERING - II	
CO-1	Compare water and waste water
CO-2	Explain principles of conventional treatment process and miscellaneous treatment techniques
CO-3	Examine the operational differences of each unit process
CO-4	Interpret the feasible technique required for particular waste water
CO-5	Determine the size of unit operations using working principles of each
CO-6	Design a sewage treatment plant assuming whatever data is required

SYLLABUS: GROUND IMPROVEMENT TECHNIQUES (B16CE3206)

(Elective-II)

In-situ densification Methods: granular soils – Introduction of Vibration at the ground surface, Impact at the Ground surface, Vibration at depth, Impact at depth, compaction control; cohesive soils - introduction, preloading or dewatering, drain walls, sand drains, sand wicks, geodrains/band drains, stone and lime columns, forced vaccum pre consolidation, thermal methods.

Stone columns, introduction, construction practice, design principles, design of stone columns, vibrofloatation techniques and other techniques like dynamic replacement etc.

Grout injections, suspension and solution grouts, grouting equipment and methods, Applications.

Reinforced Earth: Principles, components of reinforced earth, functions, determination of angle of interfacial friction, factors effecting angle of interfacial friction.

Stabilization: Mechanical stabilization, Soil aggregate mixture, properties and proportioning techniques, soft aggregate stabilization, compaction, field compaction control. Cement stabilization, Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques. Lime and Bituminous Stabilization: Types of admixtures, mechanism, factors affecting, construction methods.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 CE 3206	
Course Title: GROUND IMPROVEMENT TECHNIQUES	
CO-1	Apply in-situ densification methods for improving cohesive and cohesion less soil deposits. Design stone column for improving soft clays.
CO-2	Apply grouting technique for improving soils.
CO-3	Understand the concepts of reinforced earth.
CO-4	Understand various soil stabilization techniques.

SYLLABUS: ENVIRONMENTAL IMPACT ASSESMENT (B16CE3207)

(Open elective)

EIA and EIS concepts – Elements of EIA – Guidelines in USA, preparation of EIS, Elements of EIA

Agency Activities, Environmental Setting, Environmental attributes, air, water, soil, ecology, noise, Socioeconomic aspects, Culture and Human aspects (Human settlements – rehabilitations)

Environmental impacts, Identification measurement, Aggregation, Secondary and Cumulative Impacts

Criteria for selection of methodology, impact assessment methodologies, procedure for reviewing environment impact statement.

Case studies, Economic Impact analysis energy production impact analysis, cost benefit analysis, Environmental impact mitigation and control measures.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 CE 3207	
Course Title: ENVIRONMENTAL IMPACT ASSESMENT	
CO-1	Define the terms related to EIA
CO-2	List out the elements of EIA and guidelines to prepare EIS
CO-3	Identify the environmental attributes to be considered for the study
CO-4	Explain the methodologies for EIA and review the relief and rehabilitation works
CO-5	Discuss the case studies of EIA
CO-6	Adapt the suitable measures to control the environmental impact

SYLLABUS: MARINE STRUCTURES (B16CE3208)

(Elective-II)

Introduction: Waves, tides, tsunamis, storm surge and currents. Wave forces on small and large cylinders, Sea walls, Design of break waters and jetties.

Break waters – Types – Selection of site and type – effects on the beach – Design principles of Rubble mound and composite Breakwaters – Stability of Rubble Structures, Wharves and Jetties.

Introduction: Offshore definition, Purpose of Offshore Structures, Classification and Examples, Various types of Offshore Structures – Jacket Platforms, Semi submersibles, Tension Leg Platforms, Gravity Platforms Guyed Towers, Articulated Towers.

Load Calculations:

I. Environmental loads on off shore structures due to

   a) Wind b) Wave c) Current d) Ice e) Earth quake

II. Functional loads;

III. Buoyant Forces;

IV. Installation forces, Soil structure interaction.

Preliminary design aspects of offshore structures. Construction, Towing and installation procedure of Jacket platforms and Gravity platforms.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 CE 3208	
Course Title: MARINE STRUCTURES	
CO-1	Design of break waters and jetties.
CO-2	Understand the principles of rubble mound and composite breakwaters.
CO-3	Evaluate various loads on offshore structures.

SYLLABUS: URBAN HYDROLOGY (B16CE3209)

(Elective-II)

Introduction: Urbanisation and its effect on water cycle – urban hydrologic cycle – trends in urbanisation – Effect of urbanisation on hydrology.

Precipitation Analysis: Importance of short duration of rainfall and runoff data, methods of estimation of time of concentration for design of urban drainage systems, Intensity-Duration - Frequency (IDF) curves, design storms for urban drainage systems.

Approaches to urban drainage: Time of concentration, peak flow estimation approaches, rational method, NRCS curve number approach, runoff quantity and quality, wastewater and stormwater reuse, major and minor systems.

Elements of drainage systems: Open channel, underground drains, appurtenances, pumping, source control.

Analysis and Management: Stormwater drainage structures, design of stormwater network- Best Management Practices–detention and retention facilities, swales, constructed wetlands, models available for storm water management.

Master drainage plans: Issues to be concentrated upon – typical urban drainage master plan, interrelation between water resources investigation and urban planning processes, planning objectives, comprehensive planning, use of models in planning.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 CE 3209	
Course Title: URBAN HYDROLOGY	
CO-1	Develop intensity duration frequency curves for urban drainage systems.
CO-2	Develop design storms to size the various components of drainage systems.
CO-3	Apply best management practices to manage urban flooding.
CO-4	Prepare master drainage plan for an urbanized area.

SYLLABUS: FINITE ELEMENTS METHODS OF ANALYSIS (B16CE3209)

Introduction to finite element method, Equilibrium equations, strain – displacement relations, stress – strain relations, Compatibility equations, Variational and weighted residual methods, concept of potential energy, one dimensional problems.

Discretization of domain, element shapes, discretization procedures, node numbering, and mesh generation, interpolation functions, local and global coordinates, treatment of boundary conditions, assembly of stiffness matrix.

Basic component: One dimensional FEM single bar element, Beam element: Derivation of stiffness matrix, Assembly of stiffness, Matrix boundary conditions, shape functions for 1 D elements, Initial strain and temperature effects, and trusses under axial forces.

Two dimensional FEM: Different types of elements for plane stress and plane strain analysis – Comparison of CST and LST elements, Derivation of CST stiffness matrix and equations, Initial strain and temperature effects, Problems on plane stress and plane strains in CST elements.

Axisymmetric: Axisymmetric formulation, shape functions, strain-Displacement matrix, stress-strain relationship matrix, Element stiffness matrix, Problems on Axisymmetric.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 CE 3210	
Course Title: FINITE ELEMENTS METHODS OF ANALYSIS	
CO-1	Understand the concepts behind variational methods and weighted residual methods in FEM.
CO-2	Identify the application and characteristics of FEA elements such as bars, beams,2-Delement and axis symmetric element.
CO-3	Develop element characteristic equation procedure and generation of global stiffness equation will be applied.
CO-4	Able to apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form

SYLLABUS: GEOTECHNICAL ENGINEERING LAB - II (B16CE3211)

1.Field identification & classification of soils

2.Unconfined compression test

3.CBR test/plate bearing test

4.Triaxial compression test (u-u test)

5.Direct shear test

6.Vane shear test

7.Relative density.

8.Differential free swell and swell pressure test.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 CE 3211	
Course Title: GEOTECHNICAL ENGINEERING LAB - II	
CO-1	Classify the types of soil deposits.
CO-2	Determine the shear strength parameters of soils by various methods.
CO-3	Estimate the California Bearing Ratio (CBR) of a soil.
CO-4	Determine the relative density of a coarse-grained soil.
CO-5	Determine the swelling characteristics of expansive soils.

SYLLABUS: CONCRETE LAB (B16CE3212)

1. Fineness of cement
2. Specific gravity of cement
3. Normal consistency of cement
4. Initial and final setting time
5. Compressive strength of cement for different grades of cement
6. Specific gravity and unit weight of coarse and fine aggregates
7. Sieve analysis of coarse and fine aggregates and classification as per IS 383.
8. Bulking characteristics of sand
9. Workability tests on fresh concrete by using:
   (a)Slump cone
   (b)Compaction factor apparatus
   (c)Flow table
   (d)Vee-Bee consistometer
10. Tests on hardened concrete
    a. Compressive strength
    b. Split tensile strength
    c. Flexural strength

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 CE 3212	
Course Title: CONCRETE LAB	
CO-1	Determine physical properties of cement, sand and aggregate.
CO-2	Classify fine aggregate and coarse aggregate as per IS 383
CO-3	Determine workability of concrete.
CO-4	Determine mechanical properties of concrete.

SYLLABUS: WATER RESOURCES ENGINEERING-I (B16CE4101)

Introduction And Hydrological Aspects: Water Resources in India, Hydrology in water Resources Planning – Hydrologic Planning –Water budget equation; Precipitation – Types, Measurement of rainfall; Average depth of rainfall over an area, Mean annual rainfall, Analysis of Rainfall Data – Consistency of rainfall record, Double mass curve, Infiltration – Factors affecting and its determination, Infiltrometers; Evaporation and Evapotranspiration – Pan Evaporation; Runoff –Factors affecting Runoff, Methods of determination of Runoff, Hydrograph Analysis, Base flow separation, Unit Hydrographs, Hydrograph of different durations, Applications of Unit Hydrograph; S-hydrograph, Synthetic Unit Hydrograph; Stream flow measurement – Gauge discharge curves.

Ground Water Flow: Mechanics of interstitial flow, definitions, subsurface distribution of water, ground water movement; Darcy‟s law; Permeability – Intrinsic permeability; Well hydraulics – Steady flow in different types of aquifers and wells; Determination of hydraulic properties of aquifer; Well losses; Specific capacity of well; Well efficiency – Pumping tests – Recuperation test method for determination of well yield.

Methods of construction of open well-yield of an open well – Methods of construction of Tube Wells, Well shrouding and Well development, Spacing of tube wells, Design of tube well; Pumping requirements, Centrifugal and bore hole type pumps; Collector wells.

Reservoir Planning: Types of reservoir – Investigations for reservoir planning, Selection of site for a reservoir, Zones of storage in a reservoir; Purpose of reservoir, Design studies, Reservoir regulation, Reservoir yield, Mass curve and Demand curve, Determination of reservoir capacity, Yield from a reservoir of given capacity; Operating schedules – Rule Curve for reservoir operation; Economics of Water resources Projects –Apportionment of total cost of a Multi-Purpose project, Reservoir Losses –Measures to reduce evaporation loss in reservoirs sedimentation, Control of reservoir sedimentation.

Irrigation: Definition of irrigation, Types of irrigation systems – Direct and Indirect, Lift and Inundation irrigation Systems, Methods of irrigation – Surface and Sprinkler methods, Trickle or Drip Irrigation, Soil moisture Constants, Depth of water held by soil in different zones, Water extraction – Quality of irrigation water, Irrigation efficiencies – Soil moisture –Irrigation relationship – Water requirements of crops, Duty, Delta and Base period – Their relationship, Crops – Seasons, Factors affecting duty and methods of improving duty, Consumptive use of water –Determination of evapotranspiration – Blaney-Criddle and Penman of reservoir, Assessment of irrigation water charges.

Canal Systems: Classification of irrigation canals – Canal alignment, Design of unlined canals, Regime theories – Kennedy‟s and Lacey‟s theories, Critical tractive force method, Design problems – Balancing depth – L.S. of a channel – Design according to I.S : 7112, 1975; Schedule of area statistics, Cross section of an irrigation channel – Maintenance of irrigation channel. Regulation of channel system – Canal outlets, Requirements of a good outlet – Types of outlets; Water logging – Causes and control – Land drainage; Canal lining – methods, Design of lined canals.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16 CE4101	
Course Title: WATER RESOURCES ENGINEERING - I	
CO-1	Choose major hydrologic components & apply key concepts to several practical areas of engineering hydrology & related design aspects
CO-2	Determine aquifer parameters & yield of wells
CO-3	Carry out surface & subsurface investigation to locate ground water
CO-4	Determine storage capacity & life of reservoirs
CO-5	Assess the irrigation needs of crops
CO-6	Design of unlined & lined irrigation canals

SYLLABUS: TRANSPORTATION ENGINEERING - I (B16CE4102)

Highway Engineering – I : Highway development and planning, Classification of roads, Highway alignment, Highway Geometrics – Design of Cross sectional elements, Sight distance, horizontal and vertical alignment.

Highway Engineering – 2: Traffic Engineering – Traffic Characteristics, Traffic studies (Surveys), Traffic Control devices – Design of intersections. Design of pavements – Design factors, design of flexible pavements – Group Index method, CBR Methods, Design of Rigid pavements – Wester guard equations, I.R.C. recommendations for design of concrete roads.

Highway Engineering – 3: Construction of roads – Earthen roads – W.B.M. roads – Bitumen's roads – Cement concrete roads – Highway materials and their properties and tests. Maintenance of all roads – highway drainage – Arboriculture – Street lighting.

Airport Engineering: Layout of Airports – Components functions – Aircraft characteristics – Airport site selection – Airport obstructions – Runway design – Visual aids – Air traffic control.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16 CE4102	
Course Title: TRANSPORTATION ENGINEERING - I	
CO-1	Selecting the appropriate materials for use in different road layers
CO-2	Perform road pavement design and analysis
CO-3	Interpret geometric design fundamentals, in relation to safety and driver comfort, focusing on horizontal and vertical alignment
CO-4	Design the geometric curves of a road pavement
CO-5	Design the Traffic Management System
CO-6	Design the Components of Airport

SYLLABUS: PROJECT PLANNING AND MANAGEMENT (B16CE4103)

PERT and CPM : Introduction : Origin of PERT and CPM, Planning, Scheduling and controlling Bar charts, Milestone charts, weaknesses in Bar charts, PERT and CPM networks – Comparison, Event, Activity, Rules for drawing networks, Numbering the events (Fulkerson's law : Dummy activities, Time estimate-Expected time, Earliest allowable occurrence time, Latest allowable occurrence time, slack, project duration, probability of completion, Start and Finish time estimates, Floats, Project scheduling, Critical and sub-critical path.

Cost analysis / updating / resource scheduling: Cost Analysis direct and indirect costs, operation time, Normal and crash points, optimizing project cost, crash limit, free float limit, Optimization. Updating – Process of updating; when to update, Resource scheduling – Resource smoothening. Resource leveling, circle notation and arrow notation.

Contracts: Contracts – Element of contract, offer acceptance and consideration, valid contract, Department execution of works, Master Roll Form 21. Piece work Agreement form, work order; Contract system with tenders – Definitions – Contract, Contractor, Quotation, Earnest money, Security money, Tender, Tender notice, Tender form, Bidding procedure, Irregularities in Bidding, award, Types of contracts – Lump sum contract; Lump sum and schedule contract, Item rate contract, sub-contracts, joint ventures, Arbitration Disputes and claim settlement.

Management – Scope of the Construction Management, Significance of Construction management, Concept of Scientific Management, Qualities of Manager, Organization –Authority, Policy, Recruitment process and Training Development of Personnel Department.

Labour problems, Labour legislation in India, Workmen compensation Act 1923, and subsequent amendments, Minimum Wages Act 1948.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16 CE4103	
Course Title: PROJECT PLANNING AND MANAGEMENT	
CO-1	Define planning, controlling and scheduling to find the time estimates of a project
CO-2	Classify the contracts and contract laws applicable to construction industry
CO-3	Explain the Importance of project management and the role of project managers in various organizations
CO-4	Identify and apply various networking techniques of project management

SYLLABUS: COMPUTER APPLICATIONS IN CIVIL ENGINEERINGLAB (B16 CE 4104)

Introduction

Introduction - Various software that are used in Civil Engineering based on their purpose - Drafting - AutoCAD - Coding - C Language- Excel - Analysis and design- FEM based software (Like STAAD,SAP,ETABS)

Development and Execution of Programs in C-language

- Create a program to determine the bending moment and shear fore for uniformly distributed load on various beams. Also program on deflection of determinate beams
- Create a program to classify a soil sample based on the given data.
- Create a program to determine the Darcy's friction factor for a circular pipe.
- Create a program to estimate the population for the year by arithmetic increase method and geometric increase method.
- Create a program to convert a whole circle bearing to reduced bearing.

Formulation of design sheets in Excel.

- Create an excel sheet to design a one way slab for the given uniform distributed loads.
- Create an excel sheet to design a two way slab for the given uniform distributed loads.
- Create an excel sheet to design a singly reinforced beam.

Analysis and Design of RCC elements using software

- Analysis and design of a plane frame.
- Analysis and design of beam with various supports

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16 CE 4104	
Course Title: COMPUTER APPLICATIONS INCIVIL ENGINEERINGLAB	
CO-1	Create a program which is necessary to classify and evaluate the values.
CO-2	Create an excel sheet for the design of slabs.
CO-3	Model and analyze the beams and plane frames using STAAD.

SYLLABUS: TRANSPORTATION ENGINEERING LAB (B16 CE 4105)

Testing of Aggregates: Specific gravity – Sieve Analysis – Shape test – Flakiness Index – Elongation Index – Water absorption test – Aggregate Crushing value – Impact value – Abrasion value – Stripping value & Soundness

Testing of bituminous material: Specific gravity – Penetration value – Viscosity value – Softening point – Ductility value – Flash and Fire point.

Testing on Soils: C.B.R. test (IS 2720 – Part-XVI) – N.D.C. Penetration test (IS 2720 Part- XXXII) – Group Index.

Testing on Bituminous Mixes: Bitumen Extraction Test, Marshal Stability Test (Demonstration).

Course Outcomes for Fourth Year First Semester Course	
Course Code:B16 CE 4105	
Course Title: TRANSPORTATION ENGINEERING LAB	
CO-1	Differentiate the Different types of materials used for Road Construction
CO-2	Identify the quality of road aggregates
CO-3	Identify the quality of Binder
CO-4	Determine the strength of the Subgrade material

SYLLABUS: WATER RESOURCE ENGINEERING-II (B16 CE 4201)

Storage Works: Classification of dams, Factors governing selection of types of dam, Selection of site, Preliminary investigation.

Gravity Dams : Forces acting on a gravity dam, Stability criteria, Modes of failure – Elementary and Practical profiles, Stability analysis, Principal and shear stress – Construction joints, Openings in dams – Galleries, Foundation treatment of gravity dam.

Earth Dams: Types, Foundation for earth dams, design of earth dams, Causes for failure of earth dams, Criteria for safe design, Phreatic line, Seepage analysis – Seepage control through body and foundation.

Spillways: Essential requirements, Spillway capacity, Components, Types of spillways and their working, Design of ogee spillway, Energy dissipation below spill way, Scour protection, Use of hydraulic jump as energy dissipater – Design of stilling basins – USBR and IS standard basins; Spillway crest gates – Different types.

Diversion Head Works: Types, Location and components, effects of construction of weirs on permeable foundation, Bligh's, Lanes and Khosla‟s theories, Method of independent variables, Design principles of weirs and barrages, Design of weirs on permeable foundations, Design of vertical drop weir, Silt control devices.

Regulation Works: Canal falls – Definition, Necessity and location, Classification of falls, Design principles of syphon well drop, Notch fall, Sarada fall, Straight glacis fall; Off take alignment; Cross regulator and Distributary head regulator – Design of cross regulator and Distributor head regulator.

Cross Drainage Works: Types, Factors affecting the suitability of each types, Classification of aqueducts, Design principles of different types of aqueducts.

River Training Works: River Training and its objectives, Classification of river training works, Marginal embankment, Guide banks, Groynes, cutoffs, Bank pitching, Launching aprons, Miscellaneous types of river training works.

Water Power engineering: Development of hydro power in India, Assessment of available power, Utilization factor, Load factor, Diversity factor, Storage and Pondage; Types of hydropower schemes; Components of hydel schemes – Fore bay, Intake structure, Trash racks, Surge tanks; Water hammer pressure, Substructure and Superstructure of power house.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16 CE4201	
Course Title: WATER RESOURCE ENGINEERING-II	
CO-1	Analyze gravity and earth dams
CO-2	Design Spillways and energy dissipation works
CO-3	Design diversion head works
CO-4	Classify river training works
CO-5	Use the principal components of hydroelectric scheme

SYLLABUS: TRANSPORTATION ENGINEERING - II (B16 CE 4202)

RAILWAY ENGINEERING – 1: Historical development of railways in India – Advantages of Railways – Classification of Indian Railways – Permanent way – Components and their functions – Rail joints – Welding of Rails – Creep of Rails – Rail fixtures & Fastenings.

RAILWAY ENGINEERING – 2: Track Geometric design – Points & Crossings – Track drainage – Layout of Railway stations and yards – Signals – Interlocking – Track circuiting – Track Maintenance.

DOCK & HARBOUR ENGINEERING: Layout of Port components – Functions – Classification of Ports – Site selection – Natural Phenomenon – Tides, Winds, Waves, Currents – Drift – Navigational aids.

TUNNEL ENGINEERING: Alignment of tunnels – Cross-section of tunnels – Construction methods of Tunnels – Tunnel lining – Ventilation – Drainage – Muck disposal.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16 CE 4202	
Course Title: TRANSPORTATION ENGINEERING - II	
CO-1	Explain railway track components, its importance and requirements.
CO-2	Design elements of track geometry, points and crossings and concepts of railway signaling
CO-3	Predict the importance and necessity of harbours and docks in transportation.
CO-4	Evaluate the components of Tunnel Engineering.

SYLLABUS: IRRIGATION STRUCTURES DESIGN & DRAWING (B16 CE 4203)

Design and drawing of the following irrigation structures

1. Tank Surplus weir
2. Barrage
3. Glacis type of canal drop
4. Notch fall
5. Siphon Aqueduct- type III
6. Cross regulator and head regulator

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16 CE4203	
Course Title: IRRIGATION STRUCTURES DESIGN & DRAWING	
CO-1	Understand the paper - space environment thoroughly
CO-2	Develop the components using 2D & 3D wire frame models through various editing commands
CO-3	Explain assemble of various components of compound solids
CO-4	Design irrigation canal structures

COMPUTER SCIENCE AND ENGINEERING

SYLLABUS: ENGLISH (B16 ENG 1101)

(Common to all Branches)

Listening Skills Conversations: Life in a Hostel – Eating Away those Blues – Meeting Carl Jung – A Documentary on the Big Cat – A Consultant Interviewing Employees – A Conversation about a Business Idea.

Speaking Skills Your Favorite Holiday Destination – Describe Yourself – Why we need to save our Tiger – A Dialogue – Your First Interview – Pair Work: Setting up a New Business.**Reading Skills** Reading Comprehension: Famous People – What is Personality, Personality based on Blood Groups – News Report, Magazine Article, Mobile Towers and Health – An Excerpt from a Short Story, An Excerpt from a Biography – Open Letter to Prime Minister, Business Dilemmas: An Email Exchange – A Review of IPL: The Inside Story, Mark Zukerberg: World's Youngest Billionaire.

Writing Skills Letter Writing, Essay Writing, Email Writing, Report Writing, Paragraph Writing, Drafting a Pamphlet, Argument Writing, Dialogue Writing.

Grammar Types of Sentences, Articles, Prepositions, Gerunds and Infinitives, Conjunctions, Tense, Quantifiers, Punctuations, Correction of Sentences, Fill-in the Blanks.

Vocabulary Synonyms, Antonyms, Idioms, One Word Substitution.

Life Skills and Core Skills Self Awareness and Self-Motivation – Communication, Adaptability – Motivation, Problem Solving – Personal Presentation Skills, Stress Management – Professionalism – Ethics.

Course Outcomes for First Year First Semester Courses	
Course Code: B16 ENG 1101	
Course Title: ENGLISH	
CO-1	The overall performance of the students will be enhanced after the course; they will be in a position to make presentations on topics of current interests – politics, famous personalities, science and technology, tourism, work and business environment, with increased public speaking skills.
CO-2	Students will be able to read, listen, speak and write effectively in both academic and non-academic environment.
CO-3	The students will be updated with certain real life situations, which they can handle when come face to face.

SYLLABUS: MATHEMATICS – I (B16ENG 1102)

(Common to all Branches)

Partial Differentiation

Functions of two or more variables – Partial derivatives – Homogeneous Functions – Euler's Theorem – Total Derivative – Change of Variables – Jacobians – Geometrical Interpretation: Tangent Plane and Normal to a Surface.

Applications of Partial Differentiation

Taylor's Theorem for functions of two variables – Errors and Approximations – Total Differential – Maxima and Minima of functions of two variables – Lagrange's Method of Undetermined Multipliers – Differentiation Under the Integral Sign – Leibnitz's Rules.

Ordinary Differential Equations of First Order and First Degree

Formation of ordinary differential equations (ODEs) – Solution of an ordinary differential equation – Equations of the First Order and First Degree – Linear Differential Equation – Bernoulli's Equation – Exact Differential Equations – Equations Reducible to exact equations.

Applications of Differential Equations of First Order

Orthogonal Trajectories – Simple electric (LR & CR) Circuits – Newton's Law of Cooling – Law of Natural growth and decay.

Linear Differential Equations of Higher Order

Solutions of Linear Ordinary Differential Equations With Constant Coefficients – Rules for finding Complimentary Function – Rules for finding the particular integral – Method of variation of parameters – Cauchy's linear equation – Legendre's Linear Equation – Simultaneous linear equations.

Fourier series

Introduction - Euler's Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series – Parseval's Formula.

Course Outcomes for First Year First Semester Courses	
Course Code :B16 ENG 1102	
Course Title: MATHEMATICS - I	
CO-1	Find partial derivatives, expand a function of more than one variable in a Taylor series and utilize them for errors and approximations, maxima and minima.
CO-2	Solve a first order ODE and also find orthogonal trajectories and solve problems related to simple applications.
CO-3	Solve a given higher order ODE, an equation with constant coefficients, a Cauchy's equation or a Legendre's equation.
CO-4	Utilize knowledge of Fourier series for solving partial differential equations and also in understanding courses like Signals & Systems

SYLLABUS: MATHEMATICS – II (B16 ENG 1103)

(Common to all Branches)

Matrices – I

Rank of a matrix - Normal Form – Solutions of Linear System of Equations- Consistency of Linear System of Equations – Rouche's Theorem (statement) - Direct Methods: Gauss Elimination Method, LU Factorization Method – Eigen Values and Eigen Vectors of a Matrix– Properties - Cayley – Hamilton Theorem – Inverse and Powers of a Matrix using Cayley – Hamilton Theorem.

Matrices – II

Diagonalization of a Matrix – Quadratic Forms – Reduction of Quadratic Form to Canonical Form – Nature of a Quadratic Form – Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

Laplace Transforms-I

Introduction – Existence Conditions – Transforms of Elementary Functions – Properties of Laplace Transforms – Transforms of Derivatives – Transforms of Integrals – Multiplication by t – Division by t – Evaluation of Integrals by Laplace Transforms – Laplace Transforms of Unit Step Function, Unit Impulse Function and Periodic Functions.

Laplace Transforms-II

Inverse Laplace Transform – different methods - Convolution Theorem – Applications of Laplace Transforms to Ordinary Differential Equations, Simultaneous Linear Differential Equations with Constant Coefficients.

Difference Equations

Definition - order and solution of a difference equation - Formation of difference equations - Linear difference equations - Rules for finding C.F. - Rules for finding P.I.- Simultaneous difference equations with constant coefficients. Application to deflection of a loaded string.

Z-transforms

Z-transforms – definition - some standard Z-transforms - Linear property, damping rule - some standard results - shifting rules - initial and final value theorems - convolution theorem

- Evaluation of inverse transforms - Applications of Z-transform to difference equation.

Course Outcomes for First Year First Semester Courses	
Course Code: B16 ENG 1103	
Course Title: MATHEMATICS – II	
CO-1	Utilizing the knowledge of matrices for solving linear simultaneous equations, find Eigen values and Eigen vectors and handle quadratic forms
CO-2	Utilizing the knowledge of Laplace Transforms to find transforms of important functions that arise in applications and also solve ODE
CO-3	Also utilizing the knowledge of Laplace Transforms in courses like Net Works, Signals & Systems and Control Systems
CO-4	Utilizing the knowledge of difference equations and Z-transforms in understanding courses like Discrete Mathematical Structures and also Signals & Systems

SYLLABUS: CHEMISTRY (B16 ENG 1104)

(Common to CIVIL, CSE & IT)

Water Chemistry

Source of water- impurities- Hardness and its determination by EDTA method- Boiler troubles and their removal. Water softening methods- lime soda, zeolite and ion exchange. Municipal water treatment- Break point chlorination. Desalination of sea water – electro dialysis and reverse osmosis methods.

Building Materials

Portland cement: Manufacture-Chemistry involved in setting and hardening of cement – Cement concrete -RCC – Decay of concrete.

Refractories: Classification-Properties and Engineering applications. Ceramics: Classification-Properties and uses.

Solid State Chemistry

Classification of solids-Types of crystals-properties-Imperfections in crystals. Band theory of solids. Chemistry of semiconductors –Intrinsic, Extrinsic, compound and defect. Organic semiconductors Purification of solids by Zone refining-Single crystal growth – epitaxial growth. Elementary ideas on Liquid crystals.

Corrosion Chemistry

Definition of corrosion- Types of corrosion-chemical & electrochemical corrosion –Pitting, stress corrosion, Galvanic corrosion, Water line corrosion Factors affecting corrosion – Prevention of corrosion- Cathodic protection. Corrosion inhibitors Protective coatings- Metallic coatings, electro plating, electroless plating, chemical conversion coatings- phosphate coatings, chromate coatings, anodizing. Organic coatings-Paints.

Polymers and Plastics

Definition-Types of polymerization – mechanism of free radical polymerization. Plastics- Thermosetting and thermoplastic resins cellulose derivatives, vinyl resins, nylon 6, 6, bakelite-Compounding of plastics-Fabrication of plastics. Fiber reinforced plastics – conducting polymers -Engineering applications of polymers.

Fuels and Lubricants

Solid fuels: Coal –Analysis of coal – Metallurgical coke- manufacture-Engineering applications.

Petroleum-refining-Knocking and Octane number of gasolilne-Cetane number of diesel oil. Synthetic petrol – LPG-CNG–Applications. Rocket fuels – Propellants-classification.

LUBRICANTS: Principles of lubrications, classification of lubricants and properties of lubricants (any five)

Course Outcomes for First Year First Semester Course	
Course Code: B16 ENG 1104	
Course Title: CHEMISTRY	
CO-1	Students learn in-depth about the topics of desalination of sea water, CNG, LPG Biogas, Semiconductors, Liquid crystals, Conducting polymers, fiber reinforced plastics, building materials
CO-2	Students understand the basic and advanced applied concepts.
CO-3	Students learn to interrelate the theory and with the relevant experiment.
CO-4	Students learn experimental techniques and understand the theory about experiments

SYLLABUS: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS (B16 ENG 1106)

(Common to CIVIL, CSE & IT)

Introduction to C

Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations, Formatted Input, Formatted Output.

Decision Making, Branching, Looping, Arrays & Strings: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else. If ladder, switch statement, the (?:) operator, the GOTO statement., The while statement, the do statement, The for statement, Jumps in Loops ,One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

Functions

Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, The scope, visibility and lifetime of variables. .

Pointers

Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications

Structure and Unions

Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

File handling

Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments- Program Applications.

Numerical Methods

Solutions of Algebraic and Transcendental Equations: Bisection Method, Newton Raphson Method.

Interpolation - Newton's forward and backward Interpolation, Lagrange's Interpolation in unequal intervals.

Solutions of Linear Equations: Gauss Elimination Method, Jacobi and Gauss Seidel Methods. Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule.

Solutions of Ordinary First Order Differential Equations: Euler's Method, Modified Euler's Method and Runge-Kutta Method.

Course Outcomes for First Year First Semester Course

Course Code: B16 ENG 1106

Course Title: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS

CO-1	Student can understand basic terminology used in C programming.
CO-2	Student can write programs by applying elementary algorithms to solve problems in C language.
CO-3	Student can write, compile and debug programs in C language
CO-4	Student can Write programs to solve numerical methods
CO-5	Student can be familiar with finite precision computation.

SYLLABUS: CHEMISTRY LAB (B16 ENG 1110)

(Common to CIVIL, CSE & IT)

LIST OF PRACTICAL EXPERIMENTS:

1. Estimation of Sodium hydroxide with HCl (Na_2CO_3 primary standard).
2. Estimation of Iron as Ferrous iron in an Ore Sample.
3. Estimation of Oxalic acid by a redox method
4. Estimation of Calcium in a sample of Portland cement.
5. Estimation of Volume strength of Hydrogen Peroxide.
6. Estimation of Mohr's salt by Potassium dichromate
7. Determination of Hardness of an underground water sample.
8. Estimation of Zinc by EDTA method.
9. Determination of Alkalinity of water sample.

DEMONSTRATION EXPERIMENTS:

10. Determination of Viscosity and Viscosity index of a lubricant.
11. Printed Circuit Board
12. Determination of dissolved oxygen in given water sample.
13. Potentiometric titrations.
14. P^H Determination by using P^H meter.

SYLLABUS: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS LAB (B16 ENG 1112)

LIST OF PROGRAMMES:

1. Write a program to read x, y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line.
2. Write a program which generates 100 random numbers in the range of 1 to 100. Store them in an array and then print the array. Write 3 versions of the program using different loop constructs (eg. for, while and do-while).
3. Write a set of string manipulation functions e.g. for getting a sub-string from a given position, copying one string to another, reversing a string and adding one string to another.
4. Write a program which determines the largest and the smallest number that can be stored in different data types like short, int, long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?
5. Write a program which generates 100 random real numbers in the range of 10.0 to 20.0 and sort them in descending order.
6. Write a function for transporting a square matrix in place (in place means that your are not allowed to have full temporary matrix).
7. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their mean and standard deviation.
8. Implement bisection method to find the square root of a given number to a given accuracy.
9. Implement Newton Raphson Method to determine a root of polynomial equation.
10. Given a table of x and corresponding f(x) values, write a program which will determine f(x) value at an intermediate x value using Lagrange's Interpolation.
11. Write a function which will invert a matrix.
12. Implement Simpson's 1/3rd rule for numerical integration.
13. Implement Trapezoidal rule for numerical integration.
14. Write a program to solve a set of linear algebraic equations.
15. Write a program to solve a differential equation using Runge-Kutta Method.

SYLLABUS: MATHEMATICS – III (B16 ENG 1201)

(Common to all Branches)

Solid Geometry

Equations of a plane, Normal form, Intercept form, Equations of Straight Line – Conditions for a line to lie in a Plane – Coplanar lines – Shortest distance between two skew lines - Intersection of three Planes – Equations of Sphere – Tangent Plane to a Sphere –Cone – Cylinder.

Multiple Integrals-1

Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

Multiple Integrals-2

Beta Function - Gamma Function - Relation between Beta and Gamma Functions-Error Function - Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of mass - Center of gravity of a plane lamina- Moment of inertia.

Fourier Transforms

Introduction – definition - Fourier integral - Sine and Cosine integrals - Complex form of Fourier integral - Fourier transform - Fourier Sine and Cosine transforms -Finite Fourier Sine and Cosine transforms - properties of Fourier transforms, Convolution theorem for Fourier transforms - Perceval's identity for Fourier transforms - Fourier transforms of derivatives of a function.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1201	
Course Title: MATHEMATICS – III	
CO-1	Utilize knowledge of line, sphere etc. in his engineering subjects
CO-2	Utilize the knowledge of Beta and Gamma functions and multiple integrals to evaluate the integrals they come across in their applications
CO-3	Utilize the knowledge of Fourier Transform in courses like Signals and Systems and in the solution of partial differential equations at a later stage

SYLLABUS: PHYSICS (B16 ENG 1202)

(Common to CIVIL, CSE & IT)

Thermodynamics

Introduction, Heat and Work, First Law of Thermodynamics and applications, Reversible and Irreversible Process, Carnot Cycle and Efficiency, Second Law of Thermodynamics, Carnot's Theorem, Entropy, Second Law in terms of entropy, Entropy and disorder, Third Law of Thermodynamics (Statement Only).

Electromagnetism

Effect of Magnetic Field on – moving charges, current in long straight wire and rectangular Current Loop, Hall Effect, Biot-Savart's Law, B near a Long Wire, B for a Circular Current Loop, Ampere's Law, B for a Solenoid, Faraday's Law of electromagnetic induction, Lenz's law, Inductance of a solenoid, L-R Circuit, Displacement Current, Maxwell's Equations (integral form) and their significance (without derivation).

Interference

Principle of Super Position – Young's Experiment – Coherence – Inference in thin transparent films, Newton's Rings, Michelson Interferometer and its applications.

Lasers

Introduction, spontaneous and stimulated emissions, requirements of laser device, Ruby Laser, Gas Laser (He-Ne Laser), Semiconductor diode Laser, Characteristics and applications of Lasers.

Optical Fibers

Introduction, Principles of light propagation in optical fiber, Acceptance angle, Numerical aperture, types of fiber, Applications of Optical Fibers, Optical Fiber in Communications, advantages.

Ultrasonics

Definition, Production of Ultrasonics by Magnetostriction and Piezoelectric methods, detection methods, acoustic grating, characteristics and applications of Ultrasonics.

Modern Physics

Introduction, de Broglie concept of matter waves, Properties of matter waves, experimental verification (Davisson-Germer experiment), Heisenberg uncertainty principle, Wave function and its physical significance, Schrodinger time independent wave equation, application to a particle in a box, Band theory of Solids, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semiconductors and insulators .

Nano phase Materials

Definition, Synthesis – Synthesis methods, Condensation and Ball milling, chemical vapor deposition method – sol-gel methods, Characterization, analysis and applications of Nano materials.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1202	
Course Title: PHYSICS	
CO-1	Students learn in depth about the topics of Lasers, fiber optics, quantum mechanical theory and classical theories of thermodynamics and electromagnetism,
CO-2	Students understand the classical and modern concepts.

SYLLABUS: ENGINEERING GRAPHICS (B16 ENG 1204)

(Common to CIVIL, CSE & IT)

Introduction

Lines, Lettering and Dimensioning. Geometrical Constructions.

Curves

Conic sections: General construction of ellipse, parabola and hyperbola. Construction of involutes Normal and Tangent.

Projections of Points

Principal or Reference Planes, Projections of a point situated in any one of the four quadrants

Projections of Straight Lines

Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of straight line inclined to both the reference planes:

Projections of Planes

Projection of Perpendicular planes: Perpendicular to both reference planes, perpendicular to one reference plane and parallel to other reference plane, perpendicular to one reference plane and inclined to other reference plane. Projection of Oblique planes. Introduction to Auxiliary Planes.

Projections of Solids

Types of solids: Polyhedra and Solids of revolution. Projection of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to other and axes inclined to both the reference planes.

Projections of Section of Solids

Section Planes: Parallel and inclined section planes, Sections and True shape of section, Sections of Solids: Prism, Pyramid, Cylinder and Cone.

Development of Surfaces

Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

Isometric Views

Introduction to Isometric projection, Isometric scale and Isometric view. Isometric views of simple planes. Isometric view of Prisms, Pyramids, cylinder and cone. Isometric view of a combination of solids.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1204	
Course Title: ENGINEERING GRAPHICS	
CO-1	Apply principles of drawing to represent dimensions of an object.
CO-2	Construct polygons and engineering curves.
CO-3	Draw projections of points, lines, planes and solids.
CO-4	Represent sectional views of solids.
CO-5	Develop the surfaces of regular solids.
CO-6	Draw the isometric views of solids and combination of solids.

SYLLABUS: PROFESSIONAL ETHICS AND MORAL VALUES (B16 ENG 1206)

(Common to CIVIL, CSE & IT)

Ethics and Human Values

Ethics and Values, Ethical Vision, Ethical Decisions, **Human Values** – Classification of Values, Universality of Values.

Engineering Ethics

Nature of Engineering Ethics, Profession and Professionalism, Professional Ethics, Code of Ethics, Sample Codes – IEEE, ASCE, ASME and CSI.

Engineering as Social Experimentation

Engineering as social experimentation, Engineering Professionals – life skills, Engineers as Managers, Consultants and Leaders, Role of engineers in promoting ethical climate, balanced outlook on law.

Safety Social Responsibility and Rights

Safety and Risk, moral responsibility of engineers for safety, case studies – Bhopal gas tragedy, Chernobyl disaster, Fukushima Nuclear disaster, Professional rights, Gender discrimination, Sexual harassment at work place.

Global Issues

Globalization and MNCs, Environmental Ethics, Computer Ethics, Cyber Crimes, Ethical living, concept of Harmony in life.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1206	
Course Title: PROFESSIONAL ETHICS AND MORAL VALUES	
CO-1	By the end of the course student should be able to understand the importance of ethics and values in life and society.

SYLLABUS: BUILDING MATERIALS AND BUILDING CONSTRUCTION (B16 CE 1208)

(For Civil Engineering)

Bricks and Clay Products

Bricks: Classification of Bricks, Manufacture of Bricks, general qualities of Bricks as per IS code, tests for good bricks as per IS code, including field tests, special forms of Bricks and their uses. Clay Products: Various types of tile manufacturing and their uses, Earth-wares, Terra-cotta, stone ware, porcelain, glazing of tiles etc.

Wood, Wood Based Products

Wood: cross section details of trees, their general properties, various types of defects in wood and timber, Methods of seasoning and their importance, various Mechanical Properties of timber, Decay of timber, Wood based Products: Veneers, Plywood and its types, Manufacturing of Plywood, plywood grades as per IS code, Laminated wood, merits of plywood and laminated wood, Lamin Boards, Block Boards, Batten board, Hard board, Particle boards and Composite boards.

Paints, Varnishes

Paints and Varnishes: Constituents and characteristics of paints, types of paint, their uses and preparation on different surfaces, painting defects, causes and remedies. Constituents of varnishes, uses of varnishes, different kinds of varnish, polishes. Painting of interior walls, exterior walls, wooden doors and windows – steel windows – various types of paints (chemistry of paints not included) including distempers; emulsion paints etc., Varnishes wood work finishing types. **Plastic:** definition, classification of plastic and modern development of plastic, chemistry of plastic, polymerization, manufacturing process and their uses. **Glass:** properties of glass, types of glass and manufacturing. **Asbestos & Asphalt Bitumen & Tar :** Availability and uses of asbestos, properties of asbestos, various types of asbestos, difference between asphalt & bitumen, Types, uses and properties of Asphalt & Bitumen, composition of coal tar, wood tar, mineral tar and Naphtha.

Cements

Natural and artificial cements, types of various artificial cements and their uses. Wet and dry process of manufacturing ordinary Portland cement (OPC), Chemical and Physical analysis of OPC, various field and Laboratory Tests on OPC as per IS code. Storing of cement in the field and godowns

Foundations

Types of Foundations : Strip, Isolated, Strap, Combined Footings, Raft – Mat –Slab and Beam Raft, Box Type Raft, inverted arch foundations, SHELL foundations, Grillage foundations – Minimum depth of Foundation – Bearing capacity of soils **Masonry:** Different types of Stone Masonry – Plan, Elevation, Sections of Stone Masonry Works – Brick Masonry – Different Types of Bonds – Plan, elevation and Section of Brick Bonds upto Two- Brick wall thickness – Partition walls – Different types of Block Masonry – Hollow concrete Blocks – FAL- G Blocks, Hollow Clay Blocks.

Roofing

Mangalore tiled Roof, RCC roof, Madras Terrace, Hollow Tiled Roof, Asbestos Cement, Fibre glass, Aluminum G.I. Sheet roofing's. **Form Work, Scaffolding:** form work, Types of formwork, centering-

Scaffolding-types of scaffolding. **Trusses:** King Post & Queen Post Trusses – Steel roof Truss for 12m Span with details. **Wooden Doors And Windows:** Parallel – Glazed – Flush shutters, Plywood, Particle Board Shutters – Aluminum, PVC, Steel doors, windows and ventilators, various types of windows, Glazing – different varieties. **Stair Cases:** Stair cases or Stairway design (Architectural design or planning only) various types such as, straight flight – dog legged, quarter landing, open spiral, spiral stairs etc.

Concrete Technology and Mix Design

Polymer Concrete, Types of cement concretes, Ingredients and their characteristics, Cement concrete properties and relevant tests, storage, batching, mixing & transporting, placing & vibrating and curing. Concrete grades & mix designs upto M 20 as per IS code. Introduction to polymer concrete and it's uses.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 CE 1208	
Course Title: BUILDING MATERIALS AND BUILDING CONSTRUCTION	
CO-1	Learn and identify the relevant physical and mechanical properties pertaining to the construction industry.
CO-2	Demonstrate the relevant BIS testing procedure to be carried out to ascertain the quality of building materials.
CO-3	Develop ability to choose the modern construction material appropriate to the climate And functional aspects of the buildings.
CO-4	Ability to supervise the construction technique to be followed in brick, stone and Hollow block masonry, concreting, flooring, roofing, plastering and painting etc.
CO-5	Learn about the causes of deterioration, crack pattern, and assessment of damages.
CO-6	Learn about the construction techniques in repairing of buildings.

SYLLABUS: PROFESSIONAL ETHICS AND MORAL VALUES (B16 ENG 1206)

(Common to CIVIL, CSE & IT)

Ethics and Human Values

Ethics and Values, Ethical Vision, Ethical Decisions,

Human Values – Classification of Values, Universality of Values.

Engineering Ethics

Nature of Engineering Ethics, Profession and Professionalism, Professional Ethics, Code of Ethics, Sample Codes – IEEE, ASCE, ASME and CSI.

Engineering as Social Experimentation

Engineering as social experimentation, Engineering Professionals – life skills, Engineers as Managers, Consultants and Leaders, Role of engineers in promoting ethical climate, balanced outlook on law.

Safety Social Responsibility and Rights

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CO-5	Learn about the causes of deterioration, crack pattern, and assessment of damages.
CO-6	Learn about the construction techniques in repairing of buildings.

SYLLABUS: PROBABILITY, STATISTICS AND QUEUING THEORY (B16 CS 1208)

(Common to CSE & IT)

Probability:

Various definitions of probability, Addition theorem, Conditional probability, Multiplication theorem, Bayes theorem of probability and Geometric probability.

Random Variables and Their Properties:

Definition, Distribution function, Properties of Distribution Function, Discrete Random Variable, Probability Mass Function, Discrete Distribution Function, Continuous Random Variable, Probability Density Function, Continuous Distribution Function. Mathematical Expectation of a Random Variable, Expected Value of function of a Random Variable, Addition Theorem and Multiplication Theorem of Expectation **(without proofs)**, Statistical Measures like Mean, Variance, Moments and Covariance in terms of Expectations, Moment generating Function, Characteristic Function and Probability generating Function of a Random Variable.

Distributions:

Discrete Distributions:

Binomial distribution and Poisson distribution (Definition, Mean, Variance, mfg., Characteristic function, p.g.f., Fitting of distributions)

Continuous Distributions: Uniform distribution, its Mean and Variance. Normal Distribution and its Properties (without proofs), Standard Normal Variate, Importance of Normal distribution. Exponential Distribution, Definition, Mean Variance Memory less property of Exponential distribution

Bivariate Analysis and Curve Fitting:

CORRELATION: Definition, Karl Pearson's Coefficient of Correlation, Limits for correlation coefficient, Rank Correlation, Spearman's formula for rank correlation coefficient. CURVE FITTING, Method of least Squares, Fitting of a Straight line, fitting of a Parabola REGRESSION ANALYSIS: Regression Lines, Regression Coefficients and their properties (without proofs).

Sampling Theory:

Sample, population, statistic, parameter, Sampling distribution, standard error, interval estimation. Testing of Hypothesis: Formulation of Null hypothesis, Alternative hypothesis, Critical region, Critical value, level of Significance, Statistical Inference, Type-I-error, Type- II-error, One-tailed/Two-tailed test.

Large Sample Theory

Test of significance of single sample proportion, Test of significance for difference of proportions, Test of significance of single sample mean, Test of significance for difference of means.

Small Sample Theory: Degrees of freedom, Student's t-distribution: definition, t-test for single mean, t-test for difference of means, Paired t-test for difference of means.

F-distribution: definition, F-test for equality of two population variances. Chi-square distribution definition, Chi-square test for goodness of fit, Chi-square test for single Population Variance.

Queuing Theory: Queue description, Birth and Death Process, Distribution of Inter-arrival times, Distribution of service times, Kendall‟s representation of a queueing model, Operating characteristics of a queuing model, steady state solutions of {M/M/1: ∞/FCFS} Model and {M/M/1 ; N/FCFS} Model.

SYLLABUS: PHYSICS LAB (B16 ENG 1209)

(Common to CIVIL, CSE & IT)

LIST OF EXPERIMENTS

1. Sonometer – verification of laws of transverse vibrations in stretched strings.
2. Melde's Experiment – Determination of the frequency of an electrically maintainedtuning fork.
3. Newton's Rings – Determination of radius of curvature of a convex lens.
4. Diffraction Grating – Determination of Wavelengths of lines of mercury spectrum using spectrometer by normal incidence method.
5. Determination of Cauchy's constants of the material of the given prism usingSpectrometer and mercury light.
6. Wedge Method – Determination of thickness of a paper by forming parallel interferencefringes.
7. Variation of magnetic field along the axis of current carrying circular coil – Stewart and Gee's apparatus.
8. Carey Foster's bridge – Verification of laws of resistance.
9. Lee's Method – Determination of coefficient of thermal conductivity of a bad conductor.
10. Calibration of voltmeter using potentiometer.
11. Calibration of low range Ammeter using potentiometer.
12. Laser – Diffraction.

SYLLABUS: WORKSHOP (B16 ENG 1211)

(Common to CIVIL, CSE & IT)

Carpentry

Bench Work, tools used in carpentry.

Jobs for Class work – half lap joint, mortise and tenon joint, half – lap dovetail joint, cornerdovetail joint, central bridle joint.

Sheet Metal

Tools used in sheet metal work, Laying development of the sheet metal jobs, soldering.

Jobs for class works – Square tray, taper tray (sides), funnel, elbow pipe joint, 60^0 pipe joint.

Fitting

Tools used in fitting work, Different files, chisels, hammers and bech vice.

Jobs for class work – Square, hexagon, rectangular fit, circular fit and triangular fit.

SYLLABUS: ENGLISH LANGUAGE LAB (B16 ENG 1213)

(Common to All Branches)

1. English Sound Pattern – Letters
2. Sounds of English
3. Pronunciation
4. Stress and Intonation

Laboratory Practice Sessions:

1. Letters and Sounds, Worksheet-1
2. Interactions-1, Worksheet-2
3. The Sounds of English, Worksheet-3
4. Interactions-2, Worksheet-4
5. Pronouncing Words-Some Important Patterns, Worksheet-5
6. Interactions-3, Worksheet-2
7. Stress and Intonation, Worksheet-2

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1213	
Course Title: ENGLISH LANGUAGE LAB	
CO-1	Students will be sensitized towards recognition of English sound pattern.
CO-2	The fluency in speech will be enhanced

SYLLABUS: DATA STRUCTURES (B16 CS 2101)

Basic Concepts

System Life Cycle, Algorithm Specification, Recursive Algorithms, Data Abstraction, Performance Analysis, Space Complexity, Time Complexity, Asymptotic Notation, Comparing Time Complexities.

Arrays and Structures

Array as an Abstract Data Type, Polynomial Abstract Data Type, and Introduction to Sparse Matrix, Sparse Matrix Abstract Data Type, Transposing a Sparse Matrix, Sparse Matrix Multiplication, Representation of Multidimensional Arrays, Structures and Unions, Internal Implementation of Structures, Self-Referential Structures.

Recursion, Simple Searching and Sorting Techniques

Recursive functions, Introduction to Searching, Sequential Search, Binary Search, Interpolation Search, Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Introduction to Merge Sort, Iterative Merge Sort, Recursive Merge Sort, Shell Sort.

Stacks and Queues

Stack Abstract Data Type, Queue Abstract Data Type, Stacks and Queues using arrays, Mazing Problem, Introduction to Evaluation of Expressions, Evaluating Postfix Expressions, Infix to Postfix and Prefix conversion, Multiple Stacks and Queues, Circular Queues using arrays.

Linked Lists

Pointers, Dynamically Allocated Storage using pointers, Singly Linked Lists, Dynamically Linked Stacks and Queues, Polynomials, Representing Polynomials as Singly Linked Lists, Adding Polynomials, Erasing Polynomials, Polynomials as Circularly Linked Lists, Additional List Operations, Operations for Singly Linked Lists, Operations for Doubly Linked Lists, Radix Sort.

Trees

Representation of Trees, Binary Trees Abstract Data Type, Properties of Binary Trees, Binary Tree Representations, Binary Tree Traversals, Additional Binary Tree Operations, Threaded Binary Trees, Heap Abstract Data Type, Priority Queues, Insertion into a max heap, Deletion from a max heap, Heap Sort, Introduction to Binary Search Trees, Searching a Binary Search Tree, Inserting an Element into a Binary Search Tree, Deleting an Element from a Binary Search Tree, Height of a Binary Search Tree, Counting Binary Trees.

Graphs

Graph Abstract Data Type, Definitions, Graph Representations, Elementary Graph Operations, Depth First Search, Breadth First Search, Connected Components, Spanning Trees, Minimum Cost Spanning Trees, Prim's and Kruskal's Algorithms, Shortest Paths and Transitive Closure, Single Source All Destination – Dijkstra's Algorithm, All Pairs Shortest Paths – Floyd's Algorithm, Transitive Closure using Warshall's Algorithm.

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 CS 2101	
Course Title: DATA STRUCTURES	
CO-1	Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms.
CO-2	Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs. Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs Demonstrate different methods for traversing trees.
CO-3	Compare alternative implementations of data structures with respect to performance
CO-4	Compare and contrast the benefits of dynamic and static data structures implementations
CO-5	Describe the concept of recursion, give examples of its use, describe how it can be implemented using a stack
CO-6	Discuss the computational efficiency of the principal algorithms for sorting, searching.

SYLLABUS: ELEMENTS OF ELECTRONICS ENGINEERING (B16 EC 2103)

Transport phenomenon in semiconductors:

Intrinsic and Extrinsic semiconductors, Charge densities in semiconductors, Drift and Diffusion currents, Half effect, Mass action law.

P-N Junction Diode:

Basic operation and V-I characteristics of semiconductor diode, diode current equation, Zener diode, LED, Photo diode and tunnel diode *(Introductory treatment only)*

Diode Rectifiers:

Half wave and full wave rectifiers with and without filters, Bridge Rectifier expressions – Ripple factor, Efficiency, capacitor filters

Bipolar Junction Transistor:

Introduction, construction, basic operation, modes of operation-Active , cutoff and saturation, Transistor circuit configurations- CE, CB, CC – input and output Characteristics in various configurations *(Introductory treatment only*

Transistor Biasing and Thermal Stabilization:

Transistor Biasing, Thermal runaway, Stabilization, Different methods of Biasing- Fixed bias, Collector feedback bias, self-bias, Bias Compensation.

Transistor Amplifiers:

CE, CB, CC amplifier h-parameter model for Transistor amplifier

Field Effect Transistors:

Junction Field effect Transistors (JFET)-JFET characteristics, JFET parameters, JFET biasing, MOSFETS- Depletion and Enhancement MOSFET.

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 EC 2103	
Course Title: ELEMENTS OF ELECTRONICS ENGINEERING	
CO-1	Understand the physical structure, principles of operation, electrical characteristics and circuit models of diodes, BJTs and FETs
CO-2	Use this knowledge to analyse and design basic electronic application circuits.
CO-3	Extend the understanding of how electronic circuits and their functions fit into larger electronic systems.

SYLLABUS: DISCRETE MATHEMATICAL STRUCTURES (B16ENG2102)

Introduction :

Sets – Operations on sets – Logic: Logical inferences, Methods of proof of an implications– First order logic and other proof methods-Rules of inference for quantified propositions- mathematical induction.

Elementary Combinatorics & Recurrence relations:

Basics of counting – Combinations and Permutations – their enumeration with and without repetition - Principle of Inclusion and Exclusion and its applications, Generating functions of sequences - Calculating their coefficients-Recurrence relations-solving recurrence relations- method of characteristic roots-Non-homogeneous recurrence relations and their solutions.

Relations and Diagraphs:

Relations and directed graphs-Special properties of binary relations-equivalence relations- Ordering relations-operations on relations-Paths and closures-Directed graphs and Adjacency matrices.

Graphs Theory:

Basic concepts – Isomorphism – sub graphs - planar graphs - Euler's formula -Multi graphs and Euler Circuits - Hamiltonian graphs – Graph coloring and Chromatic number – Four color theorem - Trees and their properties – definitions of different tree structures.

Groups :

Definitions of Binary operation, Algebraic Structure, Semi-group, Monoid, Group and Abelian group.

Lattices :

Lattices and Properties of lattices – lattices as partially ordered sets – sub lattices – Direct product and Homomorphisms - Isomorphism's – Modular lattices Distributive lattices – Complemented lattices.

Boolean Algebra :

Definition – Sub algebra – Direct product – Homomorphism's – Isomorphism's – Boolean functions – Representation of Boolean functions – Minimizations of Boolean functions using K-maps.

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 ENG 2102	
Course Title: DISCRETE MATHEMATICAL STRUCTURES	
CO-1	Rewrite the mathematical arguments using logical connectives and quantifiers and verify the validity of the arguments using propositional and predicate logic.
CO-2	Solve different counting problems.
CO-3	Solve the recurrence relations which occur in many fields.
CO-4	Identify and give examples of various types of relations and describe various properties of relations.
CO-5	Determine isomorphism of graphs and utilize the concepts in graphs & trees in their fields.
CO-6	Understand the importance of Groups, lattice structures and their diagrammatic representations and also the importance of Boolean algebra in computer science.

SYLLABUS: OBJECT ORIENTED PROGRAMMING (B16CS2102)

Part 1: C++

Basics of Object Oriented Programming:

Object Oriented Paradigm, Principles of OOP, benefits of OOP, data types, declarations, expressions and operator precedence, functions, scope of variables.

Introduction to C++:

Classes and objects, Constructors & Destructors, constructor with dynamic allocation, explicit constructor, Operator Overloading through Unary, Binary, Assignment and Stream operators & type conversions.

Inheritance and Manipulating Strings:

Derived classes, syntax of derived classes, making private members inheritable, single, multilevel, multiple, hierarchical, hybrid inheritance, Virtual base Class, abstract classes, Creating String Objects, Manipulating String Objects, Relational Operations, Accessing String Characteristics.

Polymorphism:

Pointers, virtual functions and polymorphism- pointers to objects, this pointer, pointers to derived classes, virtual and pure virtual functions, Dynamic polymorphism, Virtual destructor, Virtual Base Class, Dynamic Casting, Cross Casting, Down Casting.

Templates, Exception handling, Streams and Files in C++:

Class templates, Function templates, member function templates, exception handling, managing console I/O operations, Stream Classes, Formatted and Unformatted I/O operations, managing output with manipulators, working with files.

Part 2: JAVA Introduction to JAVA:

Introduction, Classes and Objects, Inheritance, Arrays, strings and Vectors, Exception Handling, Managing I/O files in Java.

Packages and Interface, and Multi-threading: Packages, Interfaces, creating, threads, thread states, thread methods, exceptions, priority in threads, synchronization, Runnable interface, life cycle of an Applet.

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 CS 2102	
Course Title: OBJECT ORIENTED PROGRAMMING	
CO-1	Students will be able to handle I/O streams and Run time errors.
CO-2	Students will be able to construct applications and Identify where data structures are appearing in them

SYLLABUS: DIGITAL LOGIC DESIGN (B16 CS 2103)

Binary Systems:

Digital Systems. Binary Numbers. Number Base Conversions. Octal and Hexadecimal Numbers. Complements. Signed Binary Numbers. Binary Codes. Binary Storage and Registers. Binary Logic.

Boolean algebra and Logic Gates:

Basic Definitions. Axiomatic Definition of Boolean algebra. Basic Theorems and Properties of Boolean Algebra. Boolean Functions. Canonical and Standard Forms. Other Logic Operations. Digital Logic Gates. Integrated Circuits.

Combinational Logic Design, Gate-Level Minimization:

The Map Method. Four- Variable Map. Five-Variable Map. Product of Sums Simplification. Don't-Care Conditions. NAND and NOR Implementation. Other Two- Level Implementations. Exclusive-OR Function. Hardware Description Language (HDL).

Combinational Logic:

Combinational Circuits. Analysis Procedure. Design Procedure. Binary Adder-Subtractor.DecimalAdder.BinaryMultiplier.MagnitudeComparator.Decoders. Encoders. Multiplexers. HDL For Combinational Circuits.

Sequential Logic Design, Synchronous Sequential Logic:

Sequential Circuits .Latches .Flip-Flops. Analysis of Clocked Sequential Circuits. HDLForSequentialCircuits.StateReductionAssignment.DesignProcedure.

Registers and Counters:

Registers. Shift Registers. Ripple Counters. Synchronous Counters. Other Counters. HDL for Registers and Counters.

Memory and Programmable Logic:

Introduction. Random-Access Memory. Memory Decoding, Error Detection and Correction. Read-Only Memory. Programmable Logic Array. Programmable Array Logic. Sequential Programmable Devices.

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 CS 2103	
Course Title: DIGITAL LOGIC DESIGN	
CO-1	An ability to define different number systems, binary addition and subtraction, 2‟s complement representation and operations with this representation.
CO-2	An ability to understand the different Boolean algebra theorems and apply them for logic functions.
CO-3	An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
CO-4	An ability to define the following combinational circuits: multiplexer, de-multiplexers encoders/decoders, comparators, arithmetic-logic units; and to be able to build simple circuits.
CO-5	An ability to understand asynchronous and synchronous sequential circuits, like counters and shift registers.
CO-6	An ability to understand memories like RAM and ROM, Programmable Logic Array and Programmable Array Logic.

SYLLABUS: DATA STRUCTURES LAB (B16 CS 2105)

Implement the following programs using C-Language.

1. Write a program for sorting a list using Bubble sort and then apply binary search.
2. Write a program to implement the operations on stacks.
3. Write a program to implement the operations on circular queues.
4. Write a program for evaluating a given postfix expression using stack.
5. Write a program for converting a given infix expression to postfix form using stack.
6. Write a program for implementing the mazing problem.
7. Write a program for the representation of polynomials using linked list and for theaddition of two such polynomials
8. Write a program for quick sort
9. Write a program for Merge sort.
10. Write a program for Heap sort
11. Write a program to create a binary search tree and for implementing the in order,preorder, post order traversal using recursion
12. Write a program for finding the transitive closure of a digraph
13. Write a program for finding the shortest path from a given source to any vertex in adigraph using Dijkstra's algorithm
14. a)Write a program for finding the Depth First Search of a graph.

    b)Write a program for finding the Breadth First Search of a graph

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 CS 2105	
Course Title: DATA STRUCTURES LAB	
CO-1	Student will be able to write programs to implement stacks and queues.
CO-2	Ability to implement various searching and sorting techniques
CO-3	Ability to implement programs using trees and graphs.

SYLLABUS: OBJECT ORIENTED PROGRAMMING LAB (B16 CS 2106)

Part I: UML

Take an own scenario and draw the UML Diagrams (Structural, Behavioral and Interactive).

Part II: Implement the following programs using C++

1. Write a Program that implements stack operations using classes and objects.
2. Write a Program performing complex number addition using friend functions.
3. Write a Program for complex number addition using operator overloading.
4. Write a Program to perform string operations by overloading operators.
5. Write a Program on hierarchical inheritance showing public, private and protected inheritances.
6. Write a Program for computation of student's result using hybrid inheritance.
7. Write a Program implementing bubble-sort using templates.
8. Write a Program on virtual functions.
9. Write a Program for Templates.
10. Write a Program for copying one file to another file using streams.
11. Write a Program for writing and reading a class object to a file.
12. Write program to implement
    a. One catch block and all Exceptions
    b. using Multiple Catch blocks.
13. Write a program to implement the finally block.
14. Write a program to implement pointers to a derived class and virtual base classes.
15. Write a program to implement conversion of objects between different classes using conversion functions.
16. Write a program to implement function overloading- with various data types, with different number of arguments.
17. Write a program to evaluate mixed mode expressions and implicit type conversions.
18. Write a program to show that there is ambiguity in Multiple Inheritance.
19. Write a program to implement a virtual destructor.
20. Write a program to mimic a bank management system (user logins, requests for withdraw /credit, system verifies whether enough balance is available, update the account summary, etc.)

Part III: Implement the following programs using Java

1. Write a program to give an example for command line arguments.
2. Write a program to sort given list of numbers.
3. Write a program to implement linear search and binary search.
4. Write a program for this operator and super keyword.
5. Write a program that gives demonstration of static variables and methods.
6. Write a program that illustrates the simple inheritance, multilevel inheritance.
7. Write a program that demonstrates the difference between method overloading and overriding.
8. Write a program that demonstrates the difference between method overloading and constructor overloading.
9. Write a program that describes the exception handling mechanism.
10. Write a program that uses try and catch blocks and check whether the given array size is negative or not.

11.Write a program that describes the user defined exception.

12.Write a program that illustrates the creation of threads by using runnable class.

13.Write a program that illustrates the creation of threads

14.Write a program that illustrates the multiple inheritances by using interfaces.

15.Write a program that describes the life cycle of an applet.

16.Write a program that displays the number of characters, lines and words in a text file.

17.Write a program on packages.

18.Write a program to copy contents of a file into another file using File streams.

19.Write a Program for handling Array Index out of Bounds Exception and Divide-by-zero Exception.

20.Write a Program for interfaces.

21.Write a Program on Threads.

22.Write a Program for Constructors.

23.Write a Program for Wrapper Classes.

24.Write a Program for Thread Priority.

25.Write a program for Producer Consumer Problem

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 CS 2106	
Course Title: OBJECT ORIENTED PROGRAMMING LAB	
CO-1	Student will be able to use OOPs concepts
CO-2	Ability to apply Inheritance concepts to several problems.
CO-3	Ability to use Exception Handling concepts.

SYLLABUS: ENGLISH PROFICIENCY (B16 ENG 2104)

(Common to All Branches)

Speaking Skills

PPT

Describing event/place/thing Picture Description Extempore

Debate Telephonic Skills

Analyzing Proverbs

Vocabulary

Affixes

Pairs of Words

Reading Skills

Reading Comprehension Reading/Summarizing News Paper Artic

Writing Skills

Designing Posters

Essay writing

Resume Writing

(***Note: Sessional Marks will be evaluated based on Continuous Comprehensive Evaluation of the students" Performance - 40M, Attendance – 10M and External Marks will be evaluated based on Presentation Skills – 30M, Project 20M)

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 ENG 2104	
Course Title: ENGLISH PROFICIENCY	
CO-1	Students enhance their vocabulary and use it in the relevant contexts.
CO-2	They improve speaking skills.
CO-3	They learn and practice the skills of composition writing.
CO-4	They enhance their reading and understanding of different texts.
CO-5	They enrich their communication both in formal and informal contexts.
CO-6	They strengthen their confidence in presentation skills.

SYLLABUS: INDUSTRY ORIENTED TRAINING (B16 ENG 2105)

(WEB Development)

(Common to CSE & IT)

Industry Oriented Applications on following topics:

HTML: HTML Introduction, HTML Basic Tags, HTML Lists, HTML Tables, HTML Images, HTML Links & Navigation, HTML Forms.

CSS: CSS Introduction, CSS Properties - Controlling Fonts, CSS Properties - Text Formatting, Selectors - id and class, Pseudo classes, CSS for Links, CSS for Lists, CSS for Tables.

JAVA SCRIPT: JavaScript Introduction, Empty Field Validation Example, Name & Numbers Only Validation Example, Email Validation Example, innerHTML Error Display Example.

PHP: Installation of Wamp Server, PHP Introduction, Creating PHP Script, Running PHP Script, PHP Numeric Variables, Sample PHP Programs

MINI PROJECT

(Note: Total Marks will be evaluated based on Continuous evaluation - 25 Marks, Mini Project- 25 Marks)

Course Outcomes for Second Year First Semester Courses	
Course Code:B16 ENG 2105	
Course Title: INDUSTRY ORIENTED TRAINING	
CO-1	Design and develop basic web pages using HTML
CO-2	Apply cascading style sheets to web pages in order to separate form from content.
CO-3	Understand & Apply basic control of elements with JavaScript.
CO-4	Understand the basic concepts of PHP scripting
CO-5	Able to design & complete a project by applying above all the concepts.

SYLLABUS: OPERATING SYSTEMS (B16 CS 2201)

Introduction to Operating Systems:

Over View of Operating Systems, Types of Operating Systems, Operating System Structures, Operating System Services, System Calls, Virtual Machines, Operating System Design and Implementation.

Process Management:

Process Concepts, Operations on Processes, Co-operating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple - Processor Scheduling, Thread Scheduling.

Process Synchronization:

The Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors.

Deadlocks:

System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance, Deadlock Detection, Recovery from Deadlocks

Memory Management:

Logical versus Physical Address, Swapping, contiguous memory allocation, paging, structure of the page table , segmentation, Virtual Memory, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped files

File Systems, Implementation, and Secondary-storage Structure:

Concept of a file, Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers, overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, swap- space management.

Case study: Overview of LINUX, Windows Operating systems

Course Outcomes for Second Year Second Semester Courses	
Course Code: B16 CS 2201	
Course Title: OPERATING SYSTEMS	
CO-1	The student understands OS evolution, its structure and services provided by it.
CO-2	Learn process life cycle, process scheduling objectives, policies and mechanisms, process synchronization, inter process communication, deadlocks and other process subsystem related concepts.
CO-3	Learn memory hierarchy, allocation, de-allocation policies and mechanism for main and auxiliary memory, file system design and implementation issues.

SYLLABUS: COMPUTER ORGANIZATION (B16 CS 2202)

Register Transfer and Micro operations:

Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design:

Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input- Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

Micro programmed Control:

Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

Central Processing Unit:

Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer(RISC).

Pipeline and Vector Processing:

Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISK Pipeline, Vector Processing, Array Processors.

Input/output Organization:

Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.

Memory Organization:

Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory.

Course Outcomes for Second Year Second Semester Courses	
Course Code: B16 CS 2202	
Course Title: COMPUTER ORGANIZATION	
CO-1	Apply the basic knowledge about Digital logic to the Functional components of computer.
CO-2	Students will be able to Describe the major components of a computer.
CO-3	Students will be able to classify different Computer Instructions.
CO-4	Students will be able to Describe Instruction set architecture.
CO-5	Recognize the importance of peripheral devices.
CO-6	Students should be able to classify Computer memories

SYLLABUS: MICROPROCESSORS (B16 CS 2203)

Internal Architecture functional/signal description of 8085 microprocessor, Instruction set, Addressing modes and programming in 8085.

Timing diagram, counters and time delays, stacks and subroutines and Interrupts in 8085

Classification and interfacing semiconductor memories with 8085 MPU. Interfacing characteristics of IO devices, IO device addressing methods.

Interfacing peripherals to INTEL 8085: Parallel I/O interface-8255, Serial I/O Interface-8251, Timer Interface-8253.

Interfacing peripherals to INTEL 8085: Keyboard/Display Interface-8279, Interrupt controller Interface-8259.

The 8086 Microprocessor architecture: Internal Architecture & functional /signal description of 8086, segmented memory, Maximum & Minimum mode of 8086.

Instruction set and programming the 8086: Addressing modes, Instruction set and assembly language programming techniques with 8086.

Course Outcomes for Second Year Second Semester Courses	
Course Code: B16 CS 2203	
Course Title: MICROPROCESSORS	
CO-1	Understand the basic architectures of 8085 and 8086 microprocessors.
CO-2	Ability to write ALP programs using instruction sets of 8085 & 8086.
CO-3	Understand the various interfacing concepts.

SYLLABUS: DATA COMMUNICATIONS (B16 CS 2204)

Introduction to Data Communications:

A Communications Model, Data Communications and Data Communications Networking, Protocols and Protocol Architecture, Characteristics of Data Transmission: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments.

Transmission Media:

Guided Transmission Media, Wireless Transmission.

Data Encoding: Digital Data-Digital Signals, Digital Data-Analog Signals, Analog Data-Digital Signals, Analog Data-Analog Signals.

Data Communication Interface:

Asynchronous and Synchronous Transmission, Line Configurations, Interfacing. Data Link Control Flow Control, Error Detection, Error Control, High-Level Data Link Control (HDLC)

Data Communications Hardware:

Terminals: Introduction, Basic Terminal Components, Enhanced Terminal Components, General-Purpose Terminals, Remote Job Entry Terminals, Transaction Terminals, Clustering of Terminal Devices.

Communications Processing Hardware: Introduction, Switching Processors, Multi-drop Lines, Multiplexers, Concentrators, Front-End Processors

Multiplexing:

Frequency-Division Multiplexing, Synchronous Time-Division Multiplexing: Characteristics, TDM Link Control, Digital Carrier Systems, and Statistical Time-Division Multiplexing: Characteristics.

Course Outcomes for Second Year Second Semester Courses	
Course Code: B16 CS 2204	
Course Title: DATA COMMUNICATIONS	
CO-1	Students will have the ability to use Data Communications and Networking Protocols and protocol architectures
CO-2	Students will have the ability to develop communication models for providing data transmission facility
CO-3	Students will have the ability to outline Data Communication terminology
CO-4	Students will have the ability to classify various transmission media
CO-5	Students will have the ability to discriminate various types of signals for data transmission and ability to describe data encoding techniques
CO-6	Students will have the ability to describe data communications interface
CO-7	Students will have the ability to apply various flow control , error control techniques of data link control protocols
CO-8	Students will have the ability to use various data communication terminals and processing hardware
CO-9	Students will have the ability to demonstrate multiplexing techniques

SYLLABUS: ADVANCED DATA STRUCTURES (B16 CS 2205)

Trees:

Definition, operations and applications of Binary search trees, AVL trees, Red-Black Trees, Splay trees, Tries and B-Trees, B+ Trees

Priority Queues:

Heap model and implementations, Binary Heap, Applications of Priority Queues, d-Heaps, Leftist Heaps, Skew Heaps, Binomial Queues structure, operations and Implementation

Hashing & external sorting:

Hash Table Structure, Hash Function, Collision handling, Separate Chaining, Open Addressing, Rehashing, Extendible hashing, Difference between internal and external sorting, Model and simple algorithm for External sorting, Multi-way Merge, Poly-phase Merge, Replacement selection.

Graph algorithms:

Representation of graphs, Topological sort, Network flow problems, Applications of Depth first search for finding Bi-connectivity, Euler circuits, strong components, Introduction of NP-Completeness

Disjoint Set ADT & Amortized analysis:

Equivalence relations, Dynamic equivalence problem, Basic data structure, smart union algorithms, path compression, Analysis of union/find algorithm, applications of ADT Disjoint set, Introduction to amortized analysis, Basic approaches, binary queues, skew heaps, Aggregate analysis, The accounting method, The potential method and Dynamic tables.

Course Outcomes for Second Year Second Semester Courses	
Course Code: B16 CS 2205	
Course Title: ADVANCED DATA STRUCTURES	
CO-1	Student will be able to write programs to implement various trees.
CO-2	Ability to understand various hashing techniques.
CO-3	Ability to write programs to implement sorting techniques.
CO-4	Ability to understand concepts related to graph theory.

SYLLABUS: COMPUTER GRAPHICS (B16 CS 2206)

Overview of Graphics Systems:

Applications of Computer Graphics-Graphical User Interfaces-Video Display Devices-Raster Scan Systems-Random Scan Systems-Graphics Monitors and Workstations -Input Devices- Logical Classification of Input Devices-Hard Copy Devices- Graphics Software-Overview of C-Graphics, Open GL and PHIGS.

Output Primitives:

Points and Lines-Line Drawing Algorithms- Circle Generating Algorithms- Parallel Line Algorithms-Functions in C-Graphics for Output Primitives.

Attributes of Output Primitives:

Line and Curve Attributes-Color and Gray Scale Levels-Area Fill Attributes-Character Attributes-Bundled Attributes-Inquiry Functions-Anti-aliasing Techniques -Functions in C- Graphics for Attributes of Output Primitives-Filled area primitives- Boundary Fill Algorithm- Flood Fill Algorithm.

Two-Dimensional Geometric Transformations:

Basic Transformations- Matrix Representations-Homogeneous Coordinates-Composite Transformations-Reflection-Shear-Transformations between Coordinate Systems-Affine Transformations- Raster Methods for Transformations.

Two-Dimensional Viewing:

The Viewing Pipeline-Viewing Coordinate Reference Frame-Window-to-Viewport Coordinate Transformation-Clipping Operations-Point Clipping-Line Clipping-Polygon Clipping-Curve Clipping-Text and Exterior Clipping

Three-Dimensional Object Representations and Viewing:

3D Display Methods- 3D Graphics-Polygon Surfaces- Curved Lines and Surfaces- Quadratic Surfaces-Super Quadrics-Blobby Objects-Spline Representations-Cubic Spline methods- Bézier Curves and Surfaces- 3D Viewing Pipeline- Viewing Coordinates- Projections- View Volumes- General Projection Transformations.

Three-Dimensional Geometric Transformations:

Translation- Rotation- Scaling- Reflection – Shear-Composite Transformations-Modeling and Coordinate Transformations.

Case studies- Implementation of algorithms in c-graphics

Course Outcomes for Second Year Second Semester Courses	
Course Code: B16 CS 2206	
Course Title: COMPUTER GRAPHICS	
CO-1	Summarize the application areas of computer graphics
CO-2	Implement algorithms for scan converting graphic primitives in a graphic package.
CO-3	Apply direct and indirect methods for two-dimensional transformations using matrices.
CO-4	Construct three-dimensional geometric transformations using matrices.
CO-5	Visualize two-dimensional viewing transformations
CO-6	Produce views of three-dimensional scenes.
CO-7	Visualize the working of I/O devices

SYLLABUS: OPERATING SYSTEMS AND UNIX PROGRAMMING LAB (B16CS 2207)

Course Outcomes for Second Year Second Semester Courses	
Course Code: B16 CS 2207	
Course Title: OPERATING SYSTEMS AND UNIX PROGRAMMING LAB	
CO-1	The student practices UNIX commands, Vi editor, shell commands.
CO-2	The student develops skill in writing C programs using system calls for process management, inter process communication and memory management aspects.
CO-3	The student learns shell programming and develops skill for writing scripts for batch level tasks.

SYLLABUS: DIGITAL ELECTRONICS AND MICRO PROCESSORS LAB (B16 CS 2208)

DIGITAL EXPERIMENT

Verification of Truth tables of OR, AND, NOT, NAND, NOR, EX-OR gates(by using 7400- series)

Construction of gates using NAND, NOR gates.

Construction of Half and Full adders and verifying their truth tables. Operation and verifying truth tables of flip-lops-RS, D and JK using IC‟s Up/Down counters using JK flip-flops.

4-bit shift right and left registers using JK flip-flops.

MICROPROCESSORS: 8085

Binary Addition of „N‟ 8-bit numbers. Binary to BCD conversion

Arranging –Ascending/descending order

To find the largest /smallest numbers in the array. ASCII to HEXA & HEXA to ASCII conversion.

MICROPROCESSORS: 8086

Liner Search

Factorial of a given number To copy string from S1 to S2 To find GCD and LCM

MICROPROCESSOR INTERFACING WITH 8085

Elevator Traffic Light.

Analog to Digital & Digital to Analog Conversion Interrupt controller

Stepper Motor controller.

Course Outcomes for Second Year Second Semester Courses	
Course Code: B16 CS 2208	
Course Title: DIGITAL ELECTRONICS AND MICRO PROCESSORS LAB	
CO-1	The student understands the logic gates, half adders, full adders and flip-flops to design a circuit.
CO-2	The student develops the skill of writing microprocessor programming.
CO-3	The student understands the interfacing of microprocessor with stepper motor, R-2R ladder

SYLLABUS: COMPETETIVE PROGRAMMING LAB (B16 CS 2209)

1. **Introduction:**
    - The basic elements of python
    - Branching Programs
    - Control Structures
    - Strings and Input
    - Iteration
2. **Functions, Scoping and Abstraction**
- Functions and scoping
- Recursion
- Files
3. **Classes and Object-Oriented Programming**
- Abstract Data Types and Classes
- Inheritance
- Encapsulation and Information Hiding
4. **Algorithms and Data structures**
- Sequences
- Lists
- Item Ordering
- Two-Dimensional Sequences
- The Minmax
5. **Sets and Maps**
- Playing Sudoku
- Sets
- Hashing
- The HashSet Class
- Solving Sudoku
6. **Maps**
    - Memorization
    - Correlating Two Sources of Information
7. **Membership Structures**
- Bloom Filters
- The Trie Data type
8. **Balanced Binary Search Trees**
- Binary Search Trees
- AVL Trees
- Splay Trees
- Iterative Splaying
- Recursive Splaying

9. B-Trees

- B-Tree Implementation
- B-Tree Insert
- B-Tree Delete

10. PROJECT

Course Outcomes for Second Year Second Semester Courses	
Course Code: B16 CS 2209	
Course Title: COMPETETIVE PROGRAMMING	
CO-1	Write programs using python programming
CO-2	Write algorithms
CO-3	Implement various data Structures
CO-4	To apply object oriented mechanisms
CO-5	To Implement various Advance data Structures like AVL trees, B-Trees, Splay trees etc

SYLLABUS: INDUSTRY ORIENTED TRAINING (B16 ENG 2203)

(Common to CSE & IT)

Industry Oriented Applications on following topics.

Linear Linked Data: Singly linked list, operations on a linked list, circular linked list, double linked list, operations on double linked list

Standard Storage: Introduction to files, file types, file modes, and file functions

Searching & Sorting: Linear search and Binary search, Bubble sort, Selection sort, Insertion sort, Quick sort, Heap sort, Merge sort: Worst and Average case analysis. Decision Tree Model and (worst case) lower Bound on Sorting. Sorting in linear time- shell sort, radix sort, bucket sort, counting sort.

Stack & Queue: Stack structure, operations. Stack using linear list data. Stack using linear linked data. Queue structure, operations. Queue using linear list data. Queue using linear linked list. Circular queues.

Non Linear Data: Tree Structure and terminology, Binary Trees, Binary Tree traversals, Applications of Binary Tree, Binary Tree Operations.

Priority queues, union-find sets, (augmented) interval trees, (augmented) balanced BSTs and binary indexed trees, Binary Indexed Tree or Fenwick tree, Segment Tree (RMQ, Range Sum and Lazy Propagation), K-D tree, Union Find Disjoint Set, Tries, Interval Tree

Graphs: Graphs and their basic properties- degree, path, cycle, sub graphs, isomorphism, Eulerian and Hamilton walks, graph coloring, planar graphs, trees. Breadth first search and connected components. Depth first search in directed and undirected graphs.

More Trees: Binary search trees, Operations on BST, balanced binary search trees, AVL trees, Red-Black trees, skip lists, hashing. Priority queues, heaps, Fibonacci heap, union-find, splay trees Interval trees, tries.

(Note: Total Marks will be evaluated based on Continuous Evaluation - 25 Marks, Coding Contest- 25 Marks)

Course Outcomes for Second Year Second Semester Courses	
Course Code:B16 ENG 2203	
Course Title: INDUSTRY ORIENTED TRAINING	
CO-1	Implement the linked lists in real time applications.
CO-2	Apply the file handling operations.
CO-3	Apply the Searching & Sorting algorithms.
CO-4	Implement Stack & Queue operations.
CO-5	Implement the concepts and applications of Trees and Graphs.

SYLLABUS: COMPUTER NETWORKS (B16CS3101)

Switched Networks, Circuit-Switching Networks, Circuit Switching Concepts, Soft switch Architecture, Packet Switching Principles, X.25, Frame Relay

Asynchronous Transfer Mode: Protocol Architecture, ATM Logical Connections, ATM Cells, ATM Service Categories, Routing in Switched Networks

Congestion Control in Switched Data Networks: Effects of Congestion, Congestion Control, Traffic management, Congestion Control in Packet Switched networks, Principles of Cellular Networks

Local Area Network Overview: Background, Topologies and transmission media, LAN Protocol Architecture, Bridges, Layer 2 and Layer 3 Switches

High Speed LANs: The Emergence of High Speed LANs, Ethernet

Wireless LANs: Overview, Wireless LAN Technology, IEEE802.11 Architecture and Services. Internet Protocols: Basic protocol Functions, Principles of Internetworking, Connectionless Internetworking, Internet Protocol

Internet Operation: Multicasting, Routing Protocols: Autonomous Systems & Approaches to Routing

Transport protocols: Connection oriented Transport Protocol Mechanisms: Reliable Sequencing Network Service, TCP: TCP Services, TCP Header Format, TCP Mechanisms, UDP

Course Outcomes for Third Year First Semester Courses	
Course Code: B16 CS 3101	
Course Title: COMPUTER NETWORKS	
CO-1	Distinguish between Circuit Switching and Packet Switching approaches
CO-2	Apply various concepts of ATM networks
CO-3	Distinguish between various types of Networks
CO-4	Apply various Congestion Control Techniques
CO-5	Know Internetwork Operation.
CO-6	Know various Connection Oriented Transport Control Mechanisms.

SYLLABUS: WEB TECHNOLOGIES (B16CS 3102)

Introduction to HTML, Core Elements, Links and Addressing, Images , Text , Colors and Background, Lists, Tables and Layouts , Frames, Forms , Cascading Style Sheets.

Introduction to Java Scripts, Elements of Objects in Java Script, Dynamic HTML with Java Script.

Document type definition, XML Syntax, XML Schemas, Document Object model, Presenting XML, Using XML Processors.

Introduction to Servlet, Servlet Life Cycles, Servlet Basics, Tomcat Web Server, Configuring Apache Tomcat, Handling Client Request and Response, Handling Cookies, Session Tracking.

Introduction to PHP, Language Basics, Functions, Strings, Arrays. Web Techniques, Data bases, Graphics, PDF, Dates and Times.

MYSQL Installation, Accessing MySQL Using PHP, Form Handling, Cookies, Sessions, and Authentication, Tables, Inserting Data into Tables, Selecting Data from a Table, Updating Table, Deleting data from Table, Webpage creation.

Course Outcomes for Third Year First Semester Courses	
Course Code: B16 CS 3102	
Course Title: WEB TECHNOLOGIES	
CO-1	Students will be able to construct web based applications and Identify where data structures are appearing in them.
CO-2	Students will be able to connect java programs to different databases.
CO-3	Students will be able to develop EJB programs

SYLLABUS: FORMAL LANGUAGES AND AUTOMATA THEORY (B16 CS 3103)

Definitions of alphabet, strings, language, Definition of finite automata, Deterministic Finite Automata, Non-Deterministic Finite Automata, representations in mathematical diagram, tabular etc., id of finite automata, design of finite automata from the given description, Conversion of NFA to DFA, Non-Deterministic Finite Automata with ϵ-transitions, elimination of ϵ-transitions, Finite Automata with Output.

Definition of regular expression and Regular Sets, construction of regular expression from the given description, minimization of regular expressions, Conversion of regular Expression to finite automata, finite automata to regular Expression, construction of regular expression for the given finite state machine-a systematic way using Arden's theorem, discussion of pumping lemma on regular sets and Applications of pumping lemma for regular sets, closure properties and Decision Algorithms for Regular Sets, Applications of finite automata.

Definition of Context-Free Grammars, Construction of CFG from the given description, Derivation of Strings from CFG, Derivation Trees, Ambiguous Grammar, Simplification of CFG, CNF and GNF, Pumping Lemma for CFL, Applications of Pumping lemma for CFL, Closure Properties of CFL and Decision Algorithms.

Definition of push down automata, types of push down automata, push down automata to context free grammar, context free grammar to push down automata, design methodology of various push down automata‘s from the given language description, push down automata by empty stack, push down automata by final states.

Definition of Turing machine, ways of representing Turing machine‘s- tabular form, diagram, id of Turing machine, design of Turing machine from the given language description, types of Turing machine, types of grammar, types of automata, Relationship between different languages and automata, halting problem, church‘s thesis, universal Turing machine, Gödel number, definitions of recursive functions- prf, rf, decidability.

Course Outcomes for Third Year First Semester Courses	
Course Code: B16 CS 3103	
Course Title: FORMAL LANGUAGES AND AUTOMATA THEORY	
CO-1	Ability to identify analytically and intuitively for problem- solving situations in related areas of theory in computer science by using Finite-State Machines, Deterministic Finite- State Automata, Nondeterministic Finite-State Automata.
CO-2	Ability to describe the language accepted by an automata or generated by a regular expression or a context-free grammar.
CO-3	Ability to describe the functioning of Pushdown Automata.
CO-4	Ability to describe the functioning of Turing Machines.

SYLLABUS: DATABASE MANAGEMENT SYSTEMS (B16CS3104)

Introduction: File System versus DBMS, Advantages of DBMS, Types of DBMS, The Relational model, Levels of abstraction, Data Independence, Introduction to Transaction management, Structure of a DBMS.

ER Model: Basics of Database Design, ER Diagrams, Entities, Attributes and Entity Sets, Relationships & Relationship Sets, Additional Features of the ER Model: IS A relationship, Aggregation

Database Design and the Relational Model: Conceptual Design with ER Model, Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Logical Database Design: ER to Relational.

Relational Algebra and SQL: Relational Algebra, The form of a Basic SQL Query, Nested Queries, Joins, UNION, INTERSECT and EXCEPT, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Introduction to Views, Destroying/ Altering Tables and Views, Triggers, Embedded SQL, Dynamic SQL, JDBC.

Normalization: Schema Refinement and Normal Forms, Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD‘s, Normal Forms, Properties of Decomposition, Normalization, Other kinds of Dependencies: Multivalve valued and Join dependencies.

Transaction Management and Concurrency Control: The ACID Properties, Transactions & Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control**,** 2PL, Serializability and Recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques, Concurrency Control without Locking.

Crash Recovery: Introduction to ARIES, The Log, Other Recovery-Related Structures, The Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media Recovery.

Course Outcomes for Third Year First Semester Courses	
Course Code: B16 CS 3104	
Course Title: DATABASE MANAGEMENT SYSTEMS	
CO-1	Generalize the basic concepts of DBMS
CO-2	Discover the relational model and formal query languages
CO-3	Prepare SQL commands for definition, constructing and manipulation of databases
CO-4	Apply conceptual and logical database design
CO-5	Apply normalization on tables
CO-6	Schedule concurrent transactions using locking protocols and protocols without locking
CO-7	Recover transactions
CO-8	Examine database connection techniques

SYLLBUS: EMBEDDED SYSTEMS (B16CS3105)

(Elective-I)

Examples of Embedded Systems – Typical Hardware – Memory – Microprocessors – Busses – Direct Memory Access – Introduction to 8051 Microcontroller – Architecture-Instruction set – Programming-Microprocessor Architecture – Interrupt Basics – The Shared-Data problem – Interrupt Latency.

Round–Robin Architecture - Round–Robin with Interrupts Architecture - Function-Queue- Scheduling Architecture – Real-Time Operating Systems Architecture – Selection of Architecture.

Tasks and Task States – Tasks and Data – Semaphores and Shared Data – Semaphore Problems – Semaphore variants, Message Queues – Mailboxes – Pipes – Timer Functions – Events – Memory Management – Interrupt Routines in RTOS Environment.

RTOS design – Principles – Encapsulation Semaphores and Queues – Hard Real-Time Scheduling Considerations – Saving Memory Space – Saving Power.

Host and Target Machines – Linker/Locator for Embedded Software- Getting Embedded Software into the Target System, Testing on your Host Machine – Instruction Set Simulators – Laboratory Tools used for Debugging.

Course Outcomes for Third Year First Semester Courses	
Course Code:B16 CS 3105	
Course Title: EMBEDDED SYSTEMS	
CO-1	To describe the differences between general computing system and Embedded System.
CO-2	To recognize the classification of Embedded System.
CO-3	To understand various architectures of Embedded System.
CO-4	To design Real Time Embedded System using the concepts of RTOS.
CO-5	To load embedded software on Host machine.
CO-6	To test Host machine

SYLLABUS: BIO-INFORMATICS (B16CS3106)

(Elective-I)

Introduction:

Definitions, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition an prediction, Folding problem, Sequence Analysis, Homology and Analogy.

Protein Information Resources

Biological databases, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases.

Genome Information Resources

DNA sequence databases, specialized genomic resources

DNA Sequence analysis

Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases

Pair wise alignment techniques

Database searching, Alphabets and complexity, Algorithm and programs, Comparing two sequences, sub-sequences, Identity and similarity, The Dotplot, Local and global similarity, different alignment techniques, Dynamic Programming, Pair wise database searching.

Multiple sequence alignment

Definition and Goal, The consensus, computational complexity, Manualmethods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and searching

Secondary database searching

Importance and need of secondary database searches, secondary database structure and building a sequence search protocol

Analysis packages

Analysis package structure, commercial databases, commercial software, comprehensive packages, packages specializing in DNA analysis, Intranet Packages, Internet Packages.

Course Outcomes for Third Year First Semester Courses	
Course Code:B16 CS 3106	
Course Title: BIO-INFORMATICS	
CO-1	Remember various bio-informatics terminology and Biological sequences.
CO-2	Use various Genome and Protein databases.
CO-3	Analyse various DNA sequences.
CO-4	Use various tools for Sequence analysis.

SYLLABUS: IMAGE PROCESSING (B16CS3107)

(Elective-I)

Fundamentals of Image Processing: Image Acquisition, Image Model, Sampling, Quantization, Relationship between Pixels, Distance Measures, Connectivity, Image Geometry, Photographic Film. Histogram: Definition, Decision Of Contrast Basing On Histogram, Operations Basing on Histograms Like Image Stretching, Image Sliding, Image Classification. Definition and Algorithm of Histogram Equalization.

Image Enhancement in Spatial Domain: Arithmetic and Logical Operations, Pixel or Point Operations, Size Operations; Smoothing Filters-Mean, Median, Mode Filters – Comparative Study;

Edge enhancement in spatial domain: Edge enhancement filters, Directorial Filters, Sobel, Laplacian, Robert, KIRSCH Homogeneity & DIFF filters, PREWITT Filter, Contrast based edge enhancement techniques, Comparative study, Low pass filters, High pass filters, Sharpening filters, Comparative study, Color fundamentals and color model

Image Compression: Run Length Encoding, modified run length encoding, Contour Coding, Huffman Code, Compression Due to Change in Domain, Compression Due to Quantization Compression at the Time of Image Transmission. Brief Discussion on:- Image Compression Standards.

Image Segmentation: Definition of segmentation, Characteristics of Segmentation, Detection of Discontinuities, Thresholding. Pixel Based Segmentation Method. Region Based Segmentation Methods, Segmentation by Pixel Aggregation, Segmentation by Sub Region Aggregation, Histogram Based Segmentation, Spilt and Merge Technique, Segmentation of moving objects

Morphology: Dilation, Erosion, Opening, Closing, Hit-And-Miss Transform, Thinning, Thickening, Skeletons, Pruning Extensions to Gray – Scale Images Application of Morphology in I.P.

Image Transforms: A Detail Discussion on Fourier Transform, DFT, FFT, and Properties of Fourier transform, WALSH Trans Form, WFT, HADAMARD Transform, and DCT Image Enhancement in Frequency Domain: Design of Low Pass, High Pass, EDGE Enhancement, and Smoothening Filters in Frequency Domain. Butter Worth Filter, Homomorphic Filters in Frequency Domain Advantages of Filters in Frequency Domain, Comparative Study of Filters in Frequency, Domain and Spatial Domain.

Course Outcomes for Third Year First Semester Courses	
Course Code: B16 CS 3107	
Course Title: IMAGE PROCESSING	
CO-1	Ability to develop algorithms for fundamental concepts in Image processing.
CO-2	Ability to perform image enhancement, image compression and image segmentation using various methods.
CO-3	Ability to implement Image transformation techniques

SYLLABUS: APPLICATION DEVELOPMENT USING JAVA (B16EC3108)

(Elective-I)

Multithreading and AWT:

Thread, life cycle of Thread, Separate classes that implement Runnable, Inner classes that implement Runnable, Thread Priorities, Race conditions and synchronization

Basic **AWT Components,** container, Canvas, Panel, Frame, Processing events in GUI controls, Basic AWT user interface controls (Button, checkbox, Checkbox Group, Scroll Bars , Text Field, Text Area radio button, list box). **Event-handling:** Handling events with classes, Handling events by implementing interfaces, Organizing Windows with Layout Managers (Flow Layout, Border Layout, Card Layout, Grid Layout, GridBagLayout)

Java Swings

The Origins of Swing, Swing Is Built on the AWT, Two Key Swing Features, Components and Containers, the Swing Packages, Event Handling, Exploring Swing

Database Access

Structure of JDBC, Databases and Drivers, Connecting to the Database, The JDBC Classes for Creating a Connection, Basic Database Access, SQL Data types and Java Data types, Scrollable Result Sets, The JDBC Support Classes, Prepared Statements, JAVA Database connection program for MS Accesss, Oracle and MySQL

JSP

Introduction to JSP, Tomcat Server & Testing Tomcat. Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods, Requests, and Users Passing Control and Data between Pages – Sharing Session and Application Data , JSP Program for Database Access

Input /Output, NIO and Network Programming:

The **I/O** Classes and Interfaces, I/O Exceptions, The Stream Classes, The Byte Streams, The Character Streams, **NIO** Fundamentals

The Networking Classes and Interfaces, InetAddress, TCP/IP Client Sockets, Reconnection, HttpURLConnection, TCP/IP Server Sockets, Datagrams , Datagram Socket ,Datagram Packet.

Course Outcomes for Third Year First Semester Courses	
Course Code:B16 CS 3108	
Course Title: APPLICATION DEVELOPMENT USING JAVA	
CO-1	Able to do projects for web based and internet applications.
CO-2	Understand multitasking and multiprogramming development
CO-3	Able to do network programming.
CO-4	Able to Construct Web application using Java Server Pages

SYLLABUS: DATABASE MANAGEMENT SYSTEMS LAB (B16CS3110)

Features of two commercial RDBMS package such as ORACLE/DB2, MS Access, and MYSQL & Structured Query Language (SQL) used with the RDBMS.

1. Laboratory Exercises Should Include

a. Defining Schemas for Applications

b. Creation of Database Writing SQL Queries

c. Retrieve Information from Database Creating Views

d. Creating Triggers

e. Normalization up to Third Normal Form Use of Forms

f. Report Writing

g. Some sample applications are given below: Accounting

2. Some sample applications are given below:

a. Accounting Package for Shops

b. Database Manager for Magazine Agency or Newspaper Agency Ticket Booking for Performances

c. Preparing Greeting Cards & Birthday Cards

d. Personal Accounts - Insurance, Loans, Mortgage Payments, Etc. Doctor's Diary & Billing System

e. Personal Bank Account Class Marks Management

f. Hostel Accounting

g. Video Tape Library

h. History of Cricket Scores

i. Cable TV Transmission Program Manager

j. Personal Library

k. Sailors Database

l. Suppliers and Parts Database

Course Outcomes for Third Year First Semester Courses	
Course Code: B16 CS 3110	
Course Title: DATABASE MANAGEMENT SYSTEMS LAB	
CO-1	The student is exposed to a commercial RDBMS environment such as ORACLE.
CO-2	The student will learn SQL commands for data definition and manipulation.
CO-3	The student applies conceptual design.
CO-4	The student applies Logical data base design.
CO-5	The student takes up a case study and applies the design steps.

SYLLABUS: APPLIATION DEVELOPMENT LAB (B16 CS 3111)

CYCLE- 1:

1. Write a java program that implements thread class methods.
2. Write a java program that handles all mouse events and shows the event name at the centre of the window when a mouse event is fired. Use adapter classes.
3. Write a java program to demonstrate the key event handlers.
4. Write a java program to display the table using labels in grid layout.
5. Write a java program to display the Header information of the given URL
6. Write a java program to split the given URL.
7. Write a java program by using JDBC to execute a SQL query for a database and display the results.
8. Implementing one-one chat Application without threads
9. Write a java program for Datagram server and Client interaction as per given below:

   i). A program to create Datagram server to send a message to client.

   ii). A program to create Datagram client to receive the message sent by the server
10. Write JSP Program to validate user name and password on server side?
11. Write an online book purchase application using JSP. Consider a login validation page and one billing page for bill payment process. Assume any information if required?
12. Write JSP Program for Database Access.

CYCLE-2:

Each batch should develop one project out of this list using **HTML, CSS, JS, PHP and MYSQL**

1. Design Airlines Ticket Reservation System
2. Online Shopping
3. Design Library Information system.
4. Design Gram Panchayat Information system for House tax, water tax, wealth tax, Library tax collection, phone bill, Electricity bill collection.
5. Design student information system portal which maintain attendance, marks etc.
6. Design online examination system.
7. Event management System.
8. Car Rental System.
9. Cinema Booking System.
10. Hotel Management System.
11. Complaint management System.

12. Online voting system.
13. Student Result System.
14. Car Comparison System Project.
15. Selling your old stuff.
16. Aquaculture Updates.
17. Timesheet using PHP
18. Online Help Desk using PHP
19. Online marriage beuro system
20. EAMCET web counselling

Course Outcomes for Third Year First Semester Courses	
Course Code: B16 CS 3111	
Course Title: APPLIATION DEVELOPMENT LAB	
CO-1	Students will be able to create sophisticated applications to Manipulate Window Interfaces Using Swing Objects, Graphics Objects and working with Streams and File Input /Output.
CO-2	Develop Swing-based GUI.
CO-3	Develop client/server applications and TCP/IP socket programming.
CO-4	Update and retrieve the data from the databases using SQL.

SYLLABUS: VERBAL & QUANTITATIVE APTITUDE – I (B16ENG3102)

(Common to All Branches)

Part-A: Verbal Aptitude and Soft Skills-I

Grammar: (VA)

Parts of speech(with emphasis on appropriate prepositions, co-relative conjunctions, pronouns- number and person, relative pronouns), articles(nuances while using definite and indefinite articles), tenses(with emphasis on appropriate usage according to the situation), subject – verb agreement (to differentiate between number and person) , clauses(use of the appropriate clause, conditional and relative clauses), phrases(use of the phrases, phrasal verbs) to-infinitives, gerunds, question tags, voice, direct & indirect speech, degrees of comparison, modifiers, determiners, identifying errors in a given sentence, correcting errors in sentences.

Vocabulary: (VA)

Synonyms and synonym variants (with emphasis on high frequency words), antonyms and antonym variants (with emphasis on high frequency words), contextual meanings with regard to inflections of a word, frequently confused words, words often mis-used, multiple meanings of the same word (differentiating between meanings with the help of the given context), foreign phrases, homonyms, idioms, pictorial representation of words, word roots, collocations.

Reasoning: (VA)

Critical reasoning (understanding the terminology used in CR- premise, assumption, inference, conclusion), Analogies (building relationships between a pair of words and then identifying similar relationships), Sequencing of sentences (to form a coherent paragraph, to construct a meaningful and grammatically correct sentence using the jumbled text), odd man (to use logical reasoning and eliminate the unrelated word from a group), YES-NO statements (sticking to a particular line of reasoning Syllogisms.

Usage: (VA)

Sentence completion (with emphasis on signpost words and structure of a sentence), supplying a suitable beginning/ending/middle sentence to make the paragraph coherent, idiomatic language (with emphasis on business communication), and punctuation depending on the meaning of the sentence.

Soft Skills:

Introduction to Soft Skills – Significance of Inter & Intra-Personal Communication – SWOT Analysis – Creativity & Problem Solving – Leadership & Team Work - Presentation Skills Attitude – Significance – Building a positive attitude – Goal Setting – Guidelines for Goal Setting – Social Consciousness and Social Entrepreneurship – Emotional Intelligence - Stress Management, CV Making and CV Review.

Part-B: Quantitative Aptitude -I

Numbers, LCM and HCF, Chain Rule, Ratio and Proportion

Importance of different types of numbers and uses of them: Divisibility tests, finding remainders in various cases, Problems related to numbers, Methods to find LCM, Methods to find HCF, applications of LCM, HCF. Importance of chain rule, Problems on chain rule, introducing the concept of ratio in three different methods, Problems related to Ratio and Proportion.

Time and work, Time and Distance

Problems on man power and time related to work, Problems on alternate days, Problems on hours of working related to clock, Problems on pipes and cistern, Problems on combination of the some or all the above, Introduction of time and distance, Problems on average speed, Problems on Relative speed, Problems on trains, Problems on boats and streams, Problems on circular tracks, Problems on polygonal tracks, Problems on races.

Percentages, Profit Loss and Discount, Simple interest, Compound Interest, Partnerships, shares and dividends

Problems on percentages-Understanding of cost price, selling price, marked price, discount, percentage of profit, percentage of loss, percentage of discount, Problems on cost price, selling price, marked price, discount. Introduction of simple interest, Introduction of compound interest, Relation between simple interest and compound interest, Introduction of partnership, Sleeping partner concept and problems, Problems on shares and dividends, and stocks.

Introduction, number series, number analogy, classification, Letter series, ranking, directions

Problems of how to find the next number in the series, Finding the missing number and related sums, Analogy, Sums related to number analogy, Ranking of alphabet, Sums related to Classification, Sums related to letter series, Relation between number series and letter series, Usage of directions north, south, east, west, Problems related to directions north, south, east, west.

Data sufficiency, Syllogisms

Easy sums to understand data sufficiency, frequent mistakes while doing data sufficiency**,** Syllogisms Problems.

Course Outcomes for Third Year First Semester Courses	
Course Code: B16ENG3102	
Course Title: VERBAL & QUANTITATIVE APTITUDE – I	
CO-1	Detect grammatical errors in the text/sentences and rectify them while answering their competitive/ company specific tests and frame grammatically correct sentences while writing.
CO-2	Answer questions on synonyms, antonyms and other vocabulary based exercises while attempting CAT, GRE, GATE and other related tests.
CO-3	Use their logical thinking ability and solve questions related to analogy, syllogisms and other reasoning based exercises.
CO-4	Choose the appropriate word/s/phrases suitable to the given context in order to make the sentence/paragraph coherent.
CO-5	Apply soft skills in the work place and build better personal and professional relationships making informed decisions.
CO-6	The students will be able to perform well in calculating on number problems and various units of ratio concepts.
CO-8	The students will become adept in solving problems related to profit and loss, in specific, quantitative ability.
CO-9	The students will present themselves well in the recruitment process using analytical and logical skills which he or she developed during the course as they are very important for any person to be placed in the industry.
CO-10	The students will learn to apply Logical thinking to the problems of syllogisms and be able to effectively attempt competitive examinations like CAT, GRE, and GATE for further studies.

SYLLABUS: ADVANCED CODING (B16 ENG3104)

(MOOCS - I)

UNIT I Review Coding essentials and modular programming

Introduction to Linear Data, Structure of linear data, Operation logics, Matrix forms and representations, Pattern coding.

Introduction to modular programming: Formation of methods, Methods: Signature and definition, Inter-method communication, Data casting & storage classes, Recursions

UNIT II Linear Linked Data

Introduction to structure pointer, Creating Links Basic problems on Linked lists, Classical problems on linked lists. Circular Linked lists, Operations on CLL, Multiple links, Operations on Doubly linked lists

UNIT III Abstract Data-structures

Stack data-structure, Operations on stack, Infix/Prefix/Post fix expression evaluations, Implementation of stack using array, Implementation of stack using linked lists.

Queue data-structure: Operations on Queues, Formation of a circular queue, Implementation of queue using stack, Implementation of stack using array, Implementation of stack using linked lists

UNIT IV Running time analysis of code and organization of linear list data

Code evaluation w.r.t running time, Loop Complexities, Recursion complexities, Searching techniques: sequential Vs. binary searching.

Organizing the list data, Significance of sorting algorithms, Basic Sorting Techniques: Bubble sort, selection sort, Classical sorting techniques: Insertion sort, Quick sort, Merge sort.

UNIT V Standard Library templates and Java collections

Introduction to C++ language features, working on STLs, Introduction to Java as Object Oriented language, Essential Java Packages, Coding logics.

Note: This course should focus on Problems

Course Outcomes for Third Year First Semester Courses	
Course Code: B16 ENG3104	
Course Title: ADVANCED CODING	
CO-1	Acquire coding knowledge on essential of modular programming
CO-2	Acquire Programming knowledge on linked lists
CO-3	Acquire coding knowledge on ADT
CO-4	Acquire knowledge on time complexities of different methods
CO-5	Acquire Programming skill on Java libraries and Collections

SYLLABUS: DIGITAL IMAGE PROCESSING(B16CS3112A)
(MOOCS-I)

- Introduction and signal digitization
- Pixel relationship
- Camera models & imaging geometry
- Image interpolation
- Image transformation
- Image enhancement I
- Image enhancement II
- Image enhancement III
- Image restoration I
- Image restoration II & Image registration
- Colour image processing
- Image segmentation
- Morphological image processing
- Object representation, description and recognition

Suggested Reading:

1. Digital Image Processing by Rafael C Gonzalez & Richard E Woods, 3rd Edition
2. Fundamentals of Digital Image Processing by Anil K Jain
3. Digital Image Processing by William K Pratt

WEB LINK:

https://onlinecourses.nptel.ac.in/noc18_ee40/preview

SYLLABUS: E-BUSINESS (B16CS3112B)

(MOOCS-I)

Introduction to E-Business

Making Functional Areas E-Business Enabled: Value chain and supply chain, inter and intraorganizational business processes, ERP

Making Functional Areas E-Business Enabled: E-Procurement

Making Functional Areas E-Business Enabled: E-marketing, E-Selling, E-Supply ChainManagement

Technologies for E-Business: Internet and Web based system

Technologies for E-Business: Security and payment systems

Technologies for E-Business: Supply chain integration technologies (EDI, RFID, Sensors, IoT,GPS, GIS)

Technologies for E-Business: Supply chain integration technologies (Web services and cloud)

Decision Support in E-Business: Web analytics

Decision Support in E-Business: Customer behavior modeling

Decision Support in E-Business: Auctions

Decision Support in E-Business: Recommender systems

SUGGESTED READING

1. Management Information Systems: Managing the Digital Firm, Laudon and Laudon, Pearson
2. Scaling for E-Business, Menasce & Almeida, PHI
3. eBusiness & eCommerce – Managing the Digital Value Chain, Meier & Stormier, Springer
4. eBook is available in springerlink.com
5. Some reference books, Internet Resources, and Research Papers.

Web Link:

https://onlinecourses.nptel.ac.in/noc18_mg35/prev

SYLLABUS: INTRODUCION TO PARALLEL PROGRAMMING IN OPEN MP (B16 CS 3112C)

(MOOCS-II)

- Single Processor Architecture and Basic OpenMP constructs & functions
- More OpenMP constructs & functions
- Basic Linear Algebra using OpenMP and OpenMP tasks
- (Assignment 1: Programming assignment to implement and evaluate blocked matrix multiply in OpenMP)
- Critical Sections, locks and Matrix Factorization using OpenMP
- (Assignment 2: Programming assignment to implement and evaluate task based algorithm for a BLAS routine).

Suggested Reading

1. Introduction to Parallel Computing (Ananth Grama, Anshul Gupta, George Karypis, VipinKumar).

Weblink:

https://computing.llnl.gov/tutorials/openMP/

SYLLABUS: SOCIAL NETWORKS (B16 CS 3113A)

(MOOCS-II)

- Introduction
- Handling Real-world Network Datasets
- Strength of Weak Ties
- Strong and Weak Relationships (Continued) & Homophily
- Homophily Continued and +Ve / -Ve Relationships
- Link Analysis
- Cascading Behaviour in Networks
- Link Analysis (Continued)
- Power Laws and Rich-Get-Richer Phenomena
- Power law (contd..) and Epidemics
- Small World Phenomenon
- Pseudo core (How to go viral on web)

SUGGESTED READING:

1. Networks, Crowds and Markets by David Easley and Jon Kleinberg, Cambridge UniversityPress, 2010.
2. Social and Economic Networks by Matthew O. Jackson, Princeton University Press, 2010.

Web Link:

https://onlinecourses.nptel.ac.in/noc18_cs56/preview

SYLLABUS: INTRODUCTION TO INTERNET OF THINGS (B16 CS 3113B)

(MOOCS-II)

- Introduction to IoT: Part I, Part II, Sensing, Actuation, Basics of Networking: Part-I
- Basics of Networking: Part-II, Part III, Part IV, Communication Protocols: Part I, Part II
- Communication Protocols: Part III, Part IV, Part V, Sensor Networks: Part I, Part II
- Sensor Networks: Part III, Part IV, Part V, Part VI, Machine-to-Machine Communications
- Interoperability in IoT, Introduction to Arduino Programming: Part I, Part II, Integration ofSensors and Actuators with Arduino: Part I, Part II
- Introduction to Python programming: Part I, Part II, Introduction to Raspberry Pi: Part I,Part II
- Implementation of IoT with Raspberry Pi: Part I
- Implementation of IoT with Raspberry Pi: Part II, Part III, Introduction to SDN: Part I, PartII, SDN for IoT: Part I
- SDN for IoT: Part II, Data Handling and Analytics: Part I, Part II, Cloud Computing: Part I, Part II
- Cloud Computing: Part III, Part IV, Part V, Sensor-Cloud: Part I, Part II
- Fog Computing: Part I, Part II, Smart Cities and Smart Homes: Part I, Part II, Part III
- Connected Vehicles: Part I, Part II, Smart Grid: Part 1, Part II, Industrial IoT: Part I
- Industrial IoT: Part I, Case Study: Agriculture, Healthcare, Activity Monitoring: Part I, PartII.

SUGGESTED READING

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti.

Web Link:

https://onlinecourses.nptel.ac.in/noc18_cs46/previe

SYLLABUS: BLOCKCHAIN ARCHITECTURE DESIGN AND USECASES

(MOOCS-II)

Chapter	Lecture	Topic	Concepts
1.	1	Introduction to Block chain – I(Basics)	What is Block chainPublic Ledgers Block chain as public ledgers
	2	Introduction to Block chain – II (History)	Bit coin Block chain 2.0 Smart Contracts
	3	Introduction to Block chain – III (Architecture)	Block in a Block chainTransactions Distributed Consensus
	4	Introduction to Block chain – IV (Conceptualization)	The Chain and the Longest Chain Crypto currency to Block chain 2.0 Permissioned Model of Block chain
	5	Basic Crypto Primitives – I	Cryptographic Hash FunctionProperties of a hash function Hash pointer and Merle tree
2.	6	Basic Crypto Primitives – II	Digital Signature Public Key CryptographyA basic crypto currency
	7	Bit coin Basics – I	Creation of coins Payments and double spending FORTH – the precursor for Bit coin scripting
	8	Bit coin Basics – II	Bit coin Scripts Bit coin P2P Network
	9	Bit coin Basics – III	Transaction in Bit coin NetworkBlock Mining Block propagation and block relay
	10	Distributed Consensus	Why Consensus Distributed consensus in open environments Consensus in a Bit coin network
3.	11	Consensus in Bit coin – I (TheBasics)	Bit coin Consensus Proof of Work (PoW) – basic introduction Hash cash PoW
	12	Consensus in Bit coin – II (PoWand Beyond)	Bit coin PoW Attacks on Pow and the monopoly problem Proof of Stake, Proof of Burn and Proof of Elapsed Time
	13	Consensus in Bit coin – III (TheMiners)	The life of a Bit coin MinerMining Difficulty Mining Pool
	14	Permissioned Block chain – I(Basics)	Permissioned model and use cases Design issues for Permissioned block chainsExecute contracts State machine replication
	15	Permissioned Block chain – II (Consensus)	Consensus models for permissioned block chain Distributed consensus in closed environment Paxos

Chapter	Lecture	Topic	Concepts
4.	16	Permissioned Blockchain – III(RAFT Consensus)	1) RAFT Consensus 2) Byzantine general problem
	17	Permissioned Blockchain – IV (Byzantine General Problem)	1) Byzantine fault tolerant system 2) Lamport-Shostak-Pease BFT Algorithm
	18	Permissioned Blockchain – V(Practical Byzantine Fault Tolerance)	1) BFT over Asynchronous systems 2) Practical Byzantine Fault Tolerance 3) Three phase commit 4) View Change
	19	Blockchain for Enterprise –Overview	1) Concepts and benefits of block chain for enterprise 2) The Hyperledger Project
	20	Blockchain Components andConcepts	1) Actors in a Blockchain 2) Components in Blockchain design 3) Ledger in Blockchain
5.	21	Hyperledger Fabric – Transaction Flow	1) Fabric Architecture 2) Transaction flow in Fabric
	22	Hyperledger Fabric Details	1) Ordering Services 2) Channels in Fabric 3) Fabric Peer and Certificate Authority
	23	Fabric – Membership andIdentity Management	1) Organization and Consortium Network 2) Membership Service Provide 3) Transaction Signing
	24	Hyperledger Fabric Network Setup	1) Steps for network setup 2) Endorsement policies
	25	Fabric Demo on IBMBlockchain Cloud – I	1) Setup Blockchain networks 2) Experience blockchain network as different organizations 3) Deploy a simple application on IBM cloud
6.	26	Fabric Demo on IBM Blockchain Cloud – II	1) Deploy a simple application on IBM Cloud 2) Marbles (asset transfer) 3) Example smart contract code, client SDKcode 4) Perform blockchain transactions using acool UI!
	27	Fabric Demo, deploy fromscratch – III	1) Setup a Fabric network on your laptop or VM 2) Install and instantiate chaincode 3) Run application on the network you created
	28	Hyperledger Composer – Application Development	1) Goals of Hyperledger Composer 2) Key concepts for the business service provide 3) Key development concepts – Model files, Access control lists, Transaction processors, business network definition
	29	Hyperledger Composer – Network Administration	1) Key concepts for administrators 2) How composer maps to Fabric chaincode
	30	Blockchain Use Cases	1) Sample use cases by Industry 2) Business Problems and Participants 3) Communities in Blockchain network

Chapter	Lecture	Topic	Concepts
7.	31	Blockchain in Financial Service – I (Payments and SecureTrading)	1) Cross border payments 2) Steller and Ripple protocols 3) Project Ubin
	32	Blockchain in Financial Service – II (Compliance and Mortgage)	1) Know Your Customer (KYC) 2) Privacy Consents 3) Mortgage over Blockchain
	33	Blockchain in Financial Service – III (Financial Trade)	1) Blockchain enabled Trade 2) We.Trade – Trade Finance Network 3) Supply Chain Financing
	34	Revolutionizing Global Trade	1) Blockchain for Trade Logistics 2) Global Trade Digitization 3) Blockchain for Container Management
	35	Blockchain in Supply Chain – I	1) Food Safety and Food Traceability 2) Supply Chain Orchestration
8.	36	Blockchain in Supply Chain – II	1) Everledger 2) The Diamond Lifecycle 3) Addressing Supply Chain Fraud throughBlockchain
	37	Blockchain in Other Industries	1) Blockchain in Healthcare 2) Blockchain in Energy Markets 3) Blockchain in Media
	38	Blockchain in Government – I (Advantages)	1) Blockchain and Government 2) Preventing Cyber Crime through blockchain 3) Government Use-cases
	39	Blockchain in Government – II(Use Cases)	1) Auditing and Compliance 2) Blockchain for Defense 3) e-Estonia: A Case Study
	40	Blockchain in Government – III (Digital Identity)	1) Digital Identity and Single Sign On (SSO) 2) Principles of Digital Identity Management 3) Why Blockchain
9.	41	Blockchain in Government – IV (Hyperledger Indy)	1) Indy for Digital Identity Management 2) How Indy Works
	42	Blockchain in Government – V(Tax Payments and Land Registry Records)	1) Blockchain for Tax Payments 2) Blockchain for Managing Land RegistryRecords
	43	Blockchain Security – I (Overview)	1) Security properties 2) Security considerations for Blockchain 3) Intel SGX
	44	Blockchain Security – II (Membership and Access control in Fabric)	1) Identities and Policies 2) Membership and Access Control 3) Blockchain Crypto Service Providers
	45	Blockchain Security – III (Privacy in Fabric)	1) Privacy in a Blockchain System 2) Privacy through Fabric Channels 3) Smart Contract Confidentiality

Chapter	Lecture	Topic	Concepts
10.	46	Blockchain Security – III (Fabric SideDB)	1) SideDB Motivation 2) SideDB Overview
	47	Research Aspects – I (Consensus Scalability)	1) PoW vs BFT Consensus 2) Consensus Finality 3) Consensus Scalability
	48	Research Aspects – II (Bitcoin-NG)	1) Fairness and Scalability in Nakamoto Consensus 2) Bitcoin-NG: Working Principles 3) Key Blocks and Microblocks
	49	Research Aspects –III (Collective Signing)	1) Authority and Digital Signature 2) Collective Signing (CoSi) 3) Shnorr Multisignature and BLS Signatures
	50	Research Aspects – IV (Byzcoin)	1) Strong non-probabilistic consistency 2) BFT over Bitcoin – increasing scalability 3) Byzcoin Design and Performance
11.	51	Research Aspects – V (Algorand)	1) Strong Synchrony vs Weak Synchrony 2) Avoiding Forks 3) Transaction Neutrality and Frictionless Evolution
	52	Research Aspects – VI (Cross Fault Tolerance)	1) Asynchronous networks as networkfault 2) Cross fault Tolerant (XFT) architecture 3) XPaxos
	53	Research Aspects – VII (Secured Multi-Party Computation)	1) Multi-Party Computation (MPC) 2) Fairness in MPC 3) MPC over Blockchain – ensuring fairness
	54	Blockchain for Science – I (Blockchain for Big Data)	1) Big Data and Big Network 2) Why Blockchain for Big data – application aspects 3) BigChainDB – The Blockchain Database
	55	Blockchain for Science – II (Blockchain and AI)	1) Data analysis over Blockchain 2) Logic over Blockchain network 3) Inferring Decisions through AI
12.	56	Comparing Ecosystems – Ethereum	1) Architecture and concepts 2) Smart contracts and EVM 3) Additional/upcoming capabilities
	57	Comparing Ecosystems – Ethereum development tools and Quorum	1) Ethereum Development Tools 2) Motivation and concepts 3) Architecture 4) Transaction processing and consensus
	58	Comparing Ecosystems – Corda Part 1& Comparing Ecosystems – Corda Part 2	1) Key features, Notaries and Oracles 2) Transactions, Transaction Flows 3) Corda ledger and smart contracts, Consensus

Web Link:

https://onlinecourses.nptel.ac.in/noc18_cs47/course

SYLLABUS: INTRODUCTION TO R SOFTWARE (B16 CS 3113D)

(MOOCS-II)

- Basic fundamentals, installation and use of software, data editing, use of R as a calculator,functions and assignments.
- Use of R as a calculator, functions and matrix operations, missing data and logicaloperators.
- conditional executions and loops, data management with sequences.
- Data management with repeats, sorting, ordering, and lists.
- Vector indexing, factors, Data management with strings, display and formatting.
- Data management with display paste, split, find and replacement, manipulations with alphabets, evaluation of strings, data frames.
- Data frames, import of external data in various file formats, statistical functions, compilation of data.
- Graphics and plots, statistical functions for central tendency, variation, skewness and kurtosis, handling of bivariate data through graphics, correlations, programming and illustration with examples.

Suggested Reading

- Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R By Christian Heumann, Michael Schomaker and Shalabh, Springer, 2016
- The R Software-Fundamentals of Programming and Statistical Analysis -Pierre Lafaye de Micheaux, Rémy Drouilhet, Benoit Liquet, Springer 2013
- A Beginner's Guide to R (Use R) By Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, Springer 2009.

Web Link:

https://onlinecourses.nptel.ac.in/noc18_cs52

SYLLABUS: DATA WAREHOUSING & DATA MINING (B16CS3201)

Introduction to Data Mining: Evolution of I T into DBMS, Motivation and importance of Data Warehousing and Data Mining, Kinds of Patterns, Technologies, Basic Data Analytics: Data Objects and Attributes Types, Statistical Descriptions of Data, Data Visualization, Estimating Data Similarity and Dissimilarity, Major Issues in Data Mining, Data Mining Applications

Tasks involved in data processing: Data Cleaning, Data Integration, Data Reduction, Data Transformation, Discretization and Concept Hierarchy Generation.

Data Warehouse and OLAP Technology: Basic Concepts of Data warehouse, Data Modeling using Cubes and OLAP, DWH Design and usage, Implementation using Data Cubes and OLAPs, Data Generalization with AOI.

Mining Frequent Patterns Based on Associations and Correlations: Basic Concepts, Frequent Item set Mining Methods: Apriori Algorithm, Association Rule Generation, Improvements to A Priori, FP- Growth Approach, Mining Frequent Patterns using Vertical Data Formats, Mining Closed and Max Patterns, Pattern Evaluation Methods, mining in multilevel, multi-dimensional space.

Classification & Prediction: Basic Concepts, Decision Tree Induction, Bayes Classification, Rule- Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy Advanced Methods: Classification by Back Propagation, SVM, Associative Classification, Lazy Learning

Cluster Analysis: Basic Concepts and issues in clustering, Types of Data in Cluster Analysis, Partitioning Methods- K-Means, K-Medoids, Hierarchical Methods-Agglomerative versus Divisive, Distance Measures in Algorithmic Methods, Birch, Chameleon, Density Based Methods- DBSCAN, OPTICS, Grid Based Methods-STING, CLIQUE, Evaluation of Clustering Solutions.

Course Outcomes for Third Year Second Semester Courses	
Course Code: B16 CS 3201	
Course Title: DATA WAREHOUSING & DATA MINING	
CO-1	The student understands the differences between OLTP and OLAP.
CO-2	The student learns how data cube technology supports structuring and querying high dimensional data.
CO-3	The student is introduced to similarity, distance, information gain and other performance and error metrics used for data mining.
CO-4	The student is introduced to association rule mining, supervised and unsupervised learning and the corresponding classification and clustering approaches involving decision trees, Bayesian approaches, model based and agglomerative approaches.

SYLLABUS: OBJECT ORIENTED SOFTWARE ENGINEERING (B16CS3202)

Introduction to Object Oriented Software Engineering: Nature of the Software, Types of Software, Software Engineering Projects, Software Engineering Activities, Software Quality, and Introduction to Object Orientation, Software Process Models-Waterfall Model, and Opportunistic Model, Phased Released Model, Spiral Model, Evolutionary Model, Concurrent Engineering Model.

Requirements Engineering: Domain Analysis, Problem Definition and Scope, Requirements Definition, Types of Requirements, Techniques for Gathering and Analyzing Requirements, Requirement Documents, Reviewing, Managing Change in Requirements.

Unified Modeling Language & Use Case Modeling: Introduction to UML, Modeling Concepts, Types of UML Diagrams with Examples; User-Centered Design, Characteristics of Users, Developing Use - Case Models of Systems, Use-Case Diagram, Use- Case Descriptions, Basics of User Interface Design, Usability Principles, User Interfaces.

Class Design and Class Diagrams: Essentials of UML Class Diagrams, Associations and Multiplicity, Other Relationships, Generalization, Instance Diagrams, Advanced Features of Class Diagrams, Interaction and Behavioral Diagrams: Interaction Diagrams, State Diagrams, Activity Diagrams, Component and Deployment Diagrams.

Software Design and Architecture: Process of Design, Principles Leading to Good Design, Techniques for Making Good Design Decisions, Good Design Document; Pattern Introduction, Design Patterns: Abstraction-Occurrence Pattern, General Hierarchical Pattern, Play-Role Pattern, Singleton Pattern, Observer Pattern, Delegation Pattern, Adaptor Pattern, Façade Pattern, Immutable Pattern, Read-Only Interface Pattern and The Proxy Pattern; Software Architecture Contents of Architecture Model, Architectural Patterns: Multilayer, Client-Server, Broker, Transaction Processing, Pipe & Filter and MVC Architectural Patterns

Software Testing: Overview of Testing, Testing Concepts, Testing Activities, Testing Strategies, Unit Testing, Integration Testing, Function Testing, Structural Testing, Class Based Testing Strategies, Use Case/Scenario Based Testing, Regression Testing, Performance Testing, System Testing, Acceptance Testing, Installation Testing, OO Test Design Issues, Test Case Design, Quality Assurance, Root Cause Analysis, Post-Mortem Analysis.

Software Process Management: Introduction to Software Project Management, Software Engineering Teams, Project Scheduling, Tracking and Monitoring.

CASE STUDY:

1. Simple Chat Instant Messaging System
2. GPS Based Automobile Navigation System
3. Waste Management Inspection Tracking System (WMITS)
4. Geographical Information System

Course Outcomes for Third Year Second Semester Courses	
Course Code: B16 CS 3202	
Course Title: OBJECT ORIENTED SOFTWARE ENGINEERING	
CO-1	Ability to define a problem and perform Requirements Engineering.
CO-2	Ability to draw UML diagrams for the requirements gathered.
CO-3	Ability to design various aspects of the system.
CO-4	Ability to implement the designed problem in Object Oriented Programming Language and test whether all the requirements specified have been achieved or not.
CO-5	Able to apply various testing approaches to test the system.
CO-6	Able to use various Process management activities.

SYLLABUS: DESIGN AND ANALYSIS OF ALGORITHMS (B16CS3203)

Introduction

Algorithm specification, Recursive Algorithms, Performance analysis, Space Complexity, Time Complexity, Asymptotic Notation, Practical Complexities Performance Measurement, Priority queues, Heaps, Heap Sort, Sets and Disjoint set union, Union and Find Operations

Divide and Conquer

General method, Binary search, Finding maximum and minimum, Merge sort, Quicksort, Performance Measurement , Selection Problem, A Worst-Case Optimal Algorithm , Implementation of Select2,Strassen‘s matrix multiplication, Convex hull Problem, Quick Hull Algorithm

The Greedy Method

General method, Knapsack problem, Tree vertex splitting, Job sequencing with deadlines, Minimum cost spanning trees, Prim‘s algorithm, Kruskal‘s algorithm, Optimal storage on tapes, Optimal merge patterns ,Huffman coding, Single source shortest paths

Dynamic Programming

General method, Multistage graphs, All pairs shortest paths, Single source shortest paths with general weights, Optimal binary search trees, String editing, 0/1Knapsack, Reliability design, The travelling salesperson problem

Backtracking

General method, 8-Queens problem, Sum of subsets, Graph coloring, Hamiltonian cycles, Knapsack problem

Branch and Bound

The method, Least Cost(LC) Search, The15-puzzle problem, Control abstractions for LC- Search, FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack problem, Travelling sales person problem

Algebraic Problems and Lower Bound Theory

The method, Evaluation and interpolation, Fast Fourier Transform, Modular arithmetic, Comparison trees, Ordered Searching, Sorting, Selection, Oracles and adversary arguments, Merging, Largest and Second largest

NP-Hard and NP-Complete Problems

Basic concepts, Nondeterministic Algorithms, The Classes NP-hard and NP-complete

Course Outcomes for Third Year Second Semester Courses	
Course Code: B16 CS 3203	
Course Title: DESIGN AND ANALYSIS OF ALGORITHMS	
CO-1	Students will be able to Argue the correctness of algorithms using inductive proofs and invariants and analyse worst-case running times of algorithms using asymptotic analysis.
CO-2	Describe the various paradigms of design when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm and synthesize them.
CO-3	Students will be able to Compare between different data structures. Pick an appropriate data structure for a design situation.

SYLLABUS: COMPILER DESIGN (B16CS3204)

Introduction

Introduction to Language processors, The Structure of a Compiler, Bootstrapping & Cross compiler.

Lexical Analysis

The Role of Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of tokens, Lexical-Analyzer generator Lex, Design of Lexical-Analyzer generator.

Syntax Analysis

Introduction, Context-Free Grammar, Writing a Grammar, Top-Down parsing: Recursive- Descent Parsing and No recursive Predictive parsing, Error recovery in Predictive Parsing, Bottom-Up parsing: Shift Reduce Parsing.

More Powerful parsers

Introduction to LR Parsing: Simple LR, More Powerful LR parsers, Using Ambiguous grammars, Parser Generators.

Syntax-Directed Translations

Syntax-Directed definitions, Evaluation Orders for SDD‘s, Applications of Syntax-Directed Translation, Syntax-Directed Translation schemes.

Intermediate-Code Generation

Variants of Syntax Trees, Three-Address code, Types and Declarations, Translation of Expressions, Type Checking.

Code Optimization

Basic Blocks and Flow Graphs, Optimization of Basic Blocks, the Principle Sources of Optimization, Introduction to Data-Flow Analysis.

Code Generation

Issues in the Design of Code Generator, The Target Language, Addresses in the Target Code, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment.

Symbol Tables and Runtime-Environments

Symbol Table per Scope, the Use of Symbol Tables, Storage Organization, Stack Allocation of Space, Heap Management.

Course Outcomes for Third Year Second Semester Courses	
Course Code: B16 CS 3204	
Course Title: COMPILER DESIGN	
CO-1	Ability to describe the lexical analyser, and different types of parsers.
CO-2	Ability to describe the Intermediate Code generation in compiler.
CO-3	Ability to explain code optimization techniques to improve the performance of a program in terms of speed & space.
CO-4	Ability to explain code generation, symbol table and runtime storage administration.

SYLLABUS: ARTIFICIAL INTELLIGENCE (B16CS3205)

Introduction to Artificial Intelligence:

Artificial Intelligence, AI Problems, AI Techniques, Defining the Problem as a State Space Search, Problem Characteristics, Production Systems.

Search Techniques:

Issues in The Design of Search Programs, Un-Informed Search, BFS, DFS; Heuristic Search Techniques: Generate-And- Test, Hill Climbing, Best-First Search, A* Algorithm, Problem Reduction, AO*Algorithm, Constraint Satisfaction, Means-Ends Analysis.

Knowledge Representation using Rules:

Procedural Vs Declarative Knowledge, Logic programming, Forward Vs Backward Reasoning, Matching Techniques, Partial Matching, RETE Matching Algorithm AIProgramming languages: Overview of LISP and PROLOG, Production System in Prolog.

Symbolic Logic:

Propositional Logic, First Order Predicate Logic: Representing Instance and is-a Relationships, Computable Functions and Predicates, Unification & Resolution, Natural Deduction; **Structured Representations of Knowledge**: Semantic Nets, Partitioned Semantic Nets, Frames, Conceptual Dependency, Conceptual Graphs, Scripts.

Reasoning under Uncertainty:

Introduction to Non-Monotonic Reasoning, Truth Maintenance Systems, Logics for Non- Monotonic Reasoning, **Statistical Reasoning**: Bayes Theorem, Certainty Factors and Rule- Based Systems, Bayesian Probabilistic Inference, Bayesian Networks, Dempster- ShaferTheory, Fuzzy Logic: Crisp Sets ,Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences & Fuzzy Systems.

Natural Language Processing: Steps in The Natural Language Processing, Syntactic Processing and Augmented Transition Nets, Semantic Analysis, and NLP Understanding Systems.

Planning: Components of a Planning System, Goal Stack Planning, and Non-linear Planning using Constraint Posting, Hierarchical Planning, and Reactive Systems.

Experts Systems:

Overview of an Expert System, Architecture of an Expert Systems, Different Types of ExpertSystems- Rule Based, Frame Based, Decision Tree based, Case Based, Neural Network based, Black Board Architectures, Knowledge Acquisition and Validation Techniques, ,Knowledge System Building Tools, Expert System Shells.

Course Outcomes for Third Year Second Semester Courses	
Course Code: B16 CS 3205	
Course Title: ARTIFICIAL INTELLIGENCE	
CO-1	The Student understands AI problem characteristics, state space approach for solving AI problem, Production System framework.
CO-2	The student learns several optimal search strategies and the use of heuristics.
CO-3	The student learns relational, inferential, inheritable and procedural knowledge and the corresponding knowledge representation approaches.
CO-4	The student is introduced to applying AI problem solving approaches to natural language processing, planning and expert systems

SYLLABUS: CLOUD COMPUTING (B16CS3206)

(Elective-II)

Systems modeling, Clustering and virtualization: Scalable Computing over the Internet, Technologies for Network based systems, System models for Distributed and Cloud Computing, Software environments for distributed systems and clouds, Performance, Security and Energy Efficiency.

Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, Virtualization Structures/ Tools and mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data Center Automation.

Cloud Platform Architecture: Cloud Computing and service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, Inter Cloud Resource Management, Cloud Security and Trust Management. Service Oriented Architecture, Message Oriented Middleware.

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, Parallel & Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments.

Hardware and Infrastructure: Clients, Security, Network, Services. Accessing the Cloud: Platforms, Web Applications, Web APIs, and Web Browsers. Cloud Storage: Overview, Cloud Storage Providers.

Developing Applications: Google, Microsoft, Intuit Quick Base, Cast Iron Cloud, and Bungee Connect, Development, Troubleshooting, Application Management.

Course Outcomes for Third Year Second Semester Courses	
Course Code: B16 CS 3206	
Course Title: CLOUD COMPUTING	
CO-1	Define basic networking concepts for distributed and cloud computing.
CO-2	Identify Virtual machine concept.
CO-3	Explain the architecture of Cloud platform.
CO-4	Practice cloud programming.
CO-5	Explain the concepts regarding accessing the cloud and cloud storage.
CO-6	Develop cloud applications.

SYLLABUS: MOBILE COMPUTING (B16 CS 3207)

(Elective-II)

Introduction to Mobile Computing, Overview of Mobile Technologies, Limitations, The Ubiquitous Network, Architecture for Mobile Computing, Three-Tier Architecture, Design Considerations for Mobile Computing, Mobile Computing Through Internet, Mobile Devises and Mobile-Enabled Applications.

Introduction To Wireless Networking, Various Generations of Wireless Networks, Wireless LANs, Advantages and Disadvantages of WLANs, Fixed Network Transmission Hierarchy, Differences in Wireless and Fixed Telephone Networks, Traffic Routing in Wireless Networks, WAN Link Connection Technologies, Cellular Networks.

WLAN Topologies, WLAN Standard IEEE 802.11, Comparison Of IEEE 802.11a, B, G and N Standards, Wireless PANs, Hiper LAN, Wireless Local Loop, ATM, Virtual Private Networks, Wireless Data Services, Common Channel Signaling, Various Networks for Connecting to The Internet.

Emerging Technologies: Introduction - Bluetooth - Radio Frequency Identification (RFID), WIMAX -Mobile IP - Ipv6 - Java Card, TCP/IP in the Mobile Setting, GSM and GPS.

Data Management Issues, Data Replication for Mobile Computers, Adaptive Clustering for Mobile Wireless Networks, File System, Disconnected Operations, Data Services in GPRS - Applications for GPRS - Limitations - Billing and Charging.

Communications Asymmetry, Classification of New Data Delivery Mechanisms, Push- Based Mechanisms, Pull-Based Mechanisms, Hybrid Mechanisms, Selective Tuning (Indexing) Techniques. CDMA, GSM, Wireless Data, 3GNetworks and Applications.

Introduction to Mobile IP, Introduction To Wireless Application Protocol, Application Layer MMS - GPRS Applications, Short Message Service (SMS): Mobile Computing Over SMS - SMS - Value Added Services Through SMS -Accessing the SMS Bearer.

Course Outcomes for Third Year Second Semester Courses	
Course Code: B16 CS 3207	
Course Title: MOBILE COMPUTING	
CO-1	To understand the mobile Technologies.
CO-2	To understand the various issues in mobile devices.
CO-3	To study the various generations of cellular networks.
CO-4	To study various applications like SMS, MMS, Mobile IP.

SYLLABUS: DISTRIBUTED SYSTEMS (B16 CS 3208)

(Elective-II)

Introduction to Distributed Systems, What is a Distributed System?, Hard ware concepts, Software concepts, Design issues.

Communication in Distributed Systems, Lay red Protocols, ATM networks, The Client – server model, Remote Procedure call, Group communication.

Synchronization in Distributed System, Clock Synchronization, Mutual Exclusion, Election algorithms, Atomic transactions, Deadlocks in Distributed Systems.

Process and processors in Distributed System threads, System Models, Processors allocation, Scheduling in Distributed System, Fault tolerance, Real time Distributed System.

Distributed File Systems, Distributed File System Design, Distributed File System implementation, Trends in Distributed File System.

Distributed Shared Memory, Introduction, What is Shared memory?, Consistency models, Page based Distributed Shared memory, Shared – variable Distributed Shared memory, Object based Distributed Shared Memory.

Course Outcomes for Third Year Second Semester Courses	
Course Code: B16 CS 3208	
Course Title: DISTRIBUTED SYSTEMS	
CO-1	Scale as the number of entities in the system increase.
CO-2	Can sustain failures and recover from them.
CO-3	Work with distributed, fault tolerant file systems.
CO-4	Can handle and process large data volumes.
CO-5	Are secure and handle certain classes of distributed denial of service attacks.
CO-6	Are Loosely coupled, transactional and eventually stable

SYLLABUS: ADVANCED COMPUTER ARCHITECTURE (B16CS3209)

(Elective-II)

Parallel Computer Models: Elements of Modern Computer, Multi-Processor and Multi Computers- Shared Memory Multi processors, Distributed Memory Multi Computers, Multi Vector and SIMD Computers-Vector Super Computers and SMD Super Computers, Architectural Development Tracks- Multiple Processor Tracks, Multi Vector and SIMD Tracks.

Advanced Processing: Advance Processing Technology-Design Space of Processor, Instruction Set Architectures, CISC Scalar Processors, RISC Scalar Processors; Super Scalar and Vector Processor- Super Scalar Processors, VLIW Architecture, Vector and Symbolic Processors.

Pipelining and Super scalar Techniques: Linear Pipeline Processors, Non-linear pipelining Processors, Instruction Pipeline Design, Arithmetic Pipeline Design, Superscalar and Super pipeline Design.

Parallel Architectures: Multiprocessor Interconnects- Hierarchical Bus Systems, Crossbar Switch and Multiport Memory, Multistage and Combining Networks; Cache Coherence and Synchronization Mechanisms,- The Cache Coherence Problem, Snoopy bus Protocols, Directory based protocols, Hardware Synchronization Mechanisms.

Multivector and SIMD Computer: Vector Processing Principles- Vector Instruction Types, vector- Access Memory Schemes, past and Present Supercomputers; Multi Vector Multiprocessors- Performance-Directed Design Rules, Cray Y-MP, C-90, and MPP, Mainframes and Mini- supercomputers; SIMD Computer Organizations- Implementation Models, the CM-2 Architecture, The Maspar MP-1 Architecture.

Multithreaded Architecture: Latency Hiding techniques- Shared Virtual Memory, Perfecting Techniques, Distributed Coherent Caches, Scalable Coherence Interface, relaxed Memory Consistency. Principles of Multithreading- multithreading Issues and Solutions, Multiple Context Processors, Multidimensional Architectures.

Software for Parallel Programming: Parallel programming Models, parallel languages and Compilers, Code optimization and Scheduling, Loop parallelization and Pipelining.

Case Study: Multiprocessor UNIX Design Goals, Master-Slave and Multithreaded UNIX, Multicomputer UNIX Extensions.

Course Outcomes for Third Year Second Semester Courses	
Course Code: B16 CS 3209	
Course Title: ADVANCED COMPUTER ARCHITECTURE	
CO-1	Detailed idea about parallel computing models.
CO-2	Knowledge on hand about advanced processing, pipelining and super scalar techniques, Parallel, multi vector and multithreaded architectures.
CO-3	Knowing about parallel programming softwares.

SYLLABUS: ENGINEERING MINI PROJECT LAB (B16 CS 3213)

The purpose of the Software Engineering Lab course is to familiarize the students with modern software engineering methods and tools, **Rational Products**. The course is realized as a project-like assignment that can, in principle, by a team of three/four students working full time. Typically the assignments have been completed during the semester by each project team.

The goal of the Software Engineering Project is to have a walk through from the requirements, design to implementing and testing. An emphasis is put on proper documentation. Term projects are projects that a group student might take through from initial specification to implementation by giving equal importance to both design and implementation.

Cycle I: Practicing UML diagrams using IBM Rational Rose. 6*3 periods= 18periods

Before developing a mini-project, in this cycle, the student is acquainted with different UML diagrams using Rational Rose. The experiments should include drawing UML diagrams listed below for two demo/example applications assigned by the lab Instructor. The input for the following experiments is problem statement for any two demo projects supplied by the instructor.

1. Introduction to Rational Rose and Practicing the following diagrams
    a. Activity diagrams for the overall business process of the projects
    b. Use-case diagram for the demo projects along with Use-case descriptions and sub-diagrams for Use-cases.
2. Class diagram- Class diagrams including the features like classes, relationships, attributes and methods along with their visibilities.
3. Interaction diagrams- Sequence diagrams and Collaboration diagrams for different scenarios of the systems with all features like actors, objects and interactions.
4. Activity diagrams, State chart and other diagrams - Activity diagrams including the features like fork join and swim lanes. State diagrams including composite states andtransitions. Component diagrams, Package diagrams and Deployment diagrams.
5. Forward and Reverser Engineering- Forward Engineering Class diagrams to classes in C++ and java and persistent classes to a database. Reverse Engineering C++ code,java code and a database.
6. Documentation using Rational Rose clear quest.

Cycle II: Mini-Project **8*3 periods= 24periods**

The project deliverables include

- Problem statement
- Requirements Analysis
- Design
    - A Software Design Description and a System Design.
    - A test specification.
- Implementation
  Implement the assigned project with one of the following web technologies

  Front end: Java technologies/PHP/MS.NET Technologies

  Backend: Oracle/My-SQL/SQL-Server

- Testing

Course Outcomes for Third Year Second Semester Courses	
Course Code: B16 CS 3213	
Course Title: SOFTWARE ENGINEERING MINI PROJECT LAB	
CO-1	Identify various phases of Software Development
CO-2	Use various Software engineering tools
CO-3	Develop small projects

SYLLABUS: NETWORK PROGRAMMING LAB (B16 CS 3214)

1. Write a program to identify well known ports on a Local/Remote System.
   By trying to listen to the various well-known ports by opening client connections. If the exception does not occur then the remote port is active else the remote port isinactive.
2. Write a program to implement Chat Application.
   i. One-One Chat: By opening socket connection and displaying what is written by one System to other.
   ii. Many-Many Chat (Broad Casting): Each Client opens a socket connection to the chat server and writes to the socket. Whatever is written by one system can be seenby all other systems.
3. Write a program to retrieve data from a remote database using Java.
   At the remote database a server listens for client connections. This server accepts SQLqueries from the client, executes it on the database and sends the response to the client.
4. Write a program to implement Mail Client
   i. SMTP Client: Gives the server name, send email to the recipient usingSMTP Commands
   ii. POP Client: Gives the server name, user name and password, retrieve themails and allow manipulation of mailbox using POP commands.
5. Write a program to simulate Telnet Client which allows to connect to well known serversand send and receive information.
   Provide a user interface to contact well known ports so that client server interaction can beseen by the user.
6. Write a program to implement IP multicasting.
7. Write a program to implement simple file transfer between two systems (withoutprotocols)
   By opening socket connection to our server on one system and sending a file from onesystem to another
8. Write a program to implement TFTP Client and TFTP Server for file transfer
9. Write a program to implement HTTP-Server and HTTP Client.
   The Server has to process the following commands: GET, POST, HEAD, and DELETE.The server must handle multiple clients.
10. Write a program to implement UDP Echo Server and UDP Echo Client.
11. Write a program to get the attributes and contents of a web page using URL Connectionclass.
12. Write a program to implement DNS.

Course Outcomes for Third Year Second Semester Courses	
Course Code: B16 CS 3214	
Course Title: NETWORK PROGRAMMING LAB	
CO-1	Students will be able to write Socket based Network application programs
CO-2	Students will be able to design and develop Client Server applications using Java
CO-3	Students will be able to write network applications like One-One chat ,Broadcasting and Multicasting
CO-4	Students will be able to understand e-mail programming (SMTP, POP).

SYLLABUS: VERBAL & QUANTITATIVE APTITUDE – II (B16ENG3202)

(Common to all Branches)

Part-A: Verbal Aptitude and Soft Skills-II

UNIT -I (VA)

Sentence Improvement (finding a substitute given under the sentence as alternatives), Sentence equivalence (completing a sentence by choosing two words either of which will fit in the blank), cloze test (reading the written discourse carefully and choosing the correct options from the alternatives and filling in the blanks), summarizing and paraphrasing.

UNIT- II (VA)

Types of passages (to understand the nature of the passage), types of questions (with emphasis on inferential and analytical questions), style and tone (to comprehend the author‘s intention of writing a passage), strategies for quick reading(importance given to skimming, scanning), summarizing ,reading between the lines, reading beyond the lines, techniques for answering questions related to vocabulary (with emphasis on the context), supplying suitable titles to the passage, identifying the theme and central idea of the given passages.

UNIT- III (VA)

Punctuation, discourse markers, general Essay writing, writing Issues and Arguments (with emphasis on creativity and analysis of a topic), paragraph writing, preparing reports, framing a ‗Statement of purpose‘, ‗Letters of Recommendation‘, business letter writing, email writing, writing letters of complaints/responses. Picture perception and description, book review.

UNIT-IV (VA)

Just a minute sessions, reading news clippings in the class, extempore speech, telephone etiquette, making requests/suggestions/complaints, elocutions, debates, describing incidents and developing positive nonverbal communication, story narration, product description.

UNIT-V (SS)

Employability Skills – Significance — Transition from education to workplace - Preparing a road map for employment – Getting ready for the selection process, Awareness about Industry / Companies – Importance of researching your prospective workplace - Knowing about Selection process - Resume Preparation: Common resume blunders – tips, Resume Review, Group Discussion: Essential guidelines – Personal Interview: Reasons for Rejection and Selection.

Part-B: Quantitative Aptitude-II

UNIT I: Averages, mixtures and allegations, Data interpretation

Understanding of AM, GM, HM-Problems on averages, Problems on mixtures standard method. Importance of data interpretation: Problems of data interpretation using line graphs, Problems of data interpretation using bar graphs, Problems of data interpretation using pie charts, Problems of data interpretation using others.

UNIT II: Puzzle test, blood Relations, permutations, Combinations and probability Importance of puzzle test, Various Blood relations-Notation to relations and sex making of family Tree diagram, Problems related to blood relations, Concept of permutation and combination, Problems on permutation, Problems on combinations, Problems involving both permutations and combinations, Concept of probability-Problems on coins, Problems on dice, Problems on cards, Problems on years.

UNIT III: Periods, Clocks, Calendars, Cubes and cuboids

Deriving the formula to find the angle between hands for the given time, finding the time if the angle is known, Faulty clocks, History of calendar-Define year, leap year, Finding the day for the given date, Formula and method to find the day for the given date in easy way, Cuts to cubes, Colors to cubes, Cuts to cuboids, Colors to cuboids.

UNIT IV: Puzzles

Selective puzzles from previous year placement papers, sitting arrangement, problems- circular arrangement, linear arrangement, different puzzles.

UNIT V: Geometry and Menstruation

Introduction and use of geometry-Lines, Line segments, Types of angles, Intersecting lines, Parallel lines, Complementary angles, supplementary angles, Types of triangles-Problems on triangles, Types of quadrilaterals-Problems on quadrilaterals, Congruent triangles and properties, Similar triangles and its applications, Understanding about circles-Theorems on circles, Problems on circles, Tangents and circles, Importance of menstruation-Introduction of cylinder, cone, sphere, hemi sphere.

Course Outcomes for Third Year Second Semester Courses	
Course Code: B16ENG3202	
Course Title: VERBAL & QUANTITATIVE APTITUDE – II	
CO-1	Construct coherent, cohesive and unambiguous verbal expressions in both oral and written discourses.
CO-2	Analyze the given data/text and find out the correct responses to the questions asked based on the reading exercises; identify relationships or patterns within groups of words or sentences
CO-3	Write paragraphs on a particular topic, essays (issues and arguments), e mails, summaries of group discussions, reports, make notes, statement of purpose(for admission into foreign universities), letters of recommendation(for professional and educational purposes).
CO-4	Converse with ease during interactive sessions/seminars in their classrooms, compete in literary activities like elocution, debates etc., raise doubts in class, participate in JAM sessions/versant tests with confidence and convey oral information in a professional manner.
CO-5	Participate in group discussions/group activities, exhibit team spirit, use language effectively according to the situation, and respond to their interviewer/employer with a positive mind, tailor make answers to the questions asked during their technical/personal interviews, exhibit skills required for the different kinds of interviews (stress, technical, HR) that they would face during the course of their recruitment process.
CO-6	The students will be able to perform well in calculating different types of data interpretation problems.
CO-7	The students will perform efficaciously on analytical and logical problems using various methods.
CO-8	Students will find the angle measurements of clock problems with the knowledge of calendars and clock.
CO-9	The students will skilfully solve the puzzle problems like arrangement of different positions.
CO-10	The students will become good at solving the problems of lines, triangular, volume of cone, cylinder and so on.

SYLLABUS: COMPETITIVE CODING (B16 ENG 3205)

(Common to CSE & IT)

(MOOCS-III)

UNIT-I Introduction to Competitive Coding

Introduction to Competitive coding and coding Platforms. Coding solution Vs. Efficient Coding solution. Types of solution approaches. Analyzing problem specific data requirement, various data representations. Essential Data structures for fast coding. Various Syntactical I/O techniques comparison. Numbers, operations (including exponentiation). Integer properties (positive, negative, even, odd, divisible, prime, etc.), Fractions, percentages and ratios. Point, vector, Cartesian coordinates (2D integer grid).

UNIT-II Essentials to Competitive coding

Basic data structures: Arrays, Strings, Stacks, Queues, Linked Lists. Asymptotic Notations – (Big-O), Evaluating the runtime complexity – Space Complexity - Towers-of-Brahma – Standard Template Libraries - Square root functions, primarily testing and related techniques. Euclidean algorithms. Recursion techniques. Organizing data in O(n log n). Binary search techniques. Red-Black Trees. Fenwick tree, Segment Tree.

Basic Techniques

Dynamic Arrays, Set structures, Map structures, Iterators and ranges, Generating Subsets, Generating permutations, Backtracking techniques, Pruning the search. Bit masking. Disjoint set union.

UNIT-III Essential Coding Algorithms

Selection based algorithms: sorting, Coin change problem, Fractional selections, Schedules matching, Activity marking, heap sort, Huffman coding techniques, Spanning Trees, Minimizing sums, Data compression. Finding method count, Subsequence and related problems, paths in grid. DP with Bit mask

UNIT-IV String & Tree Algorithms

TRIE data structure, Naïve string searching, z-algorithm, Manacher's algorithm, Rabin-Karp, KMP Algorithm, Tree Traversals, Diameter, All longest paths, Binary trees, Applying search property to tree structures. Suffix arrays.

UNIT-V Graph Algorithms

Graph Algorithms – DFS, BFS. Depth First and Breadth First Traversals - Shortest paths: Dijkstra‘s algorithm Bellman-Ford Algorithm – Floyd Warshall Algorithm - Adjacency List Representation – Euler path, tour , cycle – Eulerian Graph - Johnson‘s Algorithm for All- pairs shortest path – Shortest path in Directed Acyclic Graph. Bridges and articulation points. Topological sorting, strongly connected components in directed graphs. 2-SAT.

Note: Introduce C++ STL/Java Collections and let students solve problems using C++STL/Java Collections.

Course Outcomes for Third Year Second Semester Courses	
Course Code: B16 ENG 3205	
Course Title: COMPETETIVE CODING	
CO-1	Acquire coding knowledge on essential of competitive coding
CO-2	Acquire Programming knowledge on time & space complexities
CO-3	Acquire coding knowledge on dynamic Arrays, Set & Map structures and sorting
CO-4	Acquire knowledge on time complexities of different methods
CO-5	Acquire Programming skill on String, Tree, Graph Theory algorithms

SYLLABUS: ANGULAR JS (B16 CS 3215A)

(MOOCS-III)

Module 1: Introduction

Introduction to AngularJS, MVC Architecture, Conceptual Overview, Setting up the Environment, First Application, and Understanding ng attributes.

Module 2: Expressions and Data Biding

Number and String Expressions, Object Binding and Expressions, Working with Arrays, Forgiving Behavior, Understanding Data binding.

Module 3: Working with Directives

Conditional Directives, Styles Directives, Mouse and Keyboard Events Directives.

Module 4: Controllers

Understanding Controllers , Programming Controllers & $scope object, Adding Behavior to a Scope Object, Passing Parameters to the Methods, Having Array as members in Controller Scope. Nested Controllers and Scope Inheritance, Multiple Controllers and their scopes.

Module 5: Filters

Built-In Filters, Uppercase and Lowercase Filters, Currency and Number Formatting Filters, Order By Filter. Filter Filter, Creating Custom Filter.

Module 6: Forms

Using Simple Form, Working with Select and Options, Input Validations, Using CSS classes, Form Events, Custom Model update triggers, Custom Validations.

Module 7: Modules

Why Module? , Module loading and Dependencies, Recommended Setup of Application, Creation vs Retrieval.

Module 8: Services

Understanding Services, Developing Creating Services, Using a Service, Injecting Dependencies in a Service.

Module 9: Ajax in AngularJS

$http Service, $q Service, Ajax Impl using $http and $q Service.

Module 10: Routing

Introduction to SPA, Creating HTML Templates, Configuring Route Provider.

WEB LINKS:

https://www.udemy.com/angularjs/

https://www.coursera.org/learn/single-page-web-apps-with-angularjs

Course Outcomes for Third Year Second Semester Courses	
Course Code: B16 CS 3215A	
Course Title: ANGULAR JS	
CO-1	The main objective of AngularJS is to reduce the code to build user interface application
CO-2	To create single page applications
CO-3	To restore data from back-end server and manipulate it easily

SYLLABUS: ASP.NET (B16 CS 3215B)

(MOOCS-III)

Chapter 1: Introduction to ASP.NET, From ASP to ASP.NET,Web Forms, Web Services ASP.NET Features

Chapter 2: Web Forms Architecture, Page Class, Web Forms Life Cycle, Web Forms Event Model, Code-Behind

Chapter 3: ASP.NET and HTTP,Request/Response Programming, HttpRequest Class, HTTP Collections, HttpResponse Class, Redirection, HttpUtility Class

Chapter 4: Web Applications Using Visual Studio Using Visual Web Developer, Visual Studio Forms Designer, Using Components, Shadow Copying, Using the Global. Sax File, Data Binding

Chapter 5: State Management and Web Applications, Session State, Application State, Multithreading Issues, Cookies

Chapter 6: Server Controls, HTML Server Controls, Web Forms Server Controls, Rich Controls, Validation Controls, User Controls

Chapter 7: Caching in ASP.NET, What Is Caching, Page-Level Caching, Page Fragment Caching, Optimizing Your ASP.NET Application, Application Caching

Chapter 8: ASP.NET Configuration and Security Fundamentals, Configuration Overview, Authentication and Authorization, Forms Authentication, Windows Authentication, Security and ASP.NET

Web Links:

https://www.asp.net/freecourses

https://mva.microsoft.com/en-us/training-courses/introduction-to-aspnet-mvc-8322?l=nKZwZ8Zy_3504984382

Course Outcomes for Third Year Second Semester Courses	
Course Code: B16CS3215B	
Course Title: ASP.NET	
CO-1	To successfully build database-driven Web applications and Web Sites.
CO-2	To build web-based enterprise applications using ASP.NET and Visual Studio.
CO-3	It is easy to develop the Web Services using .Net framework in Service-oriented Architectures.

SYLLABUS: C#.NET & VB.NET (B16CS3215C)

(MOOCS-III)

Chapter 1: C# Overview, First C# Console Application, Namespaces, Data Types, Conversions,

Control Structures, Subroutines and Functions, Parameter Passing, Strings, Arrays, Console I/O, Formatting, Exception Handling

Chapter 2 : Object-Oriented Programming in C#, Classes, Access Control, Methods and Properties, Asymmetric Accessor Accessibility, Static Data and Methods, Inheritance, Overriding Methods, Abstract Classes, Sealed Classes, Access Control and Assemblies, Auto-Implemented Properties, Implicitly Typed Variables, Object Initializers, Collection Initializers, Anonymous Types, Partial Methods, Extension Methods, Lambda Expressions, Language-Integrated Query (LINQ)

Chapter 3: VB .NET - Features, IDE- Menu System, Toolbars, Code Designer, Solution Explorer, Object Browser, Toolbox, Class View Window, Properties Window, Server Explorer, Task List, Output Window, Command Window

Chapter 4: Elements of VB.net - Properties, Events and Methods of Form, Label, Textbox, List Box, Combo Box, Radio Button, Button, Check Box, Progress Bar, Date Time Picker, Calendar, Picture Box, Scrollbar, Scrollbar, Group Box, ToolTip,Timer.

Chapter 5: Programming in VB.net: Data Types, Keywords, Declaring Variables and Constants, Operators, Understanding Scope and accessibility of variables, Conditional Statements- If- Then, If-Then-Else, Nested If, Select Case, and Looping Statement- Do loop, For Loop, For Each-Next Loop, While Loop, Arrays- Static and Dynamic.

Chapter 6: Functions, Built-In Dialog Boxes, Menus and Toolbar

Menus and toolbars- Menu Strip, Tool Strip, Status Strip, Built-In Dialog Boxes –Open File Dialogs, Save File Dialogs, Font Dialogs, Color Dialogs, Print Dialogs, Input Box, Msg Box, Interfacing With End user- Creating MDI Parent and Child, Functions and Procedures- Built- In Functions- Mathematical and String Functions, User Defined Functions and Procedures.

Chapter 7: Advanced Concepts in VB.Net

Object Oriented Programming- Creating Classes, Objects, Fields, Properties, Methods, Events , Constructors and destructors, Exception Handling- Models, Statements, File Handling- Using File Stream Class, File Mode, File Share, File Access Enumerations, Opening or Creating Files with File Stream Class, Reading and Writing Text using Stream Reader and Stream Writer Classes, Data Access withADO.Net – Data Access withServerExplorer,Data Adapter and Datasets, ADO.NET Objects and Basic SQL.

WEB LINKS:

https://www.coursera.org/learn/introduction-programming-unity

https://www.pluralsight.com/courses/dotnet-csharp-tutorial

https://www.udemy.com/learn-vbnet/

Course Outcomes for Third Year Second Semester Courses	
Course Code: B16CS3215C	
Course Title: C#.NET & VB.NET	
CO-1	Understand .NET Framework and describe some of the major enhancements to the new version of Visual Basic.
CO-2	Describe the basic structure of a Visual Basic.NET project and use main features of the integrated development environment (IDE)
CO-3	Create applications using Microsoft Windows Forms Create applications that use ADO. NET

SYLLABUS: MACHINE LEARNING (B16CS4101)

The ingredients of machine learning, Tasks: the problems that can be solved with machine learning, Models: the output of machine learning, Features, the workhorses of machine learning. (Peter Flach)

Binary classification and related tasks: Classification, Scoring and ranking **Beyond binary classification:** Handling more than two classes: *Multi-class classification*, Regression, Unsupervised and descriptive learning. (Peter Flach)

Concept Learning: The hypothesis space, Paths through the hypothesis space **Tree models:** Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction **Rule models:**Learning ordered rule lists, Learning unordered rule sets (Peter Flach)

Linear models: The least-squares method: *Univariate linear regression*, The perceptron: a heuristic learning algorithm for linear classifiers **Distance Based Models:** Introduction, Neighbours and exemplars, Nearest Neighbours classification, Distance Based Clustering, Hierarchical Clustering. (PeterFlach)

Features: Kinds of feature, Feature transformations: *Thresholding and discretisation*, *Normalisation and Calibration*, *Incomplete Features*, Feature construction and selection. Model ensembles: Bagging and random forests, Boosting (Peter Flach)

Artificial Neural Networks: Introduction, Neural network representation, appropriate problems for neural network learning, Multilayer networks and the back propagation algorithm.

Reinforcement Learning: Introduction, The Learning Task, Q Learning: The Q function, the algorithm for learning Q, An illustrative example, Convergence (Tom M. Mitchell)

Course Outcomes for Fourth Year First Semester Courses	
Course Code: B16CS4101	
Course Title: MACHINE LEARNING	
CO-1	Identify the characteristics of machine learning that make it useful toreal-world problems.
CO-2	Classify machine learning algorithms as supervised, unsupervised
CO-3	Construct different tree models and rule models.
CO-4	Be able to demonstrate linear and distance based models.
CO-5	Be able to identify and construct features and ensemble models
CO-6	Infer the concept of artificial neural networks, reinforcement learning

SYLLABUS: BIG DATA ANALYTICS (B16CS4102)

Introduction to Big Data: Big Data-definition, Characteristics of Big Data (Volume, Variety, Velocity, Veracity, Validity), Importance of Big Data , Patterns for Big Data Development, Data in the Warehouse and Data in Hadoop,

Introduction to Hadoop: Hadoop- definition, Understanding distributed systems and Hadoop, Comparing SQL databases and Hadoop, Understanding Map Reduce, Counting words with Hadoop— running your first program, History of Hadoop, Starting Hadoop - The building blocks of Hadoop, Name Node, Data Node, Secondary Name Node, Job Tracker and Task Tracker

Map Reduce -A Weather Dataset, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Hadoop Pipes, Developing a Map Reduce Application - The Configuration API, Configuring the Development Environment, Running Locally on Test Data, Running on a Cluster, Tuning a Job, Map Reduce Workflows

HDFS: Components of Hadoop -Working with files in HDFS, Anatomy of a Map Reduce program, Reading and writing the Hadoop Distributed File system -The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop File system, The Java Interface, Data Flow, Parallel Copying with distcp, Hadoop Archives

Map Reduce Programming: Writing basic Map Reduce programs - Getting the patent data set, constructing the basic template of a Map Reduce program, Counting things, Adapting for Hadoop‘s API changes, Streaming in Hadoop, Improving performance with combiners.

Map Reduce Advanced Programming: Advanced Map Reduce - Chaining MapReducejobs, joining data from different sources, creating a Bloom filter, Passing job-specific parameters to your tasks, probing for task-specific information, Partitioning into multiple output files, Inputting from and outputting to a database, keeping all output in sorted order

Graph Representation in Map Reduce: Modelling data and solving problems with graphs, Shortest Path Algorithm, Friends-of-Friends Algorithm, PageRank Algorithm, Bloom Filter, Parallelized Bloom filter creation in Map Reduce, Map-Reduce semi-join with Bloom filters.

Course Outcomes for Fourth Year First Semester Courses	
Course Code:B16CS4102	
Course Title: BIG DATA ANALYTICS	
CO-1	Gain conceptual understanding of analytics concepts, algorithms and statistical tests
CO-2	Students will be able to look at the core projects used for both batch and real time data processing such as Hadoop
CO-3	Students will be able to look at wider range of problems and data science based solutions

SYLLABUS: PRINCIPLES OF ECONOMICS & MANAGEMENT (B16ENG4101)

(Common to CSE & IT)

Introduction to Managerial Economics: Wealth, Welfare and Scarce Definitions of Economics; micro and Macro Economics; Demand- Law of Demand, Elasticity of Demand, types of Elasticity and factors of determining price elasticity of Demand: utility- Law of Diminishing Marginal Utility and its limitations.

Conditions of Different Market Structures: Perfect Competition, Monopolistic Competition, Monopoly, Oligopoly, and Duopoly.

Forms of Business Organizations: Sole Proprietorship, Partnership, Joint Stock Company- Private Limited and Public Limited Companies, Public Enterprises and their types.

Introduction to Management: Functions of Management- Taylor‘s Scientific management; Henry Fayol‘s Principle of Management; Human Resource Management- basic Functions of HR Manager; Man Power Planning, Recruitment, Selection, Training, Development, Placement, Compensation and performance Appraisal (in brief).

Production Management: Production Planning and Control, plant Location, Break- Even Analysis, assumptions and applications.

Financial Management: Types of Capital: Fixed and Working Capital, and Methods of Raining Finance; Depreciation: Straight Line and Diminishing Balance Methods. Marketing Management: Functions of marketing and Distribution Channels.

Entrepreneurship: Entrepreneurial Functions, Entrepreneurial Development: Objectives, Training, and Benefits: Phases of Installing a project.

Course Outcomes for Fourth Year First Semester Courses	
Course Code: B16 ENG 4101	
Course Title: PRINCIPLES OF ECONOMICS & MANAGEMENT	
CO-1	Understand the links between production costs and the economic models of supply.
CO-2	Represent supply, in graphical form, including the upward slope of the supply curve and what shifts the supply curve.
CO-3	Understand the efficiency and equity implications of market interference, including government policy.
CO-4	Understand how different degrees of competition in a market affect pricing and output.
CO-5	Apply economic reasoning to individual and firm behaviour.

SYLLABUS: KNOWLEDGE ENGINEERING LAB (B16CS4104)

1. Exploratory data analysis using R

1. Load the _iris. CSV‘ file and display the names and type of each column. Find statistics such as min, max, range, mean, median, variance, standard deviation for each column of data.

2. Write R program to normalize the variables into 0 to 1 scale using min-max normalisation

3. Generate histograms for any one variable (sepal length/ sepal width/ petal length/ petal width) and generate scatter plots for every pair of variables showing each species in different color .

4. Generate box plots for each of the numerical attributes. Identify the attribute with the highest variance.

5. Study of homogeneous and heterogeneous data structures such as vector, matrix, array, list, data frame in R.

6. Write R Program using _apply‘ group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them into a value around 0 with z-score normalization.

7. a) Use R to apply linear regression to predict evaporation coefficient in terms of air velocity using the data given below:

Air Velocity (cm/sec)	20, 60, 100, 140, 180, 220, 260, 300, 340, 380
Evaporation Coefficient (sqmm/sec)	0.18, 0.37, 0.35, 0.78, 0.56, 0.75, 1.18, 1.36, 1.17, 1.65

b) Analyze the significance of residual standard-error value, R-squared value, F- statistic. Find the correlation coefficient for this data and analyze the significance of the correlation value.

c) Perform a log transformation on the _Air Velocity 'column, perform linear regression again, and analyze all the relevant values.

8. Write R Program using _apply‘ group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them a value around 0 with z-score normalization.

2. WEKA Knowledge Extraction toolkit:

9. Create an ARFF (Attribute-Relation File Format) file and read it in WEKA. Explore the purpose of each button under the pre-process panel after loading the ARFF file. Also, try to interpret using a different ARFF file, *weather.arff*, provided with WEKA**.**

10. Performing data pre-processing in Weka Study **Unsupervised Attribute Filters** such as ***Replace Missing Values*** to replace missing values in the given dataset, ***Add*** to add the new attribute *Average*, ***Discretize*** to discretize the attributes into bins. Explore ***Normalize*** and ***Standardize*** options on a dataset with numerical attributes.

11. Classification using the WEKA toolkit Demonstration of classification process using id3 algorithm on categorical dataset(weather). Demonstration of classification process using naïve Bayes algorithm on categorical dataset (_vote‘). Demonstration of classification process using Random Forest algorithm on datasets containing large number of attributes.

12. Classification using the WEKA toolkit – Part 2 Demonstration of classification process using J48 algorithm on mixed type of dataset after discretizing numeric attributes. Perform cross- validation strategy with various fold levels. Compare the accuracy of the results.

13. Performing clustering in WEKA Apply hierarchical clustering algorithm on numeric dataset and estimate cluster quality. Apply DBSCAN algorithm on numeric dataset and estimate cluster quality.

14. Association rule analysis in WEKA Demonstration of Association Rule Mining on supermarket dataset using Apriori Algorithm with different support and confidence thresholds. Demonstration of Association Rule Mining on supermarket dataset using FP- Growth Algorithmwith different support and confidence thresholds.

3. Building Knowledge based Inference Systems:

15. Implement AI problem solving through Rule based forward chaining inference using public domain software tool like CLIPS.

16. Implement AI problem solving through Rule based Backward chaining inference using PROLOG

Course Outcomes for Fourth Year First Semester Courses	
Course Code: B16CS4104	
Course Title: KNOWLEDGE ENGINEERING LAB	
CO-1	Student will be able to write R programs to perform several data analytics operations on datasets
CO-2	Ability to extract patterns by applying appropriate data mining techniques from different types of datasets using WEKA.
CO-3	Ability to apply knowledge represented in the form of rules to draw conclusions using either forward or backward chaining using CLIPS /PROLOG

SYLLABUS: BIG DATA ANALYTICS LAB (B16CS4105)

1. Getting Hadoop Up and Running in a cluster:

1. Setting up Hadoop on standalone machine.
2. Word count Map Reduce program using standalone Hadoop.
3. Adding the combiner step to the Word count Map Reduce program.
4. Setting up HDFS.
5. Using HDFS monitoring UI
6. HDFS basic command-line file operations.
7. Setting Hadoop in a distributed cluster environment.
8. Running the Word Count program in a distributed cluster environment.
9. Using Map Reduce monitoring UI

2. **Hadoop Map Reduce Applications:**

10. Choosing appropriate Hadoop data types.
11. Implementing a custom Hadoop Writable data type.
12. Implementing a custom Hadoop key type.
13. Emitting data of different value types from a mapper.
14. Choosing a suitable Hadoop Input Format for your input data format.
15. Formatting the results of Map Reduce Computation – using Hadoop Output Formats.

3. **Analytics**

16. Simple analytics using Map Reduce.
17. Performing Group-By using Map Reduce.
18. Calculating frequency distributions and sorting using Map Reduce.
19. Plotting the Hadoop results using GNU plot.
20. Calculating histograms using Map Reduce.
21. Calculating scatter plots using Map Reduce.
22. Parsing a Complex dataset with Hadoop.

Joining two datasets using Map Reduce.

Course Outcomes for Fourth Year First Semester Courses	
Course Code: B16CS4105	
Course Title: BIG DATA ANALYTICS LAB	
CO-1	Applying data modelling techniques to large data sets.
CO-2	Creating applications for Big Data analytics.
CO-3	Building a complete business data analytic solution

SYLLABUS: PROJECT PHASE-I (B16CS4106)

The phase-I of the project shall comprise of

- Problem identification in close collaboration with industry.
- Literature survey.
- Deriving work content and carry out of project requirement analysis.
- Submission of interim report.
- Presentation to an expert committee.

(Note: Sessionals 50 marks will be awarded based onContinuous evaluation - 25 Marks Seminar and Viva voce - 25 Marks)

Course Outcomes for Fourth Year First Semester Courses	
Course Code: B16CS4106	
Course Title: PROJECT PHASE-I	
CO-1	Identify a current problem through literature/field/case studies and define the background objectives and methodology for solving the same.
CO-2	Write report and present it effectively.

SYLLABUS: INTERNET OF THINGS (B16 CS 4201)

The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs,

Design Principles For Connected Devices: IoT/M2M systems Layers and designs standardizations, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway, Ease of designing and affordability.

Design Principles for the Web Connectivity for connected-Devices: Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

Internet Connectivity Principles: Internet connectivity, Internet-Based Communication, IP addressing in the IOT, Application Layer Protocols: MQTT, HTTP.

Data Acquiring and storage, organizing the Data and Analytics, Cloud Computing paradigm for Data Collection, Storage and computing.

Design Methodology-Embedded Computing logic- Microcontroller, System on chips-IoT system building blocks-ARDUINO-Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

Sensors, Participatory sensing, RFIDS, and Wireless sensor Networks: Sensor technology, Participatory sensing, Industrial IoT and Automotive IoT, Actuator, Sensor Data communication protocols, Radio frequency identification Technology and Wireless sensor Network technology.

Course Outcomes for Fourth Year Second Semester Courses	
Course Code: B16CS4201	
Course Title: INTERNET OF THINGS	
CO-1	Able to understand the application areas of IOT ·
CO-2	Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks ·
CO-3	Able to understand building blocks of Internet of Things and characteristics.

SYLLABUS: CRYPTOGRAPHY AND NETWORK SECURITY (B16 CS 4202)

Overview: Computer Security Concepts, Threats, Attacks, and Assets, Security Functional Requirements, A Security Architecture for Open Systems, Computer Security Trends, Computer Security Strategy. Cryptographic Tools: Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions, Public-Key Encryption, Digital Signatures and Key Management, Random and Pseudorandom Numbers, Practical Application: Encryption of Stored Data. User Authentication: Means of Authentication, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Remote User Authentication, Security Issues for User Authentication, Practical Application: An Iris Biometric System, Case Study: Security Problems for ATM Systems.

Access Control: Access Control Principles, Subjects, Objects, and Access Rights, Discretionary Access Control, Example: UNIX File Access Control, Role-Based Access Control, Case Study: RBAC System for a Bank. Database Security: The Need for Database Security, Database Management Systems, Relational Databases, Database Access Control, Inference, Statistical Databases, Database Encryption, Cloud Security.

Malicious Software: Types of Malicious Software (Malware), Propagation—Infected Content— Viruses, Propagation—Vulnerability Exploit—Worms, Propagation—Social Engineering—SPAM E- mail, Trojans, Payload—System Corruption, Payload—Attack Agent—Zombie, Bots, Payload— Information Theft—Key loggers, Phishing, Spyware, Payload—Stealthing—Backdoors, Root kits, Countermeasures.

Denial-of-Service Attacks: Denial-of-Service Attacks, Flooding Attacks, Distributed Denial-of- Service Attacks, Application-Based Bandwidth Attacks, Reflector and Amplifier Attacks, Defenses Against Denial-of-Service Attacks, Responding to a Denial- of-Service Attack.

Intrusion Detection: Intruders, Intrusion Detection, Host-Based Intrusion Detection, Distributed Host-Based Intrusion Detection, Network-Based Intrusion Detection, Distributed Adaptive Intrusion Detection, Intrusion Detection Exchange Format, Honeypots, And Example System: Snort. Firewalls and Intrusion Prevention Systems: The Need for Firewalls, Firewall Characteristics, Types of Firewalls, Firewall Basing, Firewall Location and Configurations, Intrusion Prevention Systems, Example: Unified Threat Management Products.

Buffer Overflow: Stack Overflows, Defending Against Buffer Overflows, Other Forms of Overflow Attacks, Software Security: Software Security Issues, Handling Program Input, Writing Safe Program Code, Interacting with the Operating System and Other Programs,

Handling Program Output. Operating System Security: Introduction to Operating System Security, System Security Planning, Operating Systems Hardening, Application Security, Security Maintenance, Linux/Unix Security, Windows Security, Virtualization Security.

Symmetric Encryption and Message Confidentiality: Symmetric Encryption Principles, Data Encryption Standard, Advanced Encryption Standard, Stream Ciphers and RC4, Cipher Block Modes of Operation, Location of Symmetric Encryption Devices, Key Distribution. Public-Key Cryptography and Message Authentication: Secure Hash Function, HMAC, The RSA Public-Key Encryption Algorithm, Diffie- Hellman and Other Asymmetric Algorithms.

Internet Security Protocols and Standards: Secure E-mail and S/MIME, Domain Keys Identified Mail, Secure Socket Layer (SSL) and Transport Layer Security (TLS), HTTPS, IPv4 and IPv6 Security. Internet Authentication Applications: Kerberos, X.509, Public-Key Infrastructure, Federated Identity Management. Wireless Network Security: Wireless Security Overview, IEEE
802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security.

Course Outcomes for Fourth Year Second Semester Courses	
Course Code: B16CS4202	
Course Title: CRYPTOGRAPHY AND NETWORK SECURITY	
CO-1	Realize the need and importance of network and data security in the Internet and in the distributed environments.
CO-2	Identify the different types of network security issues and their remedies.
CO-3	Application various cryptographic tools and techniques in different contexts and as per need of security levels.
CO-4	Implementation of some Internet security protocols and standards

SYLLABUS: OPERATION RESEARCH (B16CS4203)

Overview of Operations Research, Types of OR Models, Phases of Operations Research– OR Techniques, Introduction to Linear Programming, Formulation of Linear Programming Problem, Graphical Solution; Standard Form of LPP, Basic Feasible Solutions, Unrestricted Variables, Simplex Algorithm , Artificial Variables, Big M Method, Two Phase Simplex Method, Degeneracy, Alternative Optimal, Unbounded Solutions, Infeasible Solutions, Primal And Dual Problems and Their Relations, Dual Simplex Method.

Transportation Problem as LPP, Initial Solutions, North West Corner Rule, Lowest Cost Method, Vogel's Approximation Method, Optimum Solutions of TPP, Degeneracy in Transportation, Transportation Algorithms.

Assignment Problem, Assignment Problem as LPP, Hungarian Method, Travelling Salesman Problem, Solutions of TSP.

Sequencing Problems, N-Jobs Two Machine Problems, N-Jobs K Machines Problems, Two-Jobs M- Machine Problems, Replacement Problems-Individual and Group Replacement Policy, Reliability & System Failure Problems,
Network Representation of A Project, CPM and PERT, Critical Path Calculations, Time – Cost Optimizations, PERT Analysis and Probability Considerations, Resource Analysis in Network Scheduling.

Inventory-Factors Effecting Inventory-EOQ, Inventory Problems With and Without Shortages, Inventory Problems with Price Breakups.

Game Theory: Two Person Zero Sum Games, Mixed Strategy Games and Their Algorithms.

Course Outcomes for Fourth Year Second Semester Courses	
Course Code: B16CS4203	
Course Title: OPERATIONS RESEARCH	
CO-1	Describe the basic Operations Research models, and formulate and solve Linear Programming problems.
CO-2	Formulate and solve engineering and managerial situations as Transportation and Assignment problems.
CO-3	Determine the optimal solutions for various Job Sequencing and Replacement models
CO-4	Understand Games theory and Apply them to various competitive situations.
CO-5	Describe and illustrate various Inventory models. Discuss & schedule various project management problems by CPM & PERT.

SYLLABUS: INTERNET OF THINGS LAB (B16CS4204)

LIST OF EXPERIMENTS:

1. Study of various network protocols used in IOT.
2. Application of Wi-Fi in IOT systems.
3. Application of 6lowpan in IOT systems.
4. Application of Bluetooth in IOT systems.
5. Application of 802.15.4 zigbee. In IOT systems.
6. Design a simple IOT system comprising sensors, wireless network connection, data analytics

Course Outcomes for Fourth Year Second Semester Courses	
Course Code: B16CS4204	
Course Title: INTERNET OF THINGS LAB	
CO-1	Able to understand and design the application areas of IOT ·
CO-2	Able to realize and design the revolution of Internet in Mobile Devices, Cloud & Sensor Networks ·
CO-3	Able to understand and design building blocks of Internet of Things and characteristics.

SYLLABUS: PROJECT PHASE-II (B16CS4205)

The phase-II of the project shall consists of
Implementing, Testing and validation.
Report Writing.

Sessional (50 Marks) will be awarded by the Project Guide based on continuous evaluation. External Evaluation (100 marks) of project report and viva voce will be conducted by a committeeconsisting of HOD, Guide and External Examiner.

May be carried out using in-house facilities or in an industry by specified number of students in agroup.

Format for Preparation of Project Thesis for B. Tech:

1. **Arrangement Of Contents:** The sequence in which the project report material should be arranged and bound should be as follows:

    1. Cover Page & Title Page .
    2. Bonafide Certificate
    3. Abstract.
    4. Table of Contents
    5. List of Tables
    6. List of Figures
    7. List of Symbols, Abbreviations and Nomenclature
    8. Chapters
    9. Appendices
    10. References

*The table and figures shall be introduced in the appropriate places.

Course Outcomes for Fourth Year Second Semester Courses	
Course Code: B16CS4205	
Course Title: PROJECT PHASE-II	
CO-1	Identify a current problem through literature/field/case studies and define the background objectives and methodology for solving the same.
CO-2	Analyze, design and develop a technology/ process.
CO-3	Implement and evaluate the technology at the laboratory level.
CO-4	Write report and present it effectively.

ELECTRONICS AND COMMUNICATIONS ENGINEERING

Regulation: 16	I/ IV - B.Tech I- Semester

ELECTRONICS AND COMMINICATION ENGINEERING
(under Choice Based Credit System / Elective Course System)

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2016-17 admitted Batch onwards)

CodeNo.	Course	C	Credits	Lecture Hrs	Tutorial Hrs	Lab Hrs	Sessional Marks	Exam Marks	Total Marks
B16 ENG1101	English *	ES	4	3	1	--	30	70	100
B16 ENG1102	Mathematics-I*	ES	4	3	1	--	30	70	100
B16 ENG1103	Mathematics-II*	BS	4	3	1	--	30	70	100
B16 ENG1105	Physics	ES	4	3	1	--	30	70	100
B16 ENG1107	Engineering Graphics	ES	4	2	--	3	30	70	100
B16 ENG1109	Professional Ethics & Moral Values	**ES**	2	2	--	--	30	70	100
B16 ENG1111	Physics Lab	ES	2	--	--	3	50	50	100
B16 ENG1113	Workshop	ES	2	--	--	3	50	50	100
B16 ENG1114	NCC/NSS (Audit)	BS	--	--	--	--	--	---	--
Total			**26**	**16**	**4**	**9**	**280**	**520**	**800**

- **C** – Category

ELECTRONICS AND COMMINICATION ENGINEERING
SYLLABUS: ENGLISH (B16 ENG 1101)
(Common to All Branches)

Listening Skills

Conversations: Life in a Hostel – Eating Away those Blues – Meeting Carl Jung – A Documentary on the Big Cat – A Consultant Interviewing Employees – A Conversation about a Business Idea.

Speaking Skills

Your Favorite Holiday Destination – Describe Yourself – Why we need to save our Tiger – A Dialogue – Your First Interview – Pair Work: Setting up a New Business.

Reading Skills

Reading Comprehension: Famous People – What is Personality, Personality based on Blood Groups – News Report, Magazine Article, Mobile Towers and Health – An Excerpt from a Short Story, An Excerpt from a Biography – Open Letter to Prime Minister, Business Dilemmas: An Email Exchange – A Review of IPL: The Inside Story, Mark Zukerberg: World‟s Youngest Billionaire.

Writing Skills

Letter Writing, Essay Writing, Email Writing, Report Writing, Paragraph Writing, Drafting a Pamphlet, Argument Writing, Dialogue Writing.

Grammar

Types of Sentences, Articles, Prepositions, Gerunds and Infinitives, Conjunctions, Tense, Quantifiers, Punctuations, Correction of Sentences, Fill-in the Blanks.

Vocabulary

Synonyms, Antonyms, Idioms, One Word Substitution.

Life Skills and Core Skills

Self-Awareness and Self-Motivation – Communication, Adaptability – Motivation, Problem Solving – Personal Presentation Skills, Stress Management – Professionalism – Ethics.

Course Outcomes for Fourth Year Second Semester Courses	
Course code: B16 ENG 1101	
Course Name: ENGLISH	
CO-1	The overall performance of the students will be enhanced after the course; they will be in a position to make presentations on topics of current interests – politics, famous personalities, science and technology, tourism, work and business environment, with increased public speaking skills.
CO-2	Students will be able to read, listen, speak and write effectively in both academic and non-academic environment
CO-3	The students will be updated with certain real life situations, which they can handle when, come face to face.

SYLLABUS: MATHEMATICS – I (B16ENG 1102)
(Common to all Branches)

Partial Differentiation

Functions of two or more variables – Partial derivatives – Homogeneous Functions – Euler's Theorem – Total Derivative – Change of Variables – Jacobians – Geometrical Interpretation: Tangent Plane and Normal to a Surface.

Applications of Partial Differentiation

Taylor's Theorem for functions of two variables – Errors and Approximations – Total Differential – Maxima and Minima of functions of two variables – Lagrange's Method of Undetermined Multipliers – Differentiation Under the Integral Sign – Leibnitz's Rules.

Ordinary Differential Equations of First Order and First Degree

Formation of ordinary differential equations (ODEs) – Solution of an ordinary differential equation – Equations of the First Order and First Degree – Linear Differential Equation – Bernoulli's Equation – Exact Differential Equations – Equations Reducible to exact equations.

Applications of Differential Equations of First Order

Orthogonal Trajectories – Simple electric (LR & CR) Circuits – Newton's Law of Cooling – Law of Natural growth and decay.

Linear Differential Equations of Higher Order

Solutions of Linear Ordinary Differential Equations With Constant Coefficients – Rules for finding Complimentary Function – Rules for finding the particular integral – Method of variation of parameters – Cauchy's linear equation – Legendre's Linear Equation – Simultaneous linear equations.

Fourier series

Introduction - Euler's Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series – Parseval's Formula.

Course Outcomes for First Year First Semester Courses	
Course Code : B16 ENG 1102	
Course Title: MATHEMATICS - I	
CO-1	Find partial derivatives, expand a function of more than one variable in a Taylor series and utilize them for errors and approximations, maxima and minima.
CO-2	Solve a first order ODE and also find orthogonal trajectories and solve problems related to simple applications.
CO-3	Solve a given higher order ODE, an equation with constant coefficients, a Cauchy's equation or a Legendre's equation.
CO-4	Utilize knowledge of Fourier series for solving partial differential equations and also in understanding courses like Signals & Systems

SYLLABUS: MATHEMATICS – II (B16 ENG 1103)

(Common to all Branches)

Matrices – I

Rank of a matrix - Normal Form – Solutions of Linear System of Equations- Consistency of Linear System of Equations – Rouche's Theorem (statement) - Direct Methods: Gauss Elimination Method, LU Factorization Method – Eigen Values and Eigen Vectors of a Matrix– Properties - Cayley – Hamilton Theorem – Inverse and Powers of a Matrix using Cayley – Hamilton Theorem.

Matrices – II

Diagonalization of a Matrix – Quadratic Forms – Reduction of Quadratic Form to Canonical Form – Nature of a Quadratic Form – Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

Laplace Transforms-I

Introduction – Existence Conditions – Transforms of Elementary Functions – Properties of Laplace Transforms – Transforms of Derivatives – Transforms of Integrals – Multiplication by t – Division by t – Evaluation of Integrals by Laplace Transforms – Laplace Transforms of Unit Step Function, Unit Impulse Function and Periodic Functions.

Laplace Transforms-II

Inverse Laplace Transform – different methods - Convolution Theorem – Applications of Laplace Transforms to Ordinary Differential Equations, Simultaneous Linear Differential Equations with Constant Coefficients.

Difference Equations

Definition - order and solution of a difference equation - Formation of difference equations - Linear difference equations - Rules for finding C.F. - Rules for finding P.I.- Simultaneous difference equations with constant coefficients. Application to deflection of a loaded string.

Z-transforms

Z-transforms – definition - some standard Z-transforms - Linear property, damping rule - some standard results - shifting rules - initial and final value theorems - convolution theorem

- Evaluation of inverse transforms - Applications of Z-transform to difference equation.

Course Outcomes for First Year First Semester Courses	
Course Code: B16 ENG 1103	
Course Title: MATHEMATICS – II	
CO-1	Utilizing the knowledge of matrices for solving linear simultaneous equations, find Eigen values and Eigen vectors and handle quadratic forms
CO-2	Utilizing the knowledge of Laplace Transforms to find transforms of important functions that arise in applications and also solve ODE
CO-3	Also utilizing the knowledge of Laplace Transforms in courses like Net Works, Signals & Systems and Control Systems
CO-4	Utilizing the knowledge of difference equations and Z-transforms in understanding courses like Discrete Mathematical Structures and also Signals & Systems

SYLLABUS: PHYSICS (B16 ENG 1105)

(Common to CIVIL, CSE & IT)

Thermodynamics

Introduction, Heat and Work, First Law of Thermodynamics and applications, Reversible and Irreversible Process, Carnot Cycle and Efficiency, Second Law of Thermodynamics, Carnot's Theorem, Entropy, Second Law in terms of entropy, Entropy and disorder, Third Law of Thermodynamics (Statement Only).

Electromagnetism

Effect of Magnetic Field on – moving charges, current in long straight wire and rectangular Current Loop, Hall Effect, Biot-Savart's Law, B near a Long Wire, B for a Circular Current Loop, Ampere's Law, B for a Solenoid, Faraday's Law of electromagnetic induction, Lenz's law, Inductance of a solenoid, L-R Circuit, Displacement Current, Maxwell's Equations (integral form) and their significance (without derivation).

Interference

Principle of Super Position – Young's Experiment – Coherence – Inference in thin transparent films, Newton's Rings, Michelson Interferometer and its applications.

Lasers

Introduction, spontaneous and stimulated emissions, requirements of laser device, Ruby Laser, Gas Laser (He-Ne Laser), Semiconductor diode Laser, Characteristics and applications of Lasers.

Optical Fibers

Introduction, Principles of light propagation in optical fiber, Acceptance angle, Numerical aperture, types of fiber, Applications of Optical Fibers, Optical Fiber in Communications, advantages.

Ultrasonics

Definition, Production of Ultrasonics by Magnetostriction and Piezoelectric methods, detection methods, acoustic grating, characteristics and applications of Ultrasonics.

Modern Physics

Introduction, de Broglie concept of matter waves, Properties of matter waves, experimental verification (Davisson-Germer experiment), Heisenberg uncertainty principle, Wave function and its physical significance, Schrodinger time independent wave equation, application to a particle in a box, Band theory of Solids, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semiconductors and insulators .

Nano phase Materials

Definition, Synthesis – Synthesis methods, Condensation and Ball milling, chemical vapor deposition method – sol-gel methods, Characterization, analysis and applications of Nano materials.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1105	
Course Title: PHYSICS	
CO-1	Students learn in depth about the topics of Lasers, fiber optics, quantum mechanical theory and classical theories of thermodynamics and electromagnetism,
CO-2	Students understand the classical and modern concepts.

SYLLABUS: ENGINEERING GRAPHICS (B16 ENG 1107)

(Common to CIVIL, CSE & IT)

Introduction

Lines, Lettering and Dimensioning. Geometrical Constructions.

Curves

Conic sections: General construction of ellipse, parabola and hyperbola. Construction of involutes Normal and Tangent.

Projections of Points

Principal or Reference Planes, Projections of a point situated in any one of the four quadrants

Projections of Straight Lines

Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of straight line inclined to both the reference planes:

Projections of Planes

Projection of Perpendicular planes: Perpendicular to both reference planes, perpendicular to one reference plane and parallel to other reference plane, perpendicular to one reference plane and inclined to other reference plane. Projection of Oblique planes. Introduction to Auxiliary Planes.

Projections of Solids

Types of solids: Polyhedra and Solids of revolution. Projection of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to other and axes inclined to both the reference planes.

Projections of Section of Solids

Section Planes: Parallel and inclined section planes, Sections and True shape of section, Sections of Solids: Prism, Pyramid, Cylinder and Cone.

Development of Surfaces

Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

Isometric Views

Introduction to Isometric projection, Isometric scale and Isometric view. Isometric views of simple planes. Isometric view of Prisms, Pyramids, cylinder and cone. Isometric view of a combination of solids.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1107	
Course Title: ENGINEERING GRAPHICS	
CO-1	Apply principles of drawing to represent dimensions of an object.
CO-2	Construct polygons and engineering curves.
CO-3	Draw projections of points, lines, planes and solids.
CO-4	Represent sectional views of solids.
CO-5	Develop the surfaces of regular solids.
CO-6	Draw the isometric views of solids and combination of solids.

SYLLABUS: PROFESSIONAL ETHICS AND MORAL VALUES (B16 ENG 1109)

(Common to CIVIL, CSE & IT)

Ethics and Human Values

Ethics and Values, Ethical Vision, Ethical Decisions, **Human Values** – Classification of Values, Universality of Values.

Engineering Ethics

Nature of Engineering Ethics, Profession and Professionalism, Professional Ethics, Code of Ethics, Sample Codes – IEEE, ASCE, ASME and CSI.

Engineering as Social Experimentation

Engineering as social experimentation, Engineering Professionals – life skills, Engineers as Managers, Consultants and Leaders, Role of engineers in promoting ethical climate, balanced outlook on law.

Safety Social Responsibility and Rights

Safety and Risk, moral responsibility of engineers for safety, case studies – Bhopal gas tragedy, Chernobyl disaster, Fukushima Nuclear disaster, Professional rights, Gender discrimination, Sexual harassment at work place.

Global Issues

Globalization and MNCs, Environmental Ethics, Computer Ethics, Cyber Crimes, Ethical living, concept of Harmony in life.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1109	
Course Title: PROFESSIONAL ETHICS AND MORAL VALUES	
CO-1	By the end of the course student should be able to understand the importance of ethics and values in life and society.

SYLLABUS: PHYSICS LAB (B16 ENG 1111)

(Common to CIVIL, CSE & IT)

LIST OF EXPERIMENTS

1. Sonometer – verification of laws of transverse vibrations in stretched strings.
2. Melde’s Experiment – Determination of the frequency of an electrically maintainedtuning fork.
3. Newton’s Rings – Determination of radius of curvature of a convex lens.
4. Diffraction Grating – Determination of Wavelengths of lines of mercury spectrum usingspectrometer by normal incidence method.
5. Determination of Cauchy’s constants of the material of the given prism usingSpectrometer and mercury light.
6. Wedge Method – Determination of thickness of a paper by forming parallel interferencefringes.
7. Variation of magnetic field along the axis of current carrying circular coil – Stewart and Gee’s apparatus.
8. Carey Foster’s bridge – Verification of laws of resistance.
9. Lee’s Method – Determination of coefficient of thermal conductivity of a bad conductor.
10. Calibration of voltmeter using potentiometer.
11. Calibration of low range Ammeter using potentiometer.
12. Laser – Diffraction.

SYLLABUS: WORKSHOP (B16 ENG 1113)
(Common to CIVIL, CSE & IT)

Carpentry

Bench Work, tools used in carpentry.

Jobs for Class work – half lap joint, mortise and tenon joint, half – lap dovetail joint, cornerdovetail joint, central bridle joint.

Sheet Metal

Tools used in sheet metal work, Laying development of the sheet metal jobs, soldering.

Jobs for class works – Square tray, taper tray (sides), funnel, elbow pipe joint, 60^0 pipe joint.

Fitting

Tools used in fitting work, Different files, chisels, hammers and bech vice.

Jobs for class work – Square, hexagon, rectangular fit, circular fit and triangular fit.

Course Outcomes for First Year First Semester Courses	
Course code: B16 ENG 1113	
Course Name: WORKSHOP	
CO-1	Use various tools to prepare basic carpentry and fitting joints.
CO-2	Fabricate simple components using tin smithy.

SYLLABUS: MATHEMATICS – III (B16 ENG 1201)
(Common to all Branches)

Solid Geometry

Equations of a plane, Normal form, Intercept form, Equations of Straight Line – Conditions for a line to lie in a Plane – Coplanar lines – Shortest distance between two skew lines - Intersection of three Planes – Equations of Sphere – Tangent Plane to a Sphere –Cone – Cylinder.

Multiple Integrals-1

Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

Multiple Integrals-2

Beta Function - Gamma Function - Relation between Beta and Gamma Functions-Error Function - Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of mass - Center of gravity of a plane lamina- Moment of inertia.

Fourier Transforms

Introduction – definition - Fourier integral - Sine and Cosine integrals - Complex form of Fourier integral - Fourier transform - Fourier Sine and Cosine transforms -Finite Fourier Sine and Cosine transforms - properties of Fourier transforms, Convolution theorem for Fourier transforms - Perceval’s identity for Fourier transforms - Fourier transforms of derivatives of a function.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1201	
Course Title: MATHEMATICS – III	
CO-1	Utilize knowledge of line, sphere etc. in his engineering subjects
CO-2	Utilize the knowledge of Beta and Gamma functions and multiple integrals to evaluate the integrals they come across in their applications
CO-3	Utilize the knowledge of Fourier Transform in courses like Signals and Systems and in the solution of partial differential equations at a later stage

SYLLABUS: CHEMISTRY (B16 ENG 1203)

(Common to CIVIL, CSE & IT)

Water Chemistry

Source of water- impurities- Hardness and its determination by EDTA method- Boiler troubles and their removal. Water softening methods- lime soda, zeolite and ion exchange. Municipal water treatment- Break point chlorination. Desalination of sea water – electro dialysis and reverse osmosis methods.

Building Materials

Portland cement: Manufacture-Chemistry involved in setting and hardening of cement – Cement concrete -RCC – Decay of concrete.

Refractories: Classification-Properties and Engineering applications. Ceramics: Classification-Properties and uses.

Solid State Chemistry

Classification of solids-Types of crystals-properties-Imperfections in crystals. Band theory of solids. Chemistry of semiconductors –Intrinsic, Extrinsic, compound and defect. Organic semiconductors Purification of solids by Zone refining-Single crystal growth – epitaxial growth. Elementary ideas on Liquid crystals.

Corrosion Chemistry

Definition of corrosion- Types of corrosion-chemical & electrochemical corrosion –Pitting, stress corrosion, Galvanic corrosion, Water line corrosion Factors affecting corrosion – Prevention of corrosion- Cathodic protection. Corrosion inhibitors Protective coatings- Metallic coatings, electro plating, electroless plating, chemical conversion coatings- phosphate coatings, chromate coatings, anodizing. Organic coatings-Paints.

Polymers And Plastics

Definition-Types of polymerization – mechanism of free radical polymerization. plastics- Thermosetting and thermoplastic resins cellulose derivatives, vinyl resins, nylon 6,6, bakelite-Compounding of plastics-Fabrication of plastics. Fiber reinforced plastics – conducting polymers -Engineering applications of polymers.

Fuels And Lubricants

Solid fuels: Coal –Analysis of coal – Metallurgical coke- manufacture-Engineering applications.

Petroleum-refining-Knocking and Octane number of gasolilne-Cetane number of diesel oil. Synthetic petrol – LPG-CNG–Applications. Rocket fuels – Propellants-classification.

LUBRICANTS: Principles of lubrications, classification of lubricants and properties of lubricants (any five)

Course Outcomes for First Year First Semester Course	
Course Code: B16 ENG 1203	
Course Title: CHEMISTRY	
CO-1	Students learn in-depth about the topics of desalination of sea water, CNG, LPG Biogas, Semiconductors, Liquid crystals, Conducting polymers, fiber reinforced plastics, building materials
CO-2	Students understand the basic and advanced applied concepts.
CO-3	Students learn to interrelate the theory and with the relevant experiment.
CO-4	Students learn experimental techniques and understand the theory about experiments

SYLLABUS: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS (B16 ENG 1205)

(Common to CIVIL, CSE & IT)

Introduction to C

Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations, Formatted Input, Formatted Output.

Decision Making, Branching, Looping, Arrays & Strings: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else. If ladder, switch statement, the (?:) operator, the GOTO statement., The while statement, the do statement, The for statement, Jumps in Loops ,One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

Functions

Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, The scope, visibility and lifetime of variables. .

Pointers

Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications

Structure and Unions

Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

File handling

Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments- Program Applications.

Numerical Methods

Solutions of Algebraic and Transcendental Equations: Bisection Method, Newton Raphson Method.

Interpolation - Newton’s forward and backward Interpolation, Lagrange’s Interpolation in unequal intervals.

Solutions of Linear Equations: Gauss Elimination Method, Jacobi and Gauss Seidel Methods. Numerical Integration: Trapezoidal rule, Simpson’s 1/3 rule.

Solutions of Ordinary First Order Differential Equations: Euler’s Method, Modified Euler’s Method and Runge-Kutta Method.

Course Outcomes for First Year Second Semester Courses	
Course code: B16 ENG 1205	
Course Title: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS	
CO-1	Student can understand basic terminology used in C programming. 2. 3. 4. 5.
CO-2	Student can write programs by applying elementary algorithms to solve problems in C language.
CO-3	Student can write, compile and debug programs in C language.
CO-4	Student can Write programs to solve numerical methods.
CO-5	Student can be familiar with finite precision computation.

SYLLABUS: ELECTRONIC DEVICES AND CIRCUITS (B16 EC 1208)
(For ECE)

Transport Phenomena in Semiconductors:
Mobility and conductivity, intrinsic and extrinsic semiconductors, mass action law, charge densities in a semiconductors, Hall Effect, generation and recombination of charges, drift and diffusion currents, continuity equation, injected minority carrier charge, potential variation in graded semiconductors.

PN junction diode:
Open circuited PN junction , PN junction as a rectifier, current components in a PN diode, V-I characteristics and its temperature dependence, transition capacitance, charge control description of a diode, diffusion capacitance, junction diode switching times, Zener diode, Tunnel Diode, Photo diode, Point Contact diode, Schottky barrier diode, varactor diode, PIN diode, LED.

Diode Rectifiers:
Half wave, Full wave and Bridge Rectifiers with and without filters, Ripple factor and regulation characteristics

Bipolar junction transistors:
Introduction to BJT, operation of a transistor and transistor biasing for different operating conditions, transistor current components, transistor amplification factors: α,β,γ relation between α and β,γ early effect or basewidth modulation, common base configuration and its input and output characteristics, common emitter configuration and its input and output characteristics, common collector configuration and its input and output characteristics, Comparison of CE, CB and CC Configurations, Break- down in transistors, Photo Transistor.

Field Effect transistors
JFET and its characteristics, pinch off voltage, FET small signal model, MOSFET and its characteristics

Transistor Biasing Circuits
The operating point, Bias stability, different types of biasing techniques, stabilization against variation in I_{co} , $V_{BE,}$ & β. Bias compensation, thermal runaway, thermal stability, Biasing of FETs.

Transistors at low and High frequencies
Transistor hybrid model, h-parameters, Analysis of transistor amplifier circuits using h- parameters, comparison of transistor amplifier configurations, analysis of single stage amplifier, effects of bypass and coupling capacitors, frequency response of CE amplifier, Emitter follower, High frequency model of transistor.

Course Outcomes for First Year Second Semester Courses	
Course code:**B16 EC 1208**	
Course Title: **ELECTRONIC DEVICES AND CIRCUITS**	
CO-1	Understand the physical structure, principles of operation, electrical characteristics and circuit models of diodes, BJTs and FETs.
CO-2	Use this knowledge to analyse and design basic electronic application circuits.
CO-3	Extend the understanding of how electronic circuits and their functions fit into larger electronic systems.

SYLLABUS: CIRCUIT THEORY (B16 EE 1208)

(For EEE)

Fundamentals of Electric Circuits

Concepts of Electric circuit: EMF, Current, Potential difference, Power and Energy; Concepts of Network: Active and Passive elements, classification of Linear, Non-linear, Unilateral, Bilateral Lumped and Distributed elements; Reference directions for current and voltage; Voltage and Current sources; Voltage-Current Relations of R, L, C elements; Voltage and Current division; Series and Parallel combinations of Resistance, Inductance and Capacitance

D.C Circuits

Kirchhoff's Laws; Nodal Analysis, Mesh Analysis, Source Transformation, Linearity and Superposition Theorem, Thiamin's And Norton's Theorems, Reciprocity theorem, Maximum Power Transfer Theorem, Star-Delta Transformation.

AC Circuits

The Sinusoidal Forcing Function, Phasor Concept, Average and Effective Values of Voltage and Current, Instantaneous and Average Power, Complex Power, Steady State Analysis using Mesh and Nodal Analysis, Resonance.

Three Phase Circuits

Advantages of Three Phase Circuits, Balanced and Unbalanced systems, Relation between Line and Phase Quantities in Star and delta connected circuits, Analysis of Balanced & Unbalanced Three Phase Circuits, Measurement of Power in Three Phase Power Circuits.

Magnetic Circuits

Magneto motive force(MMF), Reluctance, Magnetic flux; Analysis of magnetic circuit, Analogy between Electric & Magnetic circuits, Series Magnetic circuits, Magnetic leakage, B-H curve, Faraday's Laws of Electromagnetic Induction, Induced EMF, Dynamically Induced EMF, Statically Induced EMF, Self-Inductance, Mutual Inductance.(simple numerical problems)

Course Outcomes for First Year Second Semester Courses	
Course code:**B16 EE 1208**	
Course Name: **CIRCUIT THEORY**	
CO-1	Able to develop an understanding of the basic fundamental electrical laws, elements of electric Networks and learn the techniques to measure voltage and current.
CO-2	Develops the ability to apply circuit theorems to DC and AC circuits.
CO-3	Able to analyse the coupled & three phase circuits.

SYLLABUS: METALLURGY AND MATERIALS ENGINEERING (B16 ME 1208)

(For Mechanical Engineering)

Structure of crystalline solids

Atomic structure & bonding in solids- Crystal structures-calculations of radius, Coordination Number and Atomic Packing Factor for different cubic structures - Imperfection in solids, point defects, Linear defects, Planar defects and Volume defects- Concept of Slip & twinning.

Phase diagrams

Basic terms- phase rule- Lever rule & free energy of phase mixtures cooling curves- Phase diagram & phase transformation - construction of phase diagrams- binary phase diagrams - Brass, Bronze, Al-Cu and AlSi phase diagrams- Invariant reactions, eutectic, ,peritectic, eutectoid, peritectoid, metatectic&monotectic reactions, Iron carbon phase diagram & microstructures of plain carbon steel & cast iron

Heat treatment

Heat treatment of steel- Annealing, and its types, normalizing, hardening, tempering, martemering, austempering - TTT diagrams, drawing of TTT diagram, TTT diagram for hypo-& hypereutectoid steels, effect of alloying elements, CCT diagram- Martensitic transformation, nature of martensitic transformation- Surface hardening processes like case hardening, carburizing, cyaniding, nitriding Induction hardening, hardenability, Jominy end-quench test, Age hardening of Al & Cu alloys Precipitation Hardening

Engineering Alloys

Properties, composition, microstructure and uses of low carbon, mild medium & high carbon steels. stainless steels, high speed steels, Hadfield steels, tool steels - Cast irons, gray CI, white CI, malleable CI, SC iron-The light alloys-Al & Mg & Titanium alloys- Copper & its alloys: brasses & bronzes- super alloys, Smart materials- Nano materials.

Composite Materials

Classification of composite materials, dispersion strengthened, particle reinforced and fiber reinforced composite laminates properties of matrix and reinforcement materials and structural applications of different types of composite materials.

Course Outcomes for First Year Second Semester Courses	
Course code: B16 ME 1208	
Course Title: METALLURGY AND MATERIALS ENGINEERING	
CO-1	Understand crystalline solids and their atomic structures.
CO-2	Suggest and recommend necessary engineering materials for specific applications keeping in view of the cost, design, reliability, life, working conditions and properties of the products.
CO-3	Understand different phase transformations in Iron-Iron Carbide diagram and distinguish between steels and cast irons.
CO-4	Select different materials for tools and components based on functional requirements.
CO-5	Use composite materials for different engineering applications like aerospace, automobile, ship building industry, sports item etc.

SYLLABUS: CHEMISTRY LAB (B16 ENG 1210)

(Common to CIVIL, CSE & IT)

LIST OF PRACTICAL EXPERIMENTS:

1. Estimation of Sodium hydroxide with HCl (Na_2CO_3 primary standard).
2. Estimation of Iron as Ferrous iron in an Ore Sample.
3. Estimation of Oxalic acid by a redox method
4. Estimation of Calcium in a sample of Portland cement.
5. Estimation of Volume strength of Hydrogen Peroxide.
6. Estimation of Mohr's salt by Potassium dichromate
7. Determination of Hardness of an underground water sample.
8. Estimation of Zinc by EDTA method.
9. Determination of Alkalinity of water sample.

DEMONSTRATION EXPERIMENTS:

10. Determination of Viscosity and Viscosity index of a lubricant.
11. Printed Circuit Board
12. Determination of dissolved oxygen in given water sample.
13. Potentiometric titrations.
14. P^H Determination by using P^H meter.

SYLLABUS: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS LAB (B16 ENG 1212)

LIST OF PROGRAMMES:

1. Write a program to read x, y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line.
2. Write a program which generates 100 random numbers in the range of 1 to 100. Store them in an array and then print the array. Write 3 versions of the program using different loop constructs (eg. for, while and do-while).
3. Write a set of string manipulation functions e.g. for getting a sub-string from a given position, copying one string to another, reversing a string and adding one string to another.
4. Write a program which determines the largest and the smallest number that can be stored in different data types like short, int, long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?
5. Write a program which generates 100 random real numbers in the range of 10.0 to 20.0 and sort them in descending order.
6. Write a function for transporting a square matrix in place (in place means that your are not allowed to have full temporary matrix).
7. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their mean and standard deviation.
8. Implement bisection method to find the square root of a given number to a given accuracy.
9. Implement Newton Raphson Method to determine a root of polynomial equation.
10. Given a table of x and corresponding f(x) values, write a program which will determine f(x) value at an intermediate x value using Lagrange's Interpolation.
11. Write a function which will invert a matrix.
12. Implement Simpson's 1/3rd rule for numerical integration.
13. Implement Trapezoidal rule for numerical integration.
14. Write a program to solve a set of linear algebraic equations.
15. Write a program to solve a differential equation using Runge-Kutta Method.

SYLLABUS: ENGLISH LANGUAGE LAB (B16 ENG 1213)

(Common to All Branches)

1. English Sound Pattern – Letters
2. Sounds of English
3. Pronunciation
4. Stress and Intonation

Laboratory Practice Sessions:

1. Letters and Sounds, Worksheet-1
2. Interactions-1, Worksheet-2
3. The Sounds of English, Worksheet-3
4. Interactions-2, Worksheet-4
5. Pronouncing Words-Some Important Patterns, Worksheet-5
6. Interactions-3, Worksheet-2
7. Stress and Intonation, Worksheet-2

Course Outcomes for First Year Second Semester Courses	
Course code: B16 ENG 1213	
Course Title: ENGLISH LANGUAGE LAB	
CO-1	Students will be sensitized towards recognition of English sound pattern.
CO-2	The fluency in speech will be enhanced.

SYLLABUS: MATHEMATICS IV (B16 ENG 2101)

(Common to CE, ECE, EEE & ME)

Vector Calculus-1

Definitions of Scalar and Vector point functions, Differentiation of vectors, Vector differential operator del, Del applied to scalar point function – gradient, Del applied to vector point function- divergence and curl, physical interpretation of gradient, divergence and curl(without proof), Del applied twice to a point function, Del applied to product of two functions, Irrotational and Solenoidal Fields, scalar potential

Vector Calculus-2

Integration of vectors, line integral, circulation, work done, surface integral, Flux, Green's, Stokes and Gauss Divergence Theorems (Without proofs). Introduction to orthogonal curvilinear coordinates, cylindrical polar coordinates and spherical polar coordinates.

Applications Of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables, One –dimensional wave equation- vibrations of a stretched string (no derivation)-, one-dimensional heat equation – Heat flow along a long horizontal bar (no derivation) (problems on heat equation involving homogeneous end conditions only), two dimensional Laplace equation in Cartesian coordinates.

Complex Variables-1

Review- Cartesian form and polar form of a complex variable, Real and imaginary parts of z^n, e^z, sin z, sinh z and log z.

Limit and continuity of a function of the complex variable, derivative, analytic function, properties of Analytic functions, Cauchy- Riemann equations, Harmonic functions and Orthogonal system, application of analytic function to flow problems, geometric representation of w=f(z), conformal mapping – Bilinear transformation only.

Complex Variables-2

Integration of complex functions, Cauchy's theorem, Cauchy's integral formula (statements only) Taylor and Laurent series expansions of functions (statement of theorems only), zeros and singularities, Residue, calculation of residues, Cauchy's Residue theorem (without proof), Evaluation of real and definite integrals- integration around a unit circle.

Course Outcomes for Second Year First Semester Courses	
Course code: B16 ENG 2101	
Course Title: MATHEMATICS – IV	
CO-1	Apply the concepts of Gradient, Divergence, Curl, Directional derivative, solenoidal and Irrotational fields
CO-2	Determine scalar potential, circulation and work done.
CO-3	Evaluate integrals using Green's, Stokes and Divergence theorems.
CO-4	Obtain the solution of 1-D wave equation and 1-D heat equation.
CO-5	Determine the zeroes and poles of functions and residues at poles.
CO-6	Evaluate certain real definite integrals that arise in applications by the use of Residue theorem.

SYLLABUS: CIRCUIT ANALYSIS & SYNTHESIS (B16 EE 2104)

Analysis of DC Circuits:

Active elements, Passive elements, Reference directions for current and voltage, Kirchhoff's Laws, Voltage and Current Division Nodal Analysis, Mesh analysis, Linearity and superposition, Thevinin's theorem and Norton's theorem, Reciprocity theorem, Z,Y,H,S- parameters.

DC transients:

Inductor, Capacitor, source free RL, RC and RLC response, Evaluation of Initial conditions, Application of unit-step function to RL, RC and RLC circuits, concepts of Natural, Forced and Complete response.

Sinusoidal Steady State Analysis:

The sinusoidal forcing function, Phasor Concept, Average and Effective value of Voltage and Current, Instantaneous and Average Power, Complex Power, Steady State Analysis using mesh and node analysis, Application of network theorems to AC circuits, resonance, Concept of Duality.

Network Functions:

Network functions for single port and two port, Calculation of Network functions for Ladder and General Networks, Poles and Zeroes, Restriction of Poles and Zeroes for Driving point and Transfer functions, Time Domain Behavior from Pole Zero plot, Transfer Functions in terms of Y and Z functions, Scaling Network Functions.

Positive Real Functions:

Positive real function and other properties, Herwitz polynomials, Computation of residues, even and Odd functions, Test for Positive Real Functions.

Course Outcomes for Second Year First Semester Courses	
Course code:**B16 EE 2104**	
Course Name: **CIRCUIT ANALYSIS& SYNTHESIS**	
CO-1	Students will learn circuit conventions and analyze DC circuits using various techniques like mesh analysis, nodal analysis and theorems.
CO-2	Students will learn the significance of energy storing elements (Inductance & Capacitance) in circuits and analyse transient and steady state responses.
CO-3	Students will learn the concepts of single and three-phase balanced circuits and analyze sinusoidal steady-state using phasor concept.
CO-4	Student will learn the concept of network functions and analyze poles, zeros and time domain behavior from pole-zero plots.
CO-5	Student will learn the concept of positive real functions and test whether the given network function is Hurwitz and positive real or not.

SYLLABUS: ELECTRICAL TECHNOLOGY (B16 EE 2105)

Magnetic Circuits:

Definitions of magnetic circuit, Reluctance, MMF, Magnetic flux, Hysteresis loss. Faraday's laws of Electromagnetic induction, Induced E.M.F., Dynamically induced E.M.F., Statically induced E.M.F., Self-inductance, Mutual inductance, Lenz's law

DC Machines:

Principle of operation DC Generator - EMF equation - types - DC motor types - torque equation – speed control methods- applications - three point starter-Testing-Load test on D.C Shunt Motor, D.C Series Motor, Swinburne's test.

Transformers:

Principle of operation of single phase transformers - EMF equation - equivalent circuit –losses - efficiency and regulation-Testing- Open circuit and Short circuit tests.

Induction Motors:

Construction - Principle of operation of induction motor - slip - torque characteristics - Power flow diagram.

Synchronous Machines:

Construction-Principle of operation of alternators – EMF equation of alternator- regulation by synchronous impedance method, Principle of operation of synchronous motors, methods of starting, applications.

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 EE 2105	
Course Name: ELECTRICAL TECHNOLOGY	
CO-1	Classify the parts of DC Machines, Transformers, Three Phase Induction motors & Three Phase Synchronous machines.
CO-2	Interpret the operation and working principle of DC Machines, Transformers, Three Phase Induction motors, Three Phase Synchronous machines.
CO-3	Develop performance characteristics of various machines.
CO-4	Construct experiments on various machines.
CO-5	Analyze the application of electrical machines in various fields of engineering.

SYLLABUS: ANALOG ELECTRONIC CIRCUITS (B16 EC 2101)

Multistage Amplifiers

Transistor at high frequencies, CE short circuit current gain and concept of Gain Bandwidth Product. BJT and FET RC Coupled Amplifiers at low and high frequencies. Frequency Response and calculation of Band Width of Multistage Amplifiers.

Feed Back Amplifiers

Concept of Feed Back Amplifiers - Effect of Negative Feedback on the amplifier characteristics. Four feedback topologies, Method of analysis of Voltage Series, Current Series, Voltage Shunt and Current Shunt feedback Amplifiers.

Sinusoidal Oscillators

Condition for oscillations –LC Oscillators – Hartley, Colpitts, Clapp and Tuned Collector Oscillators – Frequency and amplitude Stability of Oscillators – Crystal Oscillators – RC Oscillators -- RC Phase Shift and Weinbridge Oscillators.

Power Amplifiers

Classification of Power Amplifiers – Class A, Class B and Class AB power Amplifiers. Series Fed, Single Ended Transformer Coupled and Push Pull Class A and Class B Power Amplifiers. Cross-over Distortion in Pure Class B Power Amplifier, Class AB Power Amplifier – Complementary Push Pull Amplifier with trickle Bias, Derating Factor – Heat Sinks.

Tuned Voltage Amplifiers

Single Tuned and Stagger Tuned Amplifiers – Analysis – Double Tuned Amplifier – Bandwidth Calculation.

Operational Amplifiers

Concept of Direct Coupled Amplifiers. Ideal Characteristics of an operational Amplifier – Differential Amplifier - Calculation of common mode Rejection ratio – Differential Amplifier supplied with a constant current – Normalized Transfer Characteristics of a differential Amplifier – Applications of OP-Amp as an Inverting and Non-Inverting Amplifier, Integrator, Differentiator Summing and Subtracting Amplifier and Logarithmic Amplifier. Parameters of an Op-Amp, Measurement of OP-Amp Parameters.

Course Outcomes for Second Year First Semester Courses	
Course code: **B16 EC 2101**	
Course Title: **ANALOG ELECTRONIC CIRCUITS**	
CO-1	Know the equivalent circuit of multistage amplifier and its analysis.
CO-2	Identify the different feedback topologies and analyze them.
CO-3	Explain the principle of oscillator and design different types of sinusoidal oscillators.
CO-4	Define the difference between voltage and power amplifiers and design different classes.
CO-5	Know that Tuned amplifiers amplify a narrow band of frequencies and will also be able to analyze them.
CO-6	Identify that Op-amp not amplifies but also perform different operations and analyze some applications.

SYLLABUS: ELEMENTARY DATA STRUCTURES (B16CS2104)

Revision of C language:

Overview Arrays and Functions:

Organization and use of one Dimensional, Two dimensional and Multi-dimensional Arrays, Handling of character strings, string operations, Concept of function, Parameter passing, Recursion.

Structures, Pointers and Files:

Definition of structure and Union, Programming examples, Pointers , Pointer Expressions, Programming examples, Dynamic Memory Allocation, Preprocessor Directives

Linear Data structures:

Stack -Representation, Operations, Queue- representation, Operations, Circular Queue, Linked List-Representation, Operations, Double Linked List and Circular List.

Non-linear Data Structures:

Trees, Binary Tree Representation, Tree Traversals, Conversion of a General Tree to Binary Tree.

Graphs

Representation of Graphs, Linked Representation of Graphs, Graph Traversals and Spanning Trees**.**

Searching & Sorting:

Basic search Techniques- Linear and Binary searching, Tree searching, Sorting-Insertion, Selection, Bubble, Quick and Merge Sorting.

Course Outcomes for Second Year First Semester Courses	
Course code: B16 CS 2104	
Course Title: ELEMENTARY DATA STRUCTURES	
CO-1	Be able to write programs and class libraries given a specification.
CO-2	Implement various data structures.
CO-3	Implement and analyse various sorting algorithms.
CO-4	Understand abstract data types and how they are implemented in C.

SYLLABUS: PROBABILITY THEORY & RANDOM PROCESSES (B16 EC 2102)

Probability Theory

Definitions of Probability, Axioms of Probability, Probability Spaces, Properties of Probabilities, Joint and Conditional Probabilities, Independent Events

Random Variables

Probability Distribution Functions, Probability Density Functions, Joint Distribution of Two Variables, Conditional Probability Distribution and Density, Independent Random Variables.

Statistical Averages

Functions of Random Variables and Random Vectors, Statistical Averages, Characteristic Function of Random Variables, Inequalities of Chebyshev and Schwartz, Convergence Concepts, Central Limit Theorem.

Random Processes

Stationarity, Ergodicity, Covariance Function and their Properties, Spectral Representation, Weiner-Kinchine Theorem.

Linear Systems and Random Noise Processes

Linear operations, Gaussian processes, Poisson Processes**,** Low-pass and Band-pass Noise Representation.

Course Outcomes for Second Year First Semester Courses	
Course code:**B16 EC 2102**	
Course Name: **PROBABILITY THEORY & RANDOM PROCESSES**	
CO-1	Understand the axiomatic formulation of modern probability theory.
CO-2	Characterize Probability Models and functions of Random variables based on single and multiple random variables.
CO-3	Evaluate and apply moments and characteristic functions and understand the concept of Inequalities and probabilistic limits.
CO-4	Understand the concept of Random process and determine covariance and spectral density of stationary random processes.
CO-5	Demonstrate the specific applications to Poisson and Gaussian process and representation of low pass and band pass noise models.
CO-6	Analyze the response of random inputs to linear time invariant systems.

SYLLABUS: ELECTRONIC DEVICES & CIRCUITS LAB (B16 EC 2105)

(Common to ECE & EEE)

LIST OF EXPERIMENTS

1. V-I characteristics of semiconductor diode, LED and Zener diode.
2. Half wave and full wave rectifier with and without filters.
3. Input and output characteristics of transistor in CE configuration.
4. Transistor biasing circuits and transistor as a switch.
5. CE amplifier.
6. JFET common source amplifier.

LIST OF SIMULATION EXPERIMENTS

7. V-I characteristics of semiconductor diode, LED and Zener diode.
8. Regulation characteristics of Zener diode.
9. Input and output characteristics of transistor in CB configuration
10. JFET Characteristics.
11. CC amplifier
12. JFET common source amplifier

Course Outcomes for Second Year First Semester Courses	
Course code: B16 EC 2105	
Course Title: ELECTRONIC DEVICES & CIRCUITS LAB	
CO-1	To understand the role of basic electronic devices like ordinary Pn diodes, Zener diodes, LEDs, BJTS and JFETs in achieving various functionalities like rectification, voltage regulation, amplification, switching action etc. in various electronic circuits.
CO-2	To construct and simulate different electronic circuits using Multisim.
CO-3	To have the hardware skills and software skills required in the design of electronic systems for various applications.

SYLLABUS: ENGLISH PROFICIENCY (B16 ENG 2104)

Speaking Skills

PPT

Describing

Event/place/thingPicture

Description Extempore

Debate Telephonic Skills

Analyzing Proverbs

Vocabulary

Affixes

Pairs of Words

Reading Skills

Reading Comprehension

Reading/Summarizing News Paper Artic

Writing Skills

Designing Posters

Essay writing

Resume Writing

Course Outcomes for Second Year First Semester Courses	
Course code: **B16 ENG 2104**	
Course Title: **ENGLISH PROFICIENCY**	
CO-1	Students enhance their vocabulary and use it in the relevant contexts.
CO-2	They improve speaking skills.
CO-3	They learn and practice the skills of composition writing.
CO-4	They enhance their reading and understanding of different texts.
CO-5	They enrich their communication both in formal and informal contexts.
CO-6	They strengthen their confidence in presentation skills.

SYLLABUS: INDUSTRY ORIENTED TRAINING (B16 ENG 2106)

(Common to ECE & EEE)

BASIC CONCEPTS

System Life Cycle, Algorithm Specification, Recursive Algorithms, Data Abstraction, Performance Analysis, Space Complexity, Time Complexity, Asymptotic Notation, Comparing Time Complexities

IMPLEMENTATION (Using C)

Arrays

Stacks

Queues

Linked List

Double linked listsTrees

Graphs

Applications of linear and nonlinear data structures and solving simple to complex problemsin perspective of industry requirements.

Basic Concepts of OOP

Procedural Paradigms, Object Oriented Paradigm, OOP Principles and Terminology, OOPbenefits, Procedure and Object Oriented programming languages, advantages and disadvantages, creating class, defining objects in C++ and JAVA.

Applications using OOP in solving simple to complex problems in perspective of industryrequirements.

(Note: Total Marks will be evaluated based on Continuous Evaluation - 25 Marks, CodingContest- 25 Marks)

Course Outcomes for Second Year First Semester Courses	
Course code:**B16 ENG 2106**	
Course Title: **INDUSTRY ORIENTED TRAINING**	
	Academic Year : 2**017-18**
CO-1	Application using implementation of Data structures.
CO-2	Application using implementation of Linear and nonlinear Data structures in view of industry.
CO-3	Applications using Object Oriented Concepts in view of industry.

SYLLABUS: SWITCHING THEORY AND LOGIC DESIGN (B16EC2201)

Number Systems and Codes

Number Systems, Base Conversion Methods, Complements of Numbers, Codes, Error detecting and Error Correcting Codes.

Logic Gates and Minimization Of Boolean Functions

Symbols and Truth Tables of Gates – AND, OR, NOT, NAND, NOR and XOR. Proof of Boolean theorems and functions– Karnaugh Map (up to 6 variables) and QuineMcClusky methods.

Combinational Logic Circuits and Design

Logic Design of Combinational circuits – Binary addition, Subtraction, Multiplexers, Demutiplexers, Decoders, Encoders, Code Conversion, Priority Encoders, Seven – segment Displays, Comparators and PLDs.

Sequential Logic Circuits and Design

The Flip-flops – SR, RS, JK, MSJK, T and D-Flip-flops. Design of Clocked Flip-flops, Flip- Flop conversion from one type to another. Design of Shift Registers and Counters.

Traditional Approaches to Sequential Analysis and Design

Analysis and Design of Finite State Machines, State Reduction.

Asynchronous Finite State Machines

Analysis and Design of Asynchronous Machines, Cycles, Races and Hazards.

Course Outcomes for Second Year Second Semester Courses	
Course code:**B16 EC 2201**	
Course Name: **SWITCHING THEORY AND LOGIC DESIGN**	
CO-1	Able to understand various basic number system conversion and simplification of Boolean expressions.
CO-2	Design and analyze combinational and sequential circuits using logic gates, latches and flip-flops.
CO-3	Analyze and design Finite State Machines.
CO-4	Analyze and design Asynchronous Machines.

SYLLABUS: MAGNETIC FIELD THEORY & TRANSMISSION LINES (B16 EC 2202)

Electrostatics:

Introduction, Coulomb's law and electric field intensity, electric field due to different types of charge distributions, electric flux density, gauss's law and applications. Energy and potential, electric field in terms of potential gradient, electric dipole, stored energy in static electric field and energy density, convection and conduction currents, continuity equation, conductors in electric field, relaxation time, dielectrics in electric field, Laplace's and Poisson's equations, uniqueness theorem, different capacitance configurations, Boundary conditions on $\vec{E}$ & $\vec{D}$ at the interface between two media, Related Problems.

Magneto statics:

Introduction, Biot-savart's law, Ampere's circuital law, applications of Ampere's circuital law, magnetic flux density, Gauss"s law for magnetic fields, scalar and vector magnetic potentials, forces due to magnetic fields, magnetization in materials, inductance, boundary conditions on $\vec{H}$ & $\vec{B}$ at the interface between two media, energy stored in steady magnetic field, Related problems.

Time varying fields and Maxwell's equations:

Introduction, Faraday's law of electromagnetic induction, Transformer emf and motional emf, Maxwell's equations in integral and differential forms, word statements, Maxwell's

equations using phasor notation, Boundary conditions an between two media, Related problems. $\vec{E}$, $\vec{D}$, $\vec{H}$ & $\vec{B}$ at the interface

Electromagnetic Waves:

Introduction, Wave equations for free space and for a conductive medium, uniform plane waves, properties of uniform plane waves, Relation between E and H in uniform plane wave, wave propagation in lossless and lossy media, Propagation in good conductors and good dielectrics, depth of penetration, polarization, Reflection of plane waves by a perfect conductor for normal and Oblique incidences, Reflection of plane waves by a perfect dielectric for normal and Oblique incidences, Brewster angle and critical angle, Poynting's theorem, Related Problems.

Transmission lines:

Introduction, types of transmission lines, equivalent circuit of transmission line, Primary and secondary constants of the line, Transmission line equations, characteristic impedance and expression for characteristic impedance, Reflection coefficient, standing wave ratio, lossless line, distortion less line, input impedance of transmission line, shorted and open circuited lines, impedance transformation with $\frac{\lambda}{8}, \frac{\lambda}{4}$ $\frac{\lambda}{2}$ lines, Construction of smith chart, Applications of smith chart, Single stub matching, Related problems.

Rectangular Waveguides:

Introduction, TM modes in rectangular waveguides, TE modes in rectangular waveguides, Impossibility of TEM mode in waveguides, Characteristics of TE and TM modes, cutoff frequency, cutoff wavelength, phase and group velocities, characteristic wave impedance, dominant mode, related problems.

Course Outcomes for Second Year Second Semester Courses	
Course code: **B16 EC 2202**	
Course Title: **ELECTRO MAGNETIC FIELD THEORY & TRANSMISSION LINES**	
CO-1	Ability to apply the knowledge of mathematics, Science and engineering to the Analysis and design of systems involving electric and magnetic fields as well as Electromagnetic Waves.
CO-2	Ability to identify, formulate and solve engineering problems in the area of electric and Magnetic fields and waves.
CO-3	Ability to use Maxwell’s equations to solve electromagnetic field problems.
CO-4	Ability to apply the knowledge of electromagnetic fields in practical transmission lines and waveguides.

SYLLABUS: PULSE AND DIGITAL CIRCUITS (B16 EC 2203)

Linear Wave Shaping:

High pass and Low pass RC circuits, Response of High pass and Low pass RC circuits to sinusoidal, step, pulse, square, exponential and Ramp inputs, High pass RC circuit as a differentiator, Low pass RC circuit as an integrator. Attenuators and its application as CRO probe, RL and RLC Circuits and their response for step input, Ringing Circuit.

Nonlinear Wave Shaping:

Diode clippers, Transistor Clippers, Clipping at two independent levels, Comparator, Applications of voltage Comparators, Diode Comparator, Clamping Operation, Clamping Circuits using Diode with Different Inputs, Clamping Circuit Theorem, Practical Clamping circuits, Effect of diode Characteristics on Clamping Voltage.

Bistable Multivibrators:

Transistor as a switch, Switching times of a transistor, Design and Analysis of Fixed-bias and self-bias transistor binary, Commutating capacitors, Triggering schemes of Binary, Transistor Schmitt trigger and its applications.

Monostable and A stable Multivibrators:

Design and analysis of Collector coupled Mon stable Multivibrator, Expression for the gate width and its waveforms. Design and analysis of Collector coupled Astable Multivibrator, expression for the Time period and its waveforms, The Astable Multivibrator as a voltage to frequency convertor.

Time Base Generators:

General features of a time-base signal, Methods of Generating time base waveform, Exponential voltage sweep circuit, Basic principles of Miller and Bootstrap time base generators, transistor Miller sweep generator, transistor Bootstrap sweep generator, Current Sweep circuit, Linearity correction through adjustment of driving Waveform.

Synchronization and Frequency Division:

Principles of Synchronization, Frequency division in sweep circuit, Synchronization of Astable Multivibrators, Synchronization of a sweep circuit with symmetrical signals, Sine wave frequency division with a sweep circuit.

Logic Families:

Realization of gates using diodes and Transistors, RTL, DTL.

Course Outcomes for Second Year Second Semester Courses	
Course code: B16 EC 2203	
Course Title: PULSE AND DIGITAL CIRCUITS	
CO-1	Understand the applications of integrator, differentiator, clippers and clamper circuits.
CO-2	Design different multivibrators for various applications.
CO-3	Design different time base generators.
CO-4	Analyze synchronization techniques for sweep circuits.
CO-5	Understand different logic families & realize logic gates using diodes and transistors.

SYLLABUS: ANALOG COMMUNICATIONS (B16EC2204)

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Linear Modulation Systems:

Need for Modulation, Frequency Translation, Method of Frequency Translation, Amplitude Modulation, Modulation Index, Spectrum of AM Signal, Modulators and Demodulators (Diode detector), DSB-SC Signal and its Spectrum, Balanced Modulator, Synchronous Detectors, SSB Signal, SSB Generation Methods, Power Calculations in AM Systems, Application of AM Systems.

Angle Modulation Systems:

Angle Modulation, Phase and Frequency Modulation and their Relationship, Phase and Frequency Deviation, Spectrum of an FM Signal, Bandwidth of Sinusoidally Modulated FM Signal, Effect of the Modulation Index on Bandwidth, Spectrum of Constant Bandwidth FM, Phasor Diagram for FM Signals.FM Generation**:** Parameter variation method, Indirect method of Frequency Modulation (Armstrong Method), Frequency Multiplication, PLL FM Demodulator, Pre – emphasis and De – emphasis, Comparison of FM and AM.

Noise in AM and FM Systems:

Sources of Noise, Resistor Noise, Shot Noise, Noise in AM Systems, Noise in Angle Modulation Systems, Comparison between AM and FM with respect to Noise, Threshold in Frequency Modulation

Radio Transmitters:

Classification of Radio Transmitters, AM and FM Transmitters, Radio Telegraph and Telephone Transmitters, SSB Transmitters

Radio Receivers:

Radio receiver Types, AM Receivers – RF Section, Frequency Changing and Tracking, Intermediate Frequency and IF Amplifiers, Automatic Gain Control (AGC); FM Receivers – Amplitude Limiting, FM Demodulators, Ratio Detectors, ISB Receiver, Comparison with AM Receivers. Communication Receivers: Extensions of the Super-heterodyne Principles, Additional Circuits.

Course Outcomes for Second Year Second Semester Courses	
Course code:**B16 EC 2204**	
Course Title: **ANALOG COMMUNICATIONS**	
CO-1	Understand the need for modulation and learn about the basic elements of communication system.
CO-2	Understand the concepts of Analog Modulation and Demodulation techniques.
CO-3	Evaluate various parameters of analog modulated waveform in Time and Frequency domain.
CO-4	Analyze and compare the performance of various analog modulation techniques in the presence of noise.
CO-5	Analyze different characteristics of transmitters.
CO-6	Analyze different characteristics of receivers.

SYLLABUS: SIGNALS AND SYSTEMS (B16EC2205)

Introduction to signals and linear time Invariant systems

Continuous –Time and Discrete –Time signals, Signal Energy and Power, Periodic Signals, Even and odd Signals, Continuous- Time complex Exponential and Sinusoidal Signals, Discrete –Time complex Exponential and Sinusoidal Signals, Periodicity of Continuous – Time and Discrete –Time Complex Exponentials, Continuous-Time Unit impulse and Unit step Signals, Discrete- Time Unit Impulse and Unit Step Sequences, Continuous –Time and Discrete –Time Systems, Interconnections of Systems, Basic System Properties of Continuous –Time and Discrete –Time Systems, Introduction of continuous–Time LTI Systems and Discrete –Time LTI Systems, Casual LTI Systems Described by Differential and Difference Equations, Singularity Functions.

Fourier Series Representation of Periodic Signals

Introduction, Fourier Series Representation of continuous time Periodic Signals, convergence of the Fourier Series, Properties of continuous time Fourier Series, Fourier Series representation of discrete time periodic signals, Properties of discrete time Fourier Series.

Continuous and Discrete time Fourier Transform

Introduction, Representation of Aperiodic signals, the continuous time Fourier Transform, The Fourier Transform for periodic signals, Properties of the continuous time Fourier Transform, Systems characterized by linear constant-coefficient Differential equations. Discrete time Fourier Transform, Fourier Transform for periodic signals, Properties of the Discrete time Fourier Transform, Systems characterized by linear constant co-efficient Difference equations.

Convolution of signals

Introduction of convolution integral and convolution sum, Graphical interpretation of Convolution, System analysis by Convolution, Convolution as a superposition of impulse response, Convolution of a function with a unit impulse, Convolution relationships, Signal comparison.

Correlation of signals

Introduction of Correlation of signals, properties of correlation functions, Introduction of Energy Density Spectrum (ESD) and Power Density Spectrum (PSD), Relation between Autocorrelation function and ESD/PSD, Relation between Convolution and Correlation. Correlation functions for nonfinite energy signals.(8 Periods)

Sampling Theorem and Z-transform

Introduction to signal reconstruction from its samples using interpolation, the effect of under sampling: aliasing, discrete time processing of continuous time signals, sampling of discrete time signals. The Z-Transform, The Inverse Z-Transform, Properties of Z-Transform, The initial and final value theorems, some common Z-transform pairs, Analysis and characterization of LTI systems using the Z-Transforms, System function algebra and block diagram representation.(10 Periods).

Course Outcomes for Second Year Second Semester Courses	
Course code: B16 EC 2205	
Course Title: SIGNALS AND SYSTEMS	
CO-1	Understand the basic concepts of signals and systems.
CO-2	Analyze the spectral characteristics of Continuous Time and Discrete Time periodic and aperiodic signals using Fourier analysis.
CO-3	Analyze system properties based on impulse response and Fourier analysis.
CO-4	Classify systems based on their properties and determine the response of LTI systems using convolution and also understand the concept of correlation between signals.
CO-5	Apply Z- transforms for analyzing discrete-time signals and systems
CO-6	Understand the process of sampling and the effects of under sampling.

SYLLABUS: ANALOG COMMUNICATION LAB (B16 EC 2207)

1. Generation of AM Signal and measurement of Modulation Index.
2. Diode Detector for AM Signals.
3. Generation of FM Signal.
4. FM Detector.
5. Receiver Measurements.
6. Balanced Modulator.
7. Passive Filters (LPF, HPF, BPF).
8. Active Filters.
9. Attenuator.
10. Equalizer and Twin-T-Network.
11. Frequency Multiplier/Limiter.
12. SSB Generation and Detection.
13. Pre-emphasis and De-emphasis.
14. PLL.
15. IF Amplifier.

Course Outcomes for Second Year Second Semester Courses	
Course code: **B16 EC 2207**	
Course Title: **ANALOG COMMUNICATION LAB**	
CO-1	Design and implement modulation and demodulation circuits for amplitude modulation technique.
CO-2	Design and implement modulation and demodulation circuits for frequency modulation technique.
CO-3	Design second order passive and active filters for various frequency bands.
CO-4	Construct the circuit and study the characteristics of different transmitter and receiver circuits such as Harmonic generator, RF Amplifier, IF Amplifier, pre-emphasis and de-emphasis.

SYLLABUS: ANALOG ELECTRONIC CIRCUITS LAB WITH SIMULATION (B16 EC 2208)

(Common to ECE & EEE)

LIST OF EXPERIMENTS

1. Design of LC Oscillators (Hartley Oscillator, Colpitts Oscillator)
2. Design of RC Oscillators (Wien Bridge Oscillator, RC phase Shift Oscillator)
3. Design of Basic Applications of Operational Amplifier.
4. Frequency response of Two Stage RC Coupled Amplifier.
5. Frequency response of Current Series Feedback Amplifier(with and without feedback)
6. Measurement of resonant frequency, bandwidth and quality factor of single Tuned Voltage Amplifier.
7. Calculation of Collector Circuit efficiency of Class B Push Pull Power Amplifier.

LIST OF EXPERIMENTS (Simulation)

8. Design of LC Oscillators (Hartley Oscillator,Colpitts Oscillator)
9. Design of RC Oscillators (Wien Bridge Oscillator,RC phase Shift Oscillator)
10. Design of Basic Applications of Operational Amplifier.
11. Frequency response of Two Stage RC Coupled Amplifier.
12. Frequency response of Current Series Feedback Amplifier(with and without feedback)
13. Measurement of resonant frequency, bandwidth and quality factor of single Tuned Voltage Amplifier.
14. Calculation of Collector Circuit efficiency of Class B Push Pull Power Amplifier.

Course Outcomes for Second Year Second Semester Courses	
Course code: **B16 EC 2208**	
Course Title: **ANALOG ELECTRONIC CIRCUITS LAB WITH SIMULATION**	
CO-1	Acquire a basic knowledge on simple applications of operational amplifier.
CO-2	Observe the amplitude and frequency responses of negative feedback amplifier and twostage RC coupled amplifier.
CO-3	Design and test sinusoidal oscillators.
CO-4	Design and test a power amplifier.
CO-5	Design, construct and take measurement of the analog electronic circuits to compare experimental results in the laboratory with theoretical analysis.
CO-6	Use Multisim to test their electronic design.

SYLLABUS: INDUSTRY ORIENTED TECHNOLOGY LAB (B16 EC 2209)

Experiments:

1. Familiarization with Aurdino microcontroller and raspberry pi, different sensors, drivers.
2. Control of conducting and non-conducting periods of LED using Aurdinomicrocontroller.
3. Interfacing humidity and temperature sensor (DHT11) with Aurdino microcontroller.
4. Interfacing ultrasonic sensor, PIR sensor with Aurdino microcontroller.
5. Interfacing DC motor with Aurdino microcontroller using L298 motor driver.
6. Interfacing and control of servo motor with Aurdino microcontroller.
7. Introduction to Raspberry Pi and interfacing different sensors and motors to it.
8. Interfacing camera with Raspberry Pi and performing different operations using open CV(Computer Vision).
9. Controlling DC motor based on DHT11 sensor output using Raspberry Pi.
10. Controlling of DC motor based on ultrasonic sensor output using Raspberry Pi.
11. Image capturing based on PIR sensor output using Raspberry Pi.
12. Introduction to GSM/GPS module and interfacing them with Aurdino and Raspberry Pi.

SYLLABUS: INDUSTRY ORIENTED TRAINING (B16 ENG2204)

(Common to ECE & EEE)

BASIC CONCEPTS

Fundamentals: HTML, OOP Concepts, Comparing JAVA with C & C++, JAVA Programming language Syntax, Variables, Data types, statements and expressions.

Control Statements: If else, for, while, and do while loops, Switch statements.

Arrays & Structures: One Dimensional & Two Dimensional Arrays, Named Structures.

Functions: Parameter Passing, Static Modifier.

IMPLEMENTATION (Using JAVA)

Classes and Interfaces

Threads and multithreaded programming packages.

Applications of AWT, Applets and Networking concepts and solving simple to complex problems in perspective of industry requirements.

(Note: Total Marks will be evaluated based on Continuous Evaluation - 25 Marks, Coding Contest- 25 Marks)

Course Outcomes for Second Year Second Semester Courses	
Course code: **B16 ENG 2204**	
Course Name: **INDUSTRY ORIENTED TRAINING**	
CO-1	Application using implementation of core JAVA concepts.
CO-2	Application using implementation of AWT, Applets.
CO-3	Applications using Networking concepts in view of industry.

SYLLABUS: LINEAR ICS AND APPLICATIONS (B16 EC 3101)

Applications of Operational Amplifiers : Basics of Op-Amp, Block Diagram, open loop and closed loop op-amp configurations, Frequency compensation Techniques, Logarithmic Amplifier, Instrumentation Amplifiers, Voltage to Current and Current to Voltage Converters. Op-amp As a Comparators, Schmitt trigger, Wave form Generators, Sample and Hold Circuits, Rectifiers, Peak Detection

Active Filters: Butterworth type LPF, HPF, BPF, BEF, All-pass Filters, Higher Order Filters and their Comparison, Switched Capacitance Filters.

Oscillators: Op-Amp Phase Shift, Wein-bridge and Quadrature Oscillator, Voltage Controlled Oscillators, Analog Multiplexers.

Special ICs: 555 Timers, 556 Function Generator ICs and their Applications, Three Terminal IC Regulators, IC 565 PLL and its Applications, Voltage to Frequency and Frequency to Voltage Converters.

Digital to Analog and Analog to Digital Converters: DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, Different types of ADCs-parallel Comparator type ADC, Counter type ADC, Successive approximation ADC and ADC specifications.

Course Outcomes for Third Year First Semester Courses	
Course code: B16 EC 3101	
Course Name: LINEAR ICS AND APPLICATIONS	
CO-1	Understand the terminal characteristics of op-amps and design/analyze fundamental circuits based on op-amps.
CO-2	Analyze the effect of feedback on the performance of op-amp.
CO-3	Design and analyze of non-linear circuits and active filters.
CO-4	Design and Analyze of various applications using IC 565 and IC 555.
CO-5	Understand the operation of Analog to Digital and Digital to Analog Converters

SYLLABUS: PRINCIPLES OF ECONOMICS AND MANAGEMENT (B16 ENG 3101)

Introduction to Managerial Economics:

Wealth, Welfare and Scarce Definitions of Economics, Micro and Macro Economics, Demand –Law of Demand, Elasticity of Demand, Types of Elasticity and Factors Determining price Elasticity; Demand :Utility-Law of Diminishing Marginal Utility and its limitations.

Conditions of Different Market Structures:

Perfect Competition, Monopolistic Competition, Monopoly, Oligopoly and Duopoly.

Forms of Business Organization:

Sole Proprietorship, Partnership, Joint Stock Company-Private Limited and public limited Companies. Public Enterprise and their types.

Introduction to Management:

Functions of Management – Taylor's Scientific Management; Henry Fayol's Principles of Management;

Human Resource Management:

Basic functions of HR Manager; Man Power Planning, Recruitment, Selection, Training, Development, Placement, Compensation and Performance Appraisal (In Brief).

Production Management:

Production Planning and Control, Plant Location, Break-Even Analysis, Assumptions and Applications.

Financial Management:

Types of capital; Fixed and Working Capital and Methods of Raising Finance; Depreciation; Straight Line and Diminishing Balance Methods.

Marketing Management:

Functions of Marketing and Distribution channels.

Entrepreneurship:

Entrepreneurial Functions, Entrepreneurial Development; Objectives, Training, Benefits; Phase of Installing a Project.

Course Outcomes for Third Year First Semester Courses	
Course code: B16 ENG 3101	
Course Name: PRINCIPLES OF ECONOMICS AND MANAGEMENT	
CO-1	Students will be able to gain empirical knowledge and understand the complete frame work of business.
CO-2	To analyse the concepts pertaining to economic decision making.
CO-3	To analyse the concepts of Managerial decision making.
CO-4	To inculcate the spirit of Entrepreneurship and gain knowledge for setting up an enterprise.

COMPUTER ARCHITECTURE AND ORGANIZATION (B16 EC3102)

Register Transfer and Micro operations:

Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

Basic Computer Organization:

Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory Reference Instructions, Input - Output and Interrupt, Complete Computer Description.

Micro programmed Control:

Control Memory, Address Sequencing, Microinstruction Formats, Micro program Example, Design of Control Unit.

CPU Organization:

Introduction, General Register Organization, Stack Organization Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC).

Input – Output Organization:

Peripheral Devices, Input - Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input- Output processor, CPU- IOP communication.

Memory Organization:

Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Course Outcomes for Third Year First Semester Courses	
Course code:**B16 EC3102**	
Course Title: **COMPUTER ARCHITECTURE AND ORGANIZATION**	
CO-1	Understand how computers represent and manipulates data.
CO-2	Develop the general architecture design of a digital computer.
CO-3	Learn the art of Microprogramming.
CO-4	Develop independent learning skills to interface main memory & I/O.

SYLLABUS: ANTENNAS AND PROPAGATION (B16 EC 3103)

Fundamentals of Antennas & Radiation from Antennas:

Definition of antennas, functions of Antennas, properties of antennas, antenna parameters, polarization, basic antenna elements, radiation mechanism, radiating fields of alternating current element, radiated power and radiation resistance of current element, different types of current distribution on linear antennas, radiated fields, radiated power and radiation resistance of half-wave dipole and quarter – wave monopole, directional characteristics of dipole antennas.

Linear Arrays:

Uniform linear arrays, field strength of a uniform linear arrays, locations of principal maximum, null and secondary maxima, first side lobe level, analysis of broad side and end fire, Pattern multiplication, binomial arrays, effect of earth on vertical patterns, methods of excitation of antennas, impedance matching techniques, transmission loss between transmitting and receiving antennas – Friis formula, antenna noise temperature and signal-to- noise ratio.

Antenna array synthesis:

Introduction, synthesis methods, fourier transform method, Woodward Lawson method, Dolph-chebychev linear method, Taylor method, Laplace transform method.

Practical Antennas – LF, MF, HF, VHF & UHF antennas

Classification of antennas according to type of radiation and type of current distribution of antennas – Isotrophic, Omnidirectional & directional antennas, standing wave and travelling wave antennas, Classification according to frequency of operation – LF, MF, HF, VHF & UHF, brief introduction to LF & MF antennas, earth mat, counterpoise earth, top capacitance hat.

HF, VHF& UHF Antennas - V Antennas, Inverted V Antennas, Rhombic antennas, folded dipole, Yagi-Uda antenna, Log periodic antenna, Loop and Helical Antennas.

Microwave antennas:

Introduction, types of reflector antennas, corner reflector, parabolic reflector, feed systems for parabolic reflector, horn antennas, slot antennas and impedance of slot antennas, Babinet's principle, lens antennas and micro strip antennas.

Antenna measurements

Introduction, measurement ranges, antenna impedance measurements, antenna gain and directivity measurement, measurement of radiation pattern, beam width and SLL, measurement of polarization, measurement of phase, measurement of radiation resistance.

Wave Propagation

Types of radio wave propagation, ground wave propagation and sommerfeld's analysis of ground wave propagation, wave tilt of ground wave, structure of ionosphere, refractive index of ionosphere, mechanism of wave bending by ionosphere, critical frequency, MUF, Skip distance, fading and remedial measures, effect of earth's magnetic field on ionosphere propagation, faraday rotation, tropospheric (space wave) propagation, range of space wave propagation, effective earth radius, field strength of space wave, atmospheric effects on space wave propagation, duct propagation and scatter propagation.

Course Outcomes for Third Year First Semester Courses	
Course code: B16 EC 3103	
Course Title: ANTENNAS AND PROPAGATION	
CO-1	Understand Radiation mechanism and functions of antennas, identify antenna Parameters derive expressions for antenna parameters.
CO-2	Analyze and design wire and aperture antennas for different applications.
CO-3	Analyze and design (or synthesize) Antenna arrays.
CO-4	Capable of performing various antenna measurements and come up with conclusions about antenna parameters and performance.
CO-5	Identify characteristics of radio wave propagation and be able to design different types of communication links for different frequency bands.

SYLLABUS: CONTROL SYSTEMS (B16EE 3103)

(Common to ECE & EEE)

Introduction to control systems: Open loop and closed loop systems- Transfer Functions of Linear Systems– Impulse Response of Linear Systems – Mathematical Modeling of Physical Systems – Equations of Electrical Networks – Modeling of Mechanical Systems – Equations of Mechanical Systems, Analogous Systems.

Block Diagrams of Control Systems: Signal Flow Graphs (Simple Problems) – Reduction Techniques for Complex Block Diagrams and Signal Flow Graphs (Simple Examples)- Feedback Characteristics of Control Systems

Time Domain Analysis of Control Systems: Time Response of First and Second Order Systems with Standard Input Signals – Steady State Error Constants – Effect of Derivative and Integral Control on Transient and Steady State Performance of Feedback Control Systems.

Concept of Stability: Routh-Hurwitz Criterion, Relative Stability Analysis, the Concept and Construction of Root Loci, Analysis of Control Systems with Root Locus (Simple Problems to understand theory).

Frequency Domain Analysis of control systems: Bode Plots- Log Magnitude versus Phase Plots- Polar Plots - Correlation between Time and Frequency Responses –NY quist Stability Criterion -Assessment of Relative Stability -All Pass and Minimum Phase Systems - Constant M and N Circles.

Course Outcomes for Third Year First Semester Courses	
Course code: **B16 EE 3103**	
Course Title: **CONTROL SYSTEMS**	
CO-1	Students will be able to model electrical and mechanical physical systems by applying laws of physics.
CO-2	Students will be able to represent mathematical models of systems using block diagrams & Signal Flow Graphs and derive their transfer functions.
CO-3	Students will be able to analyze systems in time domain for transient and steady-state behavior.
CO-4	Students will learn the concept of stability and use RH criterion and Root locus methods for stability analysis.
CO-5	Students will learn to obtain frequency response plots of systems and use them for system analysis and stability assessment.

SYLLABUS: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (B16 EC 3104)

Performance characteristics of instruments, Static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Errors in Measurement, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error. DC Voltmeters- Multi- range, Range extension/Solid state and differential voltmeters, AC voltmeters, True RMS responding voltmeter, Multi-meter for Voltage, Current and resistance measurements.

Signal Generator- fixed and variable, AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Square pulse, Random noise, sweep, Arbitrary waveform. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

Oscilloscopes CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, Dual beam CRO, .Dual trace oscilloscope, sampling oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement, standard specifications of CRO, CRO probes.

AC Bridges Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance – Shearing Bridge. Wheat stone bridge. Wien Bridge, Errors and precautions in using bridges.

Transducers- active & passive transducers : Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors.

Course Outcomes for Third Year First Semester Courses	
Course code: B16 EC 3104	
Course Title: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION	
CO-1	Evaluate basics of measurement systems, principle of basic meter.
CO-2	Evaluate how a signal can be generated using different types of meters.
CO-3	Investigate a signal / waveform with different oscillators.
CO-4	Use bridges of many types and measure appropriate parameters.
CO-5	Design different transducers for measurement of different parameters.

Syllabus: Linear Integrated Circuits & Pulse Circuts Lab with Simulation (B16 EC 3106)

LIST OF EXPERIMENTS

1. Linear Wave Shaping
   a) Passive RC Differentiator
   b) Passive RC Integrator
2. Non Linear Wave shaping
   a) Clipping Circuits
   b) Clamping Circuits
3. Self biasbistableMultivibrator
4. Schmitt Trigger Using µA 741
5. UJT Sweep Generator
6. Astable Multivibrator using 555 timer

LIST OF EXPERIMENTS (Simulation)

1. Linear Wave Shaping
   a) Passive RC Differentiator
   b) Passive RC Integrator
2. Non Linear Wave shaping
   a) Clipping Circuits
   b) Clamping Circuits
3. Self biasbistable Multivibrator
4. Schmitt Trigger Using µA 741
5. UJT Sweep Generator
6. Astable Multivibrator using 555 timer

Course Outcomes for Third Year First Semester Courses	
Course code: B16 EC 3106	
Course Title: LINEAR INTEGRATED CIRCUITS & PULSE CIRCUITS LAB WITH SIMULATION	
CO-1	Design and conduct experiments on RC low pass and high pass circuits.
CO-2	Observe operation of UJT Sweep Generator.
CO-3	Design and test different types of Multi vibrators
CO-4	Acquire a basic knowledge on simple applications of operational amplifier.
CO-5	Design, construct Schmitt trigger using operational amplifier.
CO-6	Use Multisim to test their electronic designs.

SYLLABUS: Digital Integrated Circuits &Hardware Descriptive Language (B16 EC 3107)

LIST OF EXPERIMENTS

A. HARDWARE

1. Verify the operation of following digital components using Digital Trainer Kit
   a. Logic gates
   b. Full adder using gates
   c. Full subtractor using gates
2. Design and verify the logic function of multiplexer and de-multiplexers using digital trainer kit
3. Design code convertors using digital trainer kit
   a. BCD TO SEVEN segment display
   b. Priority encoder
   c. Decoder
4. Verify the operation of fallowing flip-flops using Digital Trainer Kit
   a. RS flip flop
   b. JK flip flop
   c. D flip flop
   d. T flip flop
5. Design a following synchronous counters using Digital Trainer Kit
   a. mod 16 counter
   b. mod 8 counter
6. Verify the following logical functions of shift registers using Digital Trainer Kit
   a. SIPO
   b. PISO

B. SOFTWARE

7. Verify the operation of following digital components using ISE Simulator
   a. logic gates
   b. full adder using gates
   c. full subtractor using gates
8. Design and verify the logic function of multiplexer and demultiplexers using ISE Simulator
9. Design code convertors using ISE Simulator
   a. BCD TO SEVEN segment display
   b. Priority encoder
   c. Decoder
10. Verify the operation of fallowing flip-flops using ISE Simulator
    a. RS flip flop
    b. JK flip flop
    c. D flip flop
    d. T flip flop
11. Design a following synchronous counters using ISE Simulator
    a. mod 16 counter
    b. mod 8 counter
12. Verify the following logical functions of shift registers using ISE Simulator
    a. SIPO

b. PISO

Course Outcomes for Third Year First Semester Courses	
Course code:**B16 EC 3107**	
Course Title: DIGITAL INTEGRATED CIRCUITS &HARDWARE DESCRIPTIVE LANGUAGE	
CO-1	Synthesize, simulate and implement a digital design in a configurable digital circuit with computer supported aid tools and digital trainer kit.
CO-2	Acquire Knowledge of analysis and synthesis of combinational and sequential circuits with simulators and digital trainer kits.
CO-3	Build high level programming (HDL programming) skills for digital circuits.
CO-4	Adapt digital circuits to electronics and telecommunication field.

Code: PROBLEM SOLVING & LINGUISTIC COMPETENCE (B16ENG3102)

(Common to all Branches)

Part-A: Verbal and Soft Skills-I

Grammar: (VA**)**

Parts of speech(with emphasis on appropriate prepositions, co-relative conjunctions, pronouns-number and person, relative pronouns), articles(nuances while using definite and indefinite articles), tenses(with emphasis on appropriate usage according to the situation), subject – verb agreement (to differentiate between number and person) , clauses(use of the appropriate clause , conditional and relative clauses), phrases(use of the phrases, phrasal verbs) to-infinitives, gerunds, question tags, voice, direct & indirect speech, degrees of comparison, modifiers, determiners, identifying errors in a given sentence, correcting errors in sentences.

Vocabulary: (VA)

Synonyms and synonym variants (with emphasis on high frequency words), antonyms and antonym variants(with emphasis on high frequency words), contextual meanings with regard to inflections of a word, frequently confused words, words often mis-used, multiple meanings of the same word (differentiating between meanings with the help of the given context), foreign phrases, homonyms, idioms, pictorial representation of words, word roots, collocations.

Reasoning: (VA)

Critical reasoning (understanding the terminology used in CR- premise, assumption, inference, conclusion), Analogies (building relationships between a pair of words and then identifying similar relationships), Sequencing of sentences (to form a coherent paragraph, to construct a meaningful and grammatically correct sentence using the jumbled text), odd man (to use logical reasoning and eliminate the unrelated word from a group), YES-NO statements (sticking to a particular line of reasoning Syllogisms.

Usage: (VA)

Sentence completion (with emphasis on signpost words and structure of a sentence), supplying a suitable beginning/ending/middle sentence to make the paragraph coherent, idiomatic language (with emphasis on business communication), and punctuation depending on the meaning of the sentence.

Soft Skills:

Introduction to Soft Skills – Significance of Inter & Intra-Personal Communication – SWOT Analysis –Creativity & Problem Solving – Leadership & Team Work - Presentation Skills Attitude – Significance – Building a positive attitude – Goal Setting – Guidelines for Goal Setting – Social Consciousness and Social Entrepreneurship – Emotional Intelligence - Stress Management, CV Making and CV Review.

Part-B: Quantitative Aptitude –I

Numbers, LCM and HCF, Chain Rule, Ratio and Proportion

Importance of different types of numbers and uses of them: Divisibility tests, finding remainders in various cases, Problems related to numbers, Methods to find LCM, Methods to find HCF, applications of LCM, HCF. Importance of chain rule, Problems on chain rule, introducing the concept of ratio in three different methods, Problems related to Ratio and Proportion.

Time and work, Time and Distance

Problems on man power and time related to work, Problems on alternate days, Problems on hours of working related to clock, Problems on pipes and cistern, Problems on combination of the some or all the above, Introduction of time and distance, Problems on average speed, Problems on Relative speed, Problems on trains, Problems on boats and streams, Problems on circular tracks, Problems on polygonal tracks, Problems on races.

Percentages, Profit Loss and Discount, Simple interest, Compound Interest, Partnerships, shares and dividends:

Problems on percentages-Understanding of cost price, selling price, marked price, discount, percentage of profit, percentage of loss, percentage of discount, Problems on cost price, selling price, marked price, discount. Introduction of simple interest, Introduction of compound interest, Relation between simple interest and compound interest, Introduction of partnership, Sleeping partner concept and problems, Problems on shares and dividends, and stocks.

Introduction, number series, number analogy, classification, Letter series, ranking, directions:

Problems of how to find the next number in the series, Finding the missing number and related sums, Analogy, Sums related to number analogy, Ranking of alphabet, Sums related to Classification, Sums related to letter series, Relation between number series and letter series, Usage of directions north, south, east, west, Problems related to directions north, south, east, west.

Data sufficiency, Syllogisms:

Easy sums to understand data sufficiency, Frequent mistakes while doing data sufficiency**,** Syllogisms Problems.

Course Outcomes for Third Year First Semester Courses	
Course code: **B16 ENG 3102**	
Course Title: **VERBAL & QUANTITATIVE APTITUDE – I**	
CO-1	Detect grammatical errors in the text/sentences and rectify them while answering their competitive/ company specific tests and frame grammatically correct sentences while writing.
CO-2	Answer questions on synonyms, antonyms and other vocabulary based exercises while attempting CAT, GRE, GATE and other related tests.
CO-3	Use their logical thinking ability and solve questions related to analogy, syllogisms and other reasoning based exercises.
CO-4	Choose the appropriate word/s/phrases suitable to the given context in order to make the sentence/paragraph coherent.
CO-5	Apply soft skills in the work place and build better personal and professional relationships making informed decisions.

SYLLABUS: BASIC CODING (B16ENG 3103)
(Common to ECE & EEE)
(MOOCS-I)

UNIT I Review of Programming constructs

Programming Environment, Expressions formation, Expression evaluation, Input and Output patterns, Control Structures, Sequential branching, Unconditional branching, Loop Structures, and Coding for Pattern Display.

UNIT II Introduction to Linear Data, strings and pointers

Structure of linear data, Operation logics, Matrix forms and representations, Pattern coding, Working on character data, Compiler defined methods, Substitution coding for defined methods, Row Major representation, Column Major representation, Basic searching and sorting Methods.

UNIT III Functions, Recursions and Storage Classes

Functions – Introduction to modular programming – Function Communication - Pass by value, Pass by reference – Function pointers – Recursions – Type casting – Storage classes

Practice: programs on passing an array and catching by a pointer, function returning data, comparison between recursive and Iterative solutions.

Data referencing mechanisms: Pointing to diff. data types, Referencing to Linear data, Runtime-memory allocation, named locations vs. pointed locations, referencing a 2D-Matrix

UNIT IV User-defined data types, Pre-processor Directives and standard storage

Need for user-defined data type – structure definition – Structure declaration – Array within a Structure – Array of Structures – Nested Structures - Unions – Declaration of Union data type, Struct Vs. Union - Enum – Pre-processor directives, Standard storage methods, Operations on file, File handling methods, Orientation to Object oriented programming

Practice: Structure padding, user-defined data storage and retrieval programs

UNIT V Operating system principles and Database concepts

Introduction to Operating system principles, Process scheduling algorithms, Deadlock detection and avoidance, Memory management, networking: Introduction to Networking, OSI Model vs. TCP/IP suite, Data link layer, Internet layer, DVR Vs. LSR, Transport Layer, Application Layer

Course Outcomes for Third Year First Semester Courses	
Course code:**B16ENG3103**	
Course Name: **BASIC CODING**	
CO-1	Know about Control Structures, Loop Structures and branching in programming.
CO-2	Know about various searching and sorting methods.
CO-3	Know about Functions, Recursions and Storage Classes
CO-4	Know about Structures and Unions.
CO-5	Know different Operating System concepts.
CO-6	Differentiate OSI Model Vs. TCP/IP suite.

SYLLABUS: MICRO WAVE THEORY AND TECHNIQUES (B16 EC 3109A)

Course plan:

S. No	week	Module Name
1	1	Introduction to Microwaves: History and Applications, Effect of Microwaves on human body
2	2	Microwave Transmission Modes, Waveguides, Transmission Lines
3	3	Impedance Matching, ABCD and S-parameters
4	4	Power dividers, Combiners, Couplers
5	5	Microwave Filters
6	6	Active Components-Diodes, Transistors, Tubes, Microwave Attenuator Design
7	7	RFMEMS, RF Switches, Phase Shifter, Mixer Design
8	8	Microwave Amplifiers and LNA Design
9	9	Power Amplifier Design, Oscillator Design
10	10	Antennas
11	11	Microwave Measurements, MicrowaveSystems and Imaging
12	12	Software session and Lab demonstration

SYLLABUS: ANALYSIS AND DESIGN PRINCIPLES OF MICROWAVE ANTENNAS (B16 EC 3109B)

(MOOCS-I)

Course plan:

S. No	**week**	**Module Name**
1	1	Microwave Radiation Fundamentals
2	2	Basic Antenna Parameters
3	3	Wire Antennas
4	4	Aperture Antennas
5	5	Array of Radiating Elements
6	6	Reflector Antenna
7	7	Generalized Antenna Analysis by
8	8	Potential Concept

SYLLABUS: PRINCIPLES OF DIGITAL COMMUNICATIONS (B16 EC 3109C)

(MOOCS-I)

Course plan:

S. No	**week**	**Module Name**
1	1	Introduction I
2	2	Source Coding Theorem II
3	3	Mutual Information I
4	4	Signal Space Representations II
5	5	Optimum Receiver I
6	6	Quantizer Design I
7	7	Quantizer Design VI
8	8	Pulse Shaping I
9	9	Equalization II
10	10	Digital Modulation Methods V
11	11	Digital Modulation Methods X
12	12	Error Control Coding I

SYLLABUS: INTRODUCTION TO WIRELESS AND CELLULAR COMMUNICATIONS(B16 EC 3110A)

(MOOCS-II)

Course Layout:

Week 1: Overview of Cellular Systems and evolution 2g/3G/4G/5G

Week 2: Cellular Concepts – Frequency reuse, Cochannel and Adjacent channel Interference,C/I, Handoff,

Blocking,

Week 3: Wireless propagation Part 1 - Link budget, Free-space path loss, Noise figure of receiver

Week 4: Wireless propagation Part II - Multipath fading, Shadowing, Fading margin, shadowing margin,

Week 5: Antenna Diversity

Week 6: Wireless Channel CapacityWeek 7: MIMO

Week 8: CDMA Part I

Week 9: CDMA Part II

Week 10: OFDM and LTE Part I

Week 11: OFDM and LTE Part II

Week 12: Large Scale Propagation effects and Channel Models

SYLLABUS: Fabrication Techniques For Mems-Based Sensors: Clinical Perspective (B16EC3110B)

(MOOCS-II)

Course Intro: This course is designed with an aim of educating students in the area of micro technology and its use to fabricate sensors and systems. The students will have an exposure to sensors and its importance in the real world. The students will also able to understand how to fabricate some of those sensors. Several examples of engineering devices used in clinical research will be also covered. Class 10000 non-conventional clean room and some equipment within it will also be shown. Below are some of the course outcomes. ïƒ˜ Ability to understand micro fabrication process

ïƒ˜ Understand sensors used in electronics and biomedical areas ïƒ˜ Understand Clean Room (Class 1 to Class 10000)

ïƒ˜ Understand Micro engineering Technology ïƒ˜ Design the process flow for fabricating microheater required in gas sensors.

ïƒ˜ Design the process flow for fabricating forces sensors for biomedical application. ïƒ˜ Design microheater for gas sensors as per specifications. ïƒ˜ Design force sensors as per specifications. ïƒ˜ Understand fabrication of microfluidic platforms, micro-cantilevers, flexible force sensors, inter-digitated electrodes, polymer-glass bonding etc. for clinical research.

SYLLABUS: Introduction to Information Theory, Coding And Cryptography (B16EC3110C)

(MOOCS-II)

Course Intro: Information theory, coding and cryptography are the three loadâ €•bearing pillars of any digital communication system. In this introductory course, we will start with the basics of information theory and source coding. Subsequently, we will discuss the theory of linear block codes (including cyclic codes, BCH codes, RS codes and LDPC codes), convolutional codes, Turbo codes, and TCM and space time codes. Finally, we will introduce the basics of secure communications by focusing on cryptography and physical layer security. Wherever possible, applications of the theory in real world scenarios have been provided. The underlying aim of this course is to arouse the curiosity of the students.

Course Plan:

S. No	week	Module Name
1	1	Lecture 1: Introduction to Information Theory Lecture 2: Entropy, Mutual Information, Conditional and Joint Entropy Lecture 3:Measures for Continuous Random Variable, Relative Entropy
2	2	Lecture 4: Variable Length Codes, Prefix CodesLecture 5: Source Coding Theorem Lecture 6: Various source coding techniques: Huffman, Arithmetic, Lempel Ziv, Run Length
3	3	Lecture 7: Optimum Quantizer, Practical Application of Source Coding: JPEG Compression Lecture 8: Introduction to Super Information Lecture 9: Channel Models and Channel Capacity
4	4	Lecture 10: Noisy Channel Coding Theorem Lecture 11: Gaussian Channel and Information Capacity TheoremLecture 12: Capacity of MIMO channels
5	5	Lecture 13: Introduction to Error Control CodingLecture 14: Introduction to Galois Field Lecture 15: Equivalent Codes, Generator Matrix and Parity Check Matrix
6	6	Lecture 16: Systematic Codes, Error Detections and Correction Lecture 17: Erasure and Errors, Standard Array and Syndrome Decoding Lecture18: Probability of Error, Coding Gain and Hamming Bound
7	7	Lecture 19: Hamming Codes, LDPC Codes and MDS CodesLecture 20:Introduction to Cyclic Codes Lecture 21: Generator Polynomial, Syndrome Polynomial and Matrix Representation
8	8	Lecture 22: Fire Code, Golay Code, CRC Codes and Circuit Implementation ofCyclic Codes Lecture 23: Introduction to BCH Codes: Generator Polynomials Lecture 24: Multiple Error Correcting BCH Codes, Decoding of BCH Codes
9	9	Lecture 25: Introduction to Reed Solomon (RS) CodesLecture 26: Introduction to Convolutional Codes Lecture 27: Trellis Codes: Generator Polynomial Matrix and Encoding usingTrellis
10	10	Lecture 28: Vitrebi Decoding and Known good convolutional CodesLecture 29: Introduction to Turbo Codes Lecture 30: Introduction to Trellis Coded Modulation (TCM)
11	11	Lecture 31: Ungerboekâ€˜s design rules and Performance Evaluation of TCMschemes Lecture 32: TCM for fading channels and Space Time Trellis Codes(STTC) Lecture 33: Introduction to Space Time Block Codes (STBC)

12	12	Lecture 34: Real Orthogonal Design and Complex Orthogonal Design Lecture 35: Generalized Real Orthogonal Design and Generalized Complex Orthogonal Design Lecture 36: Introduction to Cryptography: Symmetric Key and Asymmetric KeyCryptography Lecture 37: Some wellâ€•known Algorithms: DES, IDEA,PGP, RSA, DHProtocol Lecture 38: Introduction to Physical Layer Security: Notion of Secrecy Capacity Lecture 39:Secrecy Outage capacity, Secrecy Outage probability, Cooperative jamming

SYLLABUS: DIGITAL IMAGE PROCESSING (B16 EC 3110D)

(MOOCS-II)

Course plan:

Week	Topics
1	Introduction and signal digitization
2	Pixel relationship
3	Camera models & imaging geometry.
4	Image interpolation
5	Image transformation
6	Image enhancement I.
7	Image enhancement II.
8	Image enhancement III.
9	Image restoration I
10	Image restoration II & Image registration
11	Color image processing
12	Image segmentation.
13	Morphological image processing
14	Object representation, description and recognition

SYLLABUS: MICROWAVE ENGINEERING (B16 EC 3201)

Microwave Components:

Introduction to Microwave Engineering- microwave spectrum bands, advantages and applications of microwaves, Wave-guide Components, coupling mechanisms, Directional Couplers, Magic Tee, Attenuators, Ferrite Devices, Isolators, Circulators, Cavity Resonators, Re-entrant Cavities.

Microwave Tubes:

Limitations of conventional tubes at microwave frequencies, Resonant Cavities, Linear beam tubes- Reflex Klystron, apple gate diagram and principle of working, Two – Cavity Klystron, Multi – Cavity Klystron, Traveling Wave Tube, Crossed Field Device- Magnetron, Hull cut-off voltage Equation.

Microwave Solid state Devices

Negative resistance phenomenon, Gunn Diode, domain formation, RWH theory, Tunnel Diode- principle of operation, IMPATT- principle of operation, TRAPATT, BARITT, PIN Diodes.

Scattering Matrices of Microwave Components:

Scattering Matrix and its Properties, Scattering Matrix of Isolator, circulator, directional coupler, E Plane Tee, H plane Tee and Magic Tee.

Microwave Measurements:

VSWR& Impedance measurements, Frequency, Guided Wavelength, measurements of S parameters of reciprocal/non reciprocal devices.

Microwave Integrated Circuits:

Introduction, advantages and disadvantages of MMICs, comparison of MMICs with HMICs, Applications of MICs, materials used for MMICs, Substrate, Conductor, Dielectric and Resistive Materials, Growth of MMIC, Fabrication Techniques, MOSFET Fabrication, - MOSFET formation, NMOS fabrication process.

Course Outcomes for Third Year Second Semester Courses	
Course code:**B16 EC 3201**	
Course Title: **MICROWAVE ENGINEERING**	
CO-1	Explain the working principle of different passive waveguide components used at microwave frequencies.
CO-2	Understand the conceptual and operational characteristics of different microwave signal generators and amplifiers.
CO-3	Apply the properties of scattering matrix for solving the scattering matrix of different passive microwave components for both ideal and practical considerations and analyze their operation.
CO-4	Understand different fabrication techniques involving Microwave integrated circuits.
CO-5	Understand and implement different experimental procedures involving measurement of microwave parameters.

SYLLABUS: MICROPROCESSORS AND ITS APPLICATIONS (B16 EC 3202)

Internal Architecture and Functional Description of INTEL 8085 Microprocessor Pin out & Signals, Flag Register, Memory Read/Write and I/O Read /Write Cycles, Stack Memory, Interrupt Structure of 8085, Instruction Set and Timing Diagrams, Addressing Modes.

Programming the 8085:

Introduction to 8085 Assembly Language Programming, Programming model of 8085, Addressing modes of 8085 with examples, Instruction Set, Sample Programs, Subroutines and Interrupt Service Routines.

Interfacing of Semiconductor Memory and I/O Devices to 8085:

Classification of Read Write and Read only Memories, Interfacing of SRAMs, DRAMs and EPROMs. Interfacing of Parallel I/O (8255), Timer/Counter (8253/8254), Serial I/O (8251A) with 8085 Microprocessor.

Internal Architecture and Functional description of Intel 8086/8088 microprocessor, Memory Segmentation and physical address generation and physical address generation ,Register organization, Status flags and machine control flags of 8086,pinout and signals in detail, Memory read/write and I/O read/Write Bus cycles, 8086 memory Banks,8086 minimum and maximum modes of operation.

Introduction to 8086 Assembly language programming, programmable register array of 8086,Data Addressing modes of 8086 with examples, classification of 8086 instructions, sample 8086 assembly language programs using data transfer, Arithmetic and logical instructions.

Course Outcomes for Third Year Second Semester Courses	
Course code:**B16 EC 3202**	
Course Title: **MICROPROCESSORS AND ITS APPLICATIONS**	
CO-1	Understand and analyze architecture of the 8085 and 8086 microprocessors.
CO-2	Be familiar with the 8085 and 8086 Assembly Language Programming.
CO-3	Learn about Hardware and software requirements in interfacing and designing microprocessor based products for practical applications.

SYLLABUS: DIGITAL COMMUNICATION (B16 EC 3203)

Pulse Modulation and Digital Representation of Analog Signal: Sampling, Pulse Amplitude Modulation and Concept of Time Division Multiplexing, Pulse Width Modulation, Pulse Position Modulation, Digital representation of analog signal :Quantization of signals, Quantization error, Pulse Code Modulation, Companding, T1 Digital system, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, Continuously Variable Slope Delta Modulation.

Digital Modulation and Transmission: Binary Phase-Shift Keying, Differential Phase-Shift Keying, Differentially-Encoded PSK (DEPSK), Quadrature Phase-Shift Keying (QPSK), M- ary PSK, Binary Frequency Shift-Keying, Comparison of BFSK and BPSK, M-ary FSK, Minimum Shift Keying (MSK), Duo-binary Encoding.

Mathematical Representation of Noise: Some Sources of Noise, Frequency-domain representation of Noise, Spectral Components of Noise, Response of a Narrowband Filter to Noise, Effect of a Filter on the Power Spectral Density of Noise, Superposition of Noises, Linear Filtering, Noise Bandwidth, Quadrature Components of Noise, Noise in Pulse Code Modulation and Delta Modulation Systems: PCM Transmission, Calculation of Signal-to-Noise Ratio in PCM, Delta Modulation(DM) Transmission, Calculation of Signal-to-Noise Ratio in DM, Comparison of PCM and DM .

Optimal Reception of Digital Signal: A Base-band Signal Receiver, Probability of Error, Optimum Receiver for both Baseband and Pass band - Calculation of optimum filter Transfer function, Optimum filter realization using Matched filter, Probability of Error of the Matched Filter, Optimum filter realization using Correlator, Optimal of Coherent Reception: PSK, FSK, QPSK, Comparison of Modulation Systems.

Spread Spectrum Modulation: Direct Sequence (DS) Spread Spectrum, Use of Spread Spectrum with Code Division, Multiple Access (CDMA), Ranging using DS Spread Spectrum, Frequency Hopping (FH) Spread Spectrum, Generation and Characteristics of PN Sequences, Acquisition (Coarse Synchronization) of a FH Signal, Tracking (Fine Synchronization) of a FH Signal, Acquisition (Coarse Synchronization) of a DS Signal, Tracking of a DS Signal.

COURSE OUTCOMES FOR THIRD YEAR SECOND SEMESTER COURSES	
Course code: **B16 EC 3203**	
Course Title: **DIGITAL COMMUNICATION**	
CO-1	Understand concept of different modulation techniques.
CO-2	Understand the effect of noise in various digital communication systems and learn about optimum detection.
CO-3	Compare performance of two basic digital modulation techniques.
CO-4	Analyze performance of spread spectrum communication system.

SYLLABUS: RADAR &NAVIGATION (B16EC3204)

(Elective-I)

Introduction to Radar:

Origin of Radar, Basic Principle of Radar, Range to a target, Pulse Repetition Frequency and Range Ambiguities, Radar Block Diagram and Operation, Radar Equation, Integration of Radar Pulses ,Probability of Detection and Probability of False Alarm, Radar Antenna Parameters, System Losses and Propagation Effects, Applications of Radar.

Radar Receivers:

Noise Figure and Noise Temperature, Types of Duplexers, Types of Mixers, Radar Displays, Receiver Protectors.

MTI and Pulse Doppler radar:

Introduction to Doppler Effect, Simple CW Doppler Radar, Pulse Doppler Radar, Butterfly effect, Coherent and Non Coherent Moving Target Indication Radar, Delay line Cancellers, Limitation to MTI performance, Moving target Detector, MTI from moving platform.

Tracking Radar:

Types of Tracking Radars, Sequential Lobing, Conical Scan, Monopulse tracking Radar, Low angle tracking, Synthetic Aperture Radar (SAR), Active and Passive Aperture Phased array Radars,. MST Radar, ECM, ECCM.

Fundamentals of Navigational Aids:

Principles of Direction Finders, Sense Finders, VOR, TACCAN, Aircraft Homing and ILS, Radio Altimeter, LORAN, DECCA, OMEGA

COURSE OUTCOMES FOR THIRD YEAR SECOND SEMESTER COURSES	
Course code: **B16 EC 3204**	
Course Title: **RADAR &NAVIGATION**	
CO-1	Able to understand the basic working principles of various Radars.
CO-2	Apply various mathematical equations to measure the Range and angle information of the targets from the radar.
CO-3	Analyze and design of radar signals, MTI, Pulse Doppler radar and various tracking Radars.
CO-4	Analyze various Radar systems, advantages, limitations and their applications.
CO-5	Analyze various Navigational Aids like LORAN, DECCA, OMEGA, TACAN, VOR.

SYLLABUS: INFORMATION THEORY AND CODING (B16 EC 3205)

(Elective-I)

PART-I: INFORMATION THEORY (CARLSON &HAYKIN)

Information Theory and Source Coding: Discrete memory less sources, Information measure, Entropy and Information rate, Shannon's source coding theorem, Coding for a discrete memory less source, Shannon-Fano & Huffman algorithms, Predictive coding for sources with memory.

Information Transmission: Mutual information, Mutual entropy, Discrete channel capacity, Shannon's channel coding theorem, Coding for the Binary Symmetric Channel, Continuous channels: Continuous information, Entropy, Entropy maximization, AWGN channel capacity, Ideal communication system.

PART-II: ERROR CONTROL CODING (HAYKIN& K. DEERGHARAO)

Channel Coding: Block Codes & Cyclic Codes: Rationale for coding, Types of codes, discrete memory less channels, linear block codes, Syndrome decoding, cyclic codes, Properties of BCH, RS and CRC codes.

Convolutional Codes: Representation & generation, Decoding Convolutional codes, Exhaustive search method, Maximum Likelihood decoding of Convolutional codes, Viterbi Algorithm, Sequential decoding, Trellis codes, Burst error correction, Interleaving, Concatenated coding, Automatic Repeat Request (ARQ) schemes, Applications of coding, Comparison of error rates in coded and uncoded transmission.

Modern Codes: Turbo codes, Non-recursive and Recursive Systematic Convolutional(RSC) Encoders, Turbo Encoder, Low Density Parity Check(LDPC) Codes, Properties, Construction of Parity Check Matrix H, Tanner Graphs, LDPC Encoding, MIMO System, Space–Time- Coded MIMO System, Space-Time(ST) codes, Space–Time Block Codes (STBC), Alamouti2-transmit Code - (1Q at least)

COURSE OUTCOMES FOR THIRD YEAR SECOND SEMESTER COURSES	
Course code:**B16 EC 3205**	
Course Title: **INFORMATION THEORY AND CODING**	
CO-1	Appreciate the mathematical concept of information (uncertainty) via probability & compute the entropy of a source.
CO-2	Understand the need of source coding & variable length codes.
CO-3	Device source codes using Shannon-Fano & Huffman algorithms, calculate the efficiency of a code.
CO-4	Compute mutual entropy of a channel, understand the concept of channel capacity, State Shannon's noisy channel coding theorem which creates the field of channel coding, compute channel capacity of BSC & AWGN channels, and define characteristics of an ideal communication system.
CO-5	Realize the need & benefits of channel coding, Understand Linear block codes structure, theory &use syndrome technique for decoding for linear block codes, Study cyclic codes (BCH, RS and CRC) structure, theory, implementation & decoding of cyclic codes.
CO-6	Study Convolutional codes representation, generation & decoding of convolutional codes using Viterbi algorithm, get acquainted with concatenated codes to increase coding gain & Trellis Coded Modulation (TCM), Ungerboeck trellis codes for bandwidth efficiency.
CO-7	Differentiate source coding and channel coding &learn applications of coding.
CO-8	Know modern codes & pursue modern wireless communications & information security courses.

SYLLABUS: OBJECT ORIENTED PROGRAMMING (B16CS3210)

(Elective-I)

Basics of Object Oriented Programming:

Object Oriented Paradigm, Principles of OOP, benefits of OOP, data types, declarations, expressions and operator precedence, functions, scopeofvariables.

Introduction to C++:

Classes and objects, Constructors &Destructors, constructor with dynamic allocation, explicit constructor, Operator Overloading through Unary, Binary, Assignment and Stream operators &type conversions.

Inheritance and Manipulating Strings:

Derived classes, syntax of derived classes, making private members inheritable, single, multilevel, multiple, hierarchical, hybrid inheritance, Virtual base Class, abstract classes, Creating String Objects, Manipulating String Objects, Relational Operations, Accessing String Characteristics.

Polymorphism:

Pointers, virtual functions and polymorphism- pointers to objects, this pointer, pointers to derived classes, virtual and pure virtual functions, Dynamic polymorphism, Virtual destructor, Virtual Base Class, Dynamic Casting, Cross Casting, Down Casting.

Templates, Exception handling, Streams and Files in C++:

Class templates, Function templates, member function templates, exception handling, managing console I/O operations, Stream Classes, Formatted and Unformatted I/O operations, managing output with manipulators, working with files.

COURSE OUTCOMES FOR THIRD YEAR SECOND SEMESTER COURSES	
Course code:**B16 CS 3210**	
Course Title: **OBJECT ORIENTED PROGRAMMING**	
CO-1	Students will be able to handle I/O streams and Run time errors.
CO-2	Students will be able to construct applications and Identify where data structures are appearing in them

SYLLABUS: WEB TECHNOLOGIES (B16CS3211)

Introduction to HTML, Core Elements, Links and Addressing, Images, Text, Colors and Background, Lists, Tables and Layouts, Frames, Forms, Cascading Style Sheets.

Introduction to Java Scripts, Elements of Objects in Java Script, Dynamic HTML with Java Script.

Document type definition, XML Syntax, XML Schemas, Document Object model, Presenting XML, Using XML Processors.

Introduction to PHP, Language Basics, Functions, Strings, Arrays.

MYSQL Installation, Accessing MySQL Using PHP, Form Handling, Inserting Data into Tables, Selecting Data from a Table, Updating Table, Deleting data from Table. Cookies & Session Tracking.

Course Outcomes for Third Year Second Semester Courses	
Course code: **B16 CS 3211**	
Course Title: **WEB TECHNOLOGIES**	
CO-1	They will able to write html, JavaScript, CSS codes.
CO-2	They will have clear understanding of hierarchy of objects in HTML and XML.
CO-3	Finally they can create good, effective and customized websites

SYLLABUS: SOFTWARE ENGINEERING (B16 CS 3212)

Introduction: Problem domain, Software Engineering challenges, the software engineering approach

Software Processes: Software Processes, desired characteristics of Software Processes,

Software Process development models : Waterfall model, Prototyping, Iterative development, Time Boxing model

Software Requirement analysis and specification: Need for SRS, Requirement process, Problem analysis, Requirement specification: Characteristics of SRS, Components of SRS.

Software Architecture: Role of Software Architecture, Architecture views.

Planning Software Project: Process planning, Effort estimation, Project scheduling and staffing

Software design: Introduction to Function oriented Design and Object Oriented Design.

Testing: Testing fundamentals, Black box testing, White box testing, Testing Process.

Course Outcomes for Third Year Second Semester Courses	
Course code: **B16 CS 3212**	
Course Title: **SOFTWARE ENGINEERING**	
CO-1	To Remember the basic concepts of software Engineering.
CO-2	To use various process development models
CO-3	To apply various techniques for gathering and analyzing requirements.
CO-4	To gain the knowledge of Software Architecture views.
CO-5	To estimate the cost and Schedule of Projects by using various estimation models.
CO-6	To apply various testing strategies to test the software systems.

SYLLABUS: DIGITAL SIGNAL PROCESSING (B16EC3206)

Discrete-Time Signals and Systems (Oppenheim &Proakis**)**

Introduction to Digital Signal Processing, Basic elements of a DSP system, Advantages of Digital SP over Analog SP, Discrete-time signals and systems, DT-LTI systems described by Linear constant–coefficient difference equations, Properties &Analysis of DT-LTI systems, Discrete linear convolution, Frequency domain representation of DT Signals and Systems, DTFT, Review of the Z-transform, Properties, Inverse Z-transform, Analysis of DT-LTI systems in Z-Domain, System function, One-sided Z-transform, Solution of difference equations, Structures and Realization of Digital Filters, Direct-I, II, series and parallel forms.

Discrete Fourier Transform (DFT) and Fast Fourier Transform Algorithms (FFT): (Oppenheim &Proakis)

Frequency analysis of discrete time signals, DFS, Properties of DFS, Sampling of DTFT, DFT, Properties of DFT, Circular and linear convolution of sequences using DFT, Efficient computation of DFT, Radix–2 Decimation–in–Time(DIT) & Decimation–in–Frequency(DIF) FFT Algorithms, Inverse FFT.

Design of IIR & FIR Digital Filters: (Oppenheim & Proakis)

General considerations in Filter design, Analog filter approximations– Butterworth and Chebyshev, Frequency response specifications, Design of IIR digital filters from analog filters, Bilinear Transformation Method, Impulse Invariance Technique, Low-pass filter Design examples, Characteristics of FIR Digital Filters, Design of Linear Phase FIR digital Filters using Windows, Effect of Window selection & filter length on filter frequency response, Design examples, Comparison of IIR and FIR Filters.

DSP Applications: (Mitra & Proakis**)**

Overview of DSP applications, Spectral analysis of sinusoidal signals using FFT, Sub band coding of speech signals, Signal compression, Trans multiplexers, Practical aspects of DSP system implementation, DSP hardware & DSP Processors, Finite precision arithmetic effects.

Multirate Digital Signal Processing Fundamentals (SK Mitra):

Introduction to Multirate DSP, Basic sampling rate alteration devices: up sampler, down sampler, Time and Frequency domain characterization of up/down samplers, Multirate structures for sampling rate conversion, Filters used in sampling rate alteration systems, Interpolator and decimator, Brief introduction to Digital Filter Banks.

Course Outcomes for Third Year Second Semester Courses	
Course code:**B16 EC 3206**	
Course Title: **DIGITAL SIGNAL PROCESSING**	
CO-1	Describe the DSP fundamental theory and components, Develop an understanding of DSP advantages, limitations and fundamental trade-offs.
CO-2	Carry-out LTI system analysis using convolution & Z-transform.
CO-3	Carryout data analysis &spectrum analysis using FFT.
CO-4	Design IIR & FIR digital filters to meet specifications
CO-5	Knows multi-rate SP aspects, filter banks & applications
CO-6	Tackle numerical & practical issues in DSP implementation
CO-7	Apply DSP techniques to real world problems in information processing, filtering, communications, detection & estimation, Relate & translate DSP theory to applications, Ready to take advanced DSP courses & pursue research.
CO-8	Illustrate and implement real-time DSP principles using MATLAB & DSP Processors, Ready to work in DSP industry.

SYLLABUS: EMBEDDED SYSYTEMS & MICROCONTROLLERS (B16EC3207)

(Elective-II)

Introduction to Embedded Systems: Examples, Typical Hardware, Memory, Architecture, Instruction set, Programming. Interrupt Basics, Shared-Data problem, Interrupt Latency.

Software Architectures: Round-Robin Architecture, Round-Robin with Interrupts Architecture, Function-Queue Scheduling Architecture, Real-Time Operating Systems Architecture, Selection of Architecture.. Real Time Operating System: Tasks and Task States, Tasks and Data, Semaphores and Shared Data, Semaphore Problems, Semaphore variants.

Inter Task Communication & Design issues of RTOS: Message Queues, Mailboxes, Pipes, and Interrupt Routines in RTOS Environment, Principles of RTOS, Encapsulation Semaphores and Queues, Hard, Real-Time Scheduling Considerations.

Embedded Software development Tools & Debugging techniques: Host and Target Machines, Linker/Locator for Embedded Software, Getting Embedded Software into the Target System, Testing on your Host Machine, Instruction Set Simulators, Laboratory Tools used for Debugging.

Microcontroller: Introduction to Microcontroller, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, stacks.

Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions and Bit manipulation instruction.

Course Outcomes for Third Year Second Semester Courses	
Course code:**B16 EC 3207**	
Course Title: **EMBEDDED SYSYTEMS & MICROCONTROLLERS**	
CO-1	Ability to understand the concepts related to RTOS and its Inter Task communication Methods.
CO-2	Ability to understand various design issues of RTOS.
CO-3	Understand about embedded software development tools.
CO-4	Understand the basic architecture of 8051 micro controller and instruction set.

SYLLABUS: MICRO ELECTRONICS (B16EC3208)

(Elective-II)

Integrated- Circuit Fabrication: Monolithic Integrated - Circuit (microelectronics) technology- The planar processes - Bipolar Transistor Fabrication - Fabrication of FETs - CMOS Technology - Monolithic Diodes - The Metal - Semiconductor Contact - IC Resistor - IC Capacitors - IC Packaging - Characteristics of IC Components - Microelectronic circuit layout.

Basic Digital circuits: MOS Technology - NMOS, CMOS, Inverters, Logic gates - ECL circuits.

Combinational Circuits: Arithmetic functions - Comparators - Multiplexers - DE multiplexers - Memory - Memory applications - PAL - PLAs.

Sequential Circuits: A1 - Bit memory - The circuits properties of bistable latch - The clocked SR Flip-Flop - J-K, T, and D-type Flip-flops. Shift-registers - Ripple Counters - synchronous counters - Applications of counters.

Course Outcomes for Third Year Second Semester Courses	
Course code:**B16 EC 3208**	
Course Title: **MICRO ELECTRONICS**	
CO-1	Be familiar with MOSFET basics and Fabrication process.
CO-2	Understand and analyze Digital CMOS circuits and other digital logic families

SYLLABUS: TELECOMMUNICATION SWITCHING SYSTEMS (B16EC3209)

(Elective-II)

Introduction:

Evolution of Telecommunications, Simple Telephone Communication, Basics of Switching System, Manual Switching System, Major Telecommunication.

Crossbar Switching: Principles of Common Control, Touch Tone Dial Telephone, Principles of Crossbar Switching, Crossbar Switch Configurations, Cross point Technology, Crossbar Exchange Organization.

Electronic Space Division Switching:

Stored Program Control, Centralized SPC: Standby mode, Synchronous duplex mode, Distributed SPC, Software Architecture, Application Software, Enhanced Services, Need for networks, Two stage networks, Three stage networks and n-stage networks.

Time Division Switching:

Basic Time Division Space Switching, Basic Time Division Time Switching, Time multiplexed space switching, Combination Switching: Time Space (TS) Switching, Space- time (ST) Switching, Three-Stage Combination Switching, n- Stage Combination Switching.

Telephone Networks:

Signaling Techniques, In-channel Signaling, Common Channel Signaling, CCITT Signaling System no.6, CCITT Signaling System no.7.

Traffic engineering: grade of service and blocking probability, modeling switching system, blocked models and loss estimates, delay systems.

Integrated Services Digital Network:

Motivation for ISDN, New Services, Network and Protocol Architecture, Transmission Channels, User- Network Interfaces, Signaling, Numbering and Addressing, Service Characterization, Interworking, ISDN Standards, Expert Systems in ISDN, Broadband ISDN.

Course Outcomes for Third Year Second Semester Courses	
Course code: **B16 EC 3209**	
Course Title: **TELECOMMUNICATION SWITCHING SYSTEMS**	
CO-1	Evaluate the time and space parameters of a switched signal.
CO-2	Establish the digital signal path in time and space, between two terminals.
CO-3	Evaluate the inherent facilities within the system to test some digital switch functions.
CO-4	Investigate the traffic capacity of the system.
CO-5	Able to understand different data rate and applications of ISDN.

SYLLABUS: DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES (B16 EC 3210)

Introduction to Digital Signal Processing:

Introduction, a Digital signal-processing system, the sampling process, discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), linear time-invariant systems, Digital filters, Decimation and interpolation.

Computational Accuracy in DSP Implementations:

Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

Architectures for Programmable DSP Devices:

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

Programmable Digital Signal Processors:

Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline operation of TMS320C54XX Processors.

Analog Devices Family of DSP Devices:

Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor.

Introduction to Black fin Processor - The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

Interfacing Memory and I/O Peripherals to Programmable DSP Devices:

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

Course Outcomes for Third Year Second Semester Courses	
Course code:**B16 EC 3210**	
Course Name: **DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES**	
CO-1	Apply DFT and FFT algorithms for DSP application.
CO-2	Apply the number format, dynamic range and various sources of errors in DSP system.
CO-3	Implement application programs on a DSP processor.
CO-4	Implement various DSP algorithms on TMS processors.
CO-5	Implement FFT algorithms on TMS320C54XXDSP algorithm.

SYLLABUS: DSP LABORATORY (B16 EC 3211)

LIST OF EXPERIMENTS

1. Generation of discrete –time sequences and signals.
2. Program for Linear Convolution of two sequences.
3. Program for Circular Convolution of two sequences.
4. Frequency analysis of discrete time sequences.
5. Frequency analysis of discrete time Linear and Non Linear systems.
6. Frequency analysis of discrete time variant and Time invariant systems.
7. Frequency analysis of discrete time LTI system.
8. Design of IIR digital filter using Butterworth filter.
9. Design of IIR digital filter using Chebyshev filter.
10. Design of FIR digital filter using Hamming window and Rectangular window.
11. Program for sum of sinusoidal signals.
12. Program for Fast Fourier Transform.
13. Program for adjusting intensity values of a image using histogram equalization.
14. Program for deblurring Images Using a Wiener Filter.

Course Outcomes for Third Year Second Semester Courses	
Course code:**B16 EC 3211**	
Course Title**: DSP LABORATORY**	
CO-1	Able to write the MATLAB coding for basic mathematical operations to complex operations like FFT.
CO-2	Able to Design and Analyze LTI systems& Digital Filters.
CO-3	Understand the image processing techniques

SYLLABUS: MICROPROCESSORS AND MICROCONTROLLERS LAB (B16EC3212)

Experiments Based On ALP (8085):

1. A. Assume that byte of data is stored at memory location „X‟. Write an ALP which tests bit 5 of this data. Write „FF‟ in the location „X+1‟ if the bit 5 is „1‟ and „00‟if bit 5 is „0‟.

   B. Check the zero condition of this number and write 00 at location, Y if it is „0‟ and „FF‟ at „y‟ if non zero.

   c. For data value in the location „X‟ compute the number of logic 1‟s and store the result in the location „Y+1‟.

2. **a.** Write an ALP to swap the contents of location „X‟ and „X+1‟ using BC & HL Register pairs.

   b. By using above logic, write an ALP to transfer a block of data into another block.

3. **a.** Write an ALP to add and subtract two eight bit Number stored in the location „X‟ and „X+1‟ by assuming that content of „X‟ is greater than content of „X+1‟

   b. Modify this program to add two 16 bit numbers without using DAD instruction.

4. Two 8 bit numbers 34H and 43H are stored in locations „X‟ and „X+1‟ compute the product of these two numbers using

   a. Repetitive addition method

   b. Shift and add method

5. The number of the bytes of a block of data is in location „X‟ and data starts from location „X+1‟ onwards defining a stack pointers. Write an ALP to arrange this sequence of data in reverse order. Keep the reverse sequence from „Y‟ onwards.

6. The number of bytes of a block of data is location „X‟ and data starts from location „X+1‟onwards. Arrange this block of data in ascending order by using bubble sorting technique.

7. Using 8279 write an ALP to generate the message of 4 characters. Activate the LED‟s individually and make the display ON &OFF for every 0.5 seconds.

Experiments Based On ALP (8086)

8.Programs on Data Transfer Instructions

9.Programs on Arithmetic and Logical Instructions

10. Programs on Branch Instructions

11. Programs on Subroutines

12. Sorting of an array

Experiments based on Interfacing and Microcontroller (8051)

13. Programs on Data transfer instructions using 8051 Microcontroller
14. Programs on Arithmetic and Logical instructions using 8051 Microcontroller

COURSE OUTCOMES FOR THIRD YEAR SECOND SEMESTER COURSES	
Course code: **B16 EC 3212**	
Course Title: **MICROPROCESSORS AND MICROCONTROLLERS LAB**	
CO-1	The objective of this course is to become familiar with the instruction set of Intel microprocessors and microcontroller and also to familiarize with Assembly language programming. The accompanying lab is designed to provide practical hands-on experience with microprocessor software applications and interfacing techniques.

SYLLABUS: VERBAL & QUANTITATIVE APTITUDE - II

(Common to All Branches)

Part-A: Verbal Aptitude and Soft Skills-II

UNIT -I (VA)

Sentence Improvement (finding a substitute given under the sentence as alternatives), Sentence equivalence (completing a sentence by choosing two words either of which will fit in the blank), cloze test (reading the written discourse carefully and choosing the correct options from the alternatives and filling in the blanks), summarizing and paraphrasing.

UNIT- II (VA)

Types of passages (to understand the nature of the passage), types of questions (with emphasis on inferential and analytical questions), style and tone (to comprehend the author's intention of writing a passage), strategies for quick reading(importance given to skimming, scanning), summarizing ,reading between the lines, reading beyond the lines, techniques for answering questions related to vocabulary (with emphasis on the context), supplying suitable titles to the passage, identifying the theme and central idea of the given passages.

UNIT- III (VA)

Punctuation, discourse markers, general Essay writing, writing Issues and Arguments(with emphasis on creativity and analysis of a topic), paragraph writing, preparing reports, framing a „Statement of purpose", „Letters of Recommendation", business letter writing, email writing, writing letters of complaints/responses. picture perception and description, book review.

UNIT-IV (VA)

Just a minute sessions, reading news clippings in the class, extempore speech, telephone etiquette, making requests/suggestions/complaints, elocutions, debates, describing incidents and developing positive non verbal communication, story narration, product description.

UNIT-V (SS)

Employability Skills – Significance — Transition from education to workplace - Preparing a road map for employment – Getting ready for the selection process, Awareness about Industry / Companies – Importance of researching your prospective workplace - Knowing about Selection process - Resume Preparation: Common resume blunders – tips, Resume Review, Group Discussion: Essential guidelines – Personal Interview: Reasons for Rejection and Selection.

SYLLABUS: Part-B: Quantitative Aptitude-II

UNIT I: Averages, mixtures and allegations, Data interpretation

Understanding of AM, GM, HM-Problems on averages, Problems on mixtures standard method. Importance of data interpretation: Problems of data interpretation using line graphs, Problems of data interpretation using bar graphs, Problems of data interpretation using pie charts, Problems of data interpretation using others.

UNIT II: Puzzle test, blood Relations, permutations, Combinations and probability Importance of puzzle test, Various Blood relations-Notation to relations and sex making of family Tree diagram, Problems related to blood relations, Concept of permutation and combination, Problems on permutation, Problems on combinations, Problems involving both permutations and combinations, Concept of probability-Problems on coins, Problems on dice, Problems on cards, Problems on years.

UNIT III: Periods, Clocks, Calendars, Cubes and cuboids

Deriving the formula to find the angle between hands for the given time, finding the time if the angle is known, Faulty clocks, History of calendar-Define year, leap year, Finding the day for the given date, Formula and method to find the day for the given date in easy way, Cuts to cubes, Colors to cubes, Cuts to cuboids, Colors to cuboids.

UNIT IV: Puzzles

Selective puzzles from previous year placement papers, sitting arrangement, problems- circular arrangement, linear arrangement, different puzzles.

UNIT V: Geometry and Menstruation

Introduction and use of geometry-Lines, Line segments, Types of angles, Intersecting lines, Parallel lines, Complementary angles, supplementary angles, Types of triangles-Problems on triangles, Types of quadrilaterals-Problems on quadrilaterals, Congruent triangles and properties, Similar triangles and its applications, Understanding about circles-Theorems on circles, Problems on circles, Tangents and circles, Importance of menstruation-Introduction of cylinder, cone, sphere, hemi sphere.

COURSE OUTCOMES FOR THIRD YEAR SECOND SEMESTER COURSES	
Course code:**B16ENG3202**	
Course Title: **VERBAL & QUANTITATIVE APTITUDE – II**	
CO-1	Construct coherent, cohesive and unambiguous verbal expressions in both oral and written discourses.
CO-2	Analyze the given data/text and find out the correct responses to the questions asked based on the reading exercises; identify relationships or patterns within groups of words or sentences.
CO-3	Write paragraphs on a particular topic, essays (issues and arguments), e mails, summaries of group discussions, reports, make notes, statement of purpose(for admission into foreign universities), letters of recommendation(for professional and educational purposes).
CO-4	Converse with ease during interactive sessions/seminars in their classrooms, compete in literary activities like elocution, debates etc., raise doubts in class, participate in JAM sessions/versant tests with confidence and convey oral information in a professional manner.
CO-5	Participate in group discussions/group activities, exhibit team spirit, use language effectively according to the situation, and respond to their interviewer/employer with a positive mind, tailor make answers to the questions asked during their technical/personal interviews, exhibit skills required for the different kinds of interviews (stress, technical, HR) that they would face during the course of their recruitment process.

SYLLABUS: MINI PROJECT (B16 EC3213)

COURSE OUTCOMES FOR THIRD YEAR SECOND SEMESTER COURSES	
Course code:**B16 EC 3213**	
Course Title: **MINI PROJECT**	
CO-1	Achieve practical knowledge within his chosen area of technology for project development.
CO-2	Identify, analyze, formulate and handle electronics & communications projects with a systematic and comprehensive approach.
CO-3	Contribute as an individual or as member of team in development of technical projects.
CO-4	Develop effective communication skills for presentation of project related activities.

SYLLABUS: ADVANCED CODING (B16 ENG 3204)
(Common to ECE & EEE)
(MOOCS-III)

UNIT I Review Coding essentials and modular programming

Introduction to Linear Data, Structure of linear data, Operation logics, Matrix forms and representations, Pattern coding.

Introduction to modular programming: Formation of methods, Methods: Signature and definition, Inter-method communication, Data casting & storage classes, Recursions

UNIT II Linear Linked Data

Introduction to structure pointer, Creating Links Basic problems on Linked lists, Classical problems on linked lists. Circular Linked lists, Operations on CLL, Multiple links, Operations on Doubly linked lists

UNIT III Abstract Data-structures

Stack data-structure, Operations on stack, Infix/Prefix/Post fix expression evaluations, Implementation of stack using array, Implementation of stack using linked lists.

Queue data-structure: Operations on Queues, Formation of a circular queue, Implementation of queue using stack, Implementation of stack using array, Implementation of stack using linked lists

UNIT IV Running time analysis of code and organization of linear list data

Code evaluation w.r.t running time, Loop Complexities, Recursion complexities, Searching techniques: sequential vs. binary searching.

Organizing the list data, Significance of sorting algorithms, Basic Sorting Techniques: Bubble sort, selection sort, Classical sorting techniques: Insertion sort, Quick sort, Merge sort.

UNIT V Standard Library templates and Java collections

Introduction to C++ language features, working on STLs, Introduction to Java as Object Oriented language, Essential Java Packages, Coding logics.

Course Outcomes for Third Year Second Semester Courses	
Course code:**B16 ENG 3204**	
Course Title: **ADVANCED CODING**	
CO-1	Acquire coding knowledge on essential of modular programming.
CO-2	Acquire Programming knowledge on linked lists.
CO-3	Acquire coding knowledge on ADT.
CO-4	Acquire knowledge on time complexities of different methods.
CO-5	Acquire Programming skill on Java libraries and Collections.

SYLLABUS: PRINCIPLES OF SIGNALS AND SYSTEMS (B16EC3214A)

(MOOCS-III)

Course outline

Week 1: Introduction to Signals, Signal Classification, Continuous/ Discrete Time Signals

Week 2: Definition and Classification of Systems, Linear Time Invariant (LTI) Systems

Week 3: Properties of LTI Systems, Impulse Response, Convolution, Causality, Stability

Week 4: Impulse Response of Discrete Time Systems, Discrete Time Convolution, Difference Equations and Analysis

Week 5: Laplace Transform, Properties of Laplace Transform, Inverse Laplace Transform

Week 6: Introduction to z-Transform, Properties of z-Transform, Region of Convergence, Inverse z-Transform

Week 7: Introduction to Fourier analysis, Fourier series for Periodic Signals, Properties of Fourier series.

Week 8: Introduction to Fourier Transform, Properties of Fourier Transform, Frequency Response of Continuous Time Systems, Examples of Frequency Response.

Week 9: Fourier analysis of Discrete Signals, Discrete Time Fourier Transform (DTFT), Properties of DTFT, Examples of DTFT.

Week 10: Frequency Response of Discrete Time Systems, Discrete Fourier Transform (DFT), Properties of DFT, Examples of DFT.

Week 11: IIR/ FIR Filters, Direct Form Realization, Cascade and Parallel Form Realization, Problem Solving.

Week 12: Concept of State, State Space Analysis, State Space Representation of Continuous Time Systems, Solution of State Equations for Continuous Systems

SYLLABUS: ANALOG CIRCUITS (B16 EC 3214B)

(MOOCS-III)

UNIT I Introduction to Analog circuits:

Course introduction; Need for nonlinear circuits; Incremental analysis of nonlinear circuits: Diode and its models; Incremental picture of a two port nonlinear circuit; Constraints on y- parameters and large signal characteristics to obtain a high gain; MOS transistor and its characteristics; AC coupling network to add signal to bias; AC coupling at input and output; Common source amplifier

UNIT II MOS transistor:

Output conductance of a MOS transistor; Inherent gain limitation of a transistor; Sensitivity of gm to transistor parameters; Biasing a transistor at a constant current; Drain feedback configuration; Current mirror;

UNIT III Common source Amplifier

Common source amplifier using drain feedback; Common source amplifier using current mirror bias; Common source amplifier using source feedback bias; Using a resistor instead of a current source for biasing; Further biasing techniques;

UNIT VI Voltage/Current Controlled Voltage Sources

VCVS using a transistor; Source follower biasing; CCVS using a transistor; CCVS using an opamp; Biasing a CCVS; Emitter degenerated amplifier; Common gate amplifier and its biasing; VCCS using a transistor and its biasing; pMOS transistor and its small signal model; Biasing a pMOS transistor; Converting nMOS circuits to pMOS; Amplifiers using a pMOS transistor

UNIT V Bipolar Junction Transistor

Bipolar junction transistor-large and small signal models; BJT circuits- Biasing; Common source amplifier; Emitter follower; BJT Common base amplifier, Trans impedance amplifier; Swing limits of amplifiers; Two transistors in feedback; Two transistors in feedback

SYLLABUS: MICROPROCESSORS AND MICROCONTROLLERS (B16 EC 3214C)

(MOOCS-III)

Week 1: Introduction: General processor architecture, Microprocessors, Microcontrollers, Basic Computer Organization,

Week 2:8085 Microprocessors,

Week 3: 8085 – Part II

Week 4: 8085 – Part III

Week 5: 8085 – Part IV

Week 6: 8051 – Part I

Week 7: 8051 – Part II Week 8: PIC, AVR

Week 9: ARM – Part I

Week 10: ARM – Part II

Week 11: Interfacing examples – Part I

Week 12: Interfacing examples – Part II

SYLLABUS: CONTROL SYSTEMS (B16EE 3103)

(Common to ECE & EEE)

Introduction to control systems: Open loop and closed loop systems- Transfer Functions ofLinear Systems– Impulse Response of Linear Systems – Mathematical Modeling of Physical Systems – Equations of Electrical Networks – Modeling of Mechanical Systems – Equations of Mechanical Systems, Analogous Systems.

Block Diagrams of Control Systems: Signal Flow Graphs (Simple Problems) – Reduction Techniques for Complex Block Diagrams and Signal Flow Graphs (Simple Examples)-Feedback Characteristics of Control Systems

Time Domain Analysis of Control Systems: Time Response of First and Second Order Systems with Standard Input Signals – Steady State Error Constants – Effect of Derivative and Integral Control on Transient and Steady State Performance of Feedback Control Systems.

Concept of Stability: Routh-Hurwitz Criterion, Relative Stability Analysis, the Concept and Construction of Root Loci, Analysis of Control Systems with Root Locus (Simple Problems to understand theory).

Frequency Domain Analysis of control systems: Bode Plots- Log Magnitude versus PhasePlots- Polar Plots - Correlation between Time and Frequency Responses -NY Quist Stability Criterion -Assessment of Relative Stability -All Pass and Minimum Phase Systems - ConstantM and N Circles.

Course Outcomes for Third Year First Semester Courses	
Course code: **B16 EE 3103**	
Course Title**: CONTROL SYSTEMS**	
CO-1	Students will be able to model electrical and mechanical physical systems by applying laws of physics.
CO-2	Students will be able to represent mathematical models of systems using block diagrams & Signal Flow Graphs and derive their transfer functions.
CO-3	Students will be able to analyze systems in time domain for transient and steady-state behavior.
CO-4	Students will learn the concept of stability and use RH criterion and Root locus methods for stability analysis.
CO-5	Students will learn to obtain frequency response plots of systems and use them for system analysis and stability assessment.

SYLLABUS: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (B16 EC 3104)

Performance characteristics of instruments, Static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Errors in Measurement, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error. DC Voltmeters- Multi- range, Range extension/Solid state and differential voltmeters, AC voltmeters, True RMS responding voltmeter, Multi-meter for Voltage, Current and resistance measurements.

Signal Generator- fixed and variable, AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Square pulse, Random noise, sweep, Arbitrary waveform. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

Oscilloscopes CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, Dual beam CRO, .Dual trace oscilloscope, sampling oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement, standard specifications of CRO, CRO probes.

AC Bridges Measurement of inductance- Maxwell’s bridge, Anderson Bridge. Measurement of capacitance - SchearingBridge.Wheat stone bridge. Wien Bridge, Errors and precautions in using bridges.

Transducers- active & passive transducers: Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Resistors.

Course Outcomes for Third Year First Semester Courses	
Course code: B16 EC 3104	
Course Title: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION	
CO-1	Evaluate basics of measurement systems, principle of basic meter.
CO-2	Evaluate how a signal can be generated using different types of meters.
CO-3	Investigate a signal / waveform with different oscillators.
CO-4	Use bridges of many types and measure appropriate parameters.
CO-5	Design different transducers for measurement of different parameters.

SYLLABUS: Linear Integrated Circuits & Pulse Circuits Lab with Simulation (B16 EC 3106)

LIST OF EXPERIMENTS

7. Linear Wave Shaping
   a) Passive RC Differentiator
   b) Passive RC Integrator
8. Non Linear Wave shaping
   a) Clipping Circuits
   b) Clamping Circuits
9. Self-bias bistable Multivibrator
10. Schmitt Trigger Using µA 741
11. UJT Sweep Generator
12. Astable Multivibrator using 555 timer

LIST OF EXPERIMENTS (Simulation)

7. Linear Wave Shaping
   a) Passive RC Differentiator
   b) Passive RC Integrator
8. Non Linear Wave shaping
   a) Clipping Circuits
   b) Clamping Circuits
9. Self bias bistable Multivibrator
10. Schmitt Trigger Using µA 741
11. UJT Sweep Generator
12. Astable Multivibrator using 555 timer

Course Outcomes for Third Year First Semester Courses	
Course code: **B16 EC 3106**	
Course Title: **LINEAR INTEGRATED CIRCUITS & PULSE CIRCUITS LAB WITH SIMULATION**	
CO-1	Design and conduct experiments on RC low pass and high pass circuits.
CO-2	Observe operation of UJT Sweep Generator.
CO-3	Design and test different types of Multi vibrators
CO-4	Acquire a basic knowledge on simple applications of operational amplifier.
CO-5	Design, construct Schmitt trigger using operational amplifier.
CO-6	Use Multisim to test their electronic designs.

SYLLABUS: Digital Integrated Circuits & Hardware Descriptive Language (B16 EC 3107)

LIST OF EXPERIMENTS

C. HARDWARE

15. Verify the operation of following digital components using Digital Trainer Kit
    a. Logic gates
    b. Full adder using gates
    c. Full subtractor using gates
16. Design and verify the logic function of multiplexer and de-multiplexers using digital trainer kit
17. Design code convertors using digital trainer kit
    a. BCD TO SEVEN segment display
    b. Priority encoder
    c. Decoder
18. Verify the operation of fallowing flip-flops using Digital Trainer Kit
    a. RS flip flop
    b. JK flip flop
    c. D flip flop
    d. T flip flop
19. Design a following synchronous counters using Digital Trainer Kit
    a. mod 16 counter
    b. mod 8 counter
20. Verify the following logical functions of shift registers using Digital Trainer Kit
    a. SIPO
    b. PISO

D. SOFTWARE

21. Verify the operation of following digital components using ISE Simulator
    a. logic gates
    b. full adder using gates
    c. full subtractor using gates
22. Design and verify the logic function of multiplexer and DE multiplexers using ISE Simulator
23. Design code convertors using ISE Simulator
    a. BCD TO SEVEN segment display
    b. Priority encoder
    c. Decoder
24. Verify the operation of fallowing flip-flops using ISE Simulator
    a. RS flip flop
    b. JK flip flop
    c. D flip flop
    d. T flip flop
25. Design a following synchronous counters using ISE Simulator
    a. mod 16 counter
    b. mod 8 counter
26. Verify the following logical functions of shift registers using ISE Simulator

a. SIPO

b. PISO

Course Outcomes for Third Year First Semester Courses	
Course code:B16 EC 3107	
Course Title: DIGITAL INTEGRATED CIRCUITS &HARDWARE DESCRIPTIVE LANGUAGE	
CO-1	Synthesize, simulate and implement a digital design in a configurable digital circuit with computer supported aid tools and digital trainer kit.
CO-2	Acquire Knowledge of analysis and synthesis of combinational and sequential circuits with simulators and digital trainer kits.
CO-3	Build high level programming (HDL programming) skills for digital circuits.
CO-4	Adapt digital circuits to electronics and telecommunication field.

Code: PROBLEM SOLVING & LINGUISTIC COMPETENCE (B16ENG3102)

(Common to all Branches)

Part-A: Verbal and Soft Skills-I

Grammar: (VA**)**

Parts of speech(with emphasis on appropriate prepositions, co-relative conjunctions, pronouns-number and person, relative pronouns), articles(nuances while using definite and indefinite articles), tenses(with emphasis on appropriate usage according to the situation), subject – verb agreement (to differentiate between number and person) , clauses(use of the appropriate clause , conditional and relative clauses), phrases(use of the phrases, phrasal verbs) to-infinitives, gerunds, question tags, voice, direct & indirect speech, degrees of comparison, modifiers, determiners, identifying errors in a given sentence, correcting errors in sentences.

Vocabulary: (VA)

Synonyms and synonym variants (with emphasis on high frequency words), antonyms and antonym variants(with emphasis on high frequency words), contextual meanings with regard to inflections of a word, frequently confused words, words often mis-used, multiple meanings of the same word (differentiating between meanings with the help of the given context), foreign phrases, homonyms, idioms, pictorial representation of words, word roots, collocations.

Reasoning: (VA)

Critical reasoning (understanding the terminology used in CR- premise, assumption, inference, conclusion), Analogies (building relationships between a pair of words and then identifying similar relationships), Sequencing of sentences (to form a coherent paragraph, to construct a meaningful and grammatically correct sentence using the jumbled text), odd man (to use logical reasoning and eliminate the unrelated word from a group), YES-NO statements (sticking to a particular line of reasoning Syllogisms.

Usage: (VA)

Sentence completion (with emphasis on signpost words and structure of a sentence), supplying a suitable beginning/ending/middle sentence to make the paragraph coherent, idiomatic language (with emphasis on business communication), and punctuation depending on the meaning of the sentence.

Soft Skills:

Introduction to Soft Skills – Significance of Inter & Intra-Personal Communication – SWOT Analysis –Creativity & Problem Solving – Leadership & Team Work - Presentation Skills Attitude – Significance – Building a positive attitude – Goal Setting – Guidelines for Goal Setting – Social Consciousness and Social Entrepreneurship – Emotional Intelligence - Stress Management, CV Making and CV Review.

Part-B: Quantitative Aptitude –I

Numbers, LCM and HCF, Chain Rule, Ratio and Proportion:

Importance of different types of numbers and uses of them: Divisibility tests, finding remainders in various cases, Problems related to numbers, Methods to find LCM, Methods to find HCF, applications of LCM, HCF. Importance of chain rule, Problems on chain rule, introducing the concept of ratio in three different methods, Problems related to Ratio and Proportion.

Time and work, Time and Distance:

Problems on man power and time related to work, Problems on alternate days, Problems on hours of working related to clock, Problems on pipes and cistern, Problems on combination of the some or all the above, Introduction of time and distance, Problems on average speed, Problems on Relative speed, Problems on trains, Problems on boats and Streams, Problems on circular tracks, Problems on polygonal tracks, Problems on races.

Percentages, Profit Loss and Discount, Simple interest, Compound Interest, Partnerships, shares and dividends:

Problems on percentages-Understanding of cost price, selling price, marked price, discount, percentage of profit, percentage of loss, percentage of discount, Problems on cost price, selling price, marked price, discount.

Introduction of simple interest, Introduction of compound interest, Relation between simple interest and compound interest, Introduction of partnership, Sleeping partner concept and problems, Problems on shares and dividends, and stocks.

Introduction, number series, number analogy, classification, Letter series, ranking, directions

Problems of how to find the next number in the series, Finding the missing number and related sums, Analogy, Sums related to number analogy, Ranking of alphabet, Sums related to Classification, Sums related to letter series, Relation between number series and letter series, Usage of directions north, south, east, west, Problems related to directions north, south, east, west.

Data sufficiency, Syllogisms

Easy sums to understand data sufficiency, frequent mistakes while doing data sufficiency**,** Syllogisms Problems.

Course Outcomes for Third Year First Semester Courses	
Course code: **B16 ENG 3102**	
Course Title: **VERBAL & QUANTITATIVE APTITUDE – I**	
CO-1	Detect grammatical errors in the text/sentences and rectify them while answering their competitive/ company specific tests and frame grammatically correct sentences while writing.
CO-2	Answer questions on synonyms, antonyms and other vocabulary based exercises while attempting CAT, GRE, GATE and other related tests.
CO-3	Use their logical thinking ability and solve questions related to analogy, syllogisms and other reasoning based exercises.
CO-4	Choose the appropriate word/s/phrases suitable to the given context in order to make the sentence/paragraph coherent.
CO-5	Apply soft skills in the work place and build better personal and professional relationships making informed decisions.

SYLLABUS: DIGITAL IMAGE PROCESSING (B16EC4101)

DIGITAL IMAGE FUNDAMENTALS Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels.

IMAGE ENHANCEMENT

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening of Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

IMAGE RESTORATION

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Inverse Filtering, Weiner Filtering.

IMAGE COMPRESSION Compression: Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

COLOR IMAGE PROCESSING AND SEGMENTATION

Color fundamentals, color models, the RGB, the CMY and CMYK, the HSI color models, color transformations, color slicing, tone and color corrections, histogram processing, segmentation fundamentals, and thresholding.

Course Outcomes for Fourth Year First Semester Courses	
Course code: **B16EC4101**	
Course Title: **DIGITAL IMAGE PROCESSING**	
CO-1	Discuss digital image fundamentals.
CO-2	Apply image enhancement and restoration techniques.
CO-3	Use image compression techniques.
CO-4	Represent features of color images.
CO-5	Use image segmentation techniques.

SYLLABUS: VLSI DESIGN (B16 EC4102)

Review of microelectronics and an introduction to MOS technology: Introduction to IC technology, MOS and related VLSI technology, NMOS, CMOS, Bi-CMOS Technologies, Production of E beam marks, I_{ds} versus V_{ds} Relationships, , Pull-up to Pull-down Ratio for NMOS inverter, Alternative forms of pull-up.

MOS and Bi-CMOS circuit design processes:
MOS layers, Stick diagrams, Design rules, and layout, 2 & 1.2 micro meter Double Metal, Double Poly. CMOS/Bi-CMOS rules, Layout diagrams, Symbolic diagrams.

Basic Circuit concepts:
Sheet resistance, Area capacitances of layers, Delay unit, Wiring Capacitances, Choice of layers.

Scaling of MOS Circuits: Scaling Models and Scaling Factors, Scaling Factors for device parameters, Limitations of scaling.

Sub system design and Layout:
Architectural issues, Switch logic, Gate Logic, Examples of Structural design (Combinational logic).

Sub system design process:
Design of ALU subsystem, Some commonly used Storage/Memory Elements, Aspects of design tools, Design for testability, Practical design for test guidelines, Built in self-test, CMOS project- an incrementer / decrementer, a comparator for two n-bit numbers. Ultra-fast systems, Technology development, MOSFET based design.

Course Outcomes for Fourth Year First Semester Courses	
Course code: **B16EC4102**	
Course Title: **VLSI DESIGN**	
CO-1	Apply the Concept of design rules during the layout of a circuit. Model and simulate digital.
CO-2	VLSI systems using hardware design language.
CO-3	Synthesize digital VLSI systems from register-transfer or higher level descriptions.
CO-4	Understand current trends in semiconductor technology, and how it impacts scaling and performance.

SYLLABUS: FIBER OPTIC COMMUNICATIONS (B16 EC4103)

Overview of optical fiber communication

The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, cylindrical fibers- Modes, V-number, Mode coupling, Optical propagation through fiber modes. Step Index fibers, Graded Index fibers, Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index, Related problems.

Transmission characteristics of optical fiber

Glass, Active glass, Plastic optical fibers. Signal distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacity determination, Group delay, Types of Dispersion:- Material dispersion, Wave-guide dispersion, Polarization-Mode dispersion, Intermodal dispersion, Pulse broadening in Graded index fiber, Related problems.

Optical Sources & Detectors

LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies, Reliability of LED&ILD, Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors, Related problems.

Fabrication, Cabling, Installation & Fiber connectors

Fabrication – Deposition methods. Fiber optic cables – Basic structure, Loose buffer cable, tight buffer cables, Cable classification. Installation- Classification, Procedure. Fiber connectors- Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing- Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints.

Source to fiber Power launching

Output patterns, Power coupling, Power launching vs Wavelength, Equilibrium Numerical Aperture, Laser diode to fiber coupling, Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of Error, Quantum limit, Analog receivers.

Optical system design – Point-to- point links- Link power budget, Rise time budget with examples, WDM, Necessity, Principles.

Course Outcomes for Fourth Year First Semester Courses	
Course code: **B16EC4103**	
Course Title: **FIBER OPTIC COMMUNICATIONS**	
CO-1	Choose necessary components required in modern optical communications systems.
CO-2	Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers.
CO-3	Use different types of photo detectors and optical test equipment to analyze optical fiber and light wave systems.
CO-4	Choose the optical cables for better communication with minimum losses.
CO-5	Design, build, and demonstrate optical fiber experiments in the laboratory.

SYLLABUS: MICROWAVE ENGINEERING AND OPTICAL COMMUNICATION LAB (B16EC4104)

LIST OF EXPERIMENTS

1. Measurement of Frequency and Guide Wavelength
2. Volt-Ampere characteristics of Gunn Diode
3. Measurement of Low VSWR and Unknown Load Impedance
4. Mode Characteristics of Reflex Klystron
5. Study of Directional Coupler Parameters
6. Measurement of losses in Optical Fiber
7. Measurement of Numerical Aperture
8. Study of Analog fiber Optic link
9. Study of Radiation pattern of Dipole Antenna in E-plane
10. Study of Radiation pattern of Dipole Antenna in H-plane
11. Study of Radiation pattern of Yagi-Uda Antenna in E-plane
12. Study of Radiation pattern of Yagi-Uda Antenna in H-plane

Course Outcomes for Fourth Year First Semester Courses	
Course code: **B16EC4104**	
Course Name: **MICROWAVE ENGINEERING AND OPTICAL COMMUNICATION LAB**	
CO-1	Make use of microwave equipment.
CO-2	Able to understand microwave measurements.
CO-3	Measure performance of simple microwave circuits and devices.
CO-4	Analyze the radiation patterns of antennas.
CO-5	Assess the performance of optical devices.

SYLLABUS: DIGITAL COMMUNICATION LAB (B16EC 4105)

LIST OF EXPERIMENTS:

1. Sampling theorem Verification.
2. Pulse Amplitude Modulation (PAM) and Demodulation.
3. Pulse Width Modulation (PWM) and Demodulation.
4. Pulse Position Modulation (PPM) and Demodulation.
5. Pulse Code Modulation (PCM) and Demodulation.
6. Differential Pulse Code Modulation (DPCM) and Demodulation.
7. Delta Modulation (DM) and Demodulation.
8. Phase Shift Keying (PSK).
9. Frequency Shift Keying (FSK).
10. Analog to Digital and Digital To Analog Conversion

Course Outcomes for Fourth Year First Semester Courses	
Course code: **B16EC4105**	
Course Name: **DIGITAL COMMUNICATION LAB**	
CO-1	Be able to understand basic theories of Digital communication system in practical.
CO-2	Be able to design and implement different modulation and demodulation techniques.
CO-3	Be able to Perform the time and frequency domain analysis of the signals in a digital communication system.
CO-4	Develop the skill to analyze and implement analogue to digital converters like PCM, DM.
CO-5	Have the ability to design pass band digital modulation systems and techniques with desired specifications

SYLLABUS: PROJECT PHASE-I (B16 EC 4106)

The phase-I of the project shall comprise of

- Problem identification in close collaboration with industry.
- Literature survey.
- Deriving work content and carry out of project requirement analysis.
- Submission of interim report.
- Presentation to an expert committee.

(Note: Sessional 50 marks will be awarded based on Continuous evaluation - 25 Marks Seminar and Viva voce - 25 Marks.)

Course Outcomes for Fourth Year First Semester Courses	
Course code: **B16EC4106**	
Course Name: **PROJECT PHASE-I**	
CO-1	Identify a current problem through literature/field/case studies and define the background objectives and methodology for solving the same.
CO-2	Write report and present it effectively.

SYLLABUS: CELLULAR AND MOBILE COMMUNICATIONS (B16EC4201)

Introduction to Mobile and Cellular Communication Systems: Introduction to wireless communications, examples of wireless communication systems, the cellular concept and system design fundamentals.

Elements of Cellular Radio Systems and Handoff Technologies:

Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Trunk and grade services, Methods for improving coverage and capacity in cellular system.

Multiple Access Techniques:

Multiple access techniques for wireless communications FDMA, TDMA, Spread Spectrumtechniques, SDMA, Packet Radio, CSMA, capacity of Cellular CDMA with multiple cells and capacity of SDMA.

GSM:

Wireless systems and standards, AMPS, IS-94, GSM traffic, Examples of GSM cell, Framestructure of GSM cell, details of forward and reverse CDMA channels.

Mobile Radio Propagation:

Introduction to mobile radio propagation, free space propagation models, large scale path loss, Reflection, Diffraction, Scattering, Outdoor and Indoor propagation models.

Course Outcomes for Fourth Year Second Semester Courses	
Course code: **B16EC4201**	
Course Name: **CELLULAR AND MOBILE COMMUNICATIONS**	
CO-1	Students are able to understand the fundamentals of mobile communication systems.
CO-2	Students are able to identify the problems and there remedies in wireless mobile communications.
CO-3	Students are able to analyze multiuser systems with the help of different multiplexing techniques.
CO-4	Students are able to understand the basics of GSM mobile communication standard, its architecture.
CO-5	Students are able to understand the various mobile propagation channel models and path loss models.

SYLLABUS: COMPUTER NETWORKS (B16EC4202)

Uses of Computer Networks, Line Configuration, Topology, Transmission mode, Categories of Networks-LAN, MAN, WAN; Network Software- Protocol Hierarchies, Design issues of layers, Connection Oriented and Connectionless services; Reference Models- The OSI Reference Model, The TCP/IP Reference Model, The B-ISDN ATM Reference Model.

Theoretical basis for Data communication, Transmission media- Guided and Unguided Transmission media; The Telephone System-Structure of Telephone system, Trunks and Multiplexing, Frequency Division Multiplexing, Time Division Multiplexing, Switching- Circuit

Switching, The Switch Hierarchy, Crossbar switches, Space Division Switches, Time Division Switches; Narrow band ISDN, Broadband ISDN and ATM- Virtual Circuits versus Circuit Switching.

DATA LINK LAYER

Design issues, Error Detection and Correction, Elementary Data link protocols, Sliding window protocols, HDLC, **Medium access sub layer**-The Channel allocation problem, Multiple Access Protocols-ALOHA, Carrier Sense Multiple Access protocols; IEEE standard for 802 LANs, Satellite Networks

NETWORK LAYER

Design considerations, Difference between Gateways, Ethernet switch, Router, Hub, Repeater, Congestion Control algorithms- General principles of Congestion Control, Congestion prevention policies. The Leaky bucket algorithm and Token bucket algorithm, The Network Layer in the Internet- The IP Protocol, IP Addresses.

TRANSPORT LAYER

The Transport layer Service, Elements of Transport protocols, The Internet Transport Protocols- UDP, TCP.

APPLICATION LAYER

The Domain Name System, Electronic mail, The World Wide Web.

Course Outcomes for Fourth Year Second Semester Courses	
Course code: **B16 EC 4202**	
Course Name: **COMPUTER NETWORKS**	
CO-1	Explain basic computer network principles and layers of the OSI model and TCP/IP.
CO-2	Explain the concepts of transmission media, switching and multiplexing techniques.
CO-3	Explain and analyse the error control and flow control methods.
CO-4	Explain different multiple access control protocols and IEEE standards for LANs and MANs.
CO-5	Identify the different types of connecting devices and explain the basic concepts of congestion control algorithms and internetworking.
CO-6	Explain TCP and UDP header formats.

SYLLABUS: INTERNET OF THINGS (IOT) (B16EC4203)

(Elective – III)

Introduction

IoT overview, The IoT paradigm, Smart objects, IoT Platforms (like Aurdino, ARM Cortex, Raspberry Pi / Intel Galileo), Bits and atoms, Convergence of Technologies.

Introduction to Internet and web networking basics: HTTP, Rest, JSON, XML, Interfacing to Cloud Harnessing mobile computing for IoT

Introduction to Technologies behind IoT:

RFID, NFC, Mobil Data Technologies (GPRS, 3G, 4G), Wifi, Powering the IoT using low power wireless technologies like Bluetooth smart technology, Zigbee, WSN. RTLS + GPS, Agents and Multi agent systems.

IoT Architecture:

Machine to Machine, Web of Things, IoT protocols (The Layering concepts, IoT Communication Pattern, IoT protocol Architecture, The 6LoWPAN - IPv6 over Low power Wireless Personal Area Networks)

IoT Applications and issues:

Combination scenarios, breaking assumptions, IoT in retail, IoT in healthcare, IoT in manufacturing.

Prototyping Connected Objects: Open source prototype platforms, Arduino based internet communication. Integrating and accessing Internet services, Raspberry PI / Beagle board based Gateways, Data Analysis Techniques.

Case Studies:

Case studies from Industry for different verticals like Retail, Healthcare, Home automation etc.

Course Outcomes for Fourth Year Second Semester Courses	
Course code: **B16EC4203**	
Course Title: **INTERNET OF THINGS (IOT)**	
CO-1	Interpret the vision of IOT from a global context.
CO-2	Determine the IOT Architecture and application perspective
CO-3	Identifying and describing different kinds of Internet-connected product concepts.
CO-4	Analyzing, designing, and developing prototypes models of Internet-connected products using various tools.
CO-5	Understanding the challenges and applying right techniques for user-interaction with connected-objects.

SYLLABUS: DIGITAL SYSTEM DESIGN THROUGH HDL (B16EC4204)

(Elective-III)

Digital Logic Design using VHDL

Introduction, designing with VHDL, design entry methods, logic synthesis , entities , architecture, packages and configurations, types of models: dataflow , behavioral , structural, signals vs. variables, generics, data types, concurrent vs. sequential statements , loops and program controls.

Combinational Logic Circuit Design using VHDL

Combinational circuits building blocks: Multiplexers, Decoders, Encoders, Code converters, Arithmetic comparison circuits , VHDL for combinational circuits , Adders-Half Adder, Full Adder, Ripple-Carry Adder, Carry Look-Ahead Adder, Subtraction, Multiplication. Sequential Logic Circuit: Design using VHDL Flip-flops, registers & counters, synchronous sequential circuits: Basic design steps, Mealy State model, Design of FSM using CAD tools, Serial Adder Example.

Digital Logic Design using Verilog HDL

Introduction, Verilog Data types and Operators, Binary data manipulation, Combinational and Sequential logic design, Structural Models of Combinational Logic, Logic Simulation, Design Verification and Test Methodology, Propagation Delay, Truth Table models using Verilog.

Digital Logic Circuit Design Examples using Verilog HDL

Behavioral modeling , Data types, Boolean-Equation-Based behavioral models of combinational logics , Propagation delay and continuous assignments , latches and level-sensitive circuits in Verilog, Cyclic behavioral models of flip-flops and latches and Edge detection, comparison of styles for behavioral model; Behavioral model, Multiplexers, Encoders and Decoders, Counters, Shift Registers, Register files, Dataflow models of a linear feedback shift register.

Testing of Digital Logic Circuit Design

Machines with multi cycle operations, ASM and ASMD charts for behavioral modeling. Testing of logic circuits, fault model, complexity of a test set, path-sensitization, circuits with tree structure, random tests, testing of sequential circuits, built in self-test.

Course Outcomes for Fourth Year Second Semester Courses	
Course code: **B16EC4204**	
Course Title: **DIGITAL SYSTEM DESIGN THROUGH HDL**	
CO-1	To understand and design complex digital systems at several level of abstractions.
CO-2	To create circuits that realizes specified digital functions.
CO-3	To identify logic and technology-specific parameters to control the functionality.
CO-4	To design and model complex digital system.
CO-5	To verify several digital circuits using different techniques.

SYLLABUS: BIO MEDICAL SIGNAL PROCESSING (B16EC4205)

Introduction to Biomedical Signals

The nature of Biomedical Signals, Examples of Biomedical Signals, Objectives and difficulties in biomedical analysis, Electrocardiography: Basic electrocardiography, ECG lead systems, ECG signal characteristics, Simple signal conversion systems, Conversion requirements for biomedical signals, Signal conversion circuits

Signal Averaging and Adaptive Noise cancelling

Basics of signal averaging, signal averaging as a digital filter, a typical average, software for signal averaging, limitations of signal averaging. Principal noise canceller model, 60-Hz adaptive cancelling using a sine wave model, other applications of adaptive filtering

Data Compression Techniques

Turning point algorithm, AZTEC algorithm, Fan algorithm, Huffman coding, data reduction algorithms The Fourier transform, Correlation, Convolution, Power spectrum estimation, Frequency domain analysis of the ECG

Cardiological signal processing

Basic Electrocardiography, ECG data acquisition, ECG lead system, ECG signal characteristics (parameters and their estimation), Analog filters, ECG amplifier, and QRS detector, Power spectrum of the ECG, Band pass filtering techniques, Differentiation techniques, Template matching techniques, A QRS detection algorithm, Real-time ECG processing algorithm, ECG interpretation, ST segment analyzer, Portable arrhythmia monitor

Neurological signal processing and Analysis of EEG signals

The brain and its potentials, the electrophysiological origin of brain waves, The EEG signal and its characteristics (EEG rhythms, waves, and transients), Correlation, Detection of EEG rhythms, Template matching for EEG, spike and wave detection.

Course Outcomes for Fourth Year Second Semester Courses	
Course code: **B16EC4205**	
Course Title: **BIO MEDICAL SIGNAL PROCESSING**	
CO-1	Possess the basic mathematical skills necessary to analyse ECG and EEG signals.
CO-2	Possess the basic scientific skills necessary to analyse ECG and EEG signals.
CO-3	Possess the basic computational skills necessary to analyse ECG and EEG signals.
CO-4	Applyclassicalandmodernfilteringandcompressiontechniquesforecgand EEG signals.
CO-5	Develop an understanding on basics of ECG and EEG feature extraction.

SYLLABUS: SATELLITE COMMUNICATION (B16 EC 4206)

(Elective-III)

SATELLITE ORBITS

Kepler's Laws, orbital parameters, orbital perturbations, station keeping, geo stationary and non- Geo-stationary orbits – Look Angle Determination- Limits of visibility, eclipse-Sub satellite point, Sun transit outage-Launching Procedures - launch vehicles and propulsion.

SPACE SEGMENT

Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command.

EARTH SEGMENT

The earth station - HPA – Downlink – Output back off – Satellite TWTA output – Effects of rain– Uplink rain– Fade margin – Downlink rain – Fade margin – Combined uplink and downlink C/N ratio .

SATELLITE ACCESS

Modulation and Multiplexing: Voice, Data, Video, and Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, Assignment Methods, Spread Spectrum communication.

SATELLITE APPLICATIONS

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS) - Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- World space services.

Course Outcomes for Fourth Year Second Semester Courses	
Course code: **B16EC4206**	
Course Title**: SATELLITE COMMUNICATION**	
CO-1	Choose necessary components required in modern satellite communications systems.
CO-2	Design and build space segment, depending upon the requirement.
CO-3	Design link margin for various applications.
CO-4	Choose the correct multiple access technique for better communication with minimum losses.
CO-5	Design, build, and demonstrate satellite communication link in the laboratory.

SYLLABUS: DIGITAL TV (B16 EC 4207)

(Elective-III)

Fundamentals of video principals:

Principals of color vision, the CIE color system, applications of visual properties, Essential video system characteristics, the principals of video compression.

Digital TV standards:

DTV audio encoding and decoding, DTV transport system, DTV satellite transmission, DTV data broad casting.

Advanced Television (ATV) Concepts:

Why the industry is moving to DTV, Standardization efforts towards a single Standard, the ATV emergence, the digital solution, interoperability, flexibility.

DTV picture formats:

HDTV formats, Data multiplexing, HANC multiplexing.

Digital signal compression:

Video compression standards, video data structure hierarchy, JPEG and motion JPEG schemes, MPEG-1, MPEG-2 video schemes.

Course Outcomes for Fourth Year Second Semester Courses	
Course code: **B16EC4207**	
Course Title: **DIGITAL TV**	
CO-1	Choose necessary components required in modern digital TV systems.
CO-2	Design a TV transport system.
CO-3	Design necessary formats for various applications.
CO-4	Choose the correct compression format of available.
CO-5	Design, build, and demonstrate digital TV transmission in the laboratory.

SYLLABUS: PROJECT PHASE-II (B16 EC 4208)

The phase-II of the project shall consists of

Implementing,

Testing and validation,

Report Writing.

Sessional (50 Marks) will be awarded by the Project Guide based on continuous evaluation. External Evaluation (100 marks) of project report and viva voce will be conducted by a committee consisting of HOD, Guide and External Examiner.

May be carried out using in-house facilities or in an industry by specified number of students in a group.

Format for Preparation of Project Thesis for B. Tech:

Arrangement Of Contents: The sequence in which the project report material should be arranged and bound should be as follows:

1. Cover Page & Title Page .
2. Bonafide Certificate
3. Abstract.
4. Table of Contents
5. List of Tables
6. List of Figures
7. List of Symbols, Abbreviations and Nomenclature
8. Chapters
9. Appendices
10. References

*The table and figures shall be introduced in the appropriate places.

Course Outcomes for Fourth Year Second Semester Courses	
Course code: **B16EC4208**	
Course Name: **PROJECT PHASE-II**	
CO-1	Identify a current problem through literature/field/case studies and define the background objectives and methodology for solving the same.
CO-2	Analyze, design and develop a technology/ process.
CO-3	Implement and evaluate the technology at the laboratory level.
CO-4	Write report and present it effectively.

ELECTRICAL AND ELECTRONICS ENGINEERING

ESTD: 1980

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204.

(AP) **SYLLABUS: ENGLISH** (B16 ENG1101)

(Common to all Branches)

Listening Skills

Conversations: Life in a Hostel – Eating Away those Blues – Meeting Carl Jung – A Documentary on the Big Cat – A Consultant Interviewing Employees – A Conversation about a Business Idea.

Speaking Skills

Your Favorite Holiday Destination – Describe Yourself – Why we need to save our Tiger – A Dialogue – Your First Interview – Pair Work: Setting up a New Business.

Reading Skills

Reading Comprehension: Famous People – What is Personality, Personality based on Blood Groups – News Report, Magazine Article, Mobile Towers and Health – An Excerpt from a Short Story, An Excerpt from a Biography – Open Letter to Prime Minister, Business Dilemmas: An Email Exchange – A Review of IPL: The Inside Story, Mark Zukerberg: World's Youngest Billionaire.

Writing Skills

Letter Writing, Essay Writing, Email Writing, Report Writing, Paragraph Writing, Drafting a Pamphlet, Argument Writing, Dialogue Writing.

Grammar

Types of Sentences, Articles, Prepositions, Gerunds and Infinitives, Conjunctions, Tense, Quantifiers, Punctuations, Correction of Sentences, Fill-in the Blanks.

Vocabulary

Synonyms, Antonyms, Idioms, One Word Substitution.

Life Skills and Core Skills

Self-Awareness and Self-Motivation – Communication, Adaptability – Motivation, Problem Solving – Personal Presentation Skills, Stress Management – Professionalism – Ethics.

Course Outcomes for First Year First Semester Course	
Course Code: B16 ENG1101	
Course Title: ENGLISH	
CO-1	The overall performance of the students will be enhanced after the course; they will be in a position to make presentations on topics of current interests – politics, famous personalities, science and technology, tourism, work and business environment, with increased public speaking skills.
CO-2	Students will be able to read, listen, speak and write effectively in both academic and non- academic environment.
CO-3	The students will be updated with certain real life situations, which they can handle when come face to face.

SYLLABUS: MATHEMATICS – I (B16ENG 1102)

(Common to all Branches)

Partial Differentiation

Functions of two or more variables – Partial derivatives – Homogeneous Functions – Euler's Theorem – Total Derivative – Change of Variables – Jacobians – Geometrical Interpretation: Tangent Plane and Normal to a Surface.

Applications of Partial Differentiation

Taylor's Theorem for functions of two variables – Errors and Approximations – Total Differential – Maxima and Minima of functions of two variables – Lagrange's Method of Undetermined Multipliers – Differentiation Under the Integral Sign – Leibnitz's Rules.

Ordinary Differential Equations of First Order and First Degree

Formation of ordinary differential equations (ODEs) – Solution of an ordinary differential equation – Equations of the First Order and First Degree – Linear Differential Equation – Bernoulli's Equation – Exact Differential Equations – Equations Reducible to exact equations.

Applications of Differential Equations of First Order

Orthogonal Trajectories – Simple electric (LR & CR) Circuits – Newton's Law of Cooling – Law of Natural growth and decay.

Linear Differential Equations of Higher Order

Solutions of Linear Ordinary Differential Equations With Constant Coefficients – Rules for finding Complimentary Function – Rules for finding the particular integral – Method of variation of parameters – Cauchy's linear equation – Legendre's Linear Equation – Simultaneous linear equations.

Fourier series

Introduction - Euler's Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series – Parseval's Formula.

Course Outcomes for First Year First Semester Courses	
Course Code : B16 ENG 1102	
Course Title: MATHEMATICS - I	
CO-1	Find partial derivatives, expand a function of more than one variable in a Taylor series and utilize them for errors and approximations, maxima and minima.
CO-2	Solve a first order ODE and also find orthogonal trajectories and solve problems related to simple applications.
CO-3	Solve a given higher order ODE, an equation with constant coefficients, a Cauchy's equation or a Legendre's equation.
CO-4	Utilize knowledge of Fourier series for solving partial differential equations and also in understanding courses like Signals & Systems

SYLLABUS: MATHEMATICS – II (B16 ENG 1103)

(Common to all Branches)

Matrices – I

Rank of a matrix - Normal Form – Solutions of Linear System of Equations- Consistency of Linear System of Equations – Rouche's Theorem (statement) - Direct Methods: Gauss Elimination Method, LU Factorization Method – Eigen Values and Eigen Vectors of a Matrix– Properties - Cayley – Hamilton Theorem – Inverse and Powers of a Matrix using Cayley – Hamilton Theorem.

Matrices – II

Diagonalization of a Matrix – Quadratic Forms – Reduction of Quadratic Form to Canonical Form – Nature of a Quadratic Form – Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

Laplace Transforms-I

Introduction – Existence Conditions – Transforms of Elementary Functions – Properties of Laplace Transforms – Transforms of Derivatives – Transforms of Integrals – Multiplication by t – Division by t – Evaluation of Integrals by Laplace Transforms – Laplace Transforms of Unit Step Function, Unit Impulse Function and Periodic Functions.

Laplace Transforms-II

Inverse Laplace Transform – different methods - Convolution Theorem – Applications of Laplace Transforms to Ordinary Differential Equations, Simultaneous Linear Differential Equations with Constant Coefficients.

Difference Equations

Definition - order and solution of a difference equation - Formation of difference equations - Linear difference equations - Rules for finding C.F. - Rules for finding P.I.- Simultaneous difference equations with constant coefficients. Application to deflection of a loaded string.

Z-transforms

Z-transforms – definition - some standard Z-transforms - Linear property, damping rule - some standard results - shifting rules - initial and final value theorems - convolution theorem- Evaluation of inverse transforms - Applications of Z-transform to difference equation.

Course Outcomes for First Year First Semester Courses	
Course Code: B16 ENG 1103	
Course Title: MATHEMATICS – II	
CO-1	Utilizing the knowledge of matrices for solving linear simultaneous equations, find Eigen values and Eigen vectors and handle quadratic forms
CO-2	Utilizing the knowledge of Laplace Transforms to find transforms of important functions that arise in applications and also solve ODE
CO-3	Also utilizing the knowledge of Laplace Transforms in courses like Net Works, Signals & Systems and Control Systems
CO-4	Utilizing the knowledge of difference equations and Z-transforms in understanding courses like Discrete Mathematical Structures and also Signals & Systems

 SYLLABUS: PHYSICS (B16 ENG 1105)

(Common to CIVIL, CSE & IT)

Thermodynamics

Introduction, Heat and Work, First Law of Thermodynamics and applications, Reversible and Irreversible Process, Carnot Cycle and Efficiency, Second Law of Thermodynamics, Carnot's Theorem, Entropy, Second Law in terms of entropy, Entropy and disorder, Third Law of Thermodynamics (Statement Only).

Electromagnetism

Effect of Magnetic Field on – moving charges, current in long straight wire and rectangular Current Loop, Hall Effect, Biot-Savart's Law, B near a Long Wire, B for a Circular Current Loop, Ampere's Law, B for a Solenoid, Faraday's Law of electromagnetic induction, Lenz's law, Inductance of a solenoid, L-R Circuit, Displacement Current, Maxwell's Equations (integral form) and their significance (without derivation).

Interference

Principle of Super Position – Young's Experiment – Coherence – Inference in thin transparent films, Newton's Rings, Michelson Interferometer and its applications.

Lasers

Introduction, spontaneous and stimulated emissions, requirements of laser device, Ruby Laser, Gas Laser (He-Ne Laser), Semiconductor diode Laser, Characteristics and applications of Lasers.

Optical Fibers

Introduction, Principles of light propagation in optical fiber, Acceptance angle, Numerical aperture, types of fiber, Applications of Optical Fibers, Optical Fiber in Communications, advantages.

Ultrasonics

Definition, Production of Ultrasonics by Magnetostriction and Piezoelectric methods, detection methods, acoustic grating, characteristics and applications of Ultrasonics.

Modern Physics

Introduction, de Broglie concept of matter waves, Properties of matter waves, experimental verification (Davisson-Germer experiment), Heisenberg uncertainty principle, Wave function and its physical significance, Schrodinger time independent wave equation, application to a particle in a box, Band theory of Solids, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semiconductors and insulators .

Nano phase Materials

Definition, Synthesis – Synthesis methods, Condensation and Ball milling, chemical vapor deposition method – sol-gel methods, Characterization, analysis and applications of Nano materials.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1105	
Course Title: PHYSICS	
CO-1	Students learn in depth about the topics of Lasers, fiber optics, quantum mechanical theory and classical theories of thermodynamics and electromagnetism,
CO-2	Students understand the classical and modern concepts.

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

ChinnaAmiram, Bhimavaram-534204. (AP)

ESTD: 1980

SYLLABUS: ENGINEERING GRAPHICS (B16 ENG 1107)

(Common to CIVIL, CSE & IT)

Introduction

Lines, Lettering and Dimensioning. Geometrical Constructions.

Curves

Conic sections: General construction of ellipse, parabola and hyperbola. Construction of involutes Normal and Tangent.

Projections of Points

Principal or Reference Planes, Projections of a point situated in any one of the four quadrants

Projections of Straight Lines

Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of straight line inclined to both the reference planes:

Projections of Planes

Projection of Perpendicular planes: Perpendicular to both reference planes, perpendicular to one reference plane and parallel to other reference plane, perpendicular to one reference plane and inclined to other reference plane. Projection of Oblique planes. Introduction to Auxiliary Planes.

Projections of Solids

Types of solids: Polyhedra and Solids of revolution. Projection of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to other and axes inclined to both the reference planes.

Projections of Section of Solids

Section Planes: Parallel and inclined section planes, Sections and True shape of section, Sections of Solids: Prism, Pyramid, Cylinder and Cone.

Development of Surfaces

Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

Isometric Views

Introduction to Isometric projection, Isometric scale and Isometric view. Isometric views of simple planes. Isometric view of Prisms, Pyramids, cylinder and cone. Isometric view of a combination of solids.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1107	
Course Title: ENGINEERING GRAPHICS	
CO-1	Apply principles of drawing to represent dimensions of an object.
CO-2	Construct polygons and engineering curves.
CO-3	Draw projections of points, lines, planes and solids.
CO-4	Represent sectional views of solids.
CO-5	Develop the surfaces of regular solids.
CO-6	Draw the isometric views of solids and combination of solids.

SYLLABUS: PROFESSIONAL ETHICS AND MORAL VALUES (B16 ENG 1109)

(Common to CIVIL, CSE & IT)

Ethics and Human Values

Ethics and Values, Ethical Vision, Ethical Decisions, **Human Values** – Classification of Values, Universality of Values.

Engineering Ethics

Nature of Engineering Ethics, Profession and Professionalism, Professional Ethics, Code of Ethics, Sample Codes – IEEE, ASCE, ASME and CSI.

Engineering as Social Experimentation

Engineering as social experimentation, Engineering Professionals – life skills, Engineers as Managers, Consultants and Leaders, Role of engineers in promoting ethical climate, balanced outlook on law.

Safety Social Responsibility and Rights

Safety and Risk, moral responsibility of engineers for safety, case studies – Bhopal gas tragedy, Chernobyl disaster, Fukushima Nuclear disaster, Professional rights, Gender discrimination, Sexual harassment at work place.

Global Issues

Globalization and MNCs, Environmental Ethics, Computer Ethics, Cyber Crimes, Ethical living, concept of Harmony in life.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1109	
Course Title: PROFESSIONAL ETHICS AND MORAL VALUES	
CO-1	By the end of the course student should be able to understand the importance of ethics and values in life and society.

SYLLABUS: PHYSICS LAB (B16 ENG 1111)

(Common to CIVIL, CSE & IT)

LIST OF EXPERIMENTS

1. Sonometer – verification of laws of transverse vibrations in stretched strings.
2. Melde's Experiment – Determination of the frequency of an electrically maintainedtuning fork.
3. Newton's Rings – Determination of radius of curvature of a convex lens.
4. Diffraction Grating – Determination of Wavelengths of lines of mercury spectrum usingspectrometer by normal incidence method.
5. Determination of Cauchy's constants of the material of the given prism usingSpectrometer and mercury light.
6. Wedge Method – Determination of thickness of a paper by forming parallel interferencefringes.
7. Variation of magnetic field along the axis of current carrying circular coil – Stewart and Gee's apparatus.
8. Carey Foster's bridge – Verification of laws of resistance.
9. Lee's Method – Determination of coefficient of thermal conductivity of a bad conductor.
10. Calibration of voltmeter using potentiometer.
11. Calibration of low range Ammeter using potentiometer.
12. Laser – Diffraction.

SYLLABUS: WORKSHOP (B16 ENG 1113)

(Common to CIVIL, CSE & IT)

Carpentry

Bench Work, tools used in carpentry.

Jobs for Class work – half lap joint, mortise and tenon joint, half – lap dovetail joint, cornerdovetail joint, central bridle joint.

Sheet Metal

Tools used in sheet metal work, Laying development of the sheet metal jobs, soldering.

Jobs for class works – Square tray, taper tray (sides), funnel, and elbow pipe joint, 60^0 pipe joint.

Fitting

Tools used in fitting work, Different files, chisels, hammers and bech vice.

Jobs for class work – Square, hexagon, rectangular fit, circular fit and triangular fit.

Course Outcomes for First Year First Semester Courses	
Course code: B16 ENG 1113	
Course Name: WORKSHOP	
CO-1	Use various tools to prepare basic carpentry and fitting joints.
CO-2	Fabricate simple components using tin smithy.

SYLLABUS: MATHEMATICS – III (B16 ENG 1201)

(Common to all Branches)

Solid Geometry

Equations of a plane, Normal form, Intercept form, Equations of Straight Line – Conditions for a line to lie in a Plane – Coplanar lines – Shortest distance between two skew lines - Intersection of three Planes – Equations of Sphere – Tangent Plane to a Sphere –Cone – Cylinder.

Multiple Integrals-1

Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

Multiple Integrals-2

Beta Function - Gamma Function - Relation between Beta and Gamma Functions-Error Function - Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of mass - Center of gravity of a plane lamina- Moment of inertia.

Fourier Transforms

Introduction – definition - Fourier integral - Sine and Cosine integrals - Complex form of Fourier integral - Fourier transform - Fourier Sine and Cosine transforms -Finite Fourier Sine and Cosine transforms - properties of Fourier transforms, Convolution theorem for Fourier transforms - Perceval's identity for Fourier transforms - Fourier transforms of derivatives of a function.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1201	
Course Title: MATHEMATICS – III	
CO-1	Utilize knowledge of line, sphere etc. in his engineering subjects
CO-2	Utilize the knowledge of Beta and Gamma functions and multiple integrals to evaluate the integrals they come across in their applications
CO-3	Utilize the knowledge of Fourier Transform in courses like Signals and Systems and in the solution of partial differential equations at a later stage

SYLLABUS: CHEMISTRY (B16 ENG 1203)

(Common to CIVIL, CSE & IT)

Water Chemistry

Source of water- impurities- Hardness and its determination by EDTA method- Boiler troubles and their removal. Water softening methods- lime soda, zeolite and ion exchange. Municipal water treatment- Break point chlorination. Desalination of sea water – electro dialysis and reverse osmosis methods.

Building Materials

Portland cement: Manufacture-Chemistry involved in setting and hardening of cement – Cement concrete -RCC –Decay of concrete.

Refractories: Classification-Properties and Engineering applications. Ceramics: Classification-Properties and uses.

Solid State Chemistry

Classification of solids-Types of crystals-properties-Imperfections in crystals. Band theory of solids. Chemistry of semiconductors –Intrinsic, Extrinsic, compound and defect. Organic semiconductors Purification of solids by Zone refining-Single crystal growth – epitaxial growth. Elementary ideas on Liquid crystals.

Corrosion Chemistry

Definition of corrosion- Types of corrosion-chemical & electrochemical corrosion –Pitting, stress corrosion, galvanic corrosion, and Water line corrosion Factors affecting corrosion – Prevention of corrosion- Cathodic protection. Corrosion inhibitors Protective coatings- Metallic coatings, electro plating, electro less plating, chemical conversion coatings- phosphate coatings, chromate coatings, anodizing. Organic coatings-Paints.

Polymers and Plastics

Definition-Types of polymerization – mechanism of free radical polymerization. Plastics- Thermosetting and thermoplastic resins cellulose derivatives, vinyl resins, nylon 6,6, bakelite-Compounding of plastics-Fabrication of plastics. Fiber reinforced plastics – conducting polymers -Engineering applications of polymers.

Fuels and Lubricants

Solid fuels: Coal –Analysis of coal – Metallurgical coke- manufacture-Engineering applications.

Petroleum-refining-Knocking and Octane number of gasolilne-Cetane number of diesel oil. Synthetic petrol – LPG-CNG–Applications. Rocket fuels – Propellants-classification.

LUBRICANTS: Principles of lubrications, classification of lubricants and properties of lubricants (any five)

Course Outcomes for First Year First Semester Course	
Course Code: B16 ENG 1203	
Course Title: CHEMISTRY	
CO-1	Students learn in-depth about the topics of desalination of sea water, CNG, LPG Biogas, Semiconductors, Liquid crystals, Conducting polymers, fiber reinforced plastics, building materials
CO-2	Students understand the basic and advanced applied concepts.
CO-3	Students learn to interrelate the theory and with the relevant experiment.
CO-4	Students learn experimental techniques and understand the theory about experiments

SYLLABUS: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS (B16 ENG 1205)

(Common to CIVIL, CSE & IT)

Introduction to C

Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations, Formatted Input, Formatted Output.

Decision Making, Branching, Looping, Arrays & Strings: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else. If ladder, switch statement, the (?:) operator, the GOTO statement., The while statement, the do statement, The for statement, Jumps in Loops ,One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

Functions

Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, The scope, visibility and lifetime of variables.

Pointers

Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications

Structure and Unions

Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

File handling

Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments- Program Applications.

Numerical Methods

Solutions of Algebraic and Transcendental Equations: Bisection Method, Newton Raphson Method.

Interpolation - Newton's forward and backward Interpolation, Lagrange's Interpolation in unequal intervals.

Solutions of Linear Equations: Gauss Elimination Method, Jacobi and Gauss Seidel Methods. Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule.

Solutions of Ordinary First Order Differential Equations: Euler's Method, Modified Euler's Method and Runge-Kutta Method.

Course Outcomes for First Year Second Semester Courses	
Course code: B16 ENG 1205	
Course Title: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS	
CO-1	Student can understand basic terminology used in C programming. 2. 3. 4. 5.
CO-2	Student can write programs by applying elementary algorithms to solve problems in C language.
CO-3	Student can write, compile and debug programs in C language.
CO-4	Student can Write programs to solve numerical methods.
CO-5	Student can be familiar with finite precision computation.

SYLLABUS: ELECTRONIC DEVICES AND CIRCUITS (B16 EC 1208)

(For ECE)

Transport Phenomena in Semiconductors:

Mobility and conductivity, intrinsic and extrinsic semiconductors, mass action law, charge densities in a semiconductors, Hall Effect, generation and recombination of charges, drift and diffusion currents, continuity equation, injected minority carrier charge, potential variation in graded semiconductors.

PN junction diode:

Open circuited PN junction , PN junction as a rectifier, current components in a PN diode, V-I characteristics and its temperature dependence, transition capacitance, charge control description of a diode, diffusion capacitance, junction diode switching times, Zener diode, Tunnel Diode, Photo diode, Point Contact diode, Schottky barrier diode, varactor diode, PIN diode, LED.

Diode Rectifiers:

Half wave, Full wave and Bridge Rectifiers with and without filters, Ripple factor and regulation characteristics

Bipolar junction transistors:

Introduction to BJT, operation of a transistor and transistor biasing for different operating conditions, transistor current components, transistor amplification factors: α,β,γ relation between α and β,γ early effect or basewidth modulation, common base configuration and its input and output characteristics, common emitter configuration and its input and output characteristics, common collector configuration and its input and output characteristics, Comparison of CE, CB and CC Configurations, Break- down in transistors, Photo Transistor.

Field Effect transistors

JFET and its characteristics, pinch off voltage, FET small signal model, MOSFET and its characteristics

Transistor Biasing Circuits

The operating point, Bias stability, different types of biasing techniques, stabilization against variation in I_{co} , $V_{BE,}$ & β. Bias compensation, thermal runaway, thermal stability, Biasing of FETs.

Transistors at low and High frequencies

Transistor hybrid model, h-parameters, Analysis of transistor amplifier circuits using h- parameters, comparison of transistor amplifier configurations, analysis of single stage amplifier, effects of bypass and coupling capacitors, frequency response of CE amplifier, Emitter follower, High frequency model of transistor.

Course Outcomes for First Year Second Semester Courses	
Course code:**B16 EC 1208**	
Course Title: **ELECTRONIC DEVICES AND CIRCUITS**	
CO-1	Understand the physical structure, principles of operation, electrical characteristics and circuit models of diodes, BJTs and FETs.
CO-2	Use this knowledge to analyse and design basic electronic application circuits.
CO-3	Extend the understanding of how electronic circuits and their functions fit into larger electronic systems.

SYLLABUS: CIRCUIT THEORY (B16 EE 1208)

(For EEE)

Fundamentals of Electric Circuits

Concepts of Electric circuit: EMF, Current, Potential difference, Power and Energy; Concepts of Network: Active and Passive elements, classification of Linear, Non-linear, Unilateral, Bilateral Lumped and Distributed elements; Reference directions for current and voltage; Voltage and Current sources; Voltage-Current Relations of R, L, C elements; Voltage and Current division; Series and Parallel combinations of Resistance, Inductance and Capacitance

D.C Circuits

Kirchhoff's Laws; Nodal Analysis, Mesh Analysis, Source Transformation, Linearity and Superposition Theorem, Thiamin's And Norton's Theorems, Reciprocity theorem, Maximum Power Transfer Theorem, Star-Delta Transformation.

AC Circuits

The Sinusoidal Forcing Function, Phasor Concept, Average and Effective Values of Voltage and Current, Instantaneous and Average Power, Complex Power, Steady State Analysis using Mesh and Nodal Analysis, Resonance.

Three Phase Circuits

Advantages of Three Phase Circuits, Balanced and Unbalanced systems, Relation between Line and Phase Quantities in Star and delta connected circuits, Analysis of Balanced & Unbalanced Three Phase Circuits, Measurement of Power in Three Phase Power Circuits.

Magnetic Circuits

Magneto motive force(MMF), Reluctance, Magnetic flux; Analysis of magnetic circuit, Analogy between Electric & Magnetic circuits, Series Magnetic circuits, Magnetic leakage, B-H curve, Faraday's Laws of Electromagnetic Induction, Induced EMF, Dynamically Induced EMF, Statically Induced EMF, Self-Inductance, Mutual Inductance.(simple numerical problems)

Course Outcomes for First Year Second Semester Courses	
Course code:**B16 EE 1208**	
Course Name: **CIRCUIT THEORY**	
CO-1	Able to develop an understanding of the basic fundamental electrical laws, elements of electric Networks and learn the techniques to measure voltage and current.
CO-2	Develops the ability to apply circuit theorems to DC and AC circuits.
CO-3	Able to analyse the coupled & three phase circuits.

SYLLABUS: METALLURGY AND MATERIALS ENGINEERING (B16 ME 1208)

(For Mechanical Engineering)

Structure of crystalline solids

Atomic structure & bonding in solids- Crystal structures-calculations of radius, Coordination Number and Atomic Packing Factor for different cubic structures - Imperfection in solids, point defects, Linear defects, Planar defects and Volume defects- Concept of Slip & twinning.

Phase diagrams

Basic terms- phase rule- Lever rule & free energy of phase mixtures cooling curves- Phase diagram & phase transformation - construction of phase diagrams- binary phase diagrams - Brass, Bronze, Al-Cu and AlSi phase diagrams- Invariant reactions, eutectic, ,peritectic, eutectoid, peritectoid, metatectic&monotectic reactions, Iron carbon phase diagram & microstructures of plain carbon steel & cast iron

Heat treatment

Heat treatment of steel- Annealing, and its types, normalizing, hardening, tempering, martemering, austempering - TTT diagrams, drawing of TTT diagram, TTT diagram for hypo-& hypereutectoid steels, effect of alloying elements, CCT diagram- Martensitic transformation, nature of martensitic transformation- Surface hardening processes like case hardening, carburizing, cyaniding, nitriding Induction hardening, hardenability, Jominy end-quench test, Age hardening of Al & Cu alloys Precipitation Hardening

Engineering Alloys

Properties, composition, microstructure and uses of low carbon, mild medium & high carbon steels. stainless steels, high speed steels, Hadfield steels, tool steels - Cast irons, gray CI, white CI, malleable CI, SC iron-The light alloys- Al & Mg & Titanium alloys- Copper & its alloys: brasses & bronzes- super alloys, Smart materials- Nano materials.

Composite Materials

Classification of composite materials, dispersion strengthened, particle reinforced and fiber reinforced composite laminates properties of matrix and reinforcement materials and structural applications of different types of composite materials.

Course Outcomes for First Year Second Semester Courses	
Course code: B16 ME 1208	
Course Title: METALLURGY AND MATERIALS ENGINEERING	
CO-1	Understand crystalline solids and their atomic structures. 20
CO-2	Suggest and recommend necessary engineering materials for specific applications keeping in view of the cost, design, reliability, life, working conditions and properties of the products.
CO-3	Understand different phase transformations in Iron-Iron Carbide diagram and distinguish between steels and cast irons.
CO-4	Select different materials for tools and components based on functional requirements.
CO-5	Use composite materials for different engineering applications like aerospace, automobile, ship building industry, sports item etc.

SYLLABUS: CHEMISTRY LAB (B16 ENG 1210)

(Common to CIVIL, CSE & IT)

LIST OF PRACTICAL EXPERIMENTS:

1. Estimation of Sodium hydroxide with HCl (Na_2CO_3 primary standard).
2. Estimation of Iron as Ferrous iron in an Ore Sample.
3. Estimation of Oxalic acid by a redox method
4. Estimation of Calcium in a sample of Portland cement.
5. Estimation of Volume strength of Hydrogen Peroxide.
6. Estimation of Mohr's salt by Potassium dichromate
7. Determination of Hardness of an underground water sample.
8. Estimation of Zinc by EDTA method.
9. Determination of Alkalinity of water sample.

DEMONSTRATION EXPERIMENTS:

10. Determination of Viscosity and Viscosity index of a lubricant.
11. Printed Circuit Board
12. Determination of dissolved oxygen in given water sample.
13. Potentiometric titrations.
14. P^H Determination by using P^H meter.

SYLLABUS: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS LAB (B16 ENG 1212)

LIST OF PROGRAMMES:

1. Write a program to read x, y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line.
2. Write a program which generates 100 random numbers in the range of 1 to 100. Store them in an array and then print the array. Write 3 versions of the program using different loop constructs (eg. for, while and do-while).
3. Write a set of string manipulation functions e.g. for getting a sub-string from a given position, copying one string to another, reversing a string and adding one string to another.
4. Write a program which determines the largest and the smallest number that can be stored in different data types like short, int, long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?
5. Write a program which generates 100 random real numbers in the range of 10.0 to 20.0 and sort them in descending order.
6. Write a function for transporting a square matrix in place (in place means that your are not allowed to have full temporary matrix).
7. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their mean and standard deviation.
8. Implement bisection method to find the square root of a given number to a given accuracy.
9. Implement Newton Raphson Method to determine a root of polynomial equation.
10. Given a table of x and corresponding f(x) values, write a program which will determine f(x) value at an intermediate x value using Lagrange’s Interpolation.
11. Write a function which will invert a matrix.
12. Implement Simpson’s 1/3rd rule for numerical integration.
13. Implement Trapezoidal rule for numerical integration.
14. Write a program to solve a set of linear algebraic equations.
15. Write a program to solve a differential equation using Runge-Kutta Method.

SYLLABUS: ENGLISH LANGUAGE LAB (B16 ENG 1213)

(Common to All Branches)

1. English Sound Pattern – Letters
2. Sounds of English
3. Pronunciation
4. Stress and Intonation

Laboratory Practice Sessions:

1. Letters and Sounds, Worksheet-1
2. Interactions-1, Worksheet-2
3. The Sounds of English, Worksheet-3
4. Interactions-2, Worksheet-4
5. Pronouncing Words-Some Important Patterns, Worksheet-5
6. Interactions-3, Worksheet-2
7. Stress and Intonation, Worksheet-2

Course Outcomes for First Year Second Semester Courses	
Course code: B16 ENG 1213	
Course Title: ENGLISH LANGUAGE LAB	
CO-1	Students will be sensitized towards recognition of English sound pattern.
CO-2	The fluency in speech will be enhanced.

SYLLABUS: MATHEMATICS IV (B16 ENG 2101)

(Common to CE, ECE, EEE & ME)

Vector Calculus-1

Definitions of Scalar and Vector point functions, Differentiation of vectors, Vector differential operator del, Del applied to scalar point function – gradient, Del applied to vector point function- divergence and curl, physical interpretation of gradient, divergence and curl(without proof), Del applied twice to a point function, Del applied to product of two functions, Irrotational and Solenoidal Fields, scalar potential

Vector Calculus-2

Integration of vectors, line integral, circulation, work done, surface integral, Flux, Green's, Stokes and Gauss Divergence Theorems (Without proofs). Introduction to orthogonal curvilinear coordinates, cylindrical polar coordinates and spherical polar coordinates.

Applications Of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables, One –dimensional wave equation- vibrations of a stretched string (no derivation)-, one-dimensional heat equation – Heat flow along a long horizontal bar (no derivation) (problems on heat equation involving homogeneous end conditions only), two dimensional Laplace equation in Cartesian coordinates.

Complex Variables-1

Review- Cartesian form and polar form of a complex variable, Real and imaginary parts of z^n, e^z, sin z, sinh z and log z**.**

Limit and continuity of a function of the complex variable, derivative, analytic function, properties of Analytic functions, Cauchy- Riemann equations, Harmonic functions and Orthogonal system, application of analytic function to flow problems, geometric representation of w=f(z), conformal mapping – Bilinear transformation only.

Complex Variables-2

Integration of complex functions, Cauchy's theorem, Cauchy's integral formula (statements only) Taylor and Laurent series expansions of functions (statement of theorems only), zeros and singularities, Residue, calculation of residues, Cauchy's Residue theorem (without proof), Evaluation of real and definite integrals- integration around a unit circle.

Course Outcomes for Second Year First Semester Courses	
Course code: B16 ENG 2101	
Course Title: MATHEMATICS – IV	
CO-1	Apply the concepts of Gradient, Divergence, Curl, Directional derivative, solenoidal and Irrotational fields
CO-2	Determine scalar potential, circulation and work done.
CO-3	Evaluate integrals using Green's, Stokes and Divergence theorems.
CO-4	Obtain the solution of 1-D wave equation and 1-D heat equation.
CO-5	Determine the zeroes and poles of functions and residues at poles.
CO-6	Evaluate certain real definite integrals that arise in applications by the use of Residue theorem.

SYLLABUS: NETWORK ANALYSIS & SYNTHESIS (B16 EE 2101)

DC Transients:

Inductor, capacitor, source free RL, RC & RLC response, evaluation of initial conditions, application of unit-step function to RL, RC & RLC circuits, concepts of natural, forced and complete response.

Laplace Transform Techniques:

Transforms of typical signals, response of simple circuits to unit step, ramp and impulse functions, initial and final value theorems, convolution integral, time shift and periodic functions, transfer function.

Coupled Circuits & Two-port Network parameters:

Magnetically coupled circuits, dot convention, reciprocity theorems, concept of duality, Two-port Network parameters - Z, Y, H & T parameters.

Network Functions:

Generalized network functions (driving point and transfer), Network functions for ladder & T-networks, concept of poles and zeros, determination of free and forced response from poles and zeros.

Network Synthesis:

Synthesis problem formation, Hurwitz polynomials, properties and test for positive real functions, elementary synthesis operations, Foster and Cauer Forms of LC, RC and RL networks.

Course Outcomes for Second Year First Semester Course	
Course Code: B16 EE 2101	
Course Title:NETWORK ANALYSIS & SYNTHESIS	
CO-1	Students will outline the significance of energy storing elements (Inductance &Capacitance) in circuits and study transient behavior of responses.
CO-2	Students will learn to apply Laplace transform technique for circuit analysis and knowits advantages.
CO-3	Students will learn to apply two-port network analysis for devices like amplifiers,transmission lines and understand how magnetic coupling can be included in circuit models.
CO-4	Students will learn the concept of network functions, poles and zeros and to determinethe response of network from poles and zeros. Networks(Foster, Cauer methods).
CO-5	Students will learn to apply the synthesis procedure for RC, LC &RL networks networks (Foster, Cauer methods). Networks(Foster, Cauer methods).

SYLLABUS: ELECTRO MAGNETIC FIELD THEORY (B16 EE 2102)

Coordinate systems:

Rectangular, cylindrical and spherical coordinate systems.

Electrostatics:

Coulomb's law and superposition principle, different types of charge configurations, electric flux, electric field intensity and electric flux density, electric field intensity and electric flux density due to different charge configurations, Gauss's law in integral form and point form in terms of D, applications of Gauss' law, Divergence theorem.

Electric potential, calculation of electric potential for giving charge configuration, electrostatic energy, Electrostatic boundary conditions, basic properties of conductors in electrostatic fields, capacitance, Poisons and Laplace's equations, solutions of Laplace's equations, uniqueness theorems, methods of images, electric dipoles, polarization of dielectrics, bound charges.

Magneto statics:

Biot-savart's law, determination of magnetic field intensity and magnetic flux density due to various steady current configurations, continuity equation, curl of $\overline{H}$, Ampere's circuital law in integral and differential form, applications of Ampere's law, Stokes theorem.

The scalar and vector magnetic potential and calculation of magnetic field through the vector magnetic potential for given steady current configurations, magneto static boundary conditions.

The magnetic dipole, magnetization, properties of magnetic materials, torques and forces on magnetic dipoles, bound current, Faraday's laws, Lenz's law, inductance and energy in magnetic fields.

Time varying fields and Maxwell's equations:

Lorentz force equation, Maxwell's equations, modification of amperes circuital law for time varying fields – displacement current and current density, the uniform plane wave, plane wave propagation, phase velocity and wavelength, intrinsic impedance, perfect dielectrics, attenuation, phase and propagation constants, skin depth, the poynting vector, poynting theorem and power considerations.

Course Outcomes for Second Year First Semester Course	
Course Code: B16EE2102	
Course Title: ELECTRO MAGNETIC FIELD THEORY	
CO-1	Find the electrostatic and magneto static fields for different configurations.
CO-2	Apply various principles and laws to estimate the effect of electric and magnetic fields. CO3 Distinguish between the effects of electrostatic and magneto static fields.
CO-3	Apply Maxwell's equations for static and time varying fields.
CO-4	Analyze the EM wave in different domains and compute average power density
CO-5	Analyze the EM wave in different domains and compute average power density

SYLLABUS: ELECTRICAL MEASUREMENTS & INSTRUMENTS (B16 EE 2103)

Philosophy of measurement

Methods of measurement, measurement system, classification of instrument system, characteristics of instruments & measurement system, errors in measurement & its analysis, standards.

Analog measurement of electrical quantities

Moving coil, moving iron, Electrodynamometer type, electrostatic and induction type instruments, electrodynamics wattmeter, three phase wattmeter, power in three phase system, errors & remedies in wattmeter and energy meter. Extension of instrument range, introduction to measurement of frequency and power factor.

Measurement of parameters

Different methods of measuring low, medium and high resistances, measurement of inductance & capacitance with the help of AC bridges. DC potentiometers and its applications. AC potentiometer - types & applications.

Magnetic measurement

Ballistic galvanometer, flux meter, determination of B-H curve and hysteresis loop, measurement of iron losses, current transformers and potential transformers.

Cathode Ray Oscilloscope:

Basic CRO circuit (block diagram), cathode ray tube (CRT) & its components, application of CRO in measurement of B-H curve.

Digital measurement of electrical quantities

Digital Instruments, Concept of digital measurement, Analog to digital & Digital to analog conversion, advantages of digital Instruments, digital display units, Resolution in digital meters, sensitivity & Accuracy of digital meters.

Course Outcomes for Second Year First Semester Course	
Course Code: : B16 EE 2103	
Course Title: ELECTRICAL MEASUREMENTS & INSTRUMENTS	
CO-1	illustrate the characteristics of measuring instruments (K3)
CO-2	Discriminate measuring instruments based on their principle & operation(K4)
CO-3	Calculate power and energy in $1\emptyset$, $3\emptyset$ & polyphase circuits (K3)
CO-4	Measure electrical parameters using a bridge (K3)
CO-5	Find magnetic measurements using Ballistic Galvanometers and Flux meters. (K4)CO1: illustrate the characteristics of measuring instruments (K3)
CO-6	Apply potentiometers & instrument transformers to measure electrical elements,calibration of the meters. (K3)

SYLLABUS: ELECTRONICS DEVICES &CIRCUITS (B16 EC 2104)

Transport Phenomena in Semiconductors

Mobility and conductivity, intrinsic and extrinsic semiconductors, mass action law, charge densities in a semiconductors, Hall Effect, generation and recombination of charges, drift and diffusion currents, the continuity equation, injected minority carrier charge, potential variation in graded semiconductors.

PN junction diode

Open circuited PN junction, PN junction as a rectifier, current components in a PN diode,

V-I characteristics and its temperature dependence, transition capacitance, charge control description of a diode, diffusion capacitance, junction diode switching times, Zener diode, Tunnel Diode, Photo diode, Point Contact diode, Schottky barrier diode, varactor diode, PIN diode, LED.

Diode Rectifiers

Half wave, full wave and bridge rectifiers with and without filters, ripple factor and regulation characteristics.

Bipolar junction transistors

Introduction to BJT, operation of a transistor and transistor biasing for different operating conditions, transistor current components, transistor amplification factors: α,β,γ relation between α and β,γ early effect or basewidth modulation, common base configuration and its input and output characteristics, common emitter configuration and its input and output characteristics, common collector configuration and its input and output characteristics, comparison of CE, CB and CC configurations, break- down in transistors, photo transistor.

Field Effect transistors

JFET and its characteristics, pinch off voltage, FET small signal model, MOSFET and its characteristics.

Transistor Biasing Circuits

The operating point, bias stability, different types of biasing techniques, stabilization against variation in I_{co} , $V_{BE,}$ & β. bias compensation, thermal runaway, thermal stability, biasing of FETs.

Transistors at low and high frequencies

Transistor hybrid model, H-parameters, Analysis of transistor amplifier circuits using h- parameters, comparison of transistor amplifier configurations, analysis of single stage amplifier, effects of bypass and coupling capacitors, frequency response of CE amplifier, Emitter follower, high frequency model of transistor.

Course Outcomes for Second Year First Semester Course	
Course Code: B16EC2104	
Course Title: ELECTRONICS DEVICES AND CIRCUITS	
CO-1	Understand the physical structure, principles of operation, electrical characteristics andcircuit models of diodes, BJT‟s and FET‟s.
CO-2	Use this knowledge to analyze and design basic electronic application circuits.
CO-3	Extend the understanding of how electronic circuits and their functions fit intolarger electronic systems.

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SYLLABUS: ENGINEERING MECHANICS & STRENGTH OF MATERIALS (B16 ME 2106)

Part –A: Engineering Mechanics

Statics:

Fundamentals of Mechanics: Basic Concepts, Force Systems and Equilibrium, Moment and Couple, Principle of Superposition & Transmissibility, Varignon‟s theorem, Resultant of force system – Concurrent and non-concurrent coplanar forces, Condition of static equilibrium for coplanar force system, concept of free body diagram, applications in solving the problems on static equilibrium of bodies.

Friction Concept of dry friction, limiting friction, angle of friction, Friction problems related to connecting bodies and ladder.

Properties of bodies:

Center of Gravity: Center of Gravity of Plane figures, Composite Sections and shaded areas. Area Moment of Inertia: Parallel and Perpendicular axis theorem, Moment of Inertia of symmetrical and unsymmetrical sections

Dynamics:

Kinematics – Introduction to kinematics, Equations of motion for uniform and variable motion; Projectiles.

Kinetics – D'Alemberts principle, Work energy method, Impulse momentum methods.

Part – B: Strength of Materials

Simple Stresses and Strains: Stresses and Strains, stress-strain curve, Bars of uniform, varying and tapered cross –sections, Poisons ratio, volumetric strain and relation between moduli of elasticity

Shear Force and Bending Moment: Cantilever, Simply Supported and Overhanging beams subjected to point loads and uniformly distributed loads.

Bending stresses in beams: Theory of pure bending, Flexure formula, Section modulus for cantilever and simply supported beams having symmetrical and unsymmetrical sections Torsion of Shafts: Torsion equation for circular shaft, polar modulus and related problems.

Course Outcomes for Second Year First Semester Course	
Course Code: B16 ME 2106	
Course Title: ENGINEERING MECHANICS & STRENGTH OF MATERIALS	
CO-1	Evaluate the forces in concurrent and coplanar force systems, using various principles and also under different conditions of equilibrium. Analyze the forces in various applications and apply the concepts of friction to some basic applications of Electrical engineering.
CO-2	Understand and apply principles of parallel force systems to find centroid and moment of inertia of different objects.
CO-3	Apply the concepts of kinematics and kinetics to analyze force on particles under rectilinear.
CO-4	Distinguish between various mechanical properties like yield strength, ultimate strength etc., of a given material and also to determine various types of direct stresses. Analyze the effect of shear force & bending moment on various beams.
CO-5	Determine the bending stresses in different beams of various cross sections and to find torsional stresses in shafts

SYLLABUS: NETWORKS & MEASUREMENTS LAB (B16 EE 2106)

LIST OF EXPERIMENTS

1. Verification of Ohms Law and resistance of a filament Lamp
2. Verification of superposition theorem
3. Verification of Thevinen’s theorem
4. Verification of Norton’s theorem
5. Verification of maximum power transfer theorem
6. Series resonance
7. Calculation two port network parameters
8. Calibration of wattmeter
9. Calibration of energy meter
10. Three voltmeter method
11. Measurement of 3 phase power using two wattmeter method
12. Parameters of choke coil.
13. Measurement of three phase power by using 2 C.T‟s and Single Wattmeter
14. Crompton’s DC potentiometer
15. Kelvin’s double bridge
16. Schering bridge

Course Outcomes for Second Year First Semester Course	
Course Code: B16 EE 2106	
Course Title: NETWORKS & MEASUREMENTS LAB	
CO-1	Students will gain the skill to make and experiment with practical electric circuits. CO2: Students will be able to measure voltage, current, power in practical electric circuits.CO3: Students will know the significance of various theorems and their applications.
CO-2	Students will be able to assess the behavior of electric circuits.
CO-3	Students will be able to calibrate single phase energy meter, voltmeter & wattmeterCO6: Students will be able to measure resistance, inductance & capacitance.
CO-4	Students will gain the skill to make and experiment with practical electric circuits. CO2: Students will be able to measure voltage, current, power in practical electric circuits.CO3: Students will know the significance of various theorems and their applications.
CO-5	Students will be able to assess the behavior of electric circuits.

SYLLABUS: ELECTRONICS DEVICES AND CIRCUITS LAB (B16 EC 2105)

(Common to ECE & EEE)

List Of Experiments

1. V-I characteristics of semiconductor diode, LED and Zener diode.
2. Half wave and full wave rectifier with and without filters.
3. Input and output characteristics of transistor in CE configuration.
4. Transistor biasing circuits and transistor as a switch.
5. CE amplifier.
6. JFET common source amplifier.

List Of Simulation Experiments

7. V-I characteristics of semiconductor diode, LED and Zener diode.
8. Regulation characteristics of Zener diode.
9. Input and output characteristics of transistor in CB configuration
10. JFET Characteristics.
11. CC amplifier
12. JFET common source amplifier

Course Outcomes for Second Year First Semester Course	
Course Code: B16 EC 2105	
Course Title: ELECTRONIC DEVICES & CIRCUITS LAB	
CO-1	To understand the role of basic electronic devices like ordinary Pn diodes, Zener diodes, LEDs, BJTS and JFETs in achieving various functionalities like rectification, voltage regulation, amplification, switching action etc. in various electronic circuits.
CO-2	To construct and simulate different electronic circuits using Multisim.
CO-3	To have the hardware skills and software skills required in the design of electronic systems for various applications.

SYLLABUS: ENGLISH PROFICIENCY (B16 ENG 2104)

Speaking Skills

PPT
Describing
Event/place/thin
gPicture
Description
Extempore
Debate
Telephonic
Skills
Analyzing Proverbs

Vocabulary

Affixes
Pairs of Words
Reading Skills
Reading Comprehension
Reading/Summarizing News
Paper Artic

Writing Skills

Designing Posters
Essay writing
Resume Writing

Course Outcomes for Second Year First Semester Courses	
Course code: **B16 ENG 2104**	
Course Title: **ENGLISH PROFICIENCY**	
CO-1	Students enhance their vocabulary and use it in the relevant contexts.
CO-2	They improve speaking skills.
CO-3	They learn and practice the skills of composition writing.
CO-4	They enhance their reading and understanding of different texts.
CO-5	They enrich their communication both in formal and informal contexts.
CO-6	They strengthen their confidence in presentation skills.

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SYLLABUS: INDUSTRY ORIENTED TRAINING (B16 ENG 2106)

(Common to ECE & EEE)

BASIC CONCEPTS

System Life Cycle, Algorithm Specification, Recursive Algorithms, Data Abstraction, Performance Analysis, Space Complexity, Time Complexity, Asymptotic Notation, Comparing Time Complexities

IMPLEMENTATION (Using C)

Arrays
Stacks
Queues
Linked List
Double linked listsTrees
Graphs
Applications of linear and nonlinear data structures and solving simple to complex problemsin perspective of industry requirements.

Basic Concepts of OOP

Procedural Paradigms, Object Oriented Paradigm, OOP Principles and Terminology, OOPbenefits, Procedure and Object Oriented programming languages, advantages and disadvantages, creating class, defining objects in C++ and JAVA.

Applications using OOP in solving simple to complex problems in perspective of industryrequirements.

(Note: Total Marks will be evaluated based on Continuous Evaluation - 25 Marks, CodingContest- 25 Marks)

Course Outcomes for Second Year First Semester Courses	
Course code:**B16 ENG 2106**	
Course Title: **INDUSTRY ORIENTED TRAINING**	
	Academic Year : 2**017-18**
CO-1	Application using implementation of Data structures.
CO-2	Application using implementation of Linear and nonlinear Data structures in view of industry.
CO-3	Applications using Object Oriented Concepts in view of industry.

SYLLABUS: ELECTRICAL MACHINES-I (B16 EE 2201)

Electromechanical energy conversion- Basic principles of energy, force and torque in singly and multiply excited systems.

Transformers- Principle, construction and operation of single phase transformers, phasor diagram, equivalent circuit, voltage regulation, losses and efficiency. Testing- open & short circuit tests, sumpner's test.

Autotransformers- construction, principle, applications and comparison with two winding transformer.

Three phase transformer: Construction, various types of connection and their comparative features. Parallel operation of single phase and three phase transformers. Three phase transformer connections. Scott connection, tap changing transformers- no load and on load tap changing of transformers. Cooling methods of transformers.

D.C. Machines- Working principle, construction and methods of excitation. D.C generators emf equation, armature reaction, commutation. Compensating winding, characteristics of various types of generators, applications. D.C. motors- torque equation, D.C. shunt, series and compound motors – characteristics & applications.

Starting & Speed control- Starting methods and speed control of D.C. shunt and series motors testing of D.C motors - direct and regenerative methods to test D.C. machines. Swinburne's test, field's test and separation of losses.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 EE 2201	
Course Title: ELECTRICAL MACHINES-I	
CO-1	Identify the concepts of electro mechanical energy conversion. K2
CO-2	Describe the concepts of construction, operating principle, different types of DC machines and transformers, effects on DC machine and parallel operation of DC generators. K2
CO-3	Interpret the characteristics of DC machines. K3
CO-4	Discriminate different types of speed control methods of DC motors. K4
CO-5	Examine the performance of DC machines and transformers by different testing methods. K4
CO-6	Discriminate different types of transformer connections K4

SYLLABUS: SIGNALS & SYSTEMS (B16 EE 2202)

Classification of Signals & Systems:

Basic continuous time signals, basic discrete time signals transformations of independent variables, classification of systems, properties of linear time – invariant systems.

Linear Time – Invariant (LTI) Systems:

Representation of signals in terms of impulses for discrete time and continuous time signals, convolution sum and convolution integral. Systems described by differential and difference equations. Block diagram representation of LTI systems described by differential and difference equations, singularity functions.

Analogy between vectors and signals, orthogonal vector and signal spaces. Approximation of a function by a set of mutually orthogonal functions.

Fourier analysis:

The response of continuous time LTI systems to complex exponentials – the continuous time and discrete time exponential Fourier series, convergence of Fourier series.

Fourier Transform:

Fourier transform of continuous time and discrete time aperiodic signals and periodic signals. Properties of continuous time and discrete time Fourier transforms. Frequency response characterized by linear constant coefficient differential and difference equations. First order and second order systems.

Z –transform:

Z–transform of discrete time sequence, region of convergence. Relation between Z and Fourier transform, properties of z-transforms. inverse z-transform, determination of transfer function and impulse response of an LTI system, poles and zeros and system stability.

Sampling Theorem:

The effect of under-sampling, methods of reconstruction of a signal from samples, discrete time processing of continuous time signals. Sampling in frequency domain, sampling of discrete time signals.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16EE2202	
Course Title: SIGNALS & SYSTEMS	
CO-1	Characterize and analyse the properties of continuous and discrete time signals and systems.[K2]
CO-2	Apply the convolution for continuous time signals and discrete time signals.
CO-3	Evaluate the Fourier Series of periodic signals.[K1]
CO-4	Determine the Fourier Transform and Z-Transform of different type’s of signals and make use of their Properties.[K1]
CO-5	Convert a continuous time signal to the discrete time domain and reconstruct using the sampling theorem.[K2]

SYLLABUS: ANALOG ELECTRONICS CIRCUITS (B16 EC 2206)

Multistage Amplifiers

Transistor at high frequencies, CE short circuit current gain and concept of Gain Bandwidth Product. BJT and FET RC Coupled Amplifiers at low and high frequencies. Frequency Response and calculation of Band Width of Multistage Amplifiers.

Feed Back Amplifiers

Concept of Feed Back Amplifiers - Effect of Negative Feedback on the amplifier characteristics. Four feedback topologies, Method of analysis of Voltage Series, Current Series, Voltage Shunt and Current Shunt feedback Amplifiers.

Sinusoidal Oscillators

Condition for oscillations –LC Oscillators – Hartley, Colpitts, Clapp and Tuned Collector Oscillators – Frequency and amplitude Stability of Oscillators – Crystal Oscillators – RC Oscillators -- RC Phase Shift and Weinbridge Oscillators.

Power Amplifiers

Classification of Power Amplifiers – Class A, Class B and Class AB power Amplifiers. Series Fed, Single Ended Transformer Coupled and Push Pull Class A and Class B Power Amplifiers. Cross-over Distortion in Pure Class B Power Amplifier, Class AB Power Amplifier – Complementary Push Pull Amplifier with trickle Bias, Derating Factor – Heat Sinks.

Tuned Voltage Amplifiers

Single Tuned and Stagger Tuned Amplifiers – Analysis – Double Tuned Amplifier – Bandwidth Calculation.

Operational Amplifiers

Concept of Direct Coupled Amplifiers. Ideal Characteristics of an operational Amplifier – Differential Amplifier - Calculation of common mode Rejection ratio – Differential Amplifier supplied with a constant current – Normalized Transfer Characteristics of a differential Amplifier – Applications of OP-Amp as an Inverting and Non-Inverting Amplifier, Integrator, Differentiator Summing and Subtracting Amplifier and Logarithmic Amplifier. Parameters of an Op-Amp, Measurement of OP-Amp Parameters.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 EC 2206	
Course Title: ANALOG ELECTRONICS CIRCUITS	
CO-1	Know the equivalent circuit of multistage amplifier and its analysis. [K3]
CO-2	Identify the different feedback topologies and analyze them. [K1]
CO-3	Explain the principle of oscillator and design different types of sinusoidaloscillators.[K3]
CO-4	Define the difference between voltage and power amplifiers and design differentclasses. [K1, K3]
CO-5	Know that Tuned amplifiers amplify a narrow band of frequencies and will also beable to analyze them.[K2, K3]
CO-6	Identify that Op-amp not amplifies but also perform different operations and analyzesome applications.[K1,K2]

SYLLABUS: PRIME MOVERS & PUMPS (B16 ME 2204)

Basics of Turbo Machinery

Hydrodynamic force of jets on stationary and moving flat inclined and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency. Hydraulic Turbines: Classification of turbines, impulse and reaction turbines, pelton wheel, Fancis turbine and Kaplan turbine, wok done, efficiency and draft tube theory.

Thermo dynamic cycles

Carnot, otto, Diesel, Rankine, Joule Cycles- Description and representation on P-V diagram. IC Engines: Working of petrol and Diesel Engines- Two stroke and four stroke engines- Comparison

Turbines

Steam Turbines: Classification – Impulse and reaction turbines – principle of operation – simple impulse turbine, velocity compounding, pressure compounding and pressure – velocity- compounding.

Gas turbines: Simple gas turbine plant, principle of working, Ideal and actual cycles – Open and closes cycles.

Pumps

Reciprocating Pumps: Working, Discharge, slip and indicator diagrams Centrifugal Pumps: Classification, working, workdone- manometric head- losses, efficiencies &specific speed.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 ME 2204	
Course Title: PRIME MOVERS & PUMPS	
CO-1	Understand the concepts of hydrodynamic force of jets on stationary and moving flatinclined and curved vanes.
CO-2	Apply the concepts of momentum equation for finding the forces acting on the vanes ofthe turbines.
CO-3	Understand the carnot, otto, Diesel, Rankine, Joule Cycles.
CO-4	Apply the Otto, Diesel cycles for finding the performance of S.I and C.I engines.
CO-5	Understand the working principle of steam turbines and gas turbines.
CO-6	Evaluate the performance characteristics of steam and gas turbines.
CO-7	Understand the working principle of centrifugal and reciprocating pumps.
CO-8	Evaluate the performance characteristics of steam and gas turbines CO8: Evaluate the performance characteristics of centrifugal and reciprocating pumps.

SYLLABUS: Electrical Power Generation, Transmission & Distribution (B16EE2203)

Electric Power Generation& Economic Considerations:

Layout of thermal, hydro, nuclear and gas power plants, brief description of various parts of different power plants. Load curves and associated definitions, load duration curves, different types of tariffs and examples.

Power Supply Systems& Distribution Systems:

Transmission and distribution systems- D.C 2-wire and 3- wire systems, A.C single phase, three phase and 4-wire systems, comparison of copper efficiency. Primary and secondary distribution systems, concentrated & uniformly distributed loads on distributors fed at both ends, ring distributor, voltage drop and power loss calculation, Kelvin's law.

Inductance & Capacitance calculations:

Types of conductors, line parameters, calculation of inductance and capacitance of single and double circuit transmission lines, three phase lines with bundle conductors. Skin effect and proximity effect.

Performance of transmission lines:

Generalized network constants and equivalent circuits of short, medium, long transmission line. Line performance: regulation and efficiency, Ferranti effect.

Overhead Line Insulators:

Types of insulators, potential distribution over a string of suspended insulators, methods of equalizing potential. Corona: phenomenon of corona, corona loss, concept of radio interference.

Mechanical Design of Transmission Lines:

Different types of tower, sag –tension calculations, sag template, string charts.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 EE 2203	
Course Title: ELECTRICAL POWER GENERATION, TRANSMISSION & DISTRIBUTION	
CO-1	Explain the power generation from different energy sources.CO2:
CO-2	Evaluate different tariffs.CO3:.CO5: Calculate Inductance & Capacitance of transmission lines.
CO-3	Analyze the various transmission and distribution systems.
CO-4	Design overhead transmission systems under various conditions
CO-5	Calculate Inductance & Capacitance of transmission lines.

THERMAL PRIME MOVERS LAB (B16 ME 2207)

1. Drawing of VTD for four-stroke and PTD of two-stroke engines.
2. Determination of flash and fire points
3. Determination of the kinematic and absolute viscosity of the given sample oils.
4. Load test and smoke test on I.C. engines.
5. Morse test on multi-cylinder engine.
6. Heat balance sheet on I.C. engines.
7. Study of multi-cylinder engines and determination of its firing order.
8. Economical speed test on IC engines.
9. Study on impulse and reaction turbines
10. Study on reciprocating and centrifugal pumps

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 ME 2207	
Course Title: THERMAL PRIME MOVERS LAB	
CO-1	Explain the working principle of different types of IC Engines and illustrate the valve timing and port diagrams of an ICengines.
CO-2	Determine the viscosities of oil samples, Flash and Fire point values of fuels.
CO-3	Perform the load, Morse, Heat balance and economical speed test on IC Engines.
CO-4	Discuss the working principle of different types of hydraulic turbines
CO-5	Illustrate the working principle of centrifugal and reciprocating pumps.

SYLLABUS: ANALOG ELECTRONIC CIRCUITS LAB WITH SIMULATION (B16 EC 2208)

LIST OF EXPERIMENTS

1. Design of LC Oscillators (Hartley Oscillator, Colpitts Oscillator)
2. Design of RC Oscillators (Wien Bridge Oscillator, RC phase Shift Oscillator)
3. Design of Basic Applications of Operational Amplifier.
4. Frequency response of Two Stage RC Coupled Amplifier.
5. Frequency response of Current Series Feedback Amplifier(with and without feedback)
6. Measurement of resonant frequency, bandwidth and quality factor of single Tuned Voltage Amplifier.
7. Calculation of Collector Circuit efficiency of Class B Push Pull Power Amplifier.

LIST OF EXPERIMENTS (Simulation)

8. Design of LC Oscillators (Hartley Oscillator, Colpitts Oscillator)
9. Design of RC Oscillators (Wien Bridge Oscillator,RC phase Shift Oscillator)
10. Design of Basic Applications of Operational Amplifier.
11. Frequency response of Two Stage RC Coupled Amplifier.
12. Frequency response of Current Series Feedback Amplifier(with and without feedback)
13. Measurement of resonant frequency, bandwidth and quality factor of single Tuned Voltage Amplifier.
14. Calculation of Collector Circuit efficiency of Class B Push Pull Power Amplifier.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 EC2208	
Course Title: ANALOG ELECTRONIC CIRCUITS LAB WITH SIMULATION	
CO-1	Acquire a basic knowledge on simple applications of operational amplifier.
CO-2	Observe the amplitude and frequency responses of negative feedback amplifier and twostage RC coupled amplifier.
CO-3	Design and test sinusoidal oscillators.
CO-4	Design and test a power amplifier.
CO-5	Design, construct, and take measurement of the analog electronic circuits to compare experimental results in the laboratory with theoretical analysis.
CO-6	Use Multisim to test their electronic design.

SYLLABUS: INDUSTRIAL ORIENTED TECHNOLOGY LAB (B16 EE 2205)

List of Projects:

1. Solar based automated irrigation system.
2. Smart key: a high security based door locked system.
3. Obstacle movement based automatic head lighter blinker and motion controller.
4. Sun tracking solar panel.
5. Foot step power generation.
6. Autonomous solar car to avoid road accidents.
7. Helmet operated smart e bike.
8. Cross roads traffic controller suing e-subway system.
9. Voice command page turning robot for physically challenged people.
10. Automatic fire alerting system in trains.

(Note: Total Marks will be evaluated based on Continuous Evaluation - 25 Marks, Record/Report-10 Marks, Exam-10 Marks and Attendance-5 Marks)

INDUSTRY ORIENTED TRAINING (B16 ENG 2204)

(Common to ECE & EEE)

BASIC CONCEPTS

Fundamentals: HTML, OOP Concepts, Comparing JAVA with C & C++, JAVA Programming language Syntax, Variables, Data types, statements and expressions.

Control Statements: If else, for, while, and do while loops, Switch statements.

Arrays & Structures: One Dimensional & Two Dimensional Arrays, Named Structures.

Functions: Parameter Passing, Static Modifier.

IMPLEMENTATION (Using JAVA)

Classes and Interfaces

Threads and multithreaded programming packages.

Applications of AWT, Applets and Networking concepts and solving simple to complex problems in perspective of industry requirements.

(Note: Total Marks will be evaluated based on Continuous Evaluation - 25 Marks, Coding Contest – 25 Marks)

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 ENG 2204	
Course Title: INDUSTRY ORIENTED TRAINING	
CO-1	Application using implementation of core JAVA concepts.
CO-2	Application using implementation of AWT, Applets
CO-3	Applications using Networking concepts in view of industry.

SYLLABUS: ELECTRICAL MACHINES-II (B16 EE 3101)

Basic concepts of Electrical Machines:

Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single turn coil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding, winding axis, generated emf, Air-gap MMF distribution with fixed current through winding - concentrated and distributed, Sinusoid ally distributed winding, winding distribution factor

Induction Machines

Construction, Types (squirrel cage and slip-ring), Equivalent circuit. Phasor Diagram, Torque Slip Characteristics, Starting and Maximum Torque. Losses and Efficiency. Circle Diagram. Effect of parameter variation on torque speed characteristics (variation of rotor resistance). Methods of starting, braking and speed control for induction motors. Generator operation. Self-excitation. Doubly-Fed Induction Machines.

Single phase induction motors

Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split phase starting methods & applications.

Synchronous Generators

Constructional features, Cylindrical rotor machines, Synchronous Generator-circuit model and phasor diagram, armature reaction, synchronous impedance, voltage regulation and estimation of voltage regulation by EMF, MMF and ZPF methods, Salient pole Machine- Two reaction theory, analysis of phasor diagram, power angle characteristics, determination of x_d and x_q, Parallel operation of Alternators-Synchronization and load division.

Synchronous Motors

Operating principle, circuit model, phasor diagram, effect of load, Operating characteristics of synchronous machines, V-curves, starting methods of synchronous motors.

Course Outcomes for Third Year First Semester Course	
Course Code: B16EE3101	
Course Title: ELECTRICAL MACHINES-II	
CO-1	Understand the concepts of construction, operating principle and starting methods of AC machines.
CO-2	Perform various tests on AC Machines
CO-3	Analyze the performance of different AC machines in the concepts of torque and power factor correction.

SYLLABUS: POWER SYSTEM ANALYSIS AND STABILITY (B16 EE 3102)

P.U. Representation: Single Line Diagram, Per Unit Quantities, P.U. Impedance of 3- Winding Transformers, P.U. Impedance Diagram of a Power System.

Load Flow Studies: Formulation of Network Matrices, Load Flow Problem, Gauss-Seidel Method, Newton-Raphson Method & Fast Decoupled Method of Solving Load Flow Problem.

Symmetrical Fault Analysis: 3-Phase Short Circuit Currents and Reactance"s of a Synchronous Machine, Fault Limiting Reactors.

Symmetrical Components: The Symmetrical Components, Phase Shift in Delta/Star Transformers, 3-Phase Power in terms of Symmetrical Components.

Un-Symmetrical Faults: Various Types Of Faults – LG, LL, LLG on an Unloaded Alternator, Sequence Impedances and Sequence Networks.

Power System Stability: Concepts of Stability (Steady State And Transient), Swing Equation, Equal Area Criterion, Critical Clearing Angle and Time for Transient Stability, Step by Step Method of Solution, Factors Affecting Transient Stability.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 EE 3102	
Course Title: POWER SYSTEM ANALYSIS AND STABILITY	
CO-1	Student able to understands and can draw single line diagram of the power system.
CO-2	Student understands different load flow techniques.
CO-3	Students are able to model any complex network into simple mathematical Modelling
CO-4	Student able to analyse different types of fault in a power system
CO-5	Student able to understand stability analysis of power system

SYLLABUS: LINEAR INTEGRATED AND PULSE CIRCUITS (B16 EC 3105)

Applications of Operational Amplifiers: Basics of Op-Amp, Instrumentation Amplifiers, Voltage to Current and Current to Voltage Converters. Op-amp As a Comparators, Schmitt trigger, Wave form Generators, Sample and Hold Circuits, Rectifiers.

Active Filters and Oscillators: Butterworth type LPF, HPF first and second order filters, Switched Capacitance Filters. Op-Amp Phase Shift, Wein-bridge and Quadrature Oscillator, Analog Multiplexers.

Special ICs: 555 Timers Introduction, Block diagram, 555 timer as an a stable and Monostable Multivibrator, Three Terminal IC Regulators, Voltage to Frequency and Frequency to Voltage Converters.

Wave Shaping: High pass and Low pass RC circuits, Response of High pass and Low pass RC circuits to step, square inputs. High pass RC circuit as a differentiator, Low pass RC circuit as an integrator. Diode clippers, Clipping at two independent levels, Clamping Operation, Clamping Circuits using Diode with Different Inputs, Clamping Circuit Theorem, Practical Clamping circuits.

Multivibrators: Transistor as a switch, switching times of a transistor, Design and Analysis of Fixed-bias and self-bias transistor binary, Commutating capacitors, Design and analysis of Collector coupled Monostable Multivibrator, Expression for the gate width and its waveforms. Design and analysis of Collector coupled A stable Multivibrator, Expression for the Time period and its waveforms, The Astable Multivibrator as a voltage to frequency converter.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 EC 3105	
Course Title: LINEAR INTEGRATED AND PULSE CIRCUITS	
CO-1	Discuss the op-amp’s basic construction, characteristics, parameter limitations, various configurations and different applications of op-amp.
CO-2	Analyze and design basic op-amp circuits, particularly various linear and non-linearcircuits, active filters, signal generators and 555 timers.
CO-3	Design and conduct experiments, on RC low pass and high pass circuits.
CO-4	Design and conduct experiments, on RL low pass and high pass circuits.
CO-5	Design and conduct experiments on different types of multivibrators.

SYLLABUS: CONTROL SYSTEMS (B16 EE 3103)

(Common to ECE & EEE)

Introduction to control systems : Open loop and closed loop systems- Transfer Functions of Linear Systems– Impulse Response of Linear Systems – Mathematical Modeling of Physical Systems – Equations of Electrical Networks – Modeling of Mechanical Systems – Equations of Mechanical Systems, Analogous Systems.

Block Diagrams of Control Systems: Signal Flow Graphs (Simple Problems) – Reduction Techniques for Complex Block Diagrams and Signal Flow Graphs (Simple Examples)- Feedback Characteristics of Control Systems

Time Domain Analysis of Control Systems: Time Response of First and Second Order Systems with Standard Input Signals – Steady State Error Constants – Effect of Derivative and Integral Control on Transient and Steady State Performance of Feedback Control Systems.

Concept of Stability: Routh-Hurwitz Criterion, Relative Stability Analysis, the Concept and Construction of Root Loci, Analysis of Control Systems with Root Locus (Simple Problems to understand theory).

Frequency Domain Analysis of control systems: Bode Plots- Log Magnitude versus Phase Plots- Polar Plots - Correlation between Time and Frequency Responses –NY quist Stability Criterion -Assessment of Relative Stability -All Pass and Minimum Phase Systems - Constant M and N Circles.

Course Outcomes for Third Year First Semester Course	
Course Code: B16EE3103	
Course Title: CONTROL SYSTEMS	
CO-1	Students will be able to model electrical and mechanical physical systems by applyinglaws of physics
CO-2	Students will be able to represent mathematical models of systems using block diagrams& Signal Flow Graphs and derive their transfer functions
CO-3	Students will be able to analyze systems in time domain for transient and steady-statebehaviour
CO-4	Students will learn the concept of stability and use RH criterion and Root locus methodsfor stability analysis.
CO-5	Students will learn to obtain frequency response plots of systems and use them for systemanalysis and stability assessment.

SYLLABUS: DIGITAL ELECTRONICS AND LOGIC DESIGN (B16 0EE 3104)

Numbering Systems: Digital systems - Binary, Octal, Decimal and Hex numbering systems

– Number base Conversions – (n-1)"s and n"s complements of the various numbering systems

– Binary arithmetic – Various methods to represent signed binary numbers. Binary Codes: BCD, Excess-3 codes – Binary arithmetic using BCD and Excess-3 codes – Gray code

– Error detecting codes: parity checking and Hamming code – Error correcting codes: Hamming code

Boolean Algebra and Boolean Functions: Boolean theorems and postulates – Logic gates – Truth table - Boolean functions – Dual of a function – Complement of a function – Canonical and standard forms – Simplification of Boolean functions using Boolean theorems and postulated, Karnaugh map (K-map) with maximum of 4 variables

Combinational Logic Circuits: Boolean function implementation using AND-OR logic, multilevel NAND and multilevel NOR implementation – Transformation of multilevel NAND and NOR circuits to AND-OR diagram – Combinational logic design - Half adder – Full adder – Half subtractor – Full subtractor – Parallel adder – Parallel adder/subtractor –

Carry look ahead adder – BCD adder – Magnitude comparator –code converters, Decoders – Encoders – De multiplexer – Multiplexer – Logic implementation using Programmable Logic Devices.

Sequential Logic Circuits: Differences between combinational logic and sequential logic – Flip-flops (R-S, J-K, D, T, Master-slave J-K flip-flop) – Truth tables and excitation tables of the flip-flops, Conversions of flip-flops. Digital Counters-Ripple Counter design, Synchronous Counter design with T, D and J.K. Flip-flops. Shift Registers and Operation Modes.

Realization of Logic Gates Using Diodes & Transistors:

AND, OR and NOT Gates using Diodes and Transistors, RTL, DTL, TTL and CML Logic Families and its Comparison.

Course Outcomes for Third Year First Semester Course	
Course Code: : B16 EE 3104	
Course Title: DIGITAL ELECTRONICS AND LOGIC DESIGN	
CO-1	Students will be aware of theory of Boolean Algebra& the underlying features of variousnumber systems.
CO-2	Students will be able to use the concepts of Boolean Algebra for the analysis andminimization of Boolean expressions.
CO-3	Students will be able to design of various combinational & sequential logic circuits.
CO-4	Students will be able to design various logic gates starting from simple ordinary gates tocomplex programmable logic devices & arrays.
CO-5	Students will be to design various logic gates using diodes and transistors.

SYLLABUS: COMPUTER ARCHITECTURE AND ORGANIZATION (B16 EE 3105)

(Elective-I)

Register transfer and micro operations:

Register transfer language, Register transfer, Bus and memory transfers, Arithmetic Micro Operations, Logic micro operations, Shift micro operations, Arithmetic Logic shift unit

Basic computer organization and Design:

Instruction codes, Computer registers, Computer instructions, Timing and control, Instruction cycle, Memory reference instructions, Input-output and interrupt, complete computer description, Design of Basic computer, Design of Accumulator Logic.

Micro Programmed Control:

Control Memory, Address Sequencing, Micro Program Example, and Design of control Unit

CPU Organization:

Introduction, General Register Organization, Stack Organization, Addressing modes, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, program Control (Status Bit Conditions, Conditional Branch Instruction, Subroutine call and return using Stack)

Memory Organization and I/O Organization:

Memory hierarchy, Main memory, Associative Memory, Cache Memory-Associative mapping, Direct Mapping, Set Associative mapping, Virtual memory-Address space and memory Space, Address Mapping using pages, Associative Memory Page Table, I/O Interface, Asynchronous Data Transfer(Strobe Control and handshaking), Modes of transfer, Types of interrupts, Priority Interrupt(Daisy-Chaining Priority, Parallel Priority Interrupt, Priority Encoder, Interrupt Cycle),Direct Memory Access.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 EE 3105	
Course Title: COMPUTER ARCHITECTURE AND ORGANIZATION	
CO-1	Explain register transfer, memory transfer language, computer registers, computerinstructions and addressing modes.
CO-2	Differentiate general register organization & stack organization, Reduced instruction set& complex instruction set computer.
CO-3	Asses instruction cycle, instruction formats.
CO-4	Interpret different memory organization & different modes of transfer.
CO-5	Explain register transfer, memory transfer language, computer registers, computerinstructions and addressing modes.

SYLLABUS: DATABASE MANAGEMENT SYSTEMS (B16CS3109)

(Elective-I)

Introduction: Introduction to File Processing System and DBMS, Disadvantages of FPS, Advantages of DBMS, Introduction to the Relational model, Integrity constraints, Levels of abstraction, Data Independence, Duties of DBA, Structure of a DBMS.

SQL: SQL Preliminaries, Basic form of SQL Query, Nested Queries, Joins, Set Operations, Aggregate Operators, Integrity Constraints in SQL, Null values, Data Definition Language Commands, Triggers, Views and Sequences, JDBC.

Introduction to Database Design: Basic Steps in Database Design, ER Diagrams, Entities, Attributes and Entity Sets, Relationships & Relationship Sets, Features of the ER Model, Conceptual Database Design and Logical Database Design.

Database Design: Schema Refinement and Normal Forms, Introduction to Schema Refinement, Functional Dependencies, Normal Forms, Properties of Decomposition, Normalization.

Transaction Management : The ACID Properties, Transactions & Schedules, Concurrent Execution of Transactions, Concurrency Control: Lock-Based Concurrency Control, Two Phase Locking protocol, Serializability and Recoverability, Dealing with Deadlocks, Time Stamp Ordering Protocol, Crash Recovery: Log-based Recovery, The Log, Other Recovery- Related Structures, The Write-Ahead Log Protocol, Check pointing, ARIES.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 CS 3109	
Course Title: DATABASE MANAGEMENT SYSTEMS	
CO-1	Generalize the basic concepts of DBMS
CO-2	Explore the relational model
CO-3	Prepare SQL commands for defining, constructing and manipulating databases
CO-4	Apply conceptual and logical database design
CO-5	Apply normalization on tables
CO-6	Schedule concurrent transactions using protocols that provide serializability.
CO-7	Explore techniques for Recovering database

SYLLABUS: DIGITAL SIGNAL PROCESSING (B16 EE 3106)

(Elective-I)

Discrete - time signals and systems:

Discrete - time signals – sequences, linear shift – invariant systems, stability and causality, linear constants – coefficient difference equations, frequency domain representation of discrete – time signals and systems.

Applications of z – transforms:

System functions h (z) of digital systems, stability analysis, structure and realization of digital filters, finite word length effects.

Discrete Fourier transform (DFT):

Properties of the dfs, dfs representation of periodic sequences, properties of dft, convolution of sequences.

Fast – Fourier transforms (FFT):

Radix – 2 decimation – in – time (dit) and decimation – in – frequency (dif), fft algorithms, inverse fft.

IIR digital filter design techniques:

Design of iir filters from analog filters, analog filters approximations (Butterworth and chebyshev approximations), frequency transformations, general considerations in digital filter design, bilinear transformation method, step and impulse invariance technique.

Design of IIR filters:

Fourier series method, comparison of iir and fir filters.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 EE 3106	
Course Title: DIGITAL SIGNAL PROCESSING	
CO-1	Identity properties of discrete-time systems such as time-invariance, stability, causality,and linearity.
CO-2	Compute the linear and circular convolutions of discrete-time sequences.
CO-3	Evaluate and plot the frequency (magnitude and phase) response of linear time-invariantsystems.
CO-4	Evaluate the discrete Fourier transform (DFT) of a sequence, relate it to the DTFT,
CO-5	Evaluate the transfer function of linear time-invariant systems & Determine differenceequations from transfer function descriptions using Z transforms.
CO-6	Design & Compare IIR & FIR filters

SYLLABUS: ELECTRICAL MACHINES-I LAB (B16EE3107)

1. Swimburn's Test
2. Speed control of a DC shunt motor.
3. Load test on DC Shunt motor.
4. Load test on DC series motor.
5. Load test on DC Compound generator.
6. Open circuit characteristics of a DC shunt generator.
7. Hopkinson's Test.
8. Internal and external characteristics of a DC shunt generator.
9. OC and SC tests on a single phase transformer.
10. Load test on a single phase transformer.
11. Sumpner's Test.

Course Outcomes for Third Year First Semester Course	
Course Code: B16EE3107	
Course Title: ELECTRICAL MACHINES-I LAB	
CO-1	analyze characteristics of various types of generators & motors which will help in Understanding of machines under various conditions. (K4)
CO-2	compare Speed control of dc motors which will be useful in various industries.(K4)
CO-3	determine testing of machines will give an idea in testing side in variousindustries(K4).

SYLLABUS: LINEAR INTIGRATED CIRCUITS & PULSE DIGITAL CIRCUTS LAB WITH SIMULATION (B16 EC 3108)

LIST OF EXPERIMENTS

1. Linear Wave Shaping

a) Passive RC Differentiator

b) Passive RC Integrator

2. Non Linear Wave shaping

a) Clipping Circuits

b) Clamping Circuits

3) Self bias bistableMultivibrator

4) Schmitt Trigger Using µA 741

5) UJT Sweep Generator

6) AstableMultivibrator using 555 timer

7) Multiplexer

8) Shift Registers

LIST OF EXPERIMENTS (Simulation)

1 Linear Wave Shaping

a. Passive RC Differentiator
b. Passive RC Integrator

2 Non Linear Wave shaping

c. Clipping Circuits
d. Clamping Circuits

3) Self bias bistableMultivibrator

4) Schmitt Trigger Using µA 741

5) UJT Sweep Generator

6) AstableMultivibraotr using 555 timer.

7) Multiplexer

8) Shift Registers

Course Outcomes for Third Year First Semester Course	
Course Code: B16EC3108	
Course Title: LINEAR INTEGRATED CIRCUITS & PULSE DIGITAL CIRCUITS LAB WITH SIMULATION	
CO-1	Design and conduct experiments on RC low pass and high pass circuits.
CO-2	Observe operation of UJT Sweep Generator.
CO-3	Design and test different types of Multi vibrators
CO-4	Acquire a basic knowledge on simple applications of operational amplifier.
CO-5	Design, construct Schmitt trigger using operational amplifier.
CO-6	Use Multisim to test their electronic designs.
CO-7	Design and test different types of Multiplexers and counters.

SYLLABUS: VERBAL & QUANTITATIVE APTITUDE – I (B16ENG3102)

(Common to All Branches)

Part-A: Verbal and Soft Skills-I

Grammar: (VA**)**

Parts of speech(with emphasis on appropriate prepositions, co-relative conjunctions, pronouns-number and person, relative pronouns), articles(nuances while using definite and indefinite articles), tenses(with emphasis on appropriate usage according to the situation), subject – verb agreement (to differentiate between number and person) , clauses(use of the appropriate clause , conditional and relative clauses), phrases(use of the phrases, phrasal verbs) to-infinitives, gerunds, question tags, voice, direct & indirect speech, degrees of comparison, modifiers, determiners, identifying errors in a given sentence, correcting errors in sentences.

Vocabulary: (VA)

Synonyms and synonym variants (with emphasis on high frequency words), antonyms and antonym variants(with emphasis on high frequency words), contextual meanings with regard to inflections of a word, frequently confused words, words often mis-used, multiple meanings of the same word (differentiating between meanings with the help of the given context), foreign phrases, homonyms, idioms, pictorial representation of words, word roots, collocations.

Reasoning: (VA)

Critical reasoning (understanding the terminology used in CR- premise, assumption, inference, conclusion), Analogies (building relationships between a pair of words and then identifying similar relationships), Sequencing of sentences (to form a coherent paragraph, to construct a meaningful and grammatically correct sentence using the jumbled text), odd man (to use logical reasoning and eliminate the unrelated word from a group), YES-NO statements (sticking to a particular line of reasoning Syllogisms.

Usage: (VA)

Sentence completion (with emphasis on signpost words and structure of a sentence), supplying a suitable beginning/ending/middle sentence to make the paragraph coherent, idiomatic language (with emphasis on business communication), and punctuation depending on the meaning of the sentence.

Soft Skills:

Introduction to Soft Skills – Significance of Inter & Intra-Personal Communication – SWOT Analysis – Creativity & Problem Solving – Leadership & Team Work - Presentation Skills Attitude – Significance – Building a positive attitude – Goal Setting – Guidelines for Goal Setting – Social Consciousness and Social Entrepreneurship – Emotional Intelligence - Stress Management, CV Making and CV Review.

Part-B: Quantitative Aptitude -I

Numbers, LCM and HCF, Chain Rule, Ratio and Proportion

Importance of different types of numbers and uses of them: Divisibility tests, finding remainders in various cases, Problems related to numbers, Methods to find LCM, Methods to find HCF, applications of LCM, HCF. Importance of chain rule, Problems on chain rule, introducing the concept of ratio in three different methods, Problems related to Ratio and Proportion.

Time and work, Time and Distance

Problems on man power and time related to work, Problems on alternate days, Problems on hours of working related to clock, Problems on pipes and cistern, Problems on combination of the some or all the above, Introduction of time and distance, Problems on average speed, Problems on Relative speed,

Problems on trains, Problems on boats and streams, Problems on circular tracks, Problems on polygonal tracks, Problems on races.

Percentages, Profit Loss and Discount, Simple interest, Compound Interest, Partnerships, shares and dividends

Problems on percentages-Understanding of cost price, selling price, marked price, discount, percentage of profit, percentage of loss, percentage of discount, Problems on cost price, selling price, marked price, discount.

Introduction of simple interest, Introduction of compound interest, Relation between simple interest and compound interest, Introduction of partnership, Sleeping partner concept and problems, Problems on shares and dividends, and stocks.

Introduction, number series, number analogy, classification, Letter series, ranking, directions

Problems of how to find the next number in the series, Finding the missing number and related sums, Analogy, Sums related to number analogy, Ranking of alphabet, Sums related to Classification, Sums related to letter series, Relation between number series and letter series, Usage of directions north, south, east, west, Problems related to directions north, south, east, west.

Data sufficiency, Syllogisms

Easy sums to understand data sufficiency, Frequent mistakes while doing data sufficiency**,** Syllogisms Problems.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 ENG3102	
Course Title: VERBAL & QUANTITATIVE APTITUDE -I	
CO-1	Detect grammatical errors in the text/sentences and rectify them while answering their competitive/ company specific tests and frame grammatically correct sentences while writing.
CO-2	Answer questions on synonyms, antonyms and other vocabulary based exercises while attempting CAT, GRE, GATE and other related tests.
CO-3	Use their logical thinking ability and solve questions related to analogy, syllogisms and other reasoning based exercises.
CO-4	Choose the appropriate word/s/phrases suitable to the given context in order to make the sentence/paragraph coherent.
CO-5	Apply soft skills in the work place and build better personal and professional relationships making informed decisions.
Course Code: B16 ENG3102	
Course Title: PART - B QUANTITATIVE APTITUDE -I	
CO-1	The students will be able to perform well in calculating on number problems and various units of ratio concepts.
CO-2	Accurate solving problems on time and distance and units related solutions.
CO-3	The students will become adept in solving problems related to profit and loss, in specific, quantitative ability.
CO-4	The students will present themselves well in the recruitment process using analytical and logical skills which he or she developed during the course as they are very important for any person to be placed in the industry.
CO-5	The students will learn to apply Logical thinking to the problems of syllogisms and

SYLLABUS: ADVANCED CONTROL SYSTEMS (B16EE3201)

CONTROL SYSTEMS COMPONENTS: D.C. & A.C. Tachometers-Synchros, A.C. And D.C. Servo Motors-Stepper Motors and Its Use in Control Systems, Amplidyne, Metadyne, Magnetic Amplifier –Principle, Operation.

STATE VARIABLE ANALYSIS: Concept Of State, State Variables & State Models, State Model For Linear Continuous Time Systems, Solution Of State Equation, State Transition Matrix, Concept Of Controllability & Observability (Simple Problems To Understand Theory).

THE Z-TRANSFORM: Introduction to Z-Transforms and Inverse Z-Transforms. (Simple Problems to Understand Theory).

INTRODUCTION TO DESIGN: Introduction-Preliminary Considerations Of Classical Design-Lead Compensation-Lag Compensation-Realization Of Compensating Networks- Cascade Compensation In Frequency Domain (Bode Plot Techniques) - Pole Placement By State Feed-Back.

STABILITY: Stability Of Linear Digital Control Systems, Definition & Theorem, Stability Tests, Bi-Linear Transformation Method, Jury's Stability Test.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16EE3201	
Course Title: ADVANCED CONTROL SYSTEMS	
CO-1	Know the various components and usage of each component.
CO-2	Derive stat space model for a given systems and Apply the concept of Observability and Controllability for LTI system.
CO-3	Apply Z- transform in Engineering application related to digital control systems.
CO-4	Design classical controller based on bode plots and modern controllers based on the state space techniques
CO-5	Test the digital system which is useful after designing a particular system with respect to the stability point of view.

SYLLABUS: POWER ELECTRONICS (B16 EE 3202)

Modern Power Semi Conductor Devices

Thyristors – Silicon Controlled Rectifiers (SCRs) – BJT – Power MOSFET – Power IGBT and their characteristics. Basic theory of operation of SCR – Static characteristics and Dynamic characteristics of SCR - Turn on and Turn off times – Turn on and turn off methods. Two transistor analogy of SCR -Series and parallel connections of SCRs Snubber circuit details – Numerical problems.

Thyristorfiring and Commutation circuits

SCR trigger circuits-R, RC and UJT triggering circuits. The various commutation methods of SCRs-Load commutation- Resonant Pulse Commutation- Complementary Commutation- Impulse Commutation- External Pulse Commutation Techniques. Protection of SCRs

Phase Controlled Rectifiers

Principles of phase controlled rectification -Study of Single phase and three-phase half controlled and full controlled bridge rectifiers with R, RL, RLE loads. Effect of source inductance. Dual converters- circulating current mode and circulating current free mode- control strategies. Numerical problems.

Choppers, Cyclonverter and AC Voltage Controller

Classification of Choppers A, B, C, D and E, Switching mode regulators-Study of Buck, Boost and Buck-Boost regulators, Cu regulators. Principle of operation of Single phase bridge type Cyclo converter and their applications. Single phase AC Voltage Controllers with R and RL loads.

Inverters

Principle of operation of Single phase Inverters -Three phase bridge Inverters (180^0 and 120^0 modes)-voltage control of inverters-Single pulse width modulation- multiple pulse width modulation, sinusoidal pulse width modulation. Harmonic reduction techniques- Comparison of Voltage Source Inverters and Current source Inverters.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16EE3202	
Course Title: POWER ELECTRONICS	
CO-1	Explain the principle of operation of thyristor, modern power semiconductor devices and necessity of series and parallel connection of thyristors.
CO-2	Explain the operation of Firing and Commutation techniques.
CO-3	Evaluate the phase controlled rectifiers with different loads.
CO-4	Analyze different Choppers, Cyclo-converter and AC voltage Controller configurations.
CO-5	Investigate harmonic reduction techniques for inverters based on PWM techniques

SYLLABUS: PRINCIPLES OF ECONOMICS AND MANAGEMENT (B16 ENG 3201)

Introduction to Managerial Economics:

Wealth, Welfare and Scarce Definitions of Economics, Micro and Macro Economics, Demand –Law of Demand, Elasticity of Demand, Types of Elasticity and Factors Determining price Elasticity; Demand :Utility-Law of Diminishing Marginal Utility and its limitations.

Conditions of Different Market Structures:

Perfect Competition, Monopolistic Competition, Monopoly, Oligopoly and Duopoly.

Forms of Business Organization:

Sole Proprietorship, Partnership, Joint Stock Company-Private Limited and public limited Companies. Public Enterprise and their types.

Introduction to Management:

Functions of Management – Taylor's Scientific Management; Henry Fayol's Principles of Management;

Human Resource Management:

Basic functions of HR Manager; Man Power Planning, Recruitment, Selection, Training, Development, Placement, Compensation and Performance Appraisal (In Brief).

Production Management:

Production Planning and Control, Plant Location, Break-Even Analysis, Assumptions and Applications.

Financial Management:

Types of capital; Fixed and Working Capital and Methods of Raising Finance; Depreciation; Straight Line and Diminishing Balance Methods.

Marketing Management:

Functions of Marketing and Distribution channels

Entrepreneurship:

Entrepreneurial Functions, Entrepreneurial Development; Objectives, Training, Benefits; Phase of Installing a Project.

Course Code: B16 ENG 3201	
Course Title: PRINCIPLES OF ECONOMICS AND MANAGEMENT	
CO-1	Students will be able to gain empirical knowledge and understand the complete framework of business.
CO-2	To analyse the concepts pertaining to economic decision making.
CO-3	To analyse the concepts of Managerial decision making.
CO-4	To inculcate the spirit of Entrepreneurship and gain knowledge for setting up anenterprise.

SYLLABUS: POWER SYSTEM PROTECTION (B16EE3203)

Introduction to Power System Protection: Need for protective systems, Nature and causes of faults, Types and effects of faults, Fault statistics, Evolution of protective relays, Zones of protection, Primary and Back-up protection, Essential qualities of protection, Classification of protective relays, Classification of Protective Scheme, CTs and PTs and their applications in protection schemes, Summation transformer, Phase-sequence current segregating network, Basic relay terminology.

Fuses and Circuit Breakers: Fuses and their types, High-voltage HRC fuses and their applications, Selection of fuses. Circuit breakers, Formation of arc, Methods of arc extinction, Restriking voltage, Recovery voltage, RRRV, Single and double frequency transients, Resistance switching, Current chopping, Switching of capacitor banks and un- loaded lines, Ratings and characteristics of circuit breakers.

Types of Circuit Breakers and Testing: Principle of operation of circuit breakers, Classification of circuit breakers, Constructional Features of Air Circuit Breakers, Oil Circuit Breakers, Air Blast Circuit Breakers, SF-6 Circuit Breakers and Vacuum Circuit Breakers, Testing of Circuit Breakers.

Protective Relays: Different types of protective relays, Principle of operation and characteristics of relays, Overcurrent, Earth fault and Phase fault protection, Differential and Distance protection with simple applications to Alternators; Transformers; Single and parallel feeders. Introduction to Static relaying, Static relays for time lag Overcurrent and Differential Protection.

Overvoltage Protection: Causes of over voltages, Over voltages due to Lightning, Protection against Lightning and Travelling Waves – Earth Wire, Spark Gap, Surge Arresters, Lightning Arresters, Surge Absorber, Peterson Coil, Insulation Co-ordination.

Course Code: B16 EE 3203	
Course Title: POWER SYSTEM PROTECTION	
CO-1	Identify the need for protection and know various devices for protection and terminologyused in protection.
CO-2	Discriminate the constructional details with operation principle of various types of fuses,circuit breakers, relays, lightning arresters and their applications.
CO-3	Apply the arc quenching methods to various types of circuit breakers.
CO-4	Apply various relays to various types of power system equipment like alternator, transformer and feeders and distinguish between an electromagnetic relay and a static relay.
CO-5	Identify the different causes for over voltages and choose various protection devices against over voltages.

SYLLABUS: MICROPROCESSOR & MICROCONTROLLER (B16EE3204)

8085 Microprocessor:

Introduction to microprocessors, microcomputers – Architecture of 8085 microprocessor – pin-out diagram of 8085 – Detailed description of the 8085 pins – addressing modes Memory interfacing – Machine cycles and bus timings for Opcodefetch, memory read, memory write, I/O read, I/O write operations – Memory mapped I/O and I/O mapped I/O.

8085 Instructions and programming:

Difference between Machine language, Assembly language and High level language – Brief description of the 8085 instruction set – 8085 programming using data transfer group, arithmetic group, logical group, branch transfer group, stack and subroutines – counters and delay .

Interfacing peripherals to 8085:

Function of D/A and A/D converters – Interfacing D/A and A/D converters. Detailed description and interfacing of 8251 USART, 8253/8254 programmable timer, 8255 PPI, 8257 DMA controller, 8279 programmable keyboard/display interface

8051 Microcontroller:

Introduction to microcontrollers – Comparison between microprocessors and microcontrollers – Functional block diagram of 8051 microcontroller and its description – 8051 pin-out diagram and description of 8051 pins – Interfacing external memory to 8051 – implementing counters and timers in 8051 – Serial data transfer using 8051 – Various interrupts and its programming in 8051. Interfacing Stepper motor, to 8051 microcontroller.

Advanced topics in Microprocessors:

Architecture of 8086 microprocessor pin out diagram – Addressing modes – differences between 8085 and 8086.

Course Code: B16 EE 3204	
Course Title: MICROPROCESSOR & MICROCONTROLLER	
CO-1	Understand the fundamentals of 8085 Microprocessor and microcontroller based systems.
CO-2	Familiarize with the instruction set and assembly level programming.
CO-3	Illustrate how the different peripherals (8255, 8253 etc.) are interfaced withMicroprocessor.
CO-4	Distinguish and analyze the properties of Microprocessors & Microcontrollers.
CO-5	Apply knowledge on interfacing microcontrollers for some real time applications.

SYLLABUS: ELECTRICAL MACHINES-II LAB (B16EE3205)

1. NL and BR test on a three phase squirrel cage induction motor.
2. Regulation of alternator by EMF and MMF methods.
3. Regulation of alternator by ZPF method.
4. Characteristics of line excited induction generator.
5. Characteristics of induction start synchronous motor.
6. Load test on three phase slip ring induction motor.
7. V and inverted V curves of synchronous motor.
8. Measurement of X_d and X_q of a synchronous machine.
9. Equivalent circuit of a single phase induction motor.
10. Measurement of sequence reactance of a synchronous machine.

Course Code: B16 EE 3205	
Course Title: **ELECTRICAL MACHINES-II LAB**	
CO-1	Calculate the regulation of an alternator by EMF,MMF and ZPF methods [K3]
CO-2	Verify Alternator synchronism and draw the performance characteristics, finding outdifferent reactance. [K4]
CO-3	Find the efficiency and machine performances by conducting various tests on 3-Φ and 1-Φ induction motor. [K3]
CO-4	Verify the speed variation of induction machine. [K4]

SYLLABUS: CONTROL SYSTEMS LAB (B16EE3206)

List of experiments:

1. Magnetic amplifier
2. Study of DC Servo motor
3. DC Position control system
4. Study of first order system
5. Study of second order system
6. Speed torque characteristics of AC Servomotor
7. PID Controller
8. Synchro Transmitter and Receive pair
9. Study of digital control system
10. Study of Lead-Lag compensators

Course Code: B16EE3206	
Course Title: CONTROL SYSTEMS LAB	
CO-1	Will be able to do various engineering projects.
CO-2	Ability to formulate transfer function for given control system problems.
CO-3	Ability to find time response of given control system model.
CO-4	Plot Root Locus and Bode plots for given control system model
CO-5	Ability to design Lead, Lag, Lead-Lag systems in control systems
CO-6	Ability to design PID controllers for given control system model

SYLLABUS: VERBAL & QUANTITATIVE APTITUDE – II (B16ENG3202)

(Common to All Branches)

Part-A: Verbal Aptitude and Soft Skills-II

UNIT -I (VA)

Sentence Improvement (finding a substitute given under the sentence as alternatives), Sentence equivalence (completing a sentence by choosing two words either of which will fit in the blank), cloze test (reading the written discourse carefully and choosing the correct options from the alternatives and filling in the blanks), summarizing and paraphrasing .

UNIT- II (VA)

Types of passages (to understand the nature of the passage), types of questions (with emphasis on inferential and analytical questions), style and tone (to comprehend the author‟s intention of writing a passage), strategies for quick reading(importance given to skimming, scanning), summarizing ,reading between the lines, reading beyond the lines, techniques for answering questions related to vocabulary (with emphasis on the context), supplying suitable titles to the passage, identifying the theme and central idea of the given passages.

UNIT- III (VA)

Punctuation, discourse markers, general Essay writing, writing Issues and Arguments(with emphasis on creativity and analysis of a topic), paragraph writing, preparing reports, framing a Statement of purpose, Letters of Recommendation, business letter writing, email writing, writing letters of complaints/responses. Picture perception and description, book review.

UNIT-IV (VA)

Just a minute sessions, reading news clippings in the class, extempore speech, telephone etiquette, making requests/suggestions/complaints, elocutions, debates, describing incidents and developing positive non verbal communication, story narration, product description.

UNIT-V (SS)

Employability Skills – Significance — Transition from education to workplace - Preparing a road map for employment – Getting ready for the selection process, Awareness about Industry / Companies – Importance of researching your prospective workplace - Knowing about Selection process - Resume Preparation: Common resume blunders – tips, Resume Review, Group Discussion: Essential guidelines – Personal Interview: Reasons for Rejection and Selection.

Part-B: Quantitative Aptitude-II

UNIT I: Averages, mixtures and allegations, Data interpretation

Understanding of AM, GM, HM-Problems on averages, Problems on mixtures standard method. Importance of data interpretation: Problems of data interpretation using line graphs, Problems of data interpretation using bar graphs, Problems of data interpretation using pie charts, Problems of data interpretation using others.

UNIT II: Puzzle test, blood Relations, permutations, Combinations and probability Importance of puzzle test, Various Blood relations-Notation to relations and sex making of family Tree diagram, Problems related to blood relations, Concept of permutation and combination, Problems on permutation, Problems on combinations, Problems involving both permutations and combinations, Concept of probability-Problems on coins, Problems on dice, Problems on cards, Problems on years.

UNIT III: Periods, Clocks, Calendars, Cubes and cuboids

Deriving the formula to find the angle between hands for the given time, finding the time if the angle is known, Faulty clocks, History of calendar-Define year, leap year, Finding the day for the given date, Formula and method to find the day for the given date in easy way, Cuts to cubes, Colors to cubes, Cuts to cuboids, Colors to cuboids.

UNIT IV: Puzzles

Selective puzzles from previous year placement papers, sitting arrangement, problems- circular arrangement, linear arrangement, different puzzles.

UNIT V: Geometry and Menstruation

Introduction and use of geometry-Lines, Line segments, Types of angles, Intersecting lines, Parallel lines, Complementary angles, supplementary angles, Types of triangles-Problems on triangles, Types of quadrilaterals-Problems on quadrilaterals, Congruent triangles and properties, Similar triangles and its applications, Understanding about circles-Theorems on circles, Problems on circles, Tangents and circles, Importance of menstruation-Introduction of cylinder, cone, sphere, hemi sphere.

Course Code: B16ENG3202	
Course Title: VERBAL & QUANTITATIVE APTITUDE-II	
CO-1	Construct coherent, cohesive and unambiguous verbal expressions in both oral and written discourses.
CO-2	Analyze the given data/text and find out the correct responses to the questions asked based on the reading exercises; identify relationships or patterns within groups of wordsor sentences
CO-3	Write paragraphs on a particular topic, essays (issues and arguments), e mails, summaries of group discussions, reports, make notes, statement of purpose(for admission into foreignuniversities), letters of recommendation(for professional and educational purposes).
CO-4	Converse with ease during interactive sessions/seminars in their classrooms, compete in literary activities like elocution, debates etc., raise doubts in class, participate in JAM sessions/versant tests with confidence and convey oral information in a professional manner.
CO-5	Participate in group discussions/group activities, exhibit team spirit, use language effectively according to the situation, respond to their interviewer/employer with a positive mind, tailor make answers to the questions asked during their technical/personal interviews, exhibit skills required for the different kinds of interviews (stress, technical, HR) that they would face during the course of their recruitment process.
	PART-B QUANTITATIVE APTITUDE-II
CO-1	The students will be able to perform well in calculating different types of datainterpretation problems.
CO-2	The students will perform efficaciously on analytical and logical problems using variousmethods.
CO-3	Students will find the angle measurements of clock problems with the knowledge ofcalendars and clock.
CO-4	The students will skillfully solve the puzzle problems like arrangement of differentpositions.
CO-5	The students will become good at solving the problems of lines, triangulars, volume ofcone, cylinder and so on.

SYLLABUS: MINI PROJECT (B16EE 3207)

Course Code: B16 EE 3207	
Course Title: MINI PROJECT	
CO-1	Identify the area of project work through the literature survey.
CO-2	Plan the project activity with constraints required to implement it.
CO-3	Develop communication and presentation skills.
CO-4	Work as team member for core/multidisciplinary projects.

SYLLABUS: ADVANCED CODING (B16 ENG 3204)

(Common to ECE & EEE)

UNIT I Review Coding essentials and modular programming

Introduction to Linear Data, Structure of linear data, Operation logics, Matrix forms and representations, Pattern coding.

Introduction to modular programming: Formation of methods, Methods: Signature and definition, Inter-method communication, Data casting & storage classes, Recursions

UNIT II Linear Linked Data

Introduction to structure pointer, Creating Links Basic problems on Linked lists, Classical problems on linked lists. Circular Linked lists, Operations on CLL, Multiple links, Operations on Doubly linked lists

UNIT III Abstract Data-structures

Stack data-structure, Operations on stack, Infix/Prefix/Post fix expression evaluations, Implementation of stack using array, Implementation of stack using linked lists.

Queue data-structure: Operations on Queues, Formation of a circular queue, Implementation of queue using stack, Implementation of stack using array, Implementation of stack using linked lists

UNIT IV Running time analysis of code and organization of linear list data

Code evaluation w.r.t running time, Loop Complexities, Recursion complexities, Searching techniques: sequential Vs. binary searching.

Organizing the list data, Significance of sorting algorithms, Basic Sorting Techniques: Bubble sort, selection sort, Classical sorting techniques: Insertion sort, Quick sort, Merge sort.

UNIT V Standard Library templates and Java collections

Introduction to C++ language features, working on STLs, Introduction to Java as Object Oriented language, Essential Java Packages, Coding logics.

Note: This course should focus on Problems

Course Code: B16 EE 3204	
Course Title: ADVANCED CODING	
CO-1	Acquire coding knowledge on essential of modular programming
CO-2	Acquire Programming knowledge on linked lists
CO-3	Acquire coding knowledge on ADT
CO-4	Acquire knowledge on time complexities of different methods
CO-5	Acquire Programming skill on Java libraries and Collections

SYLLABUS: MATLAB PROGRAMMING FOR NUMERICAL COMPUTATION (B16EE3208A)

(MOOCS-II)

Module 1: Introduction to MATLAB Programming

This module will introduce the students to MATLAB programming through a few examples. Students who have used MATLAB are still recommended to do this module, as it introduces MATLAB in context of how we use it in this course

Lecture 1-1 Basics of MATLAB programming

Lecture 1-2 Array operations in MATLAB

Lecture 1-3 Loops and execution control

Lecture 1-4 working with files: Scripts and Functions

Lecture 1-5 Plotting and program output

Module 2: Approximations and Errors-Taylors / Maclaurin series expansion of some functions will be used to introduce approximations and errors in computational methods

Lecture 2-1 Defining errors and precision in numerical methods

Lecture 2-2 Truncation and round-off errors

Lecture 2-3 Error propagation, Global and local truncation errors

Module 3: Numerical Differentiation and Integration-Methods of numerical differentiation and integration, trade-off between truncation and round- off errors, error propagation and MATLAB functions for integration will be discussed.

Lecture 3-1 Numerical Differentiation in single variable

Lecture 3-2 Numerical differentiation: Higher derivatives

Lecture 3-3 Differentiation in multiple variables

Lecture 3-4 Newton-Cotes integration formulae **Lecture 3-5** Multi-step application of Trapezoidal rule
Lecture 3-6 MATLAB functions for integration

Module 4: Linear Equations: The focus of this module is to do a quick introduction of most popular numerical methods in linear algebra, and use of MATLAB to solve practical problems.

Lecture 4-1 Linear algebra in MATLAB

Lecture 4-2 Gauss Elimination

Lecture 4-3 LU decomposition and partial pivoting

Lecture 4-4 Iterative methods: Gauss Siedel

Lecture 4-5 Special Matrices: Tri-diagonal matrix algorithm

Module 5: Nonlinear Equations

After introduction to bisection rule, this module primarily covers Newton-Raphson method and MATLAB routines f-zero and f-solve.

Lecture 5-1 Nonlinear equations in single variable

Lecture 5-2 MATLAB function fzero in single variable

Lecture 5-3 Fixed-point iteration in single variable

Lecture 5-4 Newton-Raphson in single variable

Lecture 5-5 MATLAB function fsolve in single and multiple variables

Lecture 5-6 Newton-Raphson in multiple variables

Module 6: Regression and Interpolation

The focus will be practical ways of using linear and nonlinear regression and interpolation functions in MATLAB.

Lecture 6-1 Introduction

Lecture 6-2 Linear least squares regression(including lsqcurvefit function)

Lecture 6-3 Functional and nonlinear regression (including lsqnonlin function)

Lecture 6-4 Interpolation in MATLAB using spline and pchip

Module 7: Ordinary Differential Equations (ODE) – Part 1

Explicit ODE solving techniques in single variable will be covered in this module.

Lecture 7-1 Introduction to ODEs; Implicit and explicit Euler‟s methods

Lecture 7-2 Second-Order Runge-Kutta Methods

Lecture 7-3 MATLAB ode45 algorithm in single variable

Lecture 7-4 Higher order Runge-Kutta methods

Lecture 7-5 Error analysis of Runge-Kutta method

Module 8: Ordinary Differential Equations (ODE) – Practical aspects

This module will cover ODE solving in multiple variables, stiff systems, and practical problems. The importance of ODEs in engineering is reflected by the fact that two modules are dedicated to ODEs.

Lecture 8-1 MATLAB ode45 algorithm in multiple variables

Lecture 8-2 Stiff ODEs and MATLAB ode15s algorithm

Lecture 8-3 Practical example for ODE-IVP

Lecture 8-4 solving transient PDE using Method of Lines

SYLLABUS: INTRODUCTION TO INTERNET OF THINGS (B16 EE 3208B)

(MOOCS-II)

Week 1: Introduction to IoT: Part I, Part II, Sensing, Actuation, Basics of Networking: Part-I

Week 2: Basics of Networking: Part-II, Part III, Part IV, Communication Protocols: Part I, Part II

Week 3: Communication Protocols: Part III, Part IV, Part V, Sensor Networks: Part I, Part II

Week 4: Sensor Networks: Part III, Part IV, Part V, Part VI, Machine-to-Machine Communications

Week 5: Interoperability in IoT, Introduction to Arduino Programming: Part I, Part II, Integration of Sensors and Actuators with Arduino: Part I, Part II

Week 6: Introduction to Python programming: Part I, Part II, Introduction to Raspberry Pi: Part I, Part II, Implementation of IoT with Raspberry Pi: Part I

Week 7: Implementation of IoT with Raspberry Pi: Part II, Part III, Introduction to SDN: Part I, Part II, SDN for IoT: Part I

Week 8: SDN for IoT: Part II, Data Handling and Analytics: Part I, Part II, Cloud Computing: Part I, Part II

Week 9: Cloud Computing: Part III, Part IV, Part V, Sensor-Cloud: Part I, Part II

Week 10: Fog Computing: Part I, Part II, Smart Cities and Smart Homes: Part I, Part II, Part III

Week 11: Connected Vehicles: Part I, Part II, Smart Grid: Part 1, Part II, Industrial IoT: Part I

Week 12: Industrial IoT: Part I, Case Study: Agriculture, Healthcare, Activity Monitoring: Part I, Part II

SYLLABUS: ELECTROMAGNETIC THEORY (B16BS3208C)

(MOOCS-II)

Week 1: Coulomb's law and electric fields

Week 2: Gauss's law, potential and energy, conductors and dielectrics

Week 3: Laplace and Poisson equations, solution methods, and capacitance

Week 4: Biot-Savart and Ampere's laws, inductance calculation

Week 5: Magnetic materials, Faraday's law and quasi-static analysis

Week 6: Maxwell equations and uniform plane waves

Week 7: Wave propagation in dielectrics and conductors, skin effect, normal incidence

Week 8: Oblique incidence, Snell's law, and total internal reflection

Week 9: Transmission lines, Smith chart, impedance matching

Week 10: Transients and pulse propagation on transmission line

Week 11: Waveguides: Metallic and Dielectric

Week 12: Antenna fundamentals

SYLLABUS: INDUSTRIAL AUTOMATION AND CONTROL (B16 EE 3209A)

(MOOCS-III)

Module I

1 Introduction

2 Introduction(Cont.)

3 Architecture of Industrial Automation Systems

4 Architecture of Industrial Automation Systems(Cont.)

Module II

5 Measurement Systems Characteristics

6 Measurement Systems Characteristics(Cont.) 7 Data Acquisition Systems

8 Data Acquisition Systems (Cont.)

Module III

9 Introduction to Automatic Control

10 Introduction to Automatic Control(Cont.)

11 11 P-I-D Control

12 12 P-I-D Control(Cont.)

13 13 PID Control Tuning

14 PID Control Tuning(Cont.)

15 Feedforward Control Ratio Control

16 Feedforward Control Ratio Control(Cont.)

17 Time Delay Systems and Inverse Response Systems

18 Time Delay Systems and Inverse Response Systems(Cont.) 19 Special Control Structures

19 Special Control Structures(Cont.)

20 Concluding Lesson on Process Control (Self-study)

21 Introduction to Sequence Control, PLC , RLL

22 Introduction to Sequence Control, PLC, RLL(Cont.)

23 Sequence Control. Scan Cycle, Simple RLL Programs

24 Sequence Control. Scan Cycle, Simple RLL Programs(Cont.)

25 Sequence Control. More RLL Elements, RLL Syntax

26 Sequence Control. More RLL Elements, RLL Syntax(Cont.)

27 A Structured Design Approach to Sequence Control

28 A Structured Design Approach to Sequence Control(Cont.)

29 PLC Hardware Environment

30 PLC Hardware Environment(Cont.)

Module IV

32 Flow Control Valves

33 Flow Control Valves(Cont.)

34 Hydraulic Control Systems – I

35 Hydraulic Control Systems – I(Cont.)

36 Hydraulic Control Systems - II

37 Hydraulic Control Systems – II(Cont.)

38 Industrial Hydraulic Circuit

39 Industrial Hydraulic Circuit(Cont.)

40 Pneumatic Control Systems – I

41 Pneumatic Control Systems – I(Cont.)

42 Pneumatic Systems - II

43 Pneumatic Systems – II(Cont.)

44 Energy Savings with Variable Speed Drives

45 Energy Savings with Variable Speed Drives(Cont.)

46 46 Introduction To CNC Machines

47 Introduction To CNC Machines(Cont.)

Module V

48 The Fieldbus Network - I

49 The Fieldbus Network - I(Cont.)

50 Higher Level Automation Systems

51 Higher Level Automation Systems(Cont.)

52 Course Review and Conclusion (Self-study)

SYLLABUS INTRODUCTION TO SMART GRID (B16EE3209B)

(MOOCS-III)

Week 1:

- Introduction to Smart Grid-I
- Introduction to Smart Grid-II
- Architecture of Smart Grid System
- Standards for Smart Grid System
- Elements and Technologies of Smart Grid System

Week 2:

- Elements and Technologies of Smart Grid System-II
- Distributed Generation Resources-I
- Distributed Generation Resources-II
- Distributed Generation Resources-III
- Distributed Generation Resources-IV

Week 3:

- Wide Area Monitoring Systems-I
- Wide Area Monitoring Systems-II
- Phasor Estimation-I
- Phasor Estimation-II
- Digital relays for Smart Grid Protection

Week 4:

- Islanding Detection Techniques-I
- lslanding Detection Techniques-II
- Islanding Detection Techniques-III
- Islanding Detection Techniques-IV
- Smart Grid Protection-I

Week 5:

- Smart Grid Protection-II
- Smart Grid Protection-III
- Modelling of Storage Devices
- Modelling of DC Smart Grid components
- Operation and control of AC Microgrid-I

Week 6:

- Operation and control of AC Microgrid-II
- Operation and control of DC Microgrid-I
- Operation and control of DC Microgrid-II
- Operation and control of AC-DC hybrid Microgrid-I
- Operation and control of AC-DC hybrid Microgrid-II

Week 7:

- Simulation and Case study of AC Microgrid
- Simulation and Case study of DC Microgrid
- Simulation and Case Study of AC-DC Hybrid Microgrid
- Demand side management. of Smart Grid
- Demand response analysis of Smart Grid

Week 8:

- Energy Management
- Design of Smart grid and Practical Smart Grid case study-I
- Design of Smart grid and Practical Smart Grid case study-II
- System Analysis of AC/DC Smart Grid
- Conclusions

SYLLABUS: ANALOG IC DESIGN (B16EE3209C)

(MOOCS-III)

Week 1 Introduction to Integrated Circuits; Review of some simple MOS amplifiers

Week 2 Noise in circuits; Noise analysis of common circuits

Week 3 Mismatch in circuits

Week 4 Introduction to negative feedback; frequency response and Bode plots

Week 5 Loop gain and stability; Dominant pole compensation

Week 6 Block level conceptualization of single- and two-stage opamps

Week 7 Differential and common-mode analysis; Differential amplifiers

Week 8 Single-stage opamp

Week 9 Telescopic opamp

Week 10 Folded cascade opamp

Week 11 Two-stage opamp

Week 12 Fully differential opamps; common-mode feedback

SYLLABUS: MECHANISM AND ROBOT KINEMATICS (B16EE3209D)

(MOOCS-III)

Week 1: Introduction to Mechanisms and Robotics, Mobility Analysis-I

Week 2: Mobility Analysis-II, Displacement Analysis: constrained mechanisms and robots-I

Week 3: Displacement Analysis: constrained mechanisms and robots-II

Week 4: Displacement Analysis: constrained mechanisms and robots- III, Velocity Analysis: constrained mechanisms and robots-I

Week 5: Velocity Analysis: constrained mechanisms and robots-II

Week 6: Velocity Analysis: constrained mechanisms and robots-III

Week 7: Velocity Analysis: singularity and path generation, Acceleration Analysis, Force Analysis-I

Week 8: Force Analysis-II, Coordinate Transformations and kinematics of serial robots

ELECTRICAL & ELECTRONICS ENGINEERING

ELECTRIC DRIVES (B16EE4101)

INTRODUCTION TO DRIVES

Definition, Advantages and applications of drives, Components of electric drive system, Difference between DC and AC drives, Multi quadrant operation of drive, Speed control methods of DC motors and Induction motor, Starting methods of synchronous motor, Electric Braking.

RECTIFIER CONTROLLED FED DC DRIVES

Single Phase Fully controlled converters connected to DC separately excited motor and DC series motor – Continuous & Discontinuous current operation – voltage and current waveforms – Speed Torque expressions – Speed Torque Characteristics.

CHOPPER CONTROLLED FED DC DRIVES

Chopper controlled DC separately excited motor and DC series motor – Continuous current operation – voltage and current waveforms – Speed Torque expressions – Speed Torque characteristics, Closed loop control of DC drive (Only Block Diagram).

CONTROL OF INDUCTION MOTORS

Variable voltage control of Induction motor by AC voltage controller, Variable frequency control of Induction motor by cycloconverter – waveforms – Speed Torque characteristics, Slip power recovery schemes – Static Kramer Drive – Static Scherbius Drive.

CONTROL OF SYNCHRONOUS MOTORS

Separate control & self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI and CSI cycloconverters, Load commutated CSI fed Synchronous Motor – Operation – Waveforms – Speed Torque characteristics.

Course Outcomes for Final Year First Semester Course	
Course Code: B16EE4101	
Course Title: ELECTRIC DRIVES	
CO-1	Identify different electric drive system.
CO-2	Understand the operation of rectifier fed DC drives, chopper fed DC drives and closed loopcontrol of DC motor.
CO-3	Analyse the slip power recovery schemes of Induction motor and speed control of converterfed induction motor & synchronous motor.
CO-4	Evaluate the performance of speed control of synchronous motor by CSI and VSI.

SYLLABUS: NON-CONVENTIONAL ENERGY SOURCES (B16EE4102)

(Elective-II)

Introduction to Non-Conventional Energy Sources:

Environmental aspects of conventional electric energy generation, renewable and non- conventional energy sources, impact of renewable energy generation on environment, prospects of renewable energy sources.

Solar Energy:

Solar radiation and its measurements: introduction to solar energy, solar constant, solar radiation at the earth's surface, solar radiation geometry, solar radiation measurements, estimation of average solar radiation, solar radiation on tilted surface. Solar energy collectors: physical principles of the conversion of solar radiation into heat, flat plate collectors, concentrating collectors, advantages and disadvantages. Solar electric power generation: principles of solar photo-voltaic cells, conversion efficiency and power output.

Wind Energy:

Introduction, basic principles of wind energy conversion-nature of wind, power in the wind, maximum power, forces on the blades, lift and drag forces, aerodynamics, types of wind power plants, types of wind turbine -generating units, generating systems, energy storage, application of wind energy, site selection considerations, environmental aspects.

Ocean Energy: Ocean thermal energy conversion: working principle, availability, types, advantages, limitations and applications. Wave energy: factors affecting the wave energy, mathematical analysis for potential energy, kinetic energy, total energy and wave power. Tidal energy: basic terminology, types of tidal plants, energy potential estimation from a tidal plant, advantages and limitations.

Geo-Thermal Energy: Structure of earth's interior, thermal gradient, geo-thermal energy sources, types of geo-thermal power generation, merits, demerits and applications of geo-thermal energy.

Bio Energy: Overview, bio-mass conversion processes, bio-gas generation, factors affecting the generation of bio gas, various types of bio gas plants.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16EE4102	
Course Title: NON-CONVENTIONAL ENERGY RESOURCES	
CO-1	Identify the need for Renewable energy
CO-2	Recognise the ways of collection of solar energy.
CO-3	Apply the knowledge of wind energy to estimate the energy potential.
CO-4	Apply the knowledge of ocean, waves and tides to estimate their energy potential.
CO-5	Understand the concepts behind geo-thermal energy and bio energy.

SYLLABUS: ENERGY MANAGEMENT AND AUDITING (B16 EE 4103)

(Elective-II)

ENERGY SCENARIO

Classification of Energy resources, Commercial and non-commercial energy, primary and secondary sources, commercial energy production, final energy consumption, Energy needs of growing economy, short terms and long terms policies, energy sector reforms, distribution system reforms and up-gradation, energy security, importance of energy conservation, energy and environmental impacts, emission check standard, United nations frame work convention on climate change, Global Climate Change Treaty, Kyoto Protocol, Clean Development Mechanism, salient features of Energy Conservation Act 2001 and Electricity Act 2003. Indian and Global energy scenario. Introduction to IE Rules. Study of Energy Conservation Building Code (ECBC), Concept of Green Building.

ENERGY MANAGEMENT

Definition and Objective of Energy Management, Principles of Energy management, Energy management Strategy, Energy Manager Skills, key elements in energy management, force field analysis, energy policy, format and statement of energy policy, Organization setup and energy management. Responsibilities and duties of energy manager under act 2001. Energy Efficiency Programmes. Energy monitoring systems. Introduction to SCADA and Automatic meter reading in utility energy management.

DEMAND MANAGEMENT

Supply side management (SSM), various measures involved such as use of FACTS, VAR Compensation, Generation system up gradation, constraints on SSM. Demand side management (DSM), advantages and Barriers, implementation of DSM, areas of development of demand side management in agricultural, domestic and commercial consumers. Demand management through tariffs (TOD). Power factor penalties and incentives in tariff for demand control. Apparent energy tariffs. Role of renewable energy sources in energy management, direct use (solar thermal, solar air conditioning, biomass) and indirect use (solar, wind etc.)

ENERGY AUDIT

Definition, need of energy audit, types of audit, procedures to follow, data and information analysis, energy audit instrumentation, energy consumption – production relationship, pie charts. Sankey diagram, Cusum technique, least square method and numerical based on it. Outcome of energy audit and energy saving potential, action plans for implementation of energy conservation options. Bench- marking energy performance of an industry. Energy Audit Report writing as per prescribed format. Audit case studies of sugar, steel, paper and cement industries.

FINANCIAL ANALYSIS AND CASE STUDIES

Costing techniques; cost factors, budgeting, standard costing, sources of capital, cash flow diagrams and activity chart. Financial appraisals; criteria, simple payback period, return on investment, net present value method, time value of money, break even analysis, sensitivity analysis and numerical based on it, cost optimization, cost of energy, cost of generation, Energy audit case studies such as IT sector, Textile, Municipal corporations, Educational Institutes, T and D Sector and Thermal Power stations.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16EE4103	
Course Title: ENERGY MANAGEMENT AND AUDITING	
CO-1	Analyze and understand energy consumption patterns and environmental impacts and mitigation method.
CO-2	Listing various energy conservation measures for various processes.
CO-3	Students can carry out preliminary audits.
CO-4	Can work out economic feasibility of encon option.

SYLLABUS: ELECTRICAL MACHINE DESIGN (B16EE4104)

(Elective-II)

FUNDAMENTAL ASPECTS OF ELECTRICAL MACHINE DESIGN: Design of Machines, Design Factors, Limitations in Design, Basic Principles, specification, Ratings, Magnetic Circuits, magnetization curves, heating, cooling, temperature rise with short term rating .(6 Hours)

D.C MACHINE: Construction Details, Armature, windings, Commutator, Design of output equation, Selection of No. of poles, Magnetic circuit and Magnetization curve. (12 Hours)

TRANSFORMER : Classification of Transformers, core construction, types of winding and design, Cooling and insulation, Output of Transformer, output equation ration of iron loss to copper loss, relation between core area and weight of iron and copper, optimum designs.(12 Hours)

THREE PHASE INDUCTION MACHINE: Stator, stator frames, rotor, rotor windings, comparison of squirrel cage and wound rotors, slip rings, design of output equation, main dimensions, stator winding, design of squirrel cage rotor and wound rotor.(12 Hours)

THREE PHASE SYNCHRONOUS MACHINE : Output equation, main dimensions for salient and non-salient pole machines, armature windings and design, selection of stator slots, air gap length, design of rotor for salient pole and turbo alternators.(12 Hours)

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16EE4104	
Course Title: ELECTRICAL MACHINE DESIGN	
CO-1	Understand the fundamental concepts of electrical machine design.
CO-2	Design the armature, field winding and main dimensions of DC Machine.
CO-3	Design of the single phase and three phase transformer dimensions and windings.
CO-4	Design number of turns, phase, air gap length and conductor size etc. for given synchronous machine.
CO-5	Find number of slots / pole and develop various winding diagrams for a given AC Machines.

SYLLABUS: OPERATIONS RESEARCH (B16 EE 4105)

(Elective-III)

INTRODUCTION TO OPERATIONS RESEARCH:

Applications of OR, Optimization, Mathematical Model- Linear Programming Problem, Requirements For A LP Problem, Examples On The Application Of LPP, Graphical Solution Of 2-Variable LP Problems, General Mathematical Formulation For LPP, Canonical And Standard Forms Of LP Problem, Simplex Method, Simple Problems on Simplex Methods, Big-M Method

TRANSPORTATION PROBLEM:

Matrix Terminology, Definition and Mathematical Representation of Transportation Model, Formulation and Solution of Transportation Models (Basic Feasible Solution by North-West Corner Method, Least Cost Entry Method. Vogel's Approximation Method)

ASSIGNMENT PROBLEM:

Matrix Terminology, Definition of Assignment Model, Comparison with Transportation Model, Mathematical Representation of Assignment Model, Formulation and Solution of Assignment Models.

PERT AND CPM NETWORK:

Introduction, Phases of Project Scheduling, Network Logic, Numbering the Events (Fulkerson's Rule), Measure of Activity, Forward Pass and Backward Pass Computations, Slack Critical Path.

GAME THEORY:

Useful Terminology, Rules for Game Theory, Saddle Point, Pure Strategy, Mini-Max, Maxi- MinPrinciple, Reduce Game by Dominance, Graphical solution, Mixed Strategies, 2x2 Games without Saddle Point.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16 EE 4105	
Course Title: OPERATIONS RESEARCH	
CO-1	Understand about the techniques of planning and monitoring the progress of a software project.
CO-2	Solve problems related to Project management.
CO-3	Analyse about the basic structure, characteristics, Functions and relationships of an organisation so that he may acquire sound, scientific and Quantitative knowledge for decision making
CO-4	Knowledge to solve problems related to planning, transportation etc.
CO-5	Realization of different techniques of engineering and other problems.

SYLLABUS: FLEXIBLE AC TRANSMISSION SYSTEMS (B16 EE 4106)

(Elective-III)

INTRODUCTION:

Reactive power control in electrical power transmission lines – Uncompensated transmission line – series compensation – Basic concepts of Static Var Compensator (SVC) – Thyristor Controlled Series capacitor (TCSC) – Static Synchronous Compensator (STATCOM) - Static Synchronous Series Compensator (SSSC).

STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS:

Voltage control by SVC –Advantages of slope in dynamic characteristics – Influence of SVC on system voltage – Design of SVC voltage regulator –Modelling of SVC for power flow and fast transient stability – Applications: Enhancement of transient stability – Steady state power transfer Enhancement of power system damping.

THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS:

Operation of the TCSC – Different modes of operation – Modelling of TCSC– Variable reactance model – Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit – Enhancement of system damping.

VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS:

Static Synchronous Compensator (STATCOM) – Principle of operation – V-I Characteristics. Applications: Steady state power transfer-enhancement of transient stability – prevention of voltage instability.

STATIC SYNCHRONOUS SERIES COMPENSATOR (SSSC):

Operation of SSSC and the Control of power flow – modelling of SSSC in load flow and transient stability studies.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16EE4106	
Course Title: FLEXIBLE AC TRANSMISSION SYSTEMS	
CO-1	Understand the needs of power systems and utility networks where installation of FACTS Controllers/Devices becomes essential.
CO-2	Evaluate the operating principles, control systems and modelling of different FACTSControllers.
CO-3	Apply different FACTS controller for enhancing power transfer, enhancement of systemdamping, enhancing power stability and prevention of voltage instability.
CO-4	Understand the needs of power systems and utility networks where installation of FACTS Controllers/Devices becomes essential.

SYLLABUS: INTRODUCTION TO SOFT COMPUTING (B16 EE 4107)

Introduction: Artificial neural network: Introduction, characteristics- learning methods – taxonomy – Evolution of neural networks- basic models – important technologies – applications. Fuzzy logic: Introduction – crisp sets- fuzzy sets – crisp relations and fuzzy relations: cartesian product of relation – classical relation, fuzzy relations, tolerance and equivalence relations, non- iterative fuzzy sets. Genetic algorithm- Introduction – biological background – traditional optimization and search techniques – Genetic basic concepts.

Neural networks: McCulloch-Pitts neuron – linear separability – hebb network – supervised learning network: perceptron networks – adaptive linear neuron, multiple adaptive linear neuron, BPN, RBF, TDNN- associative memory network: auto-associative memory network, hetero- associative memory network, BAM, Hopfield networks, iterative auto associative memory network & iterative associative memory network –unsupervised learning networks: Kohonen self organizing feature maps, LVQ – CP networks, ART network.

Fuzzy Logic: Membership functions: features, fuzzification, and methods of membership value assignments- Defuzzification: lambda cuts – methods – fuzzy arithmetic and fuzzy measures: fuzzy arithmetic – extension principle – fuzzy measures – measures of fuzziness -fuzzy integrals – fuzzy rule base and approximate reasoning : truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.

Genetic Algorithm: Genetic algorithm and search space – general genetic algorithm – operators– Generational cycle – stopping condition – constraints – classification – genetic programming – multilevel optimization – real life problem- advances in GA

Hybrid Soft Computing Techniques & Applications: Neuro-fuzzy hybrid systems – genetic neuro hybrid systems – genetic fuzzy hybrid and fuzzy genetic hybrid systems – simplified fuzzy ARTMAP – Applications: A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing based hybrid fuzzy controllers.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16 EE 4107	
Course Title: INTRODUCTION TO SOFT COMPUTING	
CO-1	Apply various soft computing frame works like neural network, fuzzy logic and genetic algorithm.
CO-2	Design of various neural networks and fuzzy logic modelling depending upon the required application.
CO-3	Discuss hybrid soft computing.

SYLLABUS: MICROPROCESSOR AND MICRO CONTROLLER LAB (B16 EE 4108)

LIST OF EXPERIMENTS:

PART A: EXPERIMENTS ON MICROPROCESSORS

1. Program to add two 8-bit binary numbers
2. Program to add an array of 8-bit binary numbers.
3. Program to pick the largest even number from an array of 8- bit binary numbers
4. Program to find the sum of an array of 2- digit packed BCD numbers.
5. Program to display decimal count from 0 to 9 with suitable delay between each count.
6. Program to convert an 8- bit binary number into BCD.
7. Program to sort given array of 8-bit binary numbers.

PART B: EXPERIMENTS ON MICRO CONTROLLERS

8. Microcontroller programming on two 8-bit numbers a)Addition, b) Subtraction , c) Multiplication & d) Division
9. Program to obtain decimal equivalent of an 8-bit hexadecimal number
10. Interfacing stepper motor and speed control using 8051 microcontroller
11. Traffic light control using 8051 microcontroller.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16EE4108	
Course Title: MICROPROCESSOR AND MICRO CONTROLLER LAB	
CO-1	Evaluate the programs using basic fundamentals of 8085 Microprocessor& 8051Microcontroller.
CO-2	Develop different programs on extended version like 8086 microprocessor.
CO-3	Design programs for interfacing circuits like traffic controller, LED display board, Motor controllers etc.

SYLLABUS: POWER ELECTRONICS LAB (B16EE4109)

LIST OF EXPERIMENTS

1. To vary dc output voltage of a single phase semi converter with R-L load.
2. To vary D.C output voltage using impulse commutated chopper.
3. To obtain the ac output voltage of a resonant series inverter at different frequencies.
4. To operate UJT as relaxation oscillator. obtain the characteristics of UJT
5. To vary the firing angle of thyristor using R & RC Triggering
6. To vary the speed of dc motor by using single phase full converter with and without free wheeling diode.
7. To find performance parameters of uncontrolled rectifiers (center tapped, Bridge type).
8. To vary single phase AC voltage-using single phase AC voltage controller.
9. To vary frequency of single phase AC voltage using 1-Φ to 1-Φmid point cyclo converter.
10. To vary frequency of mc murray bed ford inverter
11. To vary D.C output voltage using impulse commutated chopper.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16EE4109	
Course Title: POWER ELECTRONICS LAB	
CO-1	Analyze the Thyristor and Transistor characteristics.
CO-2	Evaluate the characteristics of converter and inverter with R and RL Loads.
CO-3	Apply different controllers for controlling the DC drives

SYLLABUS: PROJECT PHASE-I (B16 EE 4110)

The phase-I of the project shall comprise of

- Problem identification in close collaboration with industry.
- Literature survey.
- Deriving work content and carry out of project requirement analysis.
- Submission of interim report.
- Presentation to an expert committee.

(Note: Sessional 50 marks will be awarded based onContinuous evaluation - 25 Marks Seminar and Viva voce - 25 Marks.)

Course Outcomes for Fourth Year First Semester Course	
Course Code: : B16EE4110	
Course Title: PROJECT PHASE-I	
CO-1	Identify a current problem through literature/field/case studies and define the background objectives and methodology for solving the same.
CO-2	Write report and present it effectively.

SYLLABUS: POWER SYSTEM OPERATION & CONTROL (B16 EE 4201)

OPTIMAL SYSTEM OPERATION:

Optimal operation of Generators in Thermal power stations, Heat rate curve, Cost Curve, Incremental fuel and Production costs, Input–output characteristics. Optimum generation allocation with & without transmission line losses, Loss Coefficients, General transmission line loss formula. Optimal scheduling of Hydrothermal System**:** Short term hydrothermal scheduling problem.

UNIT COMMITMENT & OPTIMAL POWER FLOW

Optimal unit commitment problem: Need for unit commitment, Constraints in unit commitment, Cost function formulation, Solution methods using Priority list method & Dynamic programming. Optimal Power Flow: Problem formulation & Solution of OPF by Gradient Method.

AUTOMATIC GENERATION CONTROL:

Frequency control: Load-Frequency Control Concepts, Load frequency Control of a Single Area System modelling, Steady state & Dynamic response of uncontrolled & controlled cases, Two-area system modelling **-** Static analysis of uncontrolled case, Tie line with frequency bias control of two-area system.

Voltage control: Automatic voltage regulator, Exciter types, Exciter modelling, Generator modelling, static and dynamic response of AVR loop.

POWER SYSTEM SECURITY

Introduction, Factors affecting the power system security, contingency analysis procedures, linear sensitivity factors, line outages distribution factors and generation shift factors and its derivation, AC power flow method, contingency selection.

EMERGENCY CONTROL:

Concepts, Preventive and Emergency Control, Coherent Area Dynamics, Stability Enhancement Methods, Long Term Frequency Dynamics, Average System Frequency, Centre of Inertia.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16 EE 4201	
Course Title: POWER SYSTEM OPERATION & CONTROL	
CO-1	Understand in solving economic load scheduling and unit commitment problems usingvarious computational methods for optimal operation of generators.
CO-2	Solve the optimal scheduling of Thermal and Hydro-thermal system and Optimal powerflow.
CO-3	Analyze the concepts like Load Frequency Control, Power system and stability issues.

SYLLABUS: ADVANCED POWER ELECTRONICS (B16 EE 4202)

(Elective-IV)

MODERN POWER SEMICONDUCTOR DEVICES Modern power semiconductor devices – MOS turn Off Thyristor (MTO) – Emitter Turn off Thyristor (ETO) – Integrated Gate- Commutated thyristor (IGCTs) – MOS-controlled thyristors (MCTs) – Static Induction circuit – comparison of their features

D.C. TO D.C. CONVERTER Classification of choppers. Principle of operation, steady state analysis of class A chopper, step up chopper, switching mode regulators: Buck, Boost, Buck- Boost, Cuk regulators. Current commutated and voltage commutated chopper. Power Supplies: Switched mode D.C. and A.C. power supplies. Resonant D.C and A.C. power supplies.

A.C. TO A.C. CONVERTER Classification, principle of operation of step up and step down Cycloconverter. Single phase to single phase Cycloconverter with resistive and inductive load. Three phase to single phase Cycloconverter: Half wave and full wave. Cosine wave crossing technique. Three phases to three phase Cycloconverter. Output voltage equation of Cycloconverter.

D.C. TO A.C. CONVERTER Classification, basic series and improved series inverter, parallel inverter, single phase voltage source inverter, steady state analysis, Half bridge and full bridge inverter: Modified Mcmurray and Modified Mcmurray Bedford inverter, voltage control in single phase inverters, PWM inverter, reduction of harmonics, current source inverter, three phase bridge inverters.

MULTILVEL CONVERTERS AND PWM TECHNIQUES: Introduction to multilevel converters – diode clamp, flying capacitor and cascaded-cell converters; PWM with a few switching angles per quarter cycle, equal voltage contours, selective harmonic elimination, THD optimized PWM, off-line PWM, Phase disposition techniques.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16EE4202	
Course Title: ADVANCED POWER ELECTRONICS (Elective-IV)	
CO-1	Choose appropriate device for a particular converter topology.
CO-2	Understand the operating principles and models of different types of power electronicconverters including dc-dc converters, AC to AC converters and inverters
CO-3	Analyze various converter topologies and can identify the corresponding T.H.D.
CO-4	Apply the knowledge of various devices and converter topologies for different industrial applications.

SYLLABUS: ELECTRICAL DISTRIBUTION SYSTEMS (B16 EE 4203)

(Elective-IV)

GENERAL CONCEPTS:

Introduction to distribution systems, Load modelling and characteristics – Coincidence factor– Contribution factor loss factor – Relationship between the load factor and loss factor – Classification of loads (Residential, commercial, Agricultural and Industrial).

SUBSTATIONS:

Location of substations**:** Rating of distribution substation – Service area with n primary feeders – Benefits and methods of optimal location of substations..

DISTRIBUTION FEEDERS:

Design Considerations of distribution feeders**:** Radial and loop types of primary feeders –Voltage levels – Feeder loading – Basic design practice of the secondary distribution system.

SYSTEM ANALYSIS:

Voltage drop and power–loss calculations**:** Derivation for voltage drop and power loss inlines – Uniformly distributed loads and non-uniformly distributed loads – Numerical problems **-** Three phase balanced primary lines.

PROTECTION:

Objectives of distribution system protection – Types of common faults and procedure for fault calculations for distribution system – Protective devices**:** Principle of operation of fuses– Circuit reclosures – Line sectionalizes and circuit breakers.

COORDINATION:

Coordination of protective devices**:** General coordination procedure –Various types of coordinated operation of protective devices **-** Residual Current Circuit Breaker

COMPENSATION FOR POWER FACTOR IMPROVEMENT:

Capacitive compensation for power factor control – Different types of power capacitors –shunt and series capacitors – Effect of shunt capacitors (Fixed and switched) – Power factor correction

– Capacitor allocation – Economic justification – Procedure to determine the best capacitor location – Numerical problems.

VOLTAGE CONTROL:

Voltage Control**:** Equipment for voltage control – Effect of series capacitors – Effect of AVB/AVR – Line drop compensation – Numerical problems.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16EE4203	
Course Title: ELECTRICAL DISTRIBUTION SYSTEMS (Elective-IV)	
CO-1	Understand various concepts of distribution system, protection and its coordination.
CO-2	Apply the best methods for power factor improvement and voltage control.
CO-3	Differentiate the types of loads and their characteristics .

SYLLABUS: HIGH VOLTAGE DIRECT CURRENT TRANSMISSION (B16 EE 4204)

(Elective-IV)

H.V.D.C. TRANSMISSION: General considerations, Power Handling Capabilities of HVDC Lines, Basic Conversion principles, static converter configuration.

STATIC POWER CONVERTERS: 3-pulse, 6-pulse and 12-pulse converters, converter station and Terminal equipment, commutation process, Rectifier and inverter operation, equivalent circuit for converter – special features of converter transformers.

Harmonics in HVDC Systems, Harmonic elimination, AC and DC filters.

CONTROL OF HVDC CONVERTERS AND SYSTEMS: constant current, constant extinction angle and constant Ignition angle control. Individual phase control and equidistant firing angle control, DC power flow control.

Interaction between HV AC and DC systems–Voltage interaction, Harmonic instability problems and DC power modulation.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16EE4204	
Course Title: HIGH VOLTAGE DIRECT CURRENT TRANSMISSION **(Elective–IV)**	
CO-1	Understand about the importance of HVDC transmission over HVAC transmission.
CO-2	Analyze different types of Harmonics produced by converters in HVDC systems
CO-3	Apply different types of controlling techniques for converters used in HVDC systems
CO-4	Describe interaction between HVAC and HVDC transmission systems

SYLLABUS: SIMULATION LAB (B16 EE 4205)

LIST OF EXPERIMENTS

1. Series Rlc Circuit
2. Formation Of Y-Bus & Z-Bus
3. Solution of Power Flow Using Gauss Siedel Method.
4. Abcd Constants For Long Lines And Voltage Profile Observation For Open Circuit Line With And With Out Shunt Reactor Compensation
5. Optimal Operation Of Generating Units Without Considering Transmission Losses [Economic Load Dispatch]
6. Optimal Generator Scheduling Considering Transmission Losses
7. Simulation Of Steady State Stability For Small Disturbances With & Without Change In Power Input
8. Simulation Of Transient Stability
9. Simulation of Automatic Voltage Regulator Using both Stabilizer and PID Controller.
10. Simulation Of Load Frequency Control Of A Single Area System With Free Governor Operation
11. Simulation Of Load Frequency Control Of A Two Area System With Free Governor Operation
12. Load Frequency Control of a Two Area System with Tie Line Biased Control.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16 EE 4205	
Course Title: SIMULATION LAB	
CO-1	Analyze matlab program for the Ybus
CO-2	Design the Simulink models for the simulation of transient and steady state stabilities in power systems

PROJECT PHASE-II (B16 EE 4206)

The phase-II of the project shall consists of

Implementing, Testing and validation. Report Writing.

Sessionals (50 Marks) will be awarded by the Project Guide based on continuous evaluation. External Evaluation (100 marks) of project report and viva voce will be conducted by a committee consisting of HOD, Guide and External Examiner.

May be carried out using in-house facilities or in an industry by specified number of students in a group.

Format for Preparation of Project Thesis for B. Tech:

1. Arrangement Of Contents: The sequence in which the project report material should be arranged and bound should be as follows:
2. Cover Page & Title Page .
3. Bonafide Certificate
4. Abstract.
5. Table of Contents
6. List of Tables
7. List of Figures
8. List of Symbols, Abbreviations and Nomenclature
9. Chapters
10. Appendices
11. References

*The table and figures shall be introduced in the appropriate places.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16EE4206	
Course Title: PROJECT PHASE-II	
CO-1	Identify a current problem through literature/field/case studies and define the background objectives and methodology for solving the same.
CO-2	Analyze, design and develop a technology/ process.
CO-3	Implement and evaluate the technology at the laboratory level.
CO-4	Write report and present it effectively.

INFORMATION TECHNOLOGY

SYLLABUS: ENGLISH (B16 ENG 1101)

UNIT-I: Listening Skills

Conversations: Life in a Hostel – Eating Away those Blues – Meeting Carl Jung – A Documentary on the Big Cat – A Consultant Interviewing Employees – A Conversation about a Business Idea.

UNIT-II: Speaking Skills

Your Favorite Holiday Destination – Describe Yourself – Why we need to save our Tiger – A Dialogue – Your First Interview – Pair Work: Setting up a New Business.

UNIT-III: Reading Skills

Reading Comprehension: Famous People – What is Personality, Personality based on Blood Groups – News Report, Magazine Article, Mobile Towers and Health – An Excerpt from a Short Story, An Excerpt from a Biography – Open Letter to Prime Minister, Business Dilemmas: An Email Exchange – A Review of IPL: The Inside Story, Mark Zukerberg: World's Youngest Billionaire.

UNIT-IV: Writing Skills

Letter Writing, Essay Writing, Email Writing, Report Writing, Paragraph Writing, Drafting a Pamphlet, Argument Writing, Dialogue Writing.

UNIT-V: Grammar

Types of Sentences, Articles, Prepositions, Gerunds and Infinitives, Conjunctions, Tense, Quantifiers, Punctuations, Correction of Sentences, Fill-in the Blanks.

UNIT-VI: Vocabulary

Synonyms, Antonyms, Idioms, One Word Substitution.

UNIT-VII: Life Skills and Core Skills

Self-Awareness and Self-Motivation – Communication, Adaptability – Motivation, Problem Solving – Personal Presentation Skills, Stress Management – Professionalism – Ethics.

Course Outcomes for First Year First Semester Course	
Course Code: B16 ENG 1101	
Course Title: ENGLISH	
CO-1	The overall performance of the students will be enhanced after the course; they will be ina position to make presentations on topics of current interests – politics
CO-2	Students will be able to read
CO-3	The students will be updated with certain real life situations

SYLLABUS: MATHEMATICS - I (B16 ENG 1102)

UNIT-I: Partial Differentiation

Functions of two or more variables – Partial derivatives – Homogeneous Functions – Euler's Theorem – Total Derivative – Change of Variables – Jacobians – Geometrical Interpretation: Tangent Plane and Normal to a Surface

UNIT-II: Applications of Partial Differentiation

Taylor's Theorem for functions of two variables – Errors and Approximations – Total Differential – Maxima and Minima of functions of two variables – Lagrange's Method of Undetermined Multipliers – Differentiation Under the Integral Sign – Leibnitz's Rules.

UNIT-III: Ordinary Differential Equations of First Order and First Degree

Formation of ordinary differential equations (ODEs) – Solution of an ordinary differential equation – Equations of the First Order and First Degree – Linear Differential Equation – Bernoulli's Equation – Exact Differential Equations – Equations Reducible to exact equations.

UNIT-IV: Applications of Differential Equations of First Order

Orthogonal Trajectories – Simple electric (LR & CR) Circuits – Newton's Law of Cooling – Law of Natural growth and decay.

UNIT-V: Linear Differential Equations of Higher Order

Solutions of Linear Ordinary Differential Equations With Constant Coefficients – Rules for finding Complimentary Function – Rules for finding the particular integral – Method of variation of parameters – Cauchy's linear equation – Legendre's Linear Equation – Simultaneous linear equations.

UNIT-VI: Fourier series

Introduction - Eulers Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series - Parseval Formula.

Course Outcomes for First Year First Semester Course	
Course Code: B16 ENG 1102	
Course Title: MATHEMATICS - I	
CO-1	Find partial derivatives, expand a function of more than one variable in a Taylor seriesand utilize them for errors and approximations, maxima and minima.
CO-2	Solve a first order ODE and also find orthogonal trajectories and solve problems relatedto simple applications.
CO-3	Solve a given higher order ODE, an equation with constant coefficients, a Cauchy equation or a Legendre equation.
CO-4	Utilize knowledge of Fourier series for solving partial differential equations and also inunderstanding courses like Signals & Systems

SYLLABUS: MATHEMATICS – II (B16 ENG 1103)

(Common to all Branches)

Matrices – I

Rank of a matrix - Normal Form – Solutions of Linear System of Equations- Consistency of Linear System of Equations – Rouche's Theorem (statement) - Direct Methods: Gauss Elimination Method, LU Factorization Method – Eigen Values and Eigen Vectors of a Matrix– Properties - Cayley – Hamilton Theorem – Inverse and Powers of a Matrix using Cayley – Hamilton Theorem.

Matrices – II

Diagonalization of a Matrix – Quadratic Forms – Reduction of Quadratic Form to Canonical Form – Nature of a Quadratic Form – Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

Laplace Transforms-I

Introduction – Existence Conditions – Transforms of Elementary Functions – Properties of Laplace Transforms – Transforms of Derivatives – Transforms of Integrals – Multiplication by t – Division by t – Evaluation of Integrals by Laplace Transforms – Laplace Transforms of Unit Step Function, Unit Impulse Function and Periodic Functions.

Laplace Transforms-II

Inverse Laplace Transform – different methods - Convolution Theorem – Applications of Laplace Transforms to Ordinary Differential Equations, Simultaneous Linear Differential Equations with Constant Coefficients.

Difference Equations

Definition - order and solution of a difference equation - Formation of difference equations - Linear difference equations - Rules for finding C.F. - Rules for finding P.I.- Simultaneous difference equations with constant coefficients. Application to deflection of a loaded string.

Z-transforms

Z-transforms – definition - some standard Z-transforms - Linear property, damping rule - some standard results - shifting rules - initial and final value theorems - convolution theorem

- Evaluation of inverse transforms - Applications of Z-transform to difference equation.

Course Outcomes for First Year First Semester Courses	
Course Code: B16 ENG 1103	
Course Title: MATHEMATICS – II	
CO-1	Utilizing the knowledge of matrices for solving linear simultaneous equations, find Eigen values and Eigen vectors and handle quadratic forms
CO-2	Utilizing the knowledge of Laplace Transforms to find transforms of important functions that arise in applications and also solve ODE
CO-3	Also utilizing the knowledge of Laplace Transforms in courses like Net Works, Signals & Systems and Control Systems
CO-4	Utilizing the knowledge of difference equations and Z-transforms in understanding courses like Discrete Mathematical Structures and also Signals & Systems

SYLLABUS: CHEMISTRY (B16 ENG 1104)

(Common to CIVIL, CSE & IT)

Water Chemistry

Source of water- impurities- Hardness and its determination by EDTA method- Boiler troubles and their removal. Water softening methods- lime soda, zeolite and ion exchange. Municipal water treatment- Break point chlorination. Desalination of sea water – electro dialysis and reverse osmosis methods.

Building Materials

Portland cement: Manufacture-Chemistry involved in setting and hardening of cement – Cement concrete -RCC – Decay of concrete.

Refractories: Classification-Properties and Engineering applications. Ceramics: Classification-Properties and uses.

Solid State Chemistry

Classification of solids-Types of crystals-properties-Imperfections in crystals. Band theory of solids. Chemistry of semiconductors –Intrinsic, Extrinsic, compound and defect. Organic semiconductors Purification of solids by Zone refining-Single crystal growth – epitaxial growth. Elementary ideas on Liquid crystals.

Corrosion Chemistry

Definition of corrosion- Types of corrosion-chemical & electrochemical corrosion –Pitting, stress corrosion, Galvanic corrosion, Water line corrosion Factors affecting corrosion – Prevention of corrosion- Cathodic protection. Corrosion inhibitors Protective coatings- Metallic coatings, electro plating, electro less plating, chemical conversion coatings- phosphate coatings, chromate coatings, anodizing. Organic coatings-Paints.

Polymers and Plastics

Definition-Types of polymerization – mechanism of free radical polymerization. Plastics- Thermosetting and thermoplastic resins cellulose derivatives, vinyl resins, nylon 6,6, bake lite-Compounding of plastics-Fabrication of plastics. Fiber reinforced plastics – conducting polymers -Engineering applications of polymers.

Fuels And Lubricants

Solid fuels: Coal –Analysis of coal – Metallurgical coke- manufacture-Engineering applications.

Petroleum-refining-Knocking and Octane number of gasolilne-Cetane number of diesel oil. Synthetic petrol – LPG-CNG–Applications. Rocket fuels – Propellants-classification.

LUBRICANTS: Principles of lubrications, classification of lubricants and properties of lubricants (any five)

Course Outcomes for First Year First Semester Course	
Course Code: B16 ENG 1104	
Course Title: CHEMISTRY	
CO-1	Students learn in-depth about the topics of desalination of sea water, CNG, LPG Biogas, Semiconductors, Liquid crystals, Conducting polymers, fiber reinforced plastics, building materials
CO-2	Students understand the basic and advanced applied concepts.
CO-3	Students learn to interrelate the theory and with the relevant experiment.
CO-4	Students learn experimental techniques and understand the theory about experiments

SYLLABUS: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS (B16 ENG 1106)

(Common to CIVIL, CSE & IT)

Introduction to C

Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations, Formatted Input, Formatted Output.

Decision Making, Branching, Looping, Arrays & Strings: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else. If ladder, switch statement, the (?:) operator, the GOTO statement., The while statement, the do statement, The for statement, Jumps in Loops ,One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

Functions

Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, The scope, visibility and lifetime of variables. .

Pointers

Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications

Structure and Unions

Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

File handling

Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments- Program Applications.

Numerical Methods

Solutions of Algebraic and Transcendental Equations: Bisection Method, Newton Raphson Method.

Interpolation - Newton's forward and backward Interpolation, Lagrange's Interpolation in unequal intervals.

Solutions of Linear Equations: Gauss Elimination Method, Jacobi and Gauss Seidel Methods. Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule.

Solutions of Ordinary First Order Differential Equations: Euler's Method, Modified Euler's Method and Runge-Kutta Method.

Course Outcomes for First Year First Semester Course	
Course Code: B16 ENG 1106	
Course Title: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS	
CO-1	Student can understand basic terminology used in C programming.
CO-2	Student can write programs by applying elementary algorithms to solve problems in C language.
CO-3	Student can write, compile and debug programs in C language
CO-4	Student can Write programs to solve numerical methods
CO-5	Student can be familiar with finite precision computation.

SYLLABUS: CHEMISTRY LAB (B16 ENG 1110)

(Common to CIVIL, CSE & IT)

LIST OF PRACTICAL EXPERIMENTS:

1. Estimation of Sodium hydroxide with HCl (Na_2CO_3 primary standard).
2. Estimation of Iron as Ferrous iron in an Ore Sample.
3. Estimation of Oxalic acid by a redox method
4. Estimation of Calcium in a sample of Portland cement.
5. Estimation of Volume strength of Hydrogen Peroxide.
6. Estimation of Mohr's salt by Potassium dichromate
7. Determination of Hardness of an underground water sample.
8. Estimation of Zinc by EDTA method.
9. Determination of Alkalinity of water sample.

DEMONSTRATION EXPERIMENTS:

10. Determination of Viscosity and Viscosity index of a lubricant.
11. Printed Circuit Board
12. Determination of dissolved oxygen in given water sample.
13. Potentiometric titrations.
14. P^H Determination by using P^H meter.

SYLLABUS: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS LAB (B16 ENG 1112)

LIST OF PROGRAMMES:

1. Write a program to read x, y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line.
2. Write a program which generates 100 random numbers in the range of 1 to 100. Store them in an array and then print the array. Write 3 versions of the program using different loop constructs (eg. for, while and do-while).
3. Write a set of string manipulation functions e.g. for getting a sub-string from a given position, copying one string to another, reversing a string and adding one string to another.
4. Write a program which determines the largest and the smallest number that can be stored in different data types like short, int, long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?
5. Write a program which generates 100 random real numbers in the range of 10.0 to 20.0 and sort them in descending order.
6. Write a function for transporting a square matrix in place (in place means that your are not allowed to have full temporary matrix).
7. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their mean and standard deviation.
8. Implement bisection method to find the square root of a given number to a given accuracy.
9. Implement Newton Raphson Method to determine a root of polynomial equation.
10. Given a table of x and corresponding f(x) values, write a program which will determine f(x) value at an intermediate x value using Lagrange's Interpolation.
11. Write a function which will invert a matrix.
12. Implement Simpson's $1/3^{rd}$ rule for numerical integration.
13. Implement Trapezoidal rule for numerical integration.
14. Write a program to solve a set of linear algebraic equations.
15. Write a program to solve a differential equation using Runge-Kutta Method.

SYLLABUS: MATHEMATICS – III (B16 ENG 1201)

(Common to all Branches)

Solid Geometry

Equations of a plane, Normal form, Intercept form, Equations of Straight Line – Conditions for a line to lie in a Plane – Coplanar lines – Shortest distance between two skew lines - Intersection of three Planes – Equations of Sphere – Tangent Plane to a Sphere –Cone – Cylinder.

Multiple Integrals-1

Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

Multiple Integrals-2

Beta Function - Gamma Function - Relation between Beta and Gamma Functions-Error Function - Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of mass - Center of gravity of a plane lamina- Moment of inertia.

Fourier Transforms

Introduction – definition - Fourier integral - Sine and Cosine integrals - Complex form of Fourier integral - Fourier transform - Fourier Sine and Cosine transforms -Finite Fourier Sine and Cosine transforms - properties of Fourier transforms, Convolution theorem for Fourier transforms - Perceval's identity for Fourier transforms - Fourier transforms of derivatives of a function.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1201	
Course Title: MATHEMATICS – III	
CO-1	Utilize knowledge of line, sphere etc. in his engineering subjects
CO-2	Utilize the knowledge of Beta and Gamma functions and multiple integrals to evaluate the integrals they come across in their applications
CO-3	Utilize the knowledge of Fourier Transform in courses like Signals and Systems and in the solution of partial differential equations at a later stage

SYLLABUS: PHYSICS (B16 ENG 1202)

(Common to CIVIL, CSE & IT)

Thermodynamics

Introduction, Heat and Work, First Law of Thermodynamics and applications, Reversible and Irreversible Process, Carnot Cycle and Efficiency, Second Law of Thermodynamics, Carnot's Theorem, Entropy, Second Law in terms of entropy, Entropy and disorder, Third Law of Thermodynamics (Statement Only).

Electromagnetism

Effect of Magnetic Field on – moving charges, current in long straight wire and rectangular Current Loop, Hall Effect, Biot-Savart's Law, B near a Long Wire, B for a Circular Current Loop, Ampere's Law, B for a Solenoid, Faraday's Law of electromagnetic induction, Lenz's law, Inductance of a solenoid, L-R Circuit, Displacement Current, Maxwell's Equations (integral form) and their significance (without derivation).

Interference

Principle of Super Position – Young's Experiment – Coherence – Inference in thin transparent films, Newton's Rings, Michelson Interferometer and its applications.

Lasers

Introduction, spontaneous and stimulated emissions, requirements of laser device, Ruby Laser, Gas Laser (He-Ne Laser), Semiconductor diode Laser, Characteristics and applications of Lasers.

Optical Fibers

Introduction, Principles of light propagation in optical fiber, Acceptance angle, Numerical aperture, types of fiber, Applications of Optical Fibers, Optical Fiber in Communications, advantages.

Ultrasonics

Definition, Production of Ultrasonics by Magnetostriction and Piezoelectric methods, detection methods, acoustic grating, characteristics and applications of Ultrasonics.

Modern Physics

Introduction, de Broglie concept of matter waves, Properties of matter waves, experimental verification (Davisson-Germer experiment), Heisenberg uncertainty principle, Wave function and its physical significance, Schrodinger time independent wave equation, application to a particle in a box, Band theory of Solids, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semiconductors and insulators .

Nano phase Materials

Definition, Synthesis – Synthesis methods, Condensation and Ball milling, chemical vapor deposition method – sol-gel methods, Characterization, analysis and applications of Nano materials.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1202	
Course Title: PHYSICS	
CO-1	Students learn in depth about the topics of Lasers, fiber optics, quantum mechanical theory and classical theories of thermodynamics and electromagnetism,
CO-2	Students understand the classical and modern concepts.

SYLLABUS: ENGINEERING GRAPHICS (B16 ENG 1204)

(Common to CIVIL, CSE & IT)

Introduction

Lines, Lettering and Dimensioning. Geometrical Constructions. Curves Conic sections: General construction of ellipse, parabola and hyperbola. Construction of involutes Normal and Tangent.

Projections of Points

Principal or Reference Planes, Projections of a point situated in any one of the four quadrants

Projections of Straight Lines

Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of straight line inclined to both the reference planes:

Projections of Planes

Projection of Perpendicular planes: Perpendicular to both reference planes, perpendicular to one reference plane and parallel to other reference plane, perpendicular to one reference plane and inclined to other reference plane. Projection of Oblique planes. Introduction to Auxiliary Planes.

Projections of Solids

Types of solids: Polyhedra and Solids of revolution. Projection of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to other and axes inclined to both the reference planes.

Projections of Section of Solids

Section Planes: Parallel and inclined section planes, Sections and True shape of section, Sections of Solids: Prism, Pyramid, Cylinder and Cone.

Development of Surfaces

Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

Isometric Views

Introduction to Isometric projection, Isometric scale and Isometric view. Isometric views of simple planes. Isometric view of Prisms, Pyramids, cylinder and cone. Isometric view of a combination of solids.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1204	
Course Title: ENGINEERING GRAPHICS	
CO-1	Apply principles of drawing to represent dimensions of an object.
CO-2	Construct polygons and engineering curves.
CO-3	Draw projections of points, lines, planes and solids.
CO-4	Represent sectional views of solids.
CO-5	Develop the surfaces of regular solids.
CO-6	Draw the isometric views of solids and combination of solids.

SYLLABUS: PROFESSIONAL ETHICS AND MORAL VALUES (B16 ENG 1206)

(Common to CIVIL, CSE & IT)

Ethics and Human Values

Ethics and Values, Ethical Vision, Ethical Decisions, **Human Values** – Classification of Values, Universality of Values.

Engineering Ethics

Nature of Engineering Ethics, Profession and Professionalism, Professional Ethics, Code of Ethics, Sample Codes – IEEE, ASCE, ASME and CSI.

Engineering as Social Experimentation

Engineering as social experimentation, Engineering Professionals – life skills, Engineers as Managers, Consultants and Leaders, Role of engineers in promoting ethical climate, balanced outlook on law.

Safety Social Responsibility and Rights

Safety and Risk, moral responsibility of engineers for safety, case studies – Bhopal gas tragedy, Chernobyl disaster, Fukushima Nuclear disaster, Professional rights, Gender discrimination, Sexual harassment at work place.

Global Issues

Globalization and MNCs, Environmental Ethics, Computer Ethics, Cyber Crimes, Ethical living, concept of Harmony in life.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1206	
Course Title: PROFESSIONAL ETHICS AND MORAL VALUES	
CO-1	By the end of the course student should be able to understand the importance of ethics and values in life and society.

SYLLABUS: BUILDING MATERIALS AND BUILDING CONSTRUCTION (B16 CE 1208)

(For Civil Engineering)

Bricks and Clay Products

Bricks: Classification of Bricks, Manufacture of Bricks, general qualities of Bricks as per IS code, tests for good bricks as per IS code, including field tests, special forms of Bricks and their uses. Clay Products: Various types of tile manufacturing and their uses, Earth-wares, Terra-cotta, stone ware, porcelain, glazing of tiles etc.

Wood, Wood Based Products

Wood: cross section details of trees, their general properties, various types of defects in wood and timber, Methods of seasoning and their importance, various Mechanical Properties of timber, Decay of timber, Wood based Products: Veneers, Plywood and its types, Manufacturing of Plywood, plywood grades as per IS code, Laminated wood, merits of plywood and laminated wood, Lamin Boards, Block Boards, Batten board, Hard board, Particle boards and Composite boards.

Paints, Varnishes

Paints and Varnishes: Constituents and characteristics of paints, types of paint, their uses and preparation on different surfaces, painting defects, causes and remedies. Constituents of varnishes, uses of varnishes, different kinds of varnish, polishes. Painting of interior walls, exterior walls, wooden doors and windows – steel windows – various types of paints (chemistry of paints not included) including distempers; emulsion paints etc., Varnishes wood work finishing types. **Plastic:** definition, classification of plastic and modern development of plastic, chemistry of plastic, polymerization, manufacturing process and their uses. **Glass:** properties of glass, types of glass and manufacturing. **Asbestos & Asphalt Bitumen & Tar :** Availability and uses of asbestos, properties of asbestos, various types of asbestos, difference between asphalt & bitumen, Types, uses and properties of Asphalt & Bitumen, composition of coal tar, wood tar, mineral tar and Naphtha.

Cements

Natural and artificial cements, types of various artificial cements and their uses. Wet and dry process of manufacturing ordinary Portland cement (OPC), Chemical and Physical analysis of OPC, various field and Laboratory Tests on OPC as per IS code. Storing of cement in the field and godowns

Foundations

Types of Foundations : Strip, Isolated, Strap, Combined Footings, Raft – Mat –Slab and Beam Raft, Box Type Raft, inverted arch foundations, SHELL foundations, Grillage foundations – Minimum depth of Foundation – Bearing capacity of soils **Masonry:** Different types of Stone Masonry – Plan, Elevation, Sections of Stone Masonry Works – Brick Masonry – Different Types of Bonds – Plan, elevation and Section of Brick Bonds upto Two- Brick wall thickness – Partition walls – Different types of Block Masonry – Hollow concrete Blocks – FAL- G Blocks, Hollow Clay Blocks.

Roofing

Mangalore tiled Roof, RCC roof, Madras Terrace, Hollow Tiled Roof, Asbestos Cement, Fibre glass, Aluminum G.I. Sheet roofing's. **Form Work, Scaffolding:** form work, Types of formwork, centering-Scaffolding-types of scaffolding. **Trusses:** King Post & Queen Post Trusses – Steel roof Truss for 12m Span with details. **Wooden Doors And Windows:** Parallel – Glazed – Flush shutters, Plywood, Particle Board Shutters – Aluminum, PVC, Steel doors, windows and ventilators, various types of windows, Glazing – different varieties. **Stair Cases:** Stair cases or Stairway design (Architectural design or planning only) various types such as, straight flight – dog legged, quarter landing, open spiral, spiral stairs etc.

Concrete Technology and Mix Design

Polymer Concrete, Types of cement concretes, Ingredients and their characteristics, Cement concrete Properties and relevant tests, storage, batching, mixing & transporting, placing & vibrating and curing. Concrete grades & mix designs up to M 20 as per IS code. Introduction to polymer concrete and its uses.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 CE 1208	
Course Title: BUILDING MATERIALS AND BUILDING CONSTRUCTION	
CO-1	Learn and identify the relevant physical and mechanical properties pertaining to the construction industry.
CO-2	Demonstrate the relevant BIS testing procedure to be carried out to ascertain the quality of building materials.
CO-3	Develop ability to choose the modern construction material appropriate to the climate And functional aspects of the buildings.
CO-4	Ability to supervise the construction technique to be followed in brick, stone and Hollow block masonry, concreting, flooring, roofing, plastering and painting etc.
CO-5	Learn about the causes of deterioration, crack pattern, and assessment of damages.
CO-6	Learn about the construction techniques in repairing of buildings.

SYLLABUS: PROFESSIONAL ETHICS AND MORAL VALUES (B16 ENG 1206)

(Common to CIVIL, CSE & IT)

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SYLLABUS: BUILDING MATERIALS AND BUILDING CONSTRUCTION (B16 CE 1208)

(For Civil Engineering)

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CO-4	Ability to supervise the construction technique to be followed in brick, stone and hollow block masonry, concreting, flooring, roofing, plastering and painting etc.
CO-5	Learn about the causes of deterioration, crack pattern, and assessment of damages.
CO-6	Learn about the construction techniques in repairing of buildings.

SYLLABUS: PROBABILITY, STATISTICS AND QUEUING THEORY (B16 CS 1208)

(Common to CSE & IT)

Probability:

Various definitions of probability, Addition theorem, Conditional probability, Multiplication theorem, Bayes theorem of probability and Geometric probability.

Random Variables and Their Properties:

Definition, Distribution function, Properties of Distribution Function, Discrete Random Variable, Probability Mass Function, Discrete Distribution Function, Continuous Random Variable, Probability Density Function, Continuous Distribution Function. Mathematical Expectation of a Random Variable, Expected Value of function of a Random Variable, Addition Theorem and Multiplication Theorem of Expectation **(without proofs)**, Statistical Measures like Mean, Variance, Moments and Covariance in terms of Expectations, Moment generating Function, Characteristic Function and Probability generating Function of a Random Variable.

Distributions:

Discrete Distributions:

Binomial distribution and Poisson distribution (Definition, Mean, Variance, mfg., Characteristic function, p.g.f., Fitting of distributions)

Continuous Distributions: Uniform distribution, its Mean and Variance. Normal Distribution and its Properties (without proofs), Standard Normal Variate, Importance of Normal distribution. Exponential Distribution, Definition, Mean Variance Memory less property of Exponential distribution

Bivariate Analysis and Curve Fitting:

CORRELATION: Definition, Karl Pearson's Coefficient of Correlation, Limits for correlation coefficient, Rank Correlation, Spearman's formula for rank correlation coefficient. CURVE FITTING, Method of least Squares, Fitting of a Straight line, fitting of a Parabola REGRESSION ANALYSIS: Regression Lines, Regression Coefficients and their properties (without proofs).

Sampling Theory:

Sample, population, statistic, parameter, Sampling distribution, standard error, interval estimation. Testing of Hypothesis: Formulation of Null hypothesis, Alternative hypothesis, Critical region, Critical value, level of Significance, Statistical Inference, Type-I-error, Type- II-error, One-tailed/Two-tailed test.

Large Sample Theory

Test of significance of single sample proportion, Test of significance for difference of proportions, Test of significance of single sample mean, Test of significance for difference of means.

Small Sample Theory: Degrees of freedom, Student's t-distribution: definition, t-test for single mean, t-test for difference of means, Paired t-test for difference of means.

F-distribution: definition, F-test for equality of two population variances. Chi-square distribution definition, Chi-square test for goodness of fit, Chi-square test for single Population Variance.

Queuing Theory: Queue description, Birth and Death Process, Distribution of Inter-arrival times, Distribution of service times, Kendall's representation of a queueing model, Operating characteristics of a queuing model, steady state solutions of {M/M/1: ∞/FCFS} Model and {M/M/1 ; N/FCFS} Model.

SYLLABUS: PHYSICS LAB (B16 ENG 1209)

(Common to CIVIL, CSE & IT)

LIST OF EXPERIMENTS

1. Sonometer – verification of laws of transverse vibrations in stretched strings.
2. Melde's Experiment – Determination of the frequency of an electrically maintainedtuning fork.
3. Newton's Rings – Determination of radius of curvature of a convex lens.
4. Diffraction Grating – Determination of Wavelengths of lines of mercury spectrum using spectrometer by normal incidence method.
5. Determination of Cauchy's constants of the material of the given prism usingSpectrometer and mercury light.
6. Wedge Method – Determination of thickness of a paper by forming parallel interferencefringes.
7. Variation of magnetic field along the axis of current carrying circular coil – Stewart and Gee's apparatus.
8. Carey Foster's bridge – Verification of laws of resistance.
9. Lee's Method – Determination of coefficient of thermal conductivity of a bad conductor.
10. Calibration of voltmeter using potentiometer.
11. Calibration of low range Ammeter using potentiometer.
12. Laser – Diffraction.

SYLLABUS: WORKSHOP (B16 ENG 1211)

(Common to CIVIL, CSE & IT)

Carpentry

Bench Work, tools used in carpentry.

Jobs for Class work – half lap joint, mortise and tenon joint, half – lap dovetail joint, cornerdovetail joint, central bridle joint.

Sheet Metal

Tools used in sheet metal work, Laying development of the sheet metal jobs, soldering.

Jobs for class works – Square tray, taper tray (sides), funnel, elbow pipe joint, 60^0 pipe joint.

Fitting

Tools used in fitting work, Different files, chisels, hammers and bech vice.

Jobs for class work – Square, hexagon, rectangular fit, circular fit and triangular fit.

SYLLABUS: ENGLISH LANGUAGE LAB (B16 ENG 1213)

(Common to All Branches)

1. English Sound Pattern – Letters
2. Sounds of English
3. Pronunciation
4. Stress and Intonation

Laboratory Practice Sessions:

1. Letters and Sounds, Worksheet-1
2. Interactions-1, Worksheet-2
3. The Sounds of English, Worksheet-3
4. Interactions-2, Worksheet-4
5. Pronouncing Words-Some Important Patterns, Worksheet-5
6. Interactions-3, Worksheet-2
7. Stress and Intonation, Worksheet-2

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1213	
Course Title: ENGLISH LANGUAGE LAB	
CO-1	Students will be sensitized towards recognition of English sound pattern.
CO-2	The fluency in speech will be enhanced

SYLLABUS: DATA STRUCTURES (B16 IT 2101)

Basic Concepts

System Life Cycle, Algorithm Specification, Recursive Algorithms, Data Abstraction, Performance Analysis, Space Complexity, Time Complexity, Asymptotic Notation, Comparing Time Complexities.

Arrays and Structures

Array as an Abstract Data Type, Polynomial Abstract Data Type, and Introduction to Sparse Matrix, Sparse Matrix Abstract Data Type, Transposing a Sparse Matrix, Sparse Matrix Multiplication, Representation of Multidimensional Arrays, Structures and Unions, Internal Implementation of Structures, Self-Referential Structures.

Recursion, Simple Searching and Sorting Techniques

Recursive functions, Introduction to Searching, Sequential Search, Binary Search, Interpolation Search, Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Introduction to Merge Sort, Iterative Merge Sort, Recursive Merge Sort, Shell Sort.

Stacks and Queues

Stack Abstract Data Type, Queue Abstract Data Type, Stacks and Queues using arrays, Mazing Problem, Introduction to Evaluation of Expressions, Evaluating Postfix Expressions, Infix to Postfix and Prefix conversion, Multiple Stacks and Queues, Circular Queues using arrays.

Linked Lists

Pointers, Dynamically Allocated Storage using pointers, Singly Linked Lists, Dynamically Linked Stacks and Queues, Polynomials, Representing Polynomials as Singly Linked Lists, Adding Polynomials, Erasing Polynomials, Polynomials as Circularly Linked Lists, Additional List Operations, Operations for Singly Linked Lists, Operations for Doubly Linked Lists, Radix Sort.

Trees

Representation of Trees, Binary Trees Abstract Data Type, Properties of Binary Trees, Binary Tree Representations, Binary Tree Traversals, Additional Binary Tree Operations, Threaded Binary Trees, Heap Abstract Data Type, Priority Queues, Insertion into a max heap, Deletion from a max heap, Heap Sort, Introduction to Binary Search Trees, Searching a Binary Search Tree, Inserting an Element into a Binary Search Tree, Deleting an Element from a Binary Search Tree, Height of a Binary Search Tree, Counting Binary Trees.

Graphs

Graph Abstract Data Type, Definitions, Graph Representations, Elementary Graph Operations, Depth First Search, Breadth First Search, Connected Components, Spanning Trees, Minimum Cost Spanning Trees, Prim's and Kruskal's Algorithms, Shortest Paths and Transitive Closure, Single Source All Destination – Dijkstra's Algorithm, All Pairs Shortest Paths – Floyd's Algorithm, Transitive Closure using Warshall's Algorithm.

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 IT 2101	
Course Title: DATA STRUCTURES	
CO-1	Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms.
CO-2	Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs. Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs Demonstrate different methods for traversing trees.
CO-3	Compare alternative implementations of data structures with respect to performance
CO-4	Compare and contrast the benefits of dynamic and static data structures implementations
CO-5	Describe the concept of recursion, give examples of its use, describe how it can be implemented using a stack
CO-6	Discuss the computational efficiency of the principal algorithms for sorting, searching.

SYLLABUS: ELEMENTS OF ELECTRONICS ENGINEERING (B16 EC 2103)

Transport phenomenon in semiconductors:

Intrinsic and Extrinsic semiconductors, Charge densities in semiconductors, Drift and Diffusion currents, Half effect, Mass action law.

P-N Junction Diode:

Basic operation and V-I characteristics of semiconductor diode, diode current equation, Zener diode, LED, Photo diode and tunnel diode *(Introductory treatment only)*

Diode Rectifiers:

Half wave and full wave rectifiers with and without filters, Bridge Rectifier expressions – Ripple factor, Efficiency, capacitor filters

Bipolar Junction Transistor:

Introduction, construction, basic operation, modes of operation-Active , cutoff and saturation, Transistor circuit configurations- CE, CB, CC – input and output Characteristics in various configurations *(Introductory treatment only*

Transistor Biasing and Thermal Stabilization:

Transistor Biasing, Thermal runaway, Stabilization, Different methods of Biasing- Fixed bias, Collector feedback bias, self-bias, Bias Compensation.

Transistor Amplifiers:

CE, CB, CC amplifier h-parameter model for Transistor amplifier

Field Effect Transistors:

Junction Field effect Transistors (JFET)-JFET characteristics, JFET parameters, JFET biasing, MOSFETS- Depletion and Enhancement MOSFET.

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 EC 2103	
Course Title: ELEMENTS OF ELECTRONICS ENGINEERING	
CO-1	Understand the physical structure, principles of operation, electrical characteristics and circuit models of diodes, BJTs and FETs
CO-2	Use this knowledge to analyse and design basic electronic application circuits.
CO-3	Extend the understanding of how electronic circuits and their functions fit into larger electronic systems.

SYLLABUS: DISCRETE MATHEMATICAL STRUCTURES (B16ENG2102)

Introduction :

Sets – Operations on sets – Logic: Logical inferences, Methods of proof of an implications– First order logic and other proof methods-Rules of inference for quantified propositions- mathematical induction.

Elementary Combinatorics & Recurrence relations:

Basics of counting – Combinations and Permutations – their enumeration with and without repetition - Principle of Inclusion and Exclusion and its applications, Generating functions of sequences - Calculating their coefficients-Recurrence relations-solving recurrence relations- method of characteristic roots-Non-homogeneous recurrence relations and their solutions.

Relations and Diagraphs:

Relations and directed graphs-Special properties of binary relations-equivalence relations- Ordering relations-operations on relations-Paths and closures-Directed graphs and Adjacency matrices.

Graphs Theory:

Basic concepts – Isomorphism – sub graphs - planar graphs - Euler's formula -Multi graphs and Euler Circuits - Hamiltonian graphs – Graph coloring and Chromatic number – Four color theorem - Trees and their properties – definitions of different tree structures.

Groups :

Definitions of Binary operation, Algebraic Structure, Semi-group, Monoid, Group and Abelian group.

Lattices :

Lattices and Properties of lattices – lattices as partially ordered sets – sub lattices – Direct product and Homomorphisms - Isomorphism's – Modular lattices Distributive lattices – Complemented lattices.

Boolean Algebra :

Definition – Sub algebra – Direct product – Homomorphism's – Isomorphism's – Boolean functions – Representation of Boolean functions – Minimizations of Boolean functions using K-maps.

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 ENG 2102	
Course Title: DISCRETE MATHEMATICAL STRUCTURES	
CO-1	Rewrite the mathematical arguments using logical connectives and quantifiers and verify the validity of the arguments using propositional and predicate logic.
CO-2	Solve different counting problems.
CO-3	Solve the recurrence relations which occur in many fields.
CO-4	Identify and give examples of various types of relations and describe various properties of relations.
CO-5	Determine isomorphism of graphs and utilize the concepts in graphs & trees in their fields.
CO-6	Understand the importance of Groups, lattice structures and their diagrammatic representations and also the importance of Boolean algebra in computer science.

SYLLABUS: OBJECT ORIENTED PROGRAMMING (B16 IT 2102)

Part 1: C++

Basics of Object Oriented Programming:

Object Oriented Paradigm, Principles of OOP, benefits of OOP, data types, declarations, expressions and operator precedence, functions, scope of variables.

Introduction to C++:

Classes and objects, Constructors & Destructors, constructor with dynamic allocation, explicit constructor, Operator Overloading through Unary, Binary, Assignment and Stream operators & type conversions.

Inheritance and Manipulating Strings:

Derived classes, syntax of derived classes, making private members inheritable, single, multilevel, multiple, hierarchical, hybrid inheritance, Virtual base Class, abstract classes, Creating String Objects, Manipulating String Objects, Relational Operations, Accessing String Characteristics.

Polymorphism:

Pointers, virtual functions and polymorphism- pointers to objects, this pointer, pointers to derived classes, virtual and pure virtual functions, Dynamic polymorphism, Virtual destructor, Virtual Base Class, Dynamic Casting, Cross Casting, Down Casting.

Templates, Exception handling, Streams and Files in C++:

Class templates, Function templates, member function templates, exception handling, managing console I/O operations, Stream Classes, Formatted and Unformatted I/O operations, managing output with manipulators, working with files.

Part 2: JAVA Introduction to JAVA:

Introduction, Classes and Objects, Inheritance, Arrays, strings and Vectors, Exception Handling, Managing I/O files in Java.

Packages and Interface, and Multi-threading: Packages, Interfaces, creating, threads, thread states, thread methods, exceptions, priority in threads, synchronization, Runnable interface, life cycle of an Applet.

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 IT 2102	
Course Title: OBJECT ORIENTED PROGRAMMING	
CO-1	Students will be able to handle I/O streams and Run time errors.
CO-2	Students will be able to construct applications and Identify where data structures are appearing in them

SYLLABUS: DIGITAL LOGIC DESIGN (B16 IT 2103)

Binary Systems:

Digital Systems. Binary Numbers. Number Base Conversions. Octal and Hexadecimal Numbers. Complements. Signed Binary Numbers. Binary Codes. Binary Storage and Registers. Binary Logic.

Boolean algebra and Logic Gates:

Basic Definitions. Axiomatic Definition of Boolean algebra. Basic Theorems and Properties of Boolean Algebra. Boolean Functions. Canonical and Standard Forms. Other Logic Operations. Digital Logic Gates. Integrated Circuits.

Combinational Logic Design, Gate-Level Minimization:

The Map Method. Four- Variable Map. Five-Variable Map. Product of Sums Simplification. Don't-Care Conditions. NAND and NOR Implementation. Other Two- Level Implementations. Exclusive-OR Function. Hardware Description Language (HDL).

Combinational Logic:

Combinational Circuits. Analysis Procedure. Design Procedure. Binary Adder-Subtractor.DecimalAdder.BinaryMultiplier.MagnitudeComparator.Decoders. Encoders. Multiplexers. HDL For Combinational Circuits.

Sequential Logic Design, Synchronous Sequential Logic:

Sequential Circuits .Latches .Flip-Flops. Analysis of Clocked Sequential Circuits. HDLForSequentialCircuits.StateReductionAssignment.DesignProcedure.

Registers and Counters:

Registers. Shift Registers. Ripple Counters. Synchronous Counters. Other Counters. HDL for Registers and Counters.

Memory and Programmable Logic:

Introduction. Random-Access Memory. Memory Decoding, Error Detection and Correction. Read-Only Memory. Programmable Logic Array. Programmable Array Logic. Sequential Programmable Devices.

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 IT 2103	
Course Title: DIGITAL LOGIC DESIGN	
CO-1	An ability to define different number systems, binary addition and subtraction, 2‟s complement representation and operations with this representation.
CO-2	An ability to understand the different Boolean algebra theorems and apply them for logic functions.
CO-3	An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
CO-4	An ability to define the following combinational circuits: multiplexer, de-multiplexers encoders/decoders, comparators, arithmetic-logic units; and to be able to build simple circuits.
CO-5	An ability to understand asynchronous and synchronous sequential circuits, like counters and shift registers.
CO-6	An ability to understand memories like RAM and ROM, Programmable Logic Array and Programmable Array Logic.

SYLLABUS: DATA STRUCTURES LAB (B16 IT 2104)

Implement the following programs using C-Language.

1. Write a program for sorting a list using Bubble sort and then apply binary search.
2. Write a program to implement the operations on stacks.
3. Write a program to implement the operations on circular queues.
4. Write a program for evaluating a given postfix expression using stack.
5. Write a program for converting a given infix expression to postfix form using stack.
6. Write a program for implementing the mazing problem.
7. Write a program for the representation of polynomials using linked list and for theaddition of two such polynomials
8. Write a program for quick sort
9. Write a program for Merge sort.
10. Write a program for Heap sort
11. Write a program to create a binary search tree and for implementing the in order,preorder, post order traversal using recursion
12. Write a program for finding the transitive closure of a digraph
13. Write a program for finding the shortest path from a given source to any vertex in adigraph using Dijkstra's algorithm
14. a)Write a program for finding the Depth First Search of a graph.
    b)Write a program for finding the Breadth First Search of a graph

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 IT 2104	
Course Title: DATA STRUCTURES LAB	
CO-1	Student will be able to write programs to implement stacks and queues.
CO-2	Ability to implement various searching and sorting techniques
CO-3	Ability to implement programs using trees and graphs.

SYLLABUS: OBJECT ORIENTED PROGRAMMING LAB (B16 IT 2105)

1. Write a Program that implements stack operations using classes and objects.
2. Write a Program performing complex number addition using friend functions.
3. Write a Program for complex number addition using operator overloading.
4. Write a Program to perform string operations by overloading operators.
5. Write a Program on hierarchical inheritance showing public, private and protected inheritances.
6. Write a Program for computation of student's result using hybrid inheritance.
7. Write a Program implementing bubble-sort using templates.
8. Write a Program on virtual functions.
9. Write a Program for Templates.
10. Write a Program for copying one file to another file using streams.
11. Write a Program for writing and reading a class object to a file.
12. Write program to implement
    a. One catch block and all Exceptions
    b. using Multiple Catch blocks.
13. Write a program to implement the finally block.
14. Write a program to implement pointers to a derived class and virtual base classes.
15. Write a program to implement conversion of objects between different classes using conversion functions.
16. Write a program to implement function overloading- with various data types, with different number of arguments.
17. Write a program to evaluate mixed mode expressions and implicit type conversions.
18. Write a program to show that there is ambiguity in Multiple Inheritance.
19. Write a program to implement a virtual destructor.
20. Write a program to mimic a bank management system (user logins, requests for withdraw /credit, system verifies whether enough balance is available, update the account summary, etc.)

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 IT 2105	
Course Title: OBJECT ORIENTED PROGRAMMING LAB	
CO-1	Student will be able to use OOPs concepts
CO-2	Ability to apply Inheritance concepts to several problems.
CO-3	Ability to use Exception Handling concepts.

SYLLABUS: ENGLISH PROFICIENCY (B16 ENG 2104)

(Common to All Branches)

Speaking Skills

PPT

Describing event/place/thing Picture Description Extempore

Debate Telephonic Skills

Analyzing Proverbs

Vocabulary

Affixes

Pairs of Words

Reading Skills

Reading Comprehension Reading/Summarizing News Paper Artic

Writing Skills

Designing Posters

Essay writing

Resume Writing

(***Note: Sessional Marks will be evaluated based on Continuous Comprehensive Evaluation of the students" Performance - 40M, Attendance – 10M and External Marks will be evaluated based on Presentation Skills – 30M, Project 20M)

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 ENG 2104	
Course Title: ENGLISH PROFICIENCY	
CO-1	Students enhance their vocabulary and use it in the relevant contexts.
CO-2	They improve speaking skills.
CO-3	They learn and practice the skills of composition writing.
CO-4	They enhance their reading and understanding of different texts.
CO-5	They enrich their communication both in formal and informal contexts.
CO-6	They strengthen their confidence in presentation skills.

SYLLABUS: INDUSTRY ORIENTED TRAINING (B16 ENG 2105)

(WEB Development)

(Common to CSE & IT)

Industry Oriented Applications on following topics:

HTML: HTML Introduction, HTML Basic Tags, HTML Lists, HTML Tables, HTML Images, HTML Links & Navigation, HTML Forms.

CSS: CSS Introduction, CSS Properties - Controlling Fonts, CSS Properties - Text Formatting, Selectors - id and class, Pseudo classes, CSS for Links, CSS for Lists, CSS for Tables.

JAVA SCRIPT: JavaScript Introduction, Empty Field Validation Example, Name & Numbers Only Validation Example, Email Validation Example, inner HTML Error Display Example.

PHP: Installation of Wamp Server, PHP Introduction, Creating PHP Script, Running PHP Script, PHP Numeric Variables, Sample PHP Programs

MINI PROJECT

(Note: Total Marks will be evaluated based on Continuous evaluation - 25 Marks, Mini Project- 25 Marks)

Course Outcomes for Second Year First Semester Courses	
Course Code:B16 ENG 2105	
Course Title: INDUSTRY ORIENTED TRAINING	
CO-1	Design and develop basic web pages using HTML
CO-2	Apply cascading style sheets to web pages in order to separate form from content.
CO-3	Understand & Apply basic control of elements with JavaScript.
CO-4	Understand the basic concepts of PHP scripting
CO-5	Able to design & complete a project by applying above all the concepts.

SYLLABUS: OPERATING SYSTEMS (B16 IT 2201)

Introduction to Operating Systems:

Over View of Operating Systems, Types of Operating Systems, Operating System Structures, Operating System Services, System Calls, Virtual Machines, Operating System Design and Implementation.

Process Management:

Process Concepts, Operations on Processes, Co-operating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple - Processor Scheduling, Thread Scheduling.

Process Synchronization:

The Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors.

Deadlocks:

System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance, Deadlock Detection, Recovery from Deadlocks

Memory Management:

Logical versus Physical Address, Swapping, contiguous memory allocation, paging, structure of the page table , segmentation, Virtual Memory, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped files

File Systems, Implementation, and Secondary-storage Structure:

Concept of a file, Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers, overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, swap- space management.

Case study: Overview of LINUX, Windows Operating systems

Course Outcomes for Second Year Second Semester Courses	
Course Code: B16 IT 2201	
Course Title: OPERATING SYSTEMS	
CO-1	The student understands OS evolution, its structure and services provided by it.
CO-2	Learn process life cycle, process scheduling objectives, policies and mechanisms, process synchronization, inter process communication, deadlocks and other process subsystem related concepts.
CO-3	Learn memory hierarchy, allocation, de-allocation policies and mechanism for main and auxiliary memory, file system design and implementation issues.

SYLLABUS: COMPUTER ORGANIZATION (B16 IT 2202)

Register Transfer and Micro operations:

Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design:

Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input- Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

Micro programmed Control:

Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

Central Processing Unit:

Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer(RISC).

Pipeline and Vector Processing:

Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISK Pipeline, Vector Processing, Array Processors.

Input/output Organization:

Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.

Memory Organization:

Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory.

Course Outcomes for Second Year Second Semester Courses	
Course Code: B16 IT 2202	
Course Title: COMPUTER ORGANIZATION	
CO-1	Apply the basic knowledge about Digital logic to the Functional components of computer.
CO-2	Students will be able to Describe the major components of a computer.
CO-3	Students will be able to classify different Computer Instructions.
CO-4	Students will be able to Describe Instruction set architecture.
CO-5	Recognize the importance of peripheral devices.
CO-6	Students should be able to classify Computer memories

SYLLABUS: MICROPROCESSORS (B16 IT 2203)

Internal Architecture functional/signal description of 8085 microprocessor, Instruction set, Addressing modes and programming in 8085.

Timing diagram, counters and time delays, stacks and subroutines and Interrupts in 8085

Classification and interfacing semiconductor memories with 8085 MPU. Interfacing characteristics of IO devices, IO device addressing methods.

Interfacing peripherals to INTEL 8085: Parallel I/O interface-8255, Serial I/O Interface-8251, Timer Interface-8253.

Interfacing peripherals to INTEL 8085: Keyboard/Display Interface-8279, Interrupt controller Interface-8259.

The 8086 Microprocessor architecture: Internal Architecture & functional /signal description of 8086, segmented memory, Maximum & Minimum mode of 8086.

Instruction set and programming the 8086: Addressing modes, Instruction set and assembly language programming techniques with 8086.

Course Outcomes for Second Year Second Semester Courses	
Course Code: B16 IT 2203	
Course Title: MICROPROCESSORS	
CO-1	Understand the basic architectures of 8085 and 8086 microprocessors.
CO-2	Ability to write ALP programs using instruction sets of 8085 & 8086.
CO-3	Understand the various interfacing concepts.

SYLLABUS: DATA COMMUNICATIONS (B16 IT 2204)

Introduction to Data Communications:

A Communications Model, Data Communications and Data Communications Networking, Protocols and Protocol Architecture, Characteristics of Data Transmission: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments.

Transmission Media:

Guided Transmission Media, Wireless Transmission.

Data Encoding: Digital Data-Digital Signals, Digital Data-Analog Signals, Analog Data-Digital Signals, Analog Data-Analog Signals.

Data Communication Interface:

Asynchronous and Synchronous Transmission, Line Configurations, Interfacing. Data Link Control Flow Control, Error Detection, Error Control, High-Level Data Link Control (HDLC)

Data Communications Hardware:

Terminals: Introduction, Basic Terminal Components, Enhanced Terminal Components, General-Purpose Terminals, Remote Job Entry Terminals, Transaction Terminals, Clustering of Terminal Devices.

Communications Processing Hardware: Introduction, Switching Processors, Multi-drop Lines, Multiplexers, Concentrators, Front-End Processors

Multiplexing:

Frequency-Division Multiplexing, Synchronous Time-Division Multiplexing: Characteristics, TDM Link Control, Digital Carrier Systems, and Statistical Time-Division Multiplexing: Characteristics.

Course Outcomes for Second Year Second Semester Courses	
Course Code: B16 IT 2204	
Course Title: DATA COMMUNICATIONS	
CO-1	Students will have the ability to use Data Communications and Networking Protocols and protocol architectures
CO-2	Students will have the ability to develop communication models for providing data transmission facility
CO-3	Students will have the ability to outline Data Communication terminology
CO-4	Students will have the ability to classify various transmission media
CO-5	Students will have the ability to discriminate various types of signals for data transmission and ability to describe data encoding techniques
CO-6	Students will have the ability to describe data communications interface
CO-7	Students will have the ability to apply various flow control , error control techniques of data link control protocols
CO-8	Students will have the ability to use various data communication terminals and processing hardware
CO-9	Students will have the ability to demonstrate multiplexing techniques

SYLLABUS: OPERATIONS RESEARCH (B16 IT 2205)

UNIT-I: Overview of Operations Research, Types of OR Models , Phases of Operations Research– OR Techniques, Introduction to Linear Programming, Formulation of Linear Programming Problem, Graphical Solution; Graphical Sensitivity Analysis.

UNIT-II: Standard Form of LPP, Basic Feasible Solutions, Unrestricted Variables, Simplex Algorithm , Artificial Variables, Big M Method, Two Phase Simplex Method, Degeneracy, Alternative Optimal, Unbounded Solutions, Infeasible Solutions, Primal And Dual Problems And Their Relations, Dual Simplex Method

UNIT-III: Transportation Problem as LPP, Initial Solutions, North West Corner Rule, Lowest Cost Method, Vogels Approximation Method, Optimum Solutions of TPP, Degeneracy in Transportation, Transportation Algorithms.

UNIT-IV: Assignment Problem, Assignment Problem as LPP, Hungarian Method, Travelling Salesman Problem, Solutions of TSP, Sequencing Problems, N-Jobs Two Machine Problems, N-Jobs K Machines Problems, Two-Job M- Machine Problems, Crew Scheduling Problems

UNIT-V: Network Representation of A Project, CPM and PERT, Critical Path Calculations, Time – Cost Optimizations, PERT Analysis and Probability Considerations, Resource Analysis in Network Scheduling.

UNIT-VI: Inventory Control- Inventory-Factors Effecting Inventory-EOQ, Inventory Problems With and Without Shortages, Inventory Problems with Price Breakups, Multi Item Deterministic Problems. Probabilistic Inventory Problems

Game Theory: Two Person Zero Sum Games, Mixed Strategy Games and Their Algorithms.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 IT 2205	
Course Title: OPERATIONS RESEARCH	
CO-1	Ability to solve LPP problems using various methods.
CO-2	Ability to solve transportation and assignment problems using several methods.
CO-3	Analyze the PERT and CPM charts
CO-4	Ability to solve replacement problems and game theory problems.

SYLLABUS: JAVA PROGRAMMING (B16 IT 2206)

UNIT-I Fundamentals: HTML, OOP Concepts, Comparing JAVA with C & C++, JAVA Programming language Syntax, Variables, Data types, statements and expressions.

UNIT-II Control Statements: If else, for, while, and do while loops, Switch statements.

UNIT-III Arrays & Structures: One Dimensional & Two Dimensional Arrays, Named Structures.
Functions: Parameter Passing, Static Modifier.

UNIT-IV Features of JAVA: Classes and Interfaces, Threads and multithreaded programming, Exception handling, Introduction to packages, Math package, Lang package, Util package.

UNIT-V Applet Programming: Events, Event driven programming, Events like buttons, mouse, keyboards etc., Applets, Applets package, Fonts, colours, Graphics, images. AWT components, layout managers, writing event driven program using components.

UNIT-VI Networking:

Networking Basics: Socket overview, Client/Server, Reserved sockets. Proxy servers, Internet addressing; Java and the net, Inet address, TCP/IP client sockets, URL, URL connection, TCP/IP server sockets, Datagrams.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 IT 2206	
Course Title: JAVA PROGRAMMING	
CO-1	Ability to define different procedural and object oriented concepts and will be able toapply and differentiate between them.
CO-2	Ability to define, understand and differentiate different types of arrays and apply them.
CO-3	Ability to recognize various concepts of java and develops the programs using them.
CO-4	Ability to identify and differentiate the various features of AWT components to constructcontainer based programs.
CO-5	Ability to describe and explain the concept of networking.

SYLLABUS: JAVA PROGRAMMING LAB (B16 IT 2207)

1. a) Program to display the area of a rectangle.
   b) Program to find Sum of series 1 + x + x2 + x3 + …………….
2. (a) Write a class to display the area of rectangle and inherit this class into other classwhich is displaying perimeter of a rectangle and implement.
   (b) Write a class to add three no inherit this class into other class to add five no's andimplement it.
3. (a) Write a program to print the path, filename and extension for a given path of a file.
   (b) Write a program to receive two command line arguments check whether they are equalor not.
4. (a) A program to take two arguments and divide the first argument with second argument and display the result. Displays the error message if divide by zero withoutabnormal exit.
   (b) A program to accept more than one string and arrange them in alphabetical order.
   C) Write a program to display simultaneously output of even and odd numbers startingfrom one to specified number.
5. Write a program to accept data from keyboard and write it into a file.
6. Write a java program to implement stack & Queue operations.
7. Write a program to draw line and circle using mouse.
8. Write an applet program for drawing the bar chart.
9. Write an applet program to design a calculator for implementing basic functions like +, -, *, /.
10. Write a program to check active ports in system.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 IT 2207	
Course Title: JAVA PROGRAMMING LAB	
CO-1	Students will be able to understand compiling and interpreting programs.
CO-2	Students will be able to Explore features of Object Oriented Programming.
CO-3	Students will be able to implement various java concepts
CO-4	Students will be able to Develop java Programs to implement applets
CO-5	Students will be able to Develop java Programs to generate and handle events.

SYLLABUS: DIGITAL ELECTRONICS AND MICROPROCESSORS LAB (B16 IT 2208)

DIGITAL EXPERIMENT

Verification of Truth tables of OR, AND, NOT, NAND, NOR, EX-OR gates (by using 7400- series)

Construction of gates using NAND, NOR gates.

Construction of Half and Full adders and verifying their truth tables. Operation and verifying truth tables of flip-lops-RS, D and JK using IC"s Up/Down counters using JK flip-flops.

4-bit shift right and left registers using JK flip-flops.

MICROPROCESSORS: 8085

Binary Addition of 'N' 8-bit numbers. Binary to BCD conversion

Arranging –Ascending/descending order

To find the largest /smallest numbers in the array. ASCII to HEXA & HEXA to ASCII conversion.

MICROPROCESSORS: 8086

Liner Search

Factorial of a given number To copy string from S1 to S2 To find GCD and LCD

MICROPROCESSOR INTERFACING WITH 8085

Elevator Traffic Light.

Analog to Digital & Digital to Analog Convertors Interrupt controller

Stepper Motor controller.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 IT 2208	
Course Title: DIGITAL ELECTRONICS AND MICROPROCESSORS LAB	
CO-1	The student understands the logic gates, half adders, full adders and flip-flops to design a circuit.
CO-2	The student develops the skill of writing microprocessor programming with 8085.
CO-3	The student understands the interfacing of microprocessor with stepper motor, R-2R ladder.
CO-4	The student will be able to write ACP for 8086.

SYLLABUS: PYTHON PROGRAMMING (B16 IT 2209)

UNIT-I: Overview, Environment Set Up, Basic Syntax, Identifiers, Reserved Words, Lines and Indentation, Multi-Line Statements, Quotation, Comments, Multiple Statements on a Single Line Variable Types, Standard Data Types, Numbers (math, random, fraction) , Strings, Lists, Tuples , Dictionaries

UNIT-II: Operators, Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Decision Making :if, if-else, nested if , Loops: for, while, nested loops

UNIT-III: Functions, Function Arguments: Required arguments, Keyword arguments, Default arguments, Variable-length arguments, The Anonymous Functions: lambda, Scope of Variables, Modules, sys, os , Date & Time

UNIT-IV: Files & its operations, Exceptions, Standard Exceptions, Assertions, The try-finally Clause, Raising an Exception, User-Defined Exceptions, Classes and objects , OOPS, Data member , Function overloading, Instance variable, Inheritance, Instance, Instantiation, Operator overloading.

UNIT-V: HTML, CSS Basics, Data Base (SQLite), Database Connection, CRUD Application, CGI Architecture, Web Server Support and Configuration, GET and POST Methods, CGI Scripts

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 IT 2209	
Course Title: PYTHON PROGRAMMING	
CO-1	Write programs using python programming
CO-2	Write algorithms
CO-3	Implement various data Structures
CO-4	To apply object oriented mechanisms
CO-5	To Implement various Advance data Structures like AVL trees, B-Trees, Splay trees e.t.c

SYLLABUS: INDUSTRY ORIENTED TRAINING (B16 ENG 2203)

UNIT-I: Linear Linked Data: Singly linked list, operations on a linked list, circular linked list, double linked list, operations on double linked list

Standard Storage: Introduction to files, file types, file modes, and file functions

UNIT-II: Searching & Sorting: Linear search and Binary search, Bubble sort, Selection sort, Insertion sort, Quick sort, Heap sort, Merge sort: Worst and Average case analysis. Decision Tree Model and (worst case) Lower Bound on Sorting. Sorting in linear time- shell sort, radix sort, bucket sort, counting sort.

UNIT-III: Stack & Queue: Stack structure, operations. Stack using linear list data. Stack using linear linked data. Queue structure, operations. Queue using linear list data. Queue using linear linked list. Circular queues.

UNIT-IV: Non Linear Data: Tree Structure and terminology, Binary Trees, Binary Tree traversals, Applications of Binary Tree, Binary Tree Operations.

Priority queues, union-find sets, (augmented) interval trees, (augmented) balanced BSTs and binary indexed trees, Binary Indexed Tree or Fenwick tree, Segment Tree (RMQ, Range Sum and Lazy Propagation), K-D tree, Union Find Disjoint Set, Tries, Interval Tree

UNIT-V: Graphs: Graphs and their basic properties- degree, path, cycle, sub graphs, isomorphism, Eulerian and Hamilton walks, graph coloring, planar graphs, trees. Breadth first search and connected components. Depth first search in directed and undirected graphs.

UNIT-VI: More Trees: Binary search trees, Operations on BST, balanced binary search trees, AVL trees, Red-Black trees, skip lists, hashing. Priority queues, heaps, Fibonacci heap, union-find, splay trees Interval trees, tries.

(Note: Total Marks will be evaluated based on Continuous Evaluation - 25 Marks, Coding Contest- 25 Marks**)**

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 ENG 2203	
Course Title: INDUSTRY ORIENTED TRAINING	
CO-1	Implement the linked lists in real time applications.
CO-2	Apply the file handling operations.
CO-3	Apply the Searching & Sorting algorithms.
CO-4	Implement Stack & Queue operations.
CO-5	Implement the concepts and applications of Trees and Graphs.

SYLLABUS: COMPUTER NETWORKS (B16 IT 3101)

UNIT-I Introduction to Computer Networks:
Introduction, Network Hardware, Network Software, Reference Models, Network Examples, Internet Based Applications.
The Medium Access Control: The Channel Allocation Problem, CSMA Protocols, Collision Free Protocols, The Ethernet, Wireless LANS, Bluetooth

UNIT-II Network Layer: Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Network Layer in the Internet, IP Protocol, IP Address, Subnets, and Internetworking.

UNIT-III Transport layer: Transport Service, Elements of Transport Protocols, TCP and UDP Protocols, Quality of Service Model

UNIT-IV Application Layer: Over View of DNS, Electronic Mail, FTP, TFTP, BOOTP, HTTP Protocols

UNIT-V Network Devices: Over View of Repeaters, Bridges, Routers, Gateways, Multiprotocol Routers, Hubs, Switches, Modems, Channel Service Unit CSU, Data Service Units DSU, NIC, Wireless Access Points, Transceivers, Firewalls, Proxies.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3101	
Course Title: COMPUTER NETWORKS	
CO-1	The student must be able to understand the design and estimate the requirements for practicalsetup of a given network scenario and size.
CO-2	Realize the Operation, maintenance and management of the Internet by mapping thetheoretical networking concepts to the real-time network scenarios.
CO-3	Demonstrate the applications of wireless Networks and over view of advanced networking concepts.
CO-4	Identify different networking devices and their usage and functionality

SYLLABUS: WEB TECHNOLOGIES (B16 IT 3102)

UNIT-I: Introduction to HTML, Core Elements, Links and Addressing, Images, Text, Colors and Background, Lists, Tables Frames, Forms, Cascading Style Sheets.

UNIT-II: Introduction to Java Scripts, Elements of Objects in Java Script, Dynamic HTML with Java Script

UNIT-III: Document type definition, XML Syntax, XML Schemas, Document Object model Using XML Processors

UNIT-IV: Introduction to Servlet, Servlet Life Cycles, Servlet Basics, Tomcat Web Server, Configuring Apache Tomcat, Handling Client Request and Response, Handling Cookies, Session Tracking.

Introduction to PHP, Language Basics, Functions, Strings, Arrays. Web Techniques, Data bases, Graphics, PDF, Dates and Times.

UNIT-V: MYSQL Installation, Accessing MySQL Using PHP, Form Handling, Cookies, Sessions, and Authentication, Tables, Inserting Data into Tables , Selecting Data format Table, Updating Table , Deleting data from Table, Webpage creation.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3102	
Course Title: WEB TECHNOLOGIES	
CO-1	Students will be able to construct web based applications.
CO-2	Students will be able to connect PHP to different databases.
CO-3	Students will be able to develop CRUD based PHP application

SYLLABUS: FORMAL LANGUAGES & AUTOMATA THEORY (B16 IT 3103)

UNIT-I: Definitions of alphabet, strings, language, grammar, types of grammar, types of machines, generation of languages from grammar, construction of grammar from the given description of languages

UNIT-II: Definition of finite state machine, Deterministic Finite Automata and Non-Deterministic Finite Automata, representations in mathematical diagram, tabular etc., id of finite state machine's, design of finite state machine from the given description, elimination of є-transitions , indefinite state machine to definite state machine, optimization of finite state machine.

UNIT-III: Conversion of regular grammar to finite state machine, finite state machine to regular grammar, discussion of pumping lemma, systematic way of construction of finite state machine.

UNIT-IV: Definition of regular expression, regular algebra, minimization of regular expressions, closure properties, construction of regular expression from the given description, regular expression to finite state machine, finite state machine to regular expression, construction of regular expression for the given finite state machine- a systematic way using Arden's theorem.

UNIT-V: Definition of push down machine, push down machine, types of push down machine's, push down machine to context free grammar, context free grammar to push down machine, design methodology of various push down machine's, push down machine by empty stack, push down machine by final states, conversion from one type to other type, applications of push down machine's.

UNIT-VI: Parsing tree, bottom-up parsing, top-down parsing, types of context free grammar's, leftmost and right most derivations, productions, reductions, optimization of context free grammar's, elimination of є-productions, unit productions, normal forms- cnf, gnf.

UNIT-VII: Definition of Turing machine, ways of representing Turing machine's- tabular form, diagram, mathematical form, quintuples etc., design of Turing machine, id of Turing machine, types of Turing machine, halting problem, church's thesis, universal Turing machine, Gödel number, definitions of recursive functions- prf, rf, decidability.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3103	
Course Title: FORMAL LANGUAGES & AUTOMATA THEORY	
CO-1	Ability to think analytically and intuitively for problem solving situations in related areas of theory in computer science.
CO-2	Ability to describe the language accepted by an automaton or generated by a regular expression or a context-free grammar.
CO-3	Ability to Understand the functioning of Finite-State Machines, Deterministic Finite-State Automata, Nondeterministic Finite-State Automata and Pushdown Automata and Turing Machines.

SYLLABUS: DATABASE MANAGEMENT SYSTEMS (B16 IT 3104)

UNIT-I: Introduction: File system versus a DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, The Relational model, Levels of abstraction, Data Independence, Transaction management, Structure of a DBMS.

UNIT-II: Introduction to Database Design and The Relational Model: Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships & Relationship Sets, Additional Features of the ER Model, Conceptual Design with ER Model, Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/ Altering Tables and Views.

UNIT-III: Relational Algebra and SQL: Preliminaries, Relational Algebra, The form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Embedded SQL, Dynamic SQL, JDBC.

UNIT-IV: Database Design: Schema Refinement and Normal Forms, Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD‘s, Normal Forms, Properties of Decomposition, Normalization, Other kinds of Dependencies.

UNIT-V: Transaction Management: The ACID Properties, Transactions & Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control.

UNIT-VI: Concurrency Control: 2PL, Serializability and Recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques, Concurrency Control without Locking.

UNIT-VII: Crash Recovery: Introduction to ARIES, The Log, Other Recovery-Related Structures, The Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media Recovery.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3104	
Course Title: DATABASE MANAGEMENT SYSTEMS	
CO-1	The student will understand ER-modeling for conceptual database design and relationalmodel.
CO-2	The student is introduced to formal and commercial query languages: Relational Algebra,calculus and SQL.
CO-3	The student will learn schema refinement and normalization.
CO-4	The Student understands locking protocols concurrency control, and crash recovery methods.

SYLLABUS: PRINCIPLES OF PROGRAMMING LANGUAGES (B16 IT 3105)

UNIT-I: Language Design Issues: Study Programming Languages, History of Programming Languages, Role of Programming Languages, Programming Environments.

UNIT-II: Impact of Machine Architectures: Operation of a Computer, Virtual Computers and Binding Times; Language Translation Issues: Programming Language Syntax, Stages in Translation, Formal Translation Models, Recursive Descent Parsing; Modeling Language Properties: Formal Properties of Languages, Language Semantics.

UNIT-III: Elementary Data Types: Properties of Types and Objects, Scalar Data Types, Composite Data Types Encapsulation: Structured Data Types, Abstract Data Types, Encapsulation by Subprograms, Type Definitions .Inheritance: Abstract Data Types Revisited, Inheritance, and Polymorphism.

UNIT-IV: Sequence Control: Implement and Explicit Sequence Control, Sequence with Arithmetic Expressions, Sequence Control Between Statements, Sequencing with Non-arithmetic Expressions.

UNIT-V: Subprogram Control: Subprogram Sequence Control, Attributes of Data Control, Parameter Transmission, And Explicit Common Environment.

UNIT-VI: Storage Management: Elements Requiring Storage, Programmer- and System - Controlled Storage, Static Storage Management, And Heap Storage Management.

UNIT-VII: Distributed Processing: Variations on Subprogram Control, Parallel Programming, Hardware Developments, and Software Architecture. Network Programming: Desktop Publishing, The World Wide Web.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3105	
Course Title: PRINCIPLES OF PROGRAMMING LANGUAGES	
CO-1	Ability to compare different programming languages.
CO-2	Ability to discuss the significant achievements in programming language history.
CO-3	Ability to assess the programming languages in scientific manner.

SYLLABUS: ADVANCEDCOMPUTERARCHITECTURE (B16 IT 3106)

UNIT-I: Fundamentals of Computer design- Technology trends- cost- measuring and reporting performance quantitative principles of computer design.

UNIT-II: Instruction set principles and examples- classifying instruction set- memory addressing- type and size of operands- addressing modes for signal processing-operations in the instruction set- instructions for control flow- encoding an instruction set.-the role of compiler.

UNIT-III: Instruction level parallelism (ILP)- over coming data hazards- reducing branch costs –high performance instruction delivery- hardware based speculation- limitation of ILP

UNIT-IV: ILP software approach- compiler techniques- static branch protection – VLIW approach – H.W support for more ILP at compile time- H.W verses S.W Solutions.

UNIT-V: Memory hierarchy design- cache performance- reducing cache misses penalty and miss rate – virtual memory- protection and examples of VM.

UNIT-VI: Multiprocessors and thread level parallelism- symmetric shared memory architectures- distributed shared memory- Synchronization- multi threading.

UNIT-VII: Storage systems- Types – Buses – RAID- errors and failures- bench marking a storage device- designing a I/O system.

UNIT-VIII: Inter connection networks and clusters- interconnection network media – practical issues in interconnecting networks- examples – clusters- designing a cluster.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3106	
Course Title: ADVANCEDCOMPUTERARCHITECTURE	
CO-1	Understand the Concept of Parallel Processing and its applications.
CO-2	Implement the Hardware for Arithmetic Operations.
CO-3	Analyze the performance of different scalar Computers.
CO-4	Develop the Pipelining Concept for a given set of Instructions.
CO-5	Distinguish the performance of pipelining and non-pipelining environment in a processor

SYLLABUS: FILE STRUCTURES (B16 IT 3107)

UNIT-I: File Processing Operations and Secondary Storage

Physical and logical files, opening, reading & writing and closing files in C, seeking and special characters in files, physical devices and logical files, file-related header files in C

Disks – organization, tracks, sectors, blocks, capacity, non-data overhead, cost of a disk access, Magnetic Tape – types, performance, organization estimation of tape length and data transmission times, disk vs. tape,CD-ROM – CD-ROM as a file structure, physical organization, strengths and weakness of CD-ROMs, storage hierarchy

UNIT-II: Byte Journey and buffer Management and File Structure Concepts

File manager, I/O buffer, I/O processing, buffer strategies and bottlenecks

A stream file, field structures, reading a stream of fields, record structures and that uses a length indicator, Mixing numbers and characters – use of a hex dump, reading the variable length records from the files

UNIT-III: Managing records in C files and organizing files for performance

Retrieving records by keys, sequential search, direct access, choosing a record structure and record length, header records, file access and file organization

Data compression, reclaiming space – record deletion and storage compaction, deleting fixed-length records for reclaiming space dynamically, deleting variable-length records, space fragmentation, and replacement strategies.

UNIT-IV: Indexing and Indexed sequential file access and prefix B+ Trees

Index, A simple index with an entry sequenced file, basic operations on an indexed, entry sequenced file, indexes that are too large to hold in memory, indexing to provide access by multiple keys, retrieval using combination of secondary keys, improving the secondary index structure – inverted lists

Indexed sequential access, maintaining a sequence set, adding a simple index to the sequence set, the B tree, and simple prefix B+ content of the index: separators instead of keys, the simple prefix tree maintenance, index set block size, internal set block size, internal structure of index set blocks, loading a simple prefix.

UNIT-V: Hashing and Extendable hashing

Collisions in hashing, a simple hashing algorithms, hashing functions and record distributions, memory Requirements, collision resolution by progressive overflow, buckets, deletions Working of extendable hashing, implementation, deletion, extendable hashing performance

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3107	
Course Title: FILE STRUCTURES	
CO-1	Understand the fundamental concepts of file processing operations and storage structures
CO-2	Apply object orientation concepts to manipulate records.
CO-3	Apply concepts of sorting and merging on multiple files.
CO-4	Analyze the sequential and indexing file accessing techniques with appropriate data structures.
CO-5	Illustrate the usage of hashing techniques to organize file structures

SYLLABUS: BIO INFORMATICS (B16 IT 3108)

UNIT-I: Introduction: Definitions, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition an prediction, Folding problem, Sequence Analysis, Homology and Analogy. Protein Information Resources: Biological databases, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases.

UNIT-II: Genome Information Resources: DNA sequence databases, specialized genomic resources DNA Sequence analysis: Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases

UNIT-III: Pair wise alignment techniques : Database searching, Alphabets and complexity, Algorithm and programs, Comparing two sequences, sub-sequences, Identity and similarity, The Dot plot, Local and global similarity, different alignment techniques, Dynamic Programming, Pair wise database searching.

UNIT-IV: Multiple sequence alignment: Definition and Goal, The consensus, computational complexity, Manual methods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and searching

UNIT-V: Secondary database searching: Importance and need of secondary database searches, secondary database structure and building a sequence search protocol
Analysis packages: Analysis package structure, commercial databases, commercial software, comprehensive packages, packages specializing in DNA analysis, Intranet Packages, Internet Packages.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3108	
Course Title: BIO INFORMATICS	
CO-1	The students will be able to describe the contents and properties of the most important bioinformatics databases, perform text- and sequence-based
CO-2	searches, and analyse and discuss the results in light of molecular biological knowledge.
CO-3	The students will be able to explain the major steps in pair wise and multiple sequencealignment, explain the principle for, and execute pair wise
CO-4	Sequence alignment by dynamic programming The students will be able to predict thesecondary and tertiary structures of protein sequences.

SYLLABUS: DATABASE MANAGEMENT SYSTEMS LAB (B16 IT 3109)

Features of a commercial RDBMS package such as ORACLE/DB2, MS Access, MY SQL & Structured Query Language (SQL) used with the RDBMS.

1. Laboratory Exercises Should Include:
    a. Defining Schemas for Applications,
    b. Creation of Database,
    c. Writing SQL Queries,
    d. Retrieve Information from Database,
    e. Creating Views
    f. Creating Triggers
    g. Normalization up to Third Normal Form
    h. Use of Forms
    i. Report Writing
    j. Implementation of enforcing Integrity constraints.
2. Some sample applications are given below:
    a. Accounting Package for Shops,
    b. Database Manager for Magazine Agency or Newspaper Agency,
    c. Ticket Booking for Performances
    d. Preparing Greeting Cards & Birthday Cards
    e. Personal Accounts - Insurance, Loans, Mortgage Payments, Etc.,
    f. Doctor's Diary & Billing System Personal Bank Account
    g. Class Marks Management
    h. Hostel Accounting
    i. Video Tape Library,
    j. History of Cricket Scores,
    k. Cable TV Transmission Program Manager,
    l. Personal Library.
    m. Sailors Database
    n. Suppliers and Parts Database

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3109	
Course Title: DATABASE MANAGEMENT SYSTEMS LAB	
CO-1	The student is exposed to a commercial RDBMS environment such as ORACLE.
CO-2	The student will learn SQL commands for data definition and manipulation.
CO-3	The student understands conceptual through physical data base design.
CO-4	The student takes up a case study and applies the design steps.

SYLLABUS: WEB TECHNOLOGIES LAB (B16 IT 3110)

Week-1:

Design the following static web pages required for an online book store web site.

1. HOME PAGE:

The static home page must contain three **frames**.

Top frame: Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).

Left frame: At least four links for navigation, which will display the catalogue of respective links.

For e.g.: When you click the link **"CSE"** the catalogue for **CSE** Books should be displayed in the Right frame.

Right frame: The *pages to the links in the left frame must be loaded here*. Initially this page contains description of the web site.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Description of the Web Site			

Fig 1.1

2) LOGIN PAGE:

This page looks like below:

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Login: Password: Submit Reset			

3) CATOLOGUE PAGE:

The catalogue page should contain the details of all the books available in the web site in a table. The details should contain the following:

1. Snap shot of Cover Page.
2. Author Name.
3. Publisher.
4. Price.
5. Add to cart button.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL		Book : XML Bible Author : Winston Publication : Wiely	$ 40.5	Add to cart
		Book : AI Author : S.Russel Publication : Princeton hall	$ 63	Add to cart
		Book : Java 2 Author : Watson Publication : BPB publications	$ 35.5	Add to cart
		Book : HTML in 24 hours Author : Sam Peter Publication : Sam publication	$ 50	Add to cart

4) CART PAGE:

The cart page contains the details about the books which are added to the cart. The cart page should look like this:

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	**Book name** Java 2 XML bible	**Price** $35.5 $40.5	**Quantity** 2 1 **Total amount -**	**Amount** $70 $40.5 $130.5

5) Registration Page:

Create a —*registration form* —with the following fields

1) Name (Text field)
2) Password (password field)
3) E-mail id (text field)
4) Phone number (text field)
5) Sex (radio button)
6) Date of birth (3 select boxes)
7) Languages known (check boxes – English, Telugu, Hindi, Tamil)
8) Address (text area)

WEEK 3:

VALIDATION:

Write *JavaScript* to validate the following fields of the above registration page.

1. Name (Name should contains alphabets and the length should not be less than 6 characters).
2. Password (Password should not be less than 6 characters length).
3. E-mail id (should not contain any invalid and must follow the standard patternname@domain.com)
4. Phone number (Phone number should contain 10 digits only).

Note: You can also validate the login page with these parameters.

You can also use bootstrap validation also

WEEK 4:

Write a basic html by using following classes in bootstrap.css (External Style Sheet bootstrap.min.css)

1. Table
2. Button
3. Form
4. Dropdown

WEEK 5

Write an XML file which will display the Book information which includes the following:

1. Title of the book
2. Author Name
3. ISBN number
4. Publisher name
5. Edition
6. Price

Write a Document Type Definition (DTD) to validate the above XML file. Display the XML file as follows. The contents should be displayed in a table. The header of thetable should be in color GREY. Use XML schemas XSL and CSS for the above purpose

(Or)

Use Java Code to parse the xml

WEEK 6

a. Installation of tomcat and Create Hello World message using servlet
b. Read the user id and passwords entered in the Login form (week1) and authenticate (user id and passwords)using Request Dispatcher.

WEEK 7

Demonstrate Session tracking in servlets using

1. Session API
2. Cookies

WEEK 8

Write an HTML page that has one input, which can take multi-line text and a submit button. Once the user clicks the submit button, it should show the number of characters ,lines and wordsin the text entered using an alert message. Words are separated with white space and lines are separated with new line character using PHP

WEEK 9

a. PHP program to find number of page views (page Hit count using sessions)
b. A web application that lists all cookies stored in the browser on clicking –list cookies‖ button, add cookies if necessary

WEEK 10

Using PHP, MYSQL develop a basic application that can

1. Register User
2. Display Users (For Admin login)
3. Update User Detail's (For Admin login)
4. Delete User (For Admin login)

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3110	
Course Title: WEB TECHNOLOGIES LAB	
CO-1	Understand current and evolving Web languages for integrating media and user interaction in both front end and back end elements of a Web site
CO-2	Create static web pages using HTML and CSS
CO-3	Validate HTML FORM data using JavaScript at the client side
CO-4	Create dynamic web pages using PHP and MySQL
CO-5	To build XML applications with schema and style sheets that span multiple domains for usewith legacy browsers
CO-6	Install tomcat and run servlet with for authentication and Session Management

SYLLABUS: VERBAL & QUANTITATIVE APTITUDE – I (B16ENG3102)

UNIT-I: Grammar: (VA)

Parts of speech(with emphasis on appropriate prepositions, co-relative conjunctions, pronouns- number and person, relative pronouns), articles(nuances while using definite and indefinite articles), tenses(with emphasis on appropriate usage according to the situation), subject – verb agreement (to differentiate between number and person) , clauses(use of the appropriate clause , conditional and relative clauses), phrases(use of the phrases, phrasal verbs) to-infinitives, gerunds, question tags, voice, direct & indirect speech, degrees of comparison, modifiers, determiners, identifying errors in a given sentence, correcting errors in sentences.

UNIT-II: Vocabulary: (VA)

Synonyms and synonym variants (with emphasis on high frequency words), antonyms and antonym variants(with emphasis on high frequency words), contextual meanings with regard to inflections of a word, frequently confused words, words often mis-used, multiple meanings of the same word (differentiating between meanings with the help of the given context), foreign phrases, homonyms, idioms, pictorial representation of words, word roots, collocations.

UNIT-III: Reasoning: (VA)

Critical reasoning (understanding the terminology used in CR- premise, assumption, inference, conclusion), Analogies (building relationships between a pair of words and then identifying similar relationships), Sequencing of sentences (to form a coherent paragraph, to construct a meaningful and grammatically correct sentence using the jumbled text), odd man (to use logical reasoning and eliminate the unrelated word from a group), YES-NO statements (sticking to a particular line of reasoning Syllogisms.

UNIT-IV: Usage: (VA)

Sentence completion (with emphasis on signpost words and structure of a sentence), supplying a suitable beginning/ending/middle sentence to make the paragraph coherent, idiomatic language (with emphasis on business communication), and punctuation depending on the meaning of the sentence.

UNIT-V: Soft Skills:

Introduction to Soft Skills – Significance of Inter & Intra-Personal Communication – SWOT Analysis –Creativity & Problem Solving – Leadership & Team Work - Presentation Skills Attitude – Significance – Building a positive attitude – Goal Setting – Guidelines for Goal Setting – Social Consciousness and Social Entrepreneurship – Emotional Intelligence - Stress Management, CV Making and CV Review.

Course Outcomes for Third Year First Semester Course	
Course Code: B16ENG3102	
Course Title: VERBAL & QUANTITATIVE APTITUDE – I	
CO-1	Detect grammatical errors in the text/sentences and rectify them while answering their competitive/ company specific tests and frame grammatically correct sentences while writing.
CO-2	Answer questions on synonyms, antonyms and other vocabulary based exercises while attempting CAT, GRE, GATE and other related tests.
CO-3	Use their logical thinking ability and solve questions related to analogy, syllogisms and other reasoning based exercises.
CO-4	Choose the appropriate word/s/phrases suitable to the given context in order to make the sentence/paragraph coherent.
CO-5	Apply soft skills in the work place and build better personal and professional relationships making informed decisions.

SYLLABUS: ADVANCED CODING (B16 ENG3104)

UNIT-I: Review Coding essentials and modular programming

Introduction to Linear Data, Structure of linear data, Operation logics, Matrix forms and representations, Pattern coding.

Introduction to modular programming: Formation of methods, Methods: Signature and definition, Inter-method communication, Data casting & storage classes, Recursions

UNIT-II: Linear Linked Data

Introduction to structure pointer, Creating Links Basic problems on Linked lists, Classical problems on linked lists. Circular Linked lists, Operations on CLL, Multiple links, Operations on Doubly linked lists

UNIT-III: Abstract Data-structures

Stack data-structure, Operations on stack, Infix/Prefix/Post fix expression evaluations, Implementation of stack using array, Implementation of stack using linked lists.

Queue data-structure: Operations on Queues, Formation of a circular queue, Implementation of queue using stack, Implementation of stack using array, Implementation of stack using linked lists

UNIT-IV: Running time analysis of code and organization of linear list data

Code evaluation w.r.t running time, Loop Complexities, Recursion complexities, Searching techniques: sequential Vs. binary searching Organizing the list data, Significance of sorting algorithms, Basic Sorting Techniques: Bubble sort, selection sort, Classical sorting techniques: Insertion sort, Quick sort, Merge sort.

UNIT-V: Standard Library templates and Java collections

Introduction to C++ language features, working on STLs, Introduction to Java as Object Oriented language, Essential Java Packages, Coding logics.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 ENG3104	
Course Title: ADVANCED CODING	
CO-1	Acquire coding knowledge on essential of modular programming
CO-2	Acquire Programming knowledge on linked lists
CO-3	Acquire coding knowledge on ADT
CO-4	Acquire knowledge on time complexities of different methods
CO-5	Acquire Programming skill on Java libraries and Collections

SYLLABUS: IOS APPLICATION DEVELOPMENT (MOOCS-I) (B16 IT 3111A)

Industry Oriented Applications on following Topics

UNIT-I: Introduction to Swift
Swift vs. Objective-C, Swift language principles, Variables, Types, and Control Flow, Variables and constants, Built-in types, Conditional statements

UNIT-II: Collections
Arrays, Dictionaries, Sets, Functions and Closures, Basic functions, Higher-order functions, nested functions, Closures

UNIT-III: Classes and Structures
The Swift type system, Properties, Initializers, Methods, Property observers, Access modifiers, Inheritance and polymorphism, Structures

Mini project in Ios Application using Xcode

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3111A	
Course Title: IOS APPLICATION DEVELOPMENT(MOOCS-I)	
CO-1	Able to know the principles of Swift
CO-2	They can apply the Collections in real – world scenarios
CO-3	Students can understand the features of Swift
CO-4	They can understand the memory management of IOs application
CO-5	Able to know the UI kit in swift

SYLLABUS: RUBY (MOOCS-I) (B16 IT 3111B)

UNIT-I: Introduction:

Introduction to Ruby, What is Ruby? Features, Ruby gems, Help on ruby, Installation, variable Dynamic typing, Declaring a variable, Changing variable type , Converting the var value i.e. to float, string, binary etc

UNIT-II: Ruby Methods and Arithmetic and Relational Operators

What is method working with methods, Declaring and Calling a method, Passing arguments to a method Explaining the arguments and syntax with example, Arithmetic Operators, Addition Subtraction Multiplication Division Modulus, Exponent Precedence of operators Relational Operators.

UNIT-III: Logical and other Operators and Control Statements

Logical operator And && Or || Not! Parallel assignment Range operator Inclusive Operator (..) Exclusive operator (...), Control Statements in Ruby, What are control statements Syntax for if statement if..else statement if..elsif statement Examples on it.

UNIT-IV: For and each Looping Statements and while and until Looping Statements

for & each loops in Ruby, Meaning of the term ―loop‖ *,Different kinds of loop ,Syntax of ―for‖ loop*,Example implementation of ―for‖ loop , Syntax of ―each‖ loop , while & until loops in Ruby ,Usage of while loop with an example ,Usage of until loop with an example ,Usage of redo construct with an example

UNIT-V: Object Oriented Concept in Ruby and Object Oriented Programming Methods

Object Oriented Concept in Ruby, Classes in Ruby, How to create objects, Different ways of defining methods in Ruby, Using? and = to define meaningful methods, Methods in Ruby ,What are instance methods , class methods, accessor methods , Example implementation of each of the above and difference between them

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3111B	
Course Title: RUBY(MOOCS-I)	
CO-1	proficient programming in the Ruby language and programming in general
CO-2	design and revision of Ruby scripts
CO-3	debugging techniques appropriate for the Ruby language

SYLLABUS: Programming, Data Structures And Algorithms Using Python (B16 IT 3111C)
(MOOCS-I)

UNIT-I: Informal introduction to programming, algorithms and data structures via gcd Downloading and installing Python
gcd in Python: variables, operations, control flow - assignments, condition-als, loops, functions

UNIT-II: Python: types, expressions, strings, lists, tuples, Python memory model: names, mutable and immutable values List operations: slices etc,Binary search ,Inductive function definitions: numerical and structural induction Elementary inductive sorting: selection and insertion sort, In-place sorting

UNIT-III: Basic algorithmic analysis: input size, asymptotic complexity, O() notation ,Arrays vs lists
Merge sort, Quicksort, Stable sorting

UNIT-IV: Dictionaries, More on Python functions: optional arguments, default values Passing functions as arguments, Higher order functions on lists: map, lter, list comprehension

UNIT-V: Exception handling, Basic input/output, Handling files, String processing

UNIT-VI: Backtracking: N Queens, recording all solutionsScope in Python: local, global, nonlocal names Nested, functions Data structures: stack, queueHeaps, Backtracking: N Queens, recording all solutions Scope in Python: local, global, nonlocal names Nested functions, Data structures: stack, queue Heaps

UNIT-VII: Abstract data types, Classes and objects in Python "Linked" lists: find, insert, delete Binary search trees: find, insert, delete,Height-balanced binary search trees

UNIT-VIII: Efficient evaluation of recursive definitions: memorization ,Dynamic programming: examples, Other programming languages: C and manual memory managementOther, programming paradigms: functional programming

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3111C	
Course Title: PROGRAMMING, DATA STRUCTURES AND ALGORITHMS USING PYTHON(MOOCS-I)	
CO-1	Ability to apply object oriented concepts in programming
CO-2	Ability to define, understand and differentiate different types of data types and apply them.
CO-3	Ability to recognize various concepts of python dictionaries as well as classes and objects fordefining user defined datatypes such as linked lists and binary search trees.

SYLLABUS: ANDROID APP DEVELOPMENT (MOOCS-II) (B16 IT 3112A)

UNIT-I: The Basics

Chapter1:

1.0 Intro to Android,

1.1 Create Your First Android App,

1.2 Layouts, Views and Resources,

1.3 Text and Scrolling Views.

Chapter2:

2.1 Activities and Intents,

2.2 Activity Lifecycle and Saving State,

2.3 Activities and Implicit Intents.

UNIT-II: User Interface

Chapter4:

4.1 User Input Controls,

4.2 Menus,

4.3 Screen Navigation,

4.4 RecyclerView, fragments.

Chapter 5:

5.1 Drawables, Themes and Styles,

5.2 Material design

UNIT-III: Background tasks

Chapter7:

7.1 AsyncTask and AsyncTaskLoader,

7.2 Connecting to the Internet,

7.3 Broadcast receivers,

7.4 Services.

Chapter8:

8.1 Notifications,

8.2 Alarm managers,

8.3 Transferring data efficient**ly.**

UNIT-IV: Data -- saving, retrieving, and loading

Chapter9:

9.0 Concepts: Overview to storing data,

9.1 Shared preferences,

9.2 App settings.

Chapter10:

10.1 SQLite primer,

10.2 store data using SQLite database.

Chapter11: 11.1 Content Providers.

UNIT-V: What's Next?

Chapter13: 13.1 Permissions, performance and security, Espresso, media playback.

Chapter14: 14.1 Firebase and AdMob, Firebase cloud messaging, places.

Chapter15: 15.1 Publish your app

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3112A	
Course Title: ANDROID APP DEVELOPMENT(MOOCS-II)	
CO - 1	By the end of the course, student will be able to develop the android applications on their own, and work with the database to store data locally, and much more.

SYLLABUS: BLOCKCHAIN ARCHITECTURE DESIGN AND USECASE (B16 IT 3112B)

(MOOCS-II)

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3112B	
Course Title: BLOCKCHAIN ARCHITECTURE DESIGN AND USECASE(MOOCS-II)	
CO-1	Student will able to understand what is Blockchain.
CO-2	Student will able to understand about Bit coin and how bitcoin and blockchain are related.
CO-3	Student will able to understand consensus in Bitcoin.
CO-4	Student will able to apply permissioned Blockchain.
CO-5	Student will understand and learn to apply Blockchain in Government.
CO-6	Student will understand and learn to apply Blockchain security.
CO-7	Student will understand and learn to apply Blockchain in Research aspects,s cience and ecosystem.

SYLLABUS: TESTING TOOLS (MOOCS-II) (B16 IT 3112C)

UNIT-I: Testing Introduction

Introduction, Importance of software systems, Common problems in software development, **SDLC Implementation:** Feasibility study/Requirement Gathering, Analysis, Designing, Coding, Testing, Delivery and Maintenance,

Software Development Models: Waterfall Model, Incremental Model, Prototype Model/Use and Through Model, Spiral Model-Model, W- Model, Agile Testing Implementation, Agile-SCRUM,

Kinds of Testing: Un-Conventional Testing, Conventional Testing,

Methods of Testing: Black Box Testing, White Box Testing, Gray Box Testing.

Static Testing: Reviews, Inspections, Audit, Walkthrough.

Dynamic Testing: Unit Testing, Module Testing, Integration Testing, System Testing, User Acceptance Testing

UNIT-II: HP-Quality Center-11.00

Overview on Test Management, Quality Center – Introduction,

Need of Test-Management Tool, Module (Test Director Project, Site Administration, Customization),Domain / Project Fundamentals, How to Get Started

Architecture of TD/QC Tool: Site Administrator, Create Domain, Create Project, Create Users, Assign Users to Project, Monitor Connections

Customization of Quality Center Release and Cycle creation Test Requirements: Example of a test requirement, Importance of tracing and tracking Requirements, Reviewing and building a, Requirements structure, Entering requirements manually

Test Cases Creation and management: Review of an existing test case, Parameters, Building a test case structure, creating manual test cases, Requirements coverage

Test Sets and Test Execution: Creating folders and test sets, Defining test execution flow, Setting test set properties,Manual test execution, Logging defects during manual testing, Automated test execution, Adding test hosts, Running a test set, Setting run times

Defect Tracking: Reporting defects, searching for similar defects, using grid filters, Deleting defects

Reporting and Analysis: Analysis menu graphs and reports, creating editable reports with the advanced, Reporting

Bug Tracking Tools: BugZilla, Mantis, PRTracker, VSS

Automation Life Cycle Implementation Using HP-QuickTestProfessional-11.00

Introduction to Quick Test: Overview of Add-In Manager and QuickTest,QuickTest Window andTools, QuickTest Commands, Tools in QuickTest

UNIT-III: Performance Test Automation with LOADRUNNER 11.00

Introduction**,** Overview of Load Runner, The need of performance testing, When load testing comes into process, Performance Testing, Stress Testing, Load Runner Architecture, Loads Test Process

Performance Test Process: Manual Load Testing, Automation Load Testing, Performance Test Approach, Study system under test, Create Vuser Script, Execute Tests, Analyze Test Results

Load Runner Components: Virtual user generator, Controller, Analysis

Load testing process: Building Tests, Running Load Tests, Analyze the results, Load Runner Controller, Publish Reports

UNIT-IV: Browser Automation Testing Tool SELENIUM-1.10.0

Introduction to Selenium: What is Selenium, Use of Selenium, When Selenium can be useful in testing, Features of Selenium, Differences between Selenium and QTP
Selenium Components: Selenium IDE, Selenium RC, Selenium Grid

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3112C	
Course Title: TESTING TOOLS(MOOCS-II)	
CO-1	By the end of the course, student will be able to know various testing tools like HP-Quality Center-11.00, Performance Test Automation with LOADRUNNER 11.00 & Browser Automation Testing Tool SELENIUM-1.10.0

SYLLABUS: MACHINE LEARNING (MOOCS-II) (B16 IT 3112D)

UNIT-I: Introduction: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation.

UNIT-II: Linear regression, Decision trees, over fitting.

UNIT-III: Instance based learning, Feature reduction, Collaborative filtering based recommendation.

UNIT-IV: Probability and Bayes learning.

UNIT-V: Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM.

UNIT-VI: Neural network: Perception, multilayer network, back propagation, introduction to deep neural network.

UNIT-VII: Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning.

UNIT-VIII: Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3112D	
Course Title: MACHINE LEARNING(MOOCS-II)	
CO-1	Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
CO-2	Have an understanding of the strengths and weaknesses of many popular machine learning approaches.
CO-3	Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.
CO-4	Be able to design and implement various machine learning algorithms in a range of real-world applications.

SYLLABUS: MACHINE LEARNING (MOOCS-II) (B16 IT 3112D)

UNIT-I: Introduction: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation.

UNIT-II: Linear regression, Decision trees, over fitting.

UNIT-III: Instance based learning, Feature reduction, Collaborative filtering based recommendation.

UNIT-IV: Probability and Bayes learning.

UNIT-V: Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM.

UNIT-VI: Neural network: Perception, multilayer network, back propagation, introduction to deep neural network.

UNIT-VII: Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning.

UNIT-VIII: Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 IT 3112D	
Course Title: MACHINE LEARNING(MOOCS-II)	
CO-1	Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
CO-2	Have an understanding of the strengths and weaknesses of many popular machine learning approaches.
CO-3	Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.
CO-4	Be able to design and implement various machine learning algorithms in a range of real-world applications.

SYLLABUS: DATAWAREHOUSING & DATA MINING (B16IT3201)

UNIT-I: Introduction to Data Mining: Evolution of IT into DBMS, Motivation and importance of Data Warehousing and Data Mining, Kinds of Patterns, Technologies, Applications, Major Issues in Data Mining, Data Objects and Attributes Types, Statistical Descriptions of Data, Data Visualization, Estimating Data Similarity and Dissimilarity.

UNIT-II: Data pre-processing : Quality data, Data Cleaning, Data Integration, Data Reduction, Data Transformation, Discretization and Concept Hierarchy Generation.

UNIT-III: Data Warehouse and OLAP Technology: Basic Concepts of Data warehouse, Data Modeling using Cubes and OLAP, DWH Design and usage, Implementation using Data Cubes and OLAPs, Data Generalization with AOI.

UNIT-IV: Data Cube Technology: Preliminary Concepts of Data Cube Computation, Data Cube Computation Methods: Multi-way Array Aggregation for Full Cube, Multi-dimensional Data Analysis in cube space.

UNIT-V: Mining Frequent Patterns Based on Associations and Correlations: Basic Concepts, Frequent Item set Mining Methods: Apriori Algorithm, Association Rule Generation, Improvements to Apriori, FP- Growth Approach, Mining Closed and Max Patterns, Pattern Evaluation Methods, Association mining in multi-level, multi-dimensional space

UNIT-VI: Classification & Prediction: Basic Concepts, Decision Tree Induction, Bayes Classification, Rule- Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy, Classification by Back Propagation, Associative Classification, K- nearest neighbor classifier.

UNIT-VII: Cluster Analysis: Basic Concepts and issues in clustering, Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Evaluation of Clustering Solutions

Course Outcomes for Third Year Second Semester Course	
Course Code: B16IT3201	
Course Title: DATAWAREHOUSING & DATA MINING	
CO-1	The student understands the differences between OLTP and OLAP.
CO-2	The student learns how data cube technology supports summarization and querying high dimensional data.
CO-3	The student is introduced to similarity, distance, information gain and other performance and error metrics used for evaluation of mining results.
CO-4	The student is introduced to various approaches to association rule mining,supervised and unsupervised learning and the corresponding classification and clustering approaches involving decision trees, Bayesian approaches, model based and agglomerative approaches.

SYLLABUS: OBJECT ORIENTED SOFTWARE ENGINEERING (B16 IT 3202)

UNIT-I: Introduction to Object Oriented Software Engineering & Requirements Engineering: Nature of the Software, Types of Software, Software Engineering Projects, Software Engineering Activities, Software Quality, Introduction to Object Orientation, Software Process Models- Waterfall Model, Opportunistic Model , Phased Released Model, Spiral Model, Evolutionary Model, Concurrent Engineering Model, Domain Analysis, Problem Definition and Scope, Requirements Definition, Types of Requirements, Techniques for Gathering and AnalyzingRequirements.

UNIT-II: Unified Modeling Language & Use Case Modeling: Modeling Concepts, Types of UML Diagrams with Examples; User-Centered Design, Characteristics of Users, Developing Use-Case Models of Systems, Use-Case Diagram, Use- Case Descriptions, Usability Principles, Interaction and Behavioral Diagrams: Interaction Diagrams, State Diagrams, Case Study.

UNIT-III: Class Design and Class Diagrams: Activity Diagrams, Essentials of UML Class Diagrams, Associations and Multiplicity, Other Relationships, Generalization, Instance Diagrams, Advanced Features of Class Diagrams, Component and Deployment Diagrams, Case Study.

UNIT-IV: Software Design and Architecture: Process of Design, Principles Leading to Good Design, Techniques for Making Good Design Decisions, Good Design Document; Pattern Introduction, Design Patterns: Abstraction-Occurrence Pattern, General Hierarchical Pattern, Play-Role Pattern, Singleton Pattern, Observer Pattern, Delegation Pattern, Adaptor Pattern, Façade Pattern, Immutable Pattern, Read-Only Interface Pattern and The Proxy Pattern; Software Architecture Contents of Architecture Model, Architectural Patterns: Multilayer, Client-Server, Broker, Transaction Processing, Pipe & Filter and MVC Architectural Patterns.

UNIT-V: Software Testing & Software Process Management: Overview of Testing, Testing Concepts, Testing Activities, Testing Strategies, Unit Testing, Integration Testing, Function Testing, Structural Testing, Class Based Testing Strategies, Use Case/Scenario Based Testing, Regression Testing, Performance Testing, System Testing, Acceptance Testing, Installation Testing, OO Test Design Issues, Test Case Design, Quality Assurance, Root Cause Analysis, Post-Mortem Analysis, Introduction to Software Project Management, Rationale Management, Configuration Management, Activities of Software Project Management, Structure of Project Plan, Software Cost Estimation, Project Scheduling.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 IT 3202	
Course Title: OBJECT ORIENTED SOFTWARE ENGINEERING	
CO-1	Ability to define a problem and perform Requirements Engineering.
CO-2	Ability to draw UML diagrams for the requirements gathered.
CO-3	Ability to implement the designed problem in Object Oriented Programming Language.
CO-4	Test whether all the requirements specified have been achieved or not.

SYLLABUS: DESIGN AND ANALYSIS OF ALGORITHMS (B16 IT 3203)

UNIT-I: Introduction: Algorithm, Algorithm specification, Performance Analysis.

UNIT-II: Divide and Conquer: The general method -- Binary search -- finding maximum and minimum - Merge sort -- Quick sort -- Selection – Strassen‘s Matrix multiplication – Convex Hull

UNIT-III: The Greedy Method: The general method – Knapsack problem -- Job sequencing with deadlines -- Optimal storage on tapes -- minimum cost spanning trees -- Optimal Merge Patterns -- single source shortest paths.

UNIT-IV: Dynamic Programming: The general method -- Multistage graphs -- all pairs shortest paths -- optimal binary search trees -- reliability design -- the traveling sales person problem.

UNIT-V: Basic Traversal and Search techniques: Techniques for Binary trees – Techniques for Graphs– Connected components and spanning trees -- Bi-connected components and depth first search.

UNIT-V: Back Tracking: The General Method -- Eight Queens problem -- Sum of subsets -- Graphcoloring -- Hamiltonian cycle.

UNIT-VI: Branch and Bound: The Method--Least cost (LC) Search-- The 15-Puzzle: an Example—Control Abstraction for LC-Search-- 0/1Knapsack Problem--Traveling Salesperson

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 IT 3203	
Course Title: DESIGN AND ANALYSIS OF ALGORITHMS	
CO-1	Students will be able to Analyze the algorithms using asymptotic analysis.
CO-2	Student will be able to understand, apply and analyze Divide-and-Conquer technique oncomputer science problems.
CO-3	Student will be able to understand, apply and analyze Greedy technique on computer scienceproblems.
CO-4	Student will be able to understand, apply and analyze Dynamic Programming on computerscience problems.
CO-5	Student will be able to understand, apply and analyze Basic Traversal and Search techniquesand Backtracking on computer science problems.
CO-6	Student will be able to understand, apply and analyze Branch-and-Bound

SYLLABUS: COMPILER DESIGN (B16 IT 3204)

UNIT-I: Introduction to Compilers:

Translators-Compilation and Interpretation-Language processors-The Phases of Compiler-Errors encountered in Different Phases-The Grouping of Phases-Compiler Construction Tools. Programming language basics.

UNIT-II: Lexical Analysis

Need and Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions-Converting Regular Expression to DFA- Minimization of DFA-Language for Specifying Lexical Analyzers-LEX-Design of Lexical Analyzer for a sample language.

UNIT-III: Syntax Analysis:

Need and Role of the Parser-Context Free Grammars -Top Down Parsing -General Strategies- Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR (0)Item-Construction of SLR Parsing Table -Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for a Sample Language.

UNIT-IV: Syntax Directed Translation & Run Time Environment:

Syntax directed Definitions-Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions- Design of predictive translator - Type Systems-Specification of a simple type checker-Equivalence of Type Expressions-Type Conversions. RUN-TIME ENVIRONMENT: Source Language Issues-Storage Organization-Storage Allocation-Parameter Passing-Symbol Tables-Dynamic Storage Allocation -Storage Allocation in FORTAN.

UNIT-V: Code Optimization And Code Generation

Principal Sources of Optimization-DAG- Optimization of Basic Blocks-Global Data Flow Analysis-Efficient Data Flow Algorithms-Issues in Design of a Code Generator - A Simple Code Generator Algorithm.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 IT 3204	
Course Title: COMPILER DESIGN	
CO-1	To apply the knowledge of lex tool & yacc tool to devleop a scanner & parser.
CO-2	To design & conduct experiments for Intermediate Code Generation in compiler.
CO-3	To design & implement a software system for backend of the compiler.
CO-4	To learn the new code optimization techniques to improve the performance of a program in terms of speed & space.
CO-5	To acquire the knowledge of modern compiler & its features.
CO-6	To learn & use the new tools and technologies used for designing a compiler

SYLLABUS: CRYPTOGRAPHY & NETWORK SECURITY (B16 IT 3205)

UNIT-I: Overview: Computer Security Concepts, Threats, Attacks, and Assets, A Security Architecture for Open Systems, Cryptographic Tools: Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions, Public-Key Encryption, Digital Signatures and Key Management, Random and Pseudorandom Numbers. User Authentication: Means of Authentication, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Remote User Authentication, Security Issues for User Authentication.

UNIT-II: Access Control: Access Control Principles, Subjects, Objects, and Access Rights, Discretionary Access Control, Role-Based Access Control, Database Security: The Need for Database Security, Database Management Systems, Relational Databases, Database Access Control, Inference, Statistical Databases, Database Encryption, Cloud Security**.**

UNIT-III: Malicious Software: Types of Malicious Software (Malware), Propagation—Infected Content—Viruses, Propagation—Vulnerability Exploit—Worms, Propagation— Social Engineering—SPAM E-mail, Trojans, Payload—System Corruption, Payload—Attack Agent—Zombie, Bots, Payload—Information Theft—Key loggers, Phishing, Spyware, Payload—Stealthing— Backdoors, Root kits, Countermeasures. Denial-of-Service Attacks: Denial-of-Service Attacks, Flooding Attacks, Distributed Denial-of-Service Attacks, Application-Based Bandwidth Attacks,Reflector and Amplifier Attacks, Defenses Against Denial-of-Service Attacks, Responding to a Denial-of-Service Attack.

UNIT-IV: Intrusion Detection: Intruders, Intrusion Detection, Host-Based Intrusion Detection, DistributedHost-Based Intrusion Detection, Network-Based Intrusion Detection, Intrusion Detection Exchange Format, Honeypots. Firewalls and Intrusion Prevention Systems: The Need for Firewalls, Firewall Characteristics, Types of Firewalls, Firewall Basing, Firewall Location and Configurations, Intrusion Prevention Systems**.**

UNIT-V: Symmetric Encryption and Message Confidentiality: Symmetric Encryption Principles, Data Encryption Standard, Advanced Encryption Standard, Stream Ciphers and RC4, Cipher Block Modes of Operation, Location of Symmetric Encryption Devices, Key Distribution. Public-Key Cryptography and Message Authentication: Secure Hash Function, HMAC, The RSA Public- Key Encryption Algorithm, Diffie-Hellman Key Exchange Algorithm.

UNIT-VI: Internet Security Protocols and Standards: Secure E-mail and S/MIME, Domain Keys Identified Mail, Secure Socket Layer (SSL) and Transport Layer Security (TLS), HTTPS, IPv4 and IPv6 Security. Internet Authentication Applications: Kerberos, X.509, Public-Key Infrastructure, Federated Identity Management. Wireless Network Security: IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 IT 3205	
Course Title: CRYPTOGRAPHY & NETWORK SECURITY	
CO-1	Realize the need and importance of network and data security in the Internet and in the distributed environments.
CO-2	To be familiar with different means of Authentication mechanisms.
CO-3	Identify the different types of network security issues and their remedies.
CO-4	Application of various cryptographic tools and techniques in different contexts.
CO-5	To be familiar with some internet security protocols and standards.

SYLLABUS: IMAGE PROCESSING (B16 IT 3206)

UNIT-I: Fundamentals of Image Processing: Image Acquisition, Image Model, Sampling, Quantization, Relationship Between Pixels, Distance Measures, Connectivity, Image Geometry, Photographic Film. Histogram: Definition, Decision Of Contrast Basing On Histogram, Operations Basing on Histograms Like Image Stretching, Image Sliding, Image Classification. Definition and Algorithm of Histogram Equalization.

UNIT-II: Image Enhancement in Spatial Domain: Arithmetic and Logical Operations, Pixel or Point Operations, Size Operations; Smoothing Filters-Mean, Median, Mode Filters – Comparative Study.

UNIT-III: Edge enhancement in spatial domain: Edge enhancement filters, Directorial Filters, Sobel, Laplacian, Robert, KIRSCH Homogeneity & DIFF filters, PREWITT Filter, Contrast based edge enhancement techniques, Comparative study, Low pass filters, High pass filters, Sharpening filters, Comparative study, Color fundamentals and color model

UNIT-IV: Image Compression: Run Length Encoding, modified run length encoding, Contour Coding, Huffman Code, Compression Due to Change in Domain, Compression Due to Quantization Compression at the Time of Image Transmission. Brief Discussion on:- Image Compression Standards.

UNIT-V: Image Segmentation: Definition of segmentation, Characteristics of Segmentation, Detection of Discontinuities, Thresholding. Pixel Based Segmentation Method. Region Based Segmentation Methods, Segmentation by Pixel Aggregation, Segmentation by Sub Region Aggregation, Histogram Based Segmentation, Spilt and Merge Technique, Segmentation of moving objects

UNIT-VI: Morphology: Dilation, Erosion, Opening, Closing, Hit-And-Miss Transform, Thinning, Thickening, Skeletons, Pruning Extensions to Gray – Scale Images Application of Morphology in I.P

UNIT-VII: Image Transforms: A Detail Discussion On Fourier Transform, DFT,FFT, Properties of Fourier transform, WALSH Trans Form , WFT, HADAMARD Transform, DCT Image Enhancement in Frequency Domain: Design of Low Pass, High Pass, EDGE Enhancement, Smoothening Filters in Frequency Domain. Butter Worth Filter, Homomorphic Filters in Frequency Domain Advantages of Filters in Frequency Domain, Comparative Study of Filters in Frequency, Domain and Spatial Domain.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 IT 3206	
Course Title: IMAGE PROCESSING	
CO-1	Ability to develop algorithms for fundamental concepts in Image processing.
CO-2	Ability to perform image enhancement, image compression and image segmentation usingvarious methods.
CO-3	Ability to implement Image transformation techniques

SYLLABUS: DISTRIBUTED DATABASE SYSTEMS (B16 IT 3207)

UNIT-I: Features of Distributed versus Centralized Databases, Principles Of Distributed Databases ,Levels Of Distribution Transparency, Reference Architecture for Distributed Databases , Types of Data Fragmentation, Integrity Constraints in Distributed Databases.

UNIT-II: Translation of Global Queries to Fragment Queries, Equivalence Transformations for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries.

UNIT-III: Optimization of Access Strategies, A Framework for Query Optimization, Join Queries, General Queries.

UNIT-IV: The Management of Distributed Transactions, A Framework for Transaction Management, Supporting Atomicity of Distributed Transactions, Concurrency Control for Distributed Transactions, Architectural Aspects of Distributed Transactions.

UNIT-V: Concurrency Control, Foundation of Distributed Concurrency Control, Distributed Deadlocks, Concurrency Control based on Timestamps, Optimistic Methods for Distributed Concurrency Control.

UNIT-VI: Reliability, Basic Concepts, No blocking Commitment Protocols, Reliability and concurrency Control, Determining a Consistent View of the Network, Detection and Resolution of Inconsistency, Checkpoints and Cold Restart, Distributed Database Administration, Catalog Management in Distributed Databases, Authorization and Protection

UNIT-VII: Architectural Issues, Alternative Client/Server Architectures, Cache Consistency Object Management, Object Identifier Management, Pointer Swizzling, Object Migration, Distributed Object Storage, Object Query Processing, Object Query Processor Architectures, Query Processing Issues, Query Execution , Transaction Management, Transaction Management in Object DBMSs , Transactions as Objects.

UNIT-VIII: Database Integration, Scheme Translation, Scheme Integration, Query Processing Query Processing Layers in Distributed Multi-DBMSs, Query Optimization Issues. Transaction Management Transaction and Computation Model Multi database Concurrency Control, Multidatabase Recovery, Object Orientation And Interoperability Object Management Architecture CORBA and Database Interoperability Distributed Component Model COM/OLE and Database Interoperability, PUSH-Based Technologies

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 IT 3207	
Course Title: DISTRIBUTED DATABASE SYSTEMS	
CO-1	Explain the techniques used for data fragmentation, replication, and allocation during thedistributed database design process.
CO-2	Evaluate simple strategies for executing a distributed query to select the strategy that minimizes the amount of data transfer.
CO-3	Explain how the two-phase commit protocol is used to deal with committing a transactionthat accesses databases stored on multiple nodes.
CO-4	Describe distributed concurrency control based on the distinguished copy techniques and thevoting methods

SYLLABUS: COMPUTER GRAPHICS (ELECTIVE-II) (B16 IT 3208)

UNIT-I: Introduction: Computer Graphics and their applications: Computer Aided Design, Computer Art, Entertainment, Education and Training, Graphical User Interfaces; Overview of Graphics systems: Video Display Devices, Raster Scan Systems, Random Scan Systems, Graphics Monitors And Workstations, Input Devices, Hard Copy Devices, Interactive Input Methods, Windows and Icons, Virtual Reality Environments, Graphics Software.

UNIT-II: Output primitives : Points and Lines, , Line and Curve Attributes, Color and Gray scale levels, Antialiasing, Loading the Frame buffer, Line function, Line Drawing Algorithms, Circle Generating Algorithms, Ellipse Generating Algorithms, Pixel Addressing, Area Fill Attributes, Filled Area Primitives, Filled Area Functions, Cell Array, Character Generation, CharacterAttributes, Bundled Attributes, Curve Functions, Parallel Curve Algorithms.

UNIT-III: Two Dimensional Transformations: Basic 2D Transformations, Matrix Representations, Homogeneous Coordinates, Composite Transformations, Other Transformations, Transformations between Coordinate Systems, Affine Transformations.

UNIT-IV: Three Dimensional Transformations & Projections: Translation, Rotation, Scaling, Other Transformations, Composite Transformations, 3D Transformation Functions, Modeling and Coordinate Transformations, Need for projections, Parallel & Perspective projections, General Projection Transformations.

UNIT-V: Viewing Pipeline and Clipping operations: Viewing Pipeline, Viewing Coordinates & Reference frames, Window-to-Viewport Coordinate Transformation, Two Dimensional Viewing Functions, , Three Dimensional Viewing, View Volumes, Clipping and its Operations, Types of clipping operations- Point Clipping, Line Clipping, Polygon Clipping,, Curve Clipping,, Text andExterior Clipping.

UNIT-VI: Three Dimensional Concepts and Object representations: 3D display methods, 3D Graphics, Polygon Surfaces, Curved Lines and Surfaces, Quadratic Surfaces, Super Quadrics, Blobby Objects, Spline Representations, Bézier Curves and Surfaces, BSpline Curves and Surfaces.

UNIT-VII: Introduction to Multimedia: Multimedia and Hypermedia, Worldwideweb, Overview multimedia tools, Graphics and Image Data Representation.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 IT 3208	
Course Title: COMPUTER GRAPHICS(ELECTIVE-II)	
CO-1	The students will understand graphics principles and graphics hardware.
CO-2	The students can demonstrate geometrical transformations.
CO-3	The students can create interactive graphics applications and demonstrate computer graphicsanimation.

SYLLABUS: MOBILE COMPUTING (ELECTIVE-II) (B16 IT 3209)

UNIT-I: Introduction: Mobile Communications, Mobile Computing – Paradigm. Promises/Novel Applications and impediments and Architecture; Mobile and Han&)old Devices, Mobile and Handheld Devices. GSM — Services. System Architecture. Radio Interlaces, Protocols. Localization, Calling, Handover, Security, New Data Services, GPRS, CSHSD, DECT.

UNIT-II: (Wireless) Medium Access Control (MAC): Motivation for a specialized MAC (Hidden and exposed terminals. Near and far terminals), SDMA, FDMA TDMA, CDMA, Wireless LAN/(IEEE 802.11) Mobile Network Layer IP end Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration. Tunneling and Encapsulation, Route Optimization, DHCR

UNIT-III: Mobile Transport Layer: Conventional TCP/iP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks. Database Issues: Database Hoarding & Caching Techniques. Client-Server Computing a Adaptation, Transnational Models,Query processing, Data Recovery Process & QoS Issues.

UNIT-IV: Data Dissemination and Synchronization: Communications Asymmetry. Classification of Data Delivery Mechanisms. Data Dissemination, Broadcast Models. Selective Tuning and Indexing Methods. Data Synchronization – Introduction. Software, and Protocols.

UNIT-V: Mobile Ad hoc Networks (MANETs): Introduction, Applications a Challenges of a MANET Routing, Classification of Routing Algorithms. Algorithms such as DSR. AODV. DSDV. etc. , Mobile Agents. Service Discovery.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16IT3209	
Course Title: MOBILE COMPUTING (ELECTIVE-II)	
CO-1	Able to think and develop new mobile application.
CO-2	Able to take any new technical issue related to s new paradigm and come up with a solution(s).
CO-3	Able to develop new ad hoc network applications and/or/ algorithms/ protocols.
CO-4	Able to understand & develop any existing or new protocol related to mobile environment.

SYLLABUS: SOFT COMPUTING AND NEURAL NETWORKS (ELECTIVE-II) (B16IT3210)

UNIT-I: Introduction: Artificial neural network: Introduction, characteristics- learning methods – taxonomy – Evolution of neural networks- basic models - important technologies - applications. Fuzzy logic: Introduction - crisp sets- fuzzy sets - crisp relations and fuzzy relations: cartesian product of relation - classical relation, fuzzy relations, tolerance and equivalence relations, non- iterative fuzzy sets. Genetic algorithm- Introduction - biological background - traditional optimization and search techniques - Genetic basic concepts.

UNIT-II: Neural Networks: McCulloch-Pitts neuron - linear separability - hebb network - supervised learning network: perceptron networks - adaptive linear neuron, multiple adaptive linear neuron, BPN, RBF, TDNN- associative memory network: auto-associative memory network, hetero- associative memory network, BAM, hopfield networks, iterative autoassociative memory network & iterative associative memory network – unsupervised learning networks: Kohonen self organizing feature maps, LVQ – CP networks, ART network.

UNIT-III: Fuzzy Logic: Membership functions: features, fuzzification, methods of membership value assignments- Defuzzification: lambda cuts - methods - fuzzy arithmetic and fuzzy measures: fuzzy arithmetic - extension principle - fuzzy measures - measures of fuzziness -fuzzy integrals - fuzzy rule base and approximate reasoning : truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.

UNIT-IV: Genetic Algorithm: Genetic algorithm and search space - general genetic algorithm – operators
- Generational cycle - stopping condition – constraints - classification - genetic programming – multilevel optimization – real life problem- advances in GA

UNIT-V: Hybrid Soft Computing Techniques & Applications: Neuro-fuzzy hybrid systems - genetic neuro hybrid systems - genetic fuzzy hybrid and fuzzy genetic hybrid systems - simplified fuzzy ARTMAP - Applications: A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing based hybridfuzzy controllers.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16IT3210	
Course Title: SOFT COMPUTING AND NEURAL NETWORKS (ELECTIVE-II)	
CO-1	Apply various soft computing frame works.
CO-2	Design of various neural networks.
CO-3	Use fuzzy logic.
CO-4	Apply genetic programming.
CO-5	Discuss hybrid soft computing

SYLLABUS: SOFTWARE ENGINEERING AND MINI PROJECT LAB (B16 IT 3211)

The purpose of the Software Engineering Lab course is to familiarize the students with modern software engineering methods and tools, Rational Products. The course is realized as a project- like assignment that can, in principle, by a team of three/four students working full time. Typically the assignments have been completed during the semester by each project team.
The goal of the Software Engineering Project is to have a walk through from the requirements, design to implementing and testing. An emphasis is put on proper documentation. Term projects are projects that a group student might take through from initial specification to implementation by giving equal importance to both design and implementation.

Cycle I: Practicing UML diagrams using IBM Rational Rose. 6*3 periods= 18periods

Before developing a mini-project, in this cycle, the student is acquainted with different UML diagrams using Rational Rose. The experiments should include drawing UML diagrams listed below for two demo/example applications assigned by the lab Instructor. The input for the following experiments is problem statement for any two demo projects supplied by the instructor.

1. Introduction to Rational Rose and Practicing the following diagrams
   A. Activity diagrams for the overall business process of the projects
   B. Use-case diagram for the demo projects along with Use-case descriptions and sub-diagrams for Use-cases.

2. Class diagram- Class diagrams including the features like classes, relationships, attributes and methods along with their visibilities.
3. Interaction diagrams- Sequence diagrams and Collaboration diagrams for different scenarios of the systems with all features like actors, objects and interactions.

4. Activity diagrams, State chart and other diagrams - Activity diagrams including the features like fork join and swim lanes. State diagrams including composite states and transitions. Component diagrams, Package diagrams and Deployment diagrams.
5. Forward and Reverser Engineering- Forward Engineering Class diagrams to classes in C++ and java and persistent classes to a database. Reverse Engineering C++ code, java code and a database

6. Documentation using Rational Rose clear quest.

Cycle II: Mini-Project 8*3 periods= 24periods

The project deliverables include

- Problem statement
- Requirements Analysis
- Design

A Software Design Description and a
System Design.A test specification.

- Implementation

Implement the assigned project with one of the following web technologies

- Front end: Java technologies/PHP/MS.NET Technologies
- Backend: Oracle/My-SQL/SQL-Server
- Testing

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 IT 3211	
Course Title: SOFTWARE ENGINEERING AND MINI PROJECT LAB	
CO-1	Students will be **Construct, Design and implement** complex software solutions.
CO-2	Students will be able to test and document the software.
CO-3	Students will be capable of working as part of a software team and develop significant projects under a tight deadline.
CO-4	Students will be able **apply** the deep knowledge of the technologies they used for implementing their project.
CO-5	Students will be able to **assess** the changes required for customization in project management**.**

SYLLABUS: COMPUTER GRAPHICS & MULTIMEDIA LAB (B16 IT 3212)

1. To implement Bresenham algorithms for line, circle and ellipse drawing
2. To perform 2D Transformations such as translation, rotation, scaling, Reflection and sharing.
3. To implement Cohen–Sutherland 2D clipping and window–viewport mapping
4. To perform 3D Transformations such as translation, rotation and scaling.
5. User Interface Design & Graphics II: Create a user interface for your final project. Include 2 backgrounds and 1 button set. Aim for a cohesive look.
6. Multimedia Sound: Create 2 soundtracks and 2 EFX sounds for a previous project.
7. Procedure to create an animation to indicate a ball bouncing on steps
8. Procedure to simulate movement of a cloud.
9. Procedure to create an animation with the following features. WELCOME Letters should appear one by one The fill color of the text should change to a different color after the display of the full word.
10. Procedure to create an animation to represent the growing moon
11. Procedure to extract the flower only from given photographic image and organize it on a background. Selecting your own background for organization.
12. Procedure to use appropriate tool(s) from the toolbox cut the objects from 3 files (f1.jpg, f2.jpg & f3.jpg); organize them in a single file and apply feather effects.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 IT 3212	
Course Title: COMPUTER GRAPHICS & MULTIMEDIA LAB	
CO-1	Create and evaluate graphic design projects using computer graphics software

SYLLABUS: VERBAL & QUANTITATIVE APTITUDE – II (B16ENG3202)

UNIT-I: Sentence Improvement (finding a substitute given under the sentence as alternatives), Sentence equivalence (completing a sentence by choosing two words either of which will fit in the blank), cloze test (reading the written discourse carefully and choosing the correct options from the alternatives and filling in the blanks), summarizing and paraphrasing.

UNIT-II: Types of passages (to understand the nature of the passage), types of questions (with emphasis on inferential and analytical questions), style and tone (to comprehend the author‗s intention of writing a passage), strategies for quick reading(importance given to skimming, scanning), summarizing ,reading between the lines, reading beyond the lines, techniques for answering questions related to vocabulary (with emphasis on the context), supplying suitable titles to the passage, identifying the theme and central idea of the given passages.

UNIT-III: Punctuation, discourse markers, general Essay writing, writing Issues and Arguments(with emphasis on creativity and analysis of a topic), paragraph writing, preparing reports, framing a
_Statement of purpose‗, _Letters of Recommendation‗, business letter writing, email writing, writing letters of complaints/responses. picture perception and description, book review.

UNIT-IV: Just a minute sessions, reading news clippings in the class, extempore speech, telephone etiquette, making requests/suggestions/complaints, elocutions, debates, describing incidents and developing positive non verbal communication, story narration, product description.

UNIT-V: Employability Skills – Significance — Transition from education to workplace - Preparing a road map for employment – Getting ready for the selection process, Awareness about Industry / Companies – Importance of researching your prospective workplace - Knowing about Selection process - Resume Preparation: Common resume blunders – tips, Resume Review, Group Discussion: Essential guidelines – Personal Interview: Reasons for Rejection and Selection.

Reading/ Listening material:

1. Guide to IELTS, Cambridge University Press
2. Barron‗s GRE guide.
3. Newspapers like _The Hindu‗, _Times of India‗, _Economic Times‗.
4. Magazines like Frontline, Outlook and Business India.
5. News channels NDTV, National News, CNN

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 ENG 3202	
Course Title: VERBAL & QUANTITATIVE APTITUDE – II	
CO-1	Construct coherent, cohesive and unambiguous verbal expressions in both oral and written discourses.
CO-2	Analyze the given data/text and find out the correct responses to the questions asked based on the reading exercises; identify relationships or patterns within groups of words or sentences
CO-3	Write paragraphs on a particular topic, essays (issues and arguments), e mails, summaries of group discussions, reports, make notes, statement of purpose(for admission into foreign universities), letters of recommendation(for professional and educational purposes).
CO-4	Converse with ease during interactive sessions/seminars in their classrooms, compete in literary activities like elocution, debates etc., raise doubts in class, participate in JAM sessions/versant tests with confidence and convey oral information in a professional manner.
CO-5	Participate in group discussions/group activities, exhibit team spirit, use language effectively according to the situation, and respond to their interviewer/employer with a positive mind, tailor make answers to the questions asked during their technical/personal interviews, exhibit skills required for the different kinds of interviews (stress, technical, HR) that they would face during the course of their recruitment process.

SYLLABUS: QUANTITATIVE APTITUDE-II Part-B (B16ENG3202)

UNIT-I: Averages, mixtures and allegations, Data interpretation

Understanding of AM, GM, HM-Problems on averages, Problems on mixtures standard method. Importance of data interpretation: Problems of data interpretation using line graphs, Problems of data interpretation using bar graphs, Problems of data interpretation using pie charts, Problems of data interpretation using others.

UNIT-II: Puzzle test, blood Relations, permutations, Combinations and probability Importance of puzzle test, Various Blood relations-Notation to relations and sex making of family Tree diagram, Problems related to blood relations, Concept of permutation and combination, Problems on permutation, Problems on combinations, Problems involving both permutations and combinations, Concept of probability-Problems on coins, Problems on dice, Problems on cards, Problems on years.

UNIT-III: Periods, Clocks, Calendars, Cubes and cuboids

Deriving the formula to find the angle between hands for the given time, finding the time if the angle is known, Faulty clocks, History of calendar-Define year, leap year, Finding the day for the given date, Formula and method to find the day for the given date in easy way, Cuts to cubes, Colors to cubes, Cuts to cuboids, Colors to cuboids.

UNIT-IV: Puzzles

Selective puzzles from previous year placement papers, sitting arrangement, problems- circular arrangement, linear arrangement, different puzzles.

UNIT-V: Geometry and Menstruation

Introduction and use of geometry-Lines, Line segments, Types of angles, Intersecting lines, Parallel lines, Complementary angles, supplementary angles, Types of triangles-Problems on triangles, Types of quadrilaterals-Problems on quadrilaterals, Congruent triangles and properties, Similar triangles and its applications, Understanding about circles-Theorems on circles, Problems on circles, Tangents and circles, Importance of menstruation-Introduction of cylinder, cone, sphere, hemi sphere.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16ENG3202	
Course Title: QUANTITATIVE APTITUDE-II	
CO-1	The students will be able to perform well in calculating different types of data interpretation problems.
CO-2	The students will perform efficaciously on analytical and logical problems using variousmethods.
CO-3	Students will find the angle measurements of clock problems with the knowledge ofcalendars and clock.
CO-4	The students will skillfully solve the puzzle problems like arrangement of different positions.
CO-5	The students will become good at solving the problems of lines, triangulars, volume of cone, cylinder and so on.

SYLLABUS: COMPETETIVE CODING (B16 ENG 3205)

UNIT-I: Introduction to Competitive Coding

Introduction to Competitive coding and coding Platforms. Coding solution Vs. Efficient Coding solution. Types of solution approaches. Analyzing problem specific data requirement, Various data representations. Essential Data structures for fast coding. Various Syntactical I/O techniques comparison. Numbers, operations (including exponentiation). Integer properties(positive, negative, even, odd, divisible, prime, etc), Fractions, percentages and ratios. Point, vector, Cartesian coordinates(2D integer grid).

UNIT-II: Essentials to Competitive coding

Basic data structures: Arrays, Strings, Stacks, Queues, Linked Lists . Asymptotic Notations – (Big-O), Evaluating the runtime complexity – Space Complexity - Towers-of-Brahma – Standard Template Libraries - Square root functions, primality testing and related techniques. Euclidean algorithms. Recursion techniques. Organizing data in O(n log n). Binary search techniques. Red-Black Trees. Fenwick tree, Segment Tree.

Basic Techniques

Dynamic Arrays, Set structures, Map structures, Iterators and ranges, Generating Subsets, Generating permutations, Backtracking techniques, Pruning the search. Bit masking. Disjoint set union.

UNIT-III: Essential Coding Algorithms

Selection based algorithms: sorting, Coin change problem, Fractional selections, Schedules matching, Activity marking, heap sort, Huffman coding techniques, Spanning Trees, Minimizing sums, Data compression. Finding method count, Subsequence and related problems, paths in grid. DP with Bit mask.

UNIT-IV: String & Tree Algorithms

TRIE data structure, Naïve string searching, z-algorithm, Manacher's algorithm, Rabin-Karp, KMP Algorithm, Tree Traversals, Diameter, All longest paths, Binary trees, Applying search property to tree structures. Suffix arrays.

UNIT-V: Graph Algorithms

Graph Algorithms – DFS, BFS. Depth First and Breadth First Traversals - Shortest paths: Dijkstra's algorithm Bellman-Ford Algorithm – Floyd Warshall Algorithm - Adjacency List Representation – Euler path, tour , cycle – Eulerian Graph - Johnson's Algorithm for All-pairs shortest path – Shortest path in Directed Acyclic Graph. Bridges and articulation points. Topological sorting, Strongly connected components in directed graphs. 2-SAT.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 ENG 3205	
Course Title: COMPETETIVE CODING	
CO-1	Acquire coding knowledge on essential of competitive coding
CO-2	Acquire Programming knowledge on time & space complexities
CO-3	Acquire coding knowledge on dynamic Arrays, Set & Map structures and sorting
CO-4	Acquire knowledge on time complexities of different methods
CO-5	Acquire Programming skill on String, Tree, Graph Theory algorithms

SYLLABUS: AMAZON WEBSERVICES (MOOCS-III) (B16 IT 3213A)

UNIT-I:

1. Creating AWS account
2. Free tier Eligible services
3. Understanding AWS Regions and availability zones

UNIT-II:

EC2 (Elastic Cloud Compute)

- About EC2 and types , Pricing
- EIP (Elastic IP address), Allocating, associating , releasing
- Launch windows and Linux Instances in AWS
- Connecting windows and Linux instances from windows desktop and Linux machines

UNIT-III:

S3 (Simple Storage Service)

- About AWS Storage services, EBS and S3
- Creating S3 Buckets and putting objects in bucket
- Discussion about Bucket Properties
- S3 Pricing
- About S3 glacier

UNIT-IV:

EBS (Elastic Block Storage)

- Types of EBS Volumes
- Creation, attaching and Detaching volumes

UNIT-V:

ELB (Elastic Load Balancer)

- Understanding the load balancing
- Configuring ELB and adding the

webservers under ELBAuto Scaling

- Types of Scaling (Horizontal and Vertical)
- Configuring Launch Configuration
- Creating and defining the auto scaling group policy

UNIT-VI:

IAM (Identity Access Management)

- Understanding of AWS Security using IAM
- Definition of Roles, policies and Groups
- Creating IAM Users and managing password policies

RDS (Relational Database server)

- About RDS and available RDS Engines in AWS
- Configuring MYSQL RDS service
- Connecting EC2 Instance to RDS Instance
-

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 IT 3213A	
Course Title: AMAZON WEBSERVICES(MOOCS-III)	
CO-1	By the end of the course, student will be able to deploy their projects into cloud and they develop their projects by using AWS.

SYLLABUS: ASP.NET (MOOCS-III) (B16 IT 3213B)

UNIT-I: Introduction to ASP.NET, From ASP to ASP.NET, Web Forms, and Web Services ASP.NET Features

UNIT-II: Web Forms Architecture, Page Class, Web Forms Life Cycle, Web Forms Event Model, Code-Behind

UNIT-III: ASP.NET and HTTP, Request/Response Programming, HttpRequest Class, HTTP Collections, HttpResponse Class, Redirection, HttpUtility Class

UNIT-IV: Web Applications Using Visual Studio, Using Visual Web Developer, Visual Studio Forms Designer, Using Components, Shadow Copying, Using the Global. Sax File, Data Binding

UNIT-V: State Management and Web Applications, Session State, Application State, Multithreading Issues, Cookies

UNIT-VI: Server Controls, HTML Server Controls, Web Forms Server Controls, Rich Controls, Validation Controls, User Controls.

UNIT-VII: Caching in ASP.NET, What Is Caching, Page-Level Caching, Page Fragment Caching, Optimizing Your ASP.NET Application, Application Caching

UNIT-VIII: ASP.NET Configuration and Security Fundamentals, Configuration Overview, Authentication and Authorization, Forms Authentication, Windows Authentication, Security and ASP.NET

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 IT 3213B	
Course Title: ASP.NET(MOOCS-III)	
CO-1	To successfully build database
CO-2	To build web-based enterprise applications using ASP.NET and Visual Studio.
CO-3	It is easy to develop the Web Services using .Net framework in Service

SYLLABUS: ROUTING & SWITCHING (MOOCS-III) (B16 IT 3213C)

UNIT-I: Explore the Network

UNIT-II: Configure a Network Operating System

UNIT-III: Network Protocols and Communications

UNIT-IV: Network Access

UNIT-V: Ethernet

UNIT-VI: Network Layer

UNIT-VII: IP Addressing

UNIT-VIII: Subnetting IP Networks

UNIT-IX: Transport Layer

UNIT-X: Application Layer

UNIT-XI: Build a Small Network

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 IT 3213C	
Course Title: ROUTING & SWITCHING (MOOCS-III)	
CO-1	Explain network technologies.
CO-2	Explain how devices access local and remote network resources.
CO-3	Describe router hardware.
CO-4	Explain how switching operates in a small to medium-sized business network.
CO-5	Design an IP addressing scheme to provide network connectivity for a small to medium-sized business network.
CO-6	Configure initial settings on a network device.
CO-7	Implement basic network connectivity between devices.
CO-8	Configure monitoring tools available for small to medium-sized business networks.

SYLLABUS: DATA SCIENCE USING ADVANCED PYTHON(MOOCS-IV) (B16 IT 3214A)

UNIT-I: Introduction to Data Science

Introduction**,** Data Science environment setup, Pandas: Dimension & Description, Series, Data Frame, Panel (Heterogeneous data, Size Mutable, Data Mutable), Numpy: Operations using NumPy, NumPy – A Replacement for MatLab, ndarray Object, SciPy: SciPy Sub-packages, Data Structure, Matplotlib.

UNIT-II: Data Processing

Data Operations: Data Operations in Numpy, Data Operations in Pandas, Pandas Series, Pandas Data Frame, Pandas Panel,

Data Cleansing: Analysis of missing data, Cleaning / Filling Missing Data, Replace Missing values, Processing CSV Data, Relational Databases,

Data Wrangling: Merging Data, Grouping Data, Concatenating Data, **Data Aggregation:** Applying Aggregations on DataFrame, Processing Unstructured Data,Word Tokenization, Stemming and Lemmatization

UNIT-III: Data Visualization

Chart Properties, Chart Styling, Box Plots, Heat Maps, Scatter Plots, Bubble Charts, 3D Charts, Time Series, Geographical Data, Graph Data

UNIT-IV: Statistical Data Analysis

Measuring Central Tendency,Measuring Variance,Normal Distribution,Binomial Distribution,Poisson Distribution,Bernoulli Distribution,P-Value,Correlation,Chi-Square Test,Linear Regression

UNIT-V: Project Development

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 IT 3214A	
Course Title: DATA SCIENCE USING ADVANCED PYTHON (MOOCS-IV)	
CO-1	To work on data easily.
CO-2	Familiar with Various modules for exploring on data like processing, visualization and statistical dataanalysis.
CO-3	Able to work on real time data

SYLLABUS: ANGULAR JS(MOOCS-IV) (B16 IT 3214B)

UNIT-I: Introduction

Introduction to AngularJS, MVC Architecture, Conceptual Overview, Setting up the Environment, First Application, Understanding ng attributes.

UNIT-II: Expressions and Data Biding

Number and String Expressions , Object Binding and Expressions, Working with Arrays, Forgiving Behavior, Understanding Data binding.

UNIT-III: Working with Directives

Conditional Directives ,Styles Directives, Mouse and Keyboard Events Directives.

UNIT-IV: Controllers

Understanding Controllers , Programming Controllers & $scope object, Adding Behavior to a Scope Object, Passing Parameters to the Methods, Having Array as members in Controller Scope. Nested Controllers and Scope Inheritance, Multiple Controllers and their scopes.

UNIT-V: Filters

Built-In Filters , Uppercase and Lowercase Filters, Currency and Number Formatting Filters, OrderBy Filter. Filter Filter ,Creating Custom Filter.

UNIT-VI: Forms

Using Simple Form, Working with Select and Options, Input Validations, Using CSS classes, Form Events, Custom Model update triggers, Custom Validations.

UNIT-VII: Modules

Why Module? , Module Loading and Dependencies, Recommended Setup of Application, Creation vs Retrieval.

UNIT-VIII: Services

Understanding Services, Developing Creating Services, Using a Service, Injecting Dependencies in a Service.

UNIT-IX: Ajax in AngularJS

$http Service, $q Service, Ajax Impl using $http and $q Service.

UNIT-X: Routing

Introduction to SPA , Creating HTML Templates, Configuring Route Provider.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 IT 3214B	
Course Title: ANGULAR JS (MOOCS-IV)	
CO-1	The main objective of AngularJS is to reduce the code to build user interface application.
CO-2	To create single page applications.
CO-3	To restore data from back-end server and manipulate it easily

SYLLABUS: C#.NET and VB.NET(MOOCS-IV) (B16 IT 3214C)

UNIT-I: C# Overview, First C# Console Application, Namespaces, Data Types, Conversions,Control Structures, Subroutines and Functions, Parameter Passing, Strings, Arrays, Console I/O, Formatting, Exception Handling

UNIT-II: Object-Oriented Programming in C#, Classes, Access Control, Methods and Properties, Asymmetric Accessor Accessibility, Static Data and Methods, Inheritance, Overriding Methods, Abstract Classes, Sealed Classes, Access Control and Assemblies, Auto- Implemented Properties, Implicitly Typed Variables, Object Initializers, Collection Initializers, Anonymous Types, Partial Methods, Extension Methods, Lambda Expressions, Language- Integrated Query (LINQ)

UNIT-III: VB .NET - Features,IDE- Menu System, Toolbars,Code Designer,Solution Explorer,Object Browser, Toolbox, Class View Window, Properties Window,Server Explorer, Task List,Output Window, Command Window

UNIT-IV: Elements of VB.net - Properties, Events and Methods of Form, Label, TextBox, ListBox, Combo Box, RadioButton, Button, Check Box, Progress Bar, Date Time Picker, Calendar, Picture Box,HScrollbar, VScrollBar, Group Box, ToolTip,Timer.

UNIT-V: Programming in VB.net: Data Types, Keywords, Declaring Variables and Constants, Operators, Understanding Scope and accessibility of variables, Conditional Statements- If- Then, If-Then-Else, Nested If, Select Case, Looping Statement- Do loop, For Loop, For Each-Next Loop, While Loop, Arrays- Static and Dynamic.

UNIT-VI: Functions, Built-In Dialog Boxes, Menus and Toolbar Menus and toolbars- Menu Strip, Tool Strip, Status Strip, Built-In Dialog Boxes –Open File Dialogs, Save File Dialogs, Font Dialogs, Color Dialogs, Print Dialogs, Input Box, Msg Box, Interfacing With End user- Creating MDI Parent and Child, Functions and Procedures- Built-In Functions- Mathematical and String Functions, User Defined Functions and Procedures.

UNIT-VII: Advanced Concepts in VB.Net Object Oriented Programming- Creating Classes , Objects, Fields, Properties, Methods, Events , Constructors and destructors, Exception Handling- Models, Statements, File Handling- Using File Stream Class, File Mode, File Share, File Access Enumerations, Opening or Creating Files with File Stream Class, Reading and Writing Text using Stream Reader and Stream Writer Classes, Data Access withADO.Net – Data Access with Server Explorer, Data Adapter and Datasets, ADO.NET Objects and Basic SQL.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 IT 3214C	
Course Title: C#.NET and VB.NET (MOOCS-IV)	
CO-1	Understand .NET Framework and describe some of the major enhancements to the new version ofVisual Basic.
CO-2	Describe the basic structure of a Visual Basic.NET project and use main features of the integrateddevelopment environment (IDE).
CO-3	Create applications using Microsoft Windows Forms Create applications that use ADO. NET

SYLLABUS: MATLAB (MOOCS-IV) (B16 IT 3214D)

UNIT-I: Introduction, Basic features, A minimum MATLAB session, Starting MATLAB, Using MATLAB as a calculator, Quitting MATLAB, Creating MATLAB variables, Overwriting variable, Error messages, Making corrections, Controlling the hierarchy of operations or precedence, Controlling the appearance of floating point number, Managing the workspace, Keeping track of your work session, Entering multiple statements per line, Miscellaneous commands

UNIT-II: Mathematical functions, Basic plotting: overview, Creating simple plots,Adding titles, axis labels, and annotations, Multiple data sets in one plot, Specifying line styles and colors, Matrix generation: Entering a vector, Entering a matrix, Matrix indexing, Colon operator,Linear spacing, Colon operator in a matrix, Creating a sub-matrix, Deleting row or column, Dimension, Continuation, Transposing a matrix, Concatenating matrices, Matrix generators, Special matrices

UNIT-III: Array operations and Linear equations, Array operations: Matrix arithmetic operations, Array arithmetic operations, Solving linear equations: Matrix inverse, Matrix functions

UNIT-IV: Introduction to programming in MATLAB, Introduction-File Scripts: Examples, Script side-effects, M-File functions: Anatomy of a M-File function, Input and output arguments, Input to a script file, Output commands

UNIT-V: Control flow and operators, The __if...end''structure, Relational and logical operators, The __for...end''loop, The __while...end''loop, Other flow structures, Operator precedence, Saving output to a file

UNIT-VI: Debugging M-files, Debugging process**:** Preparing for debugging**,** Setting breakpoints**,** Running with breakpoints**,** Examining values, Correcting and ending debugging, Ending debugging, Correcting an M-file

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 IT 3214D	
Course Title: MATLAB (MOOCS-IV)	
CO-1	Understand the main features of the MATLAB development environment.
CO-2	Use the MATLAB GUI effectively.
CO-3	Design simple algorithms to solve problems.
CO-4	Write simple programs in MATLAB to solve scientific and mathematical problems

SYLLABUS: CLOUD COMPUTING (B16IT4101)

UNIT-I: Introduction to cloud computing: Cloud computing components, Infrastructure services, storage applications, database services – introduction to SaaS, PaaS, IaaS, IdaaS, data storage in cloud, Virtualization: enabling technologies, types of virtualization, server virtualization, desktop virtualization, memory virtualization, application and storage virtualization, tools and products available for virtualization.

UNIT-II: SAAS and PAAS: Getting started with SaaS, Software plus Services - Overview SaaS solutions, SOA, PaaS and benefits.

UNIT-III: IaaS and Cloud Data Storage: understanding IaaS, improving performance for load balancing, server types within IaaS, utilizing cloud based NAS devices, cloud based data storage, and backup services, cloud based block storage and database services.

UNIT-IV: Cloud Application development: Client server distributed architecture for cloud designing cloud based solutions, coding cloud based applications, and traditional Apps vs cloud Apps, fundamental treatment of web application frameworks. Web Applications, Web APIs, Web Browsers.

UNIT-V: Cloud Governance and economics: Securing the cloud, disaster recovery and business continuity in the cloud, Managing the cloud, migrating to the cloud, governing and evaluating the clouds business impact and economics, Inside Cloud: Introduction to MapReduce and Hadoop- over view of big data and its impact on cloud.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16IT4101	
Course Title: CLOUD COMPUTING	
CO-1	The student will understand the cloud environment.
CO-2	The student will understand and learn the various Cloud based Services.
CO-3	The student will able to develop cloud based applications.
CO-4	The Student understands the security, governance and Economic in Cloud computing.

SYLLABUS: BIG DATA ANALYTICS (B16IT4102)

UNIT-I: Introduction to Big Data & Hadoop: Data,Big Data-definition,Categories Of Big Data, Characteristics of Big Data (Volume,Variety, Velocity, Veracity, Validity), Importance of Big Data, Patterns for Big Data Development, Hadoop- definition, Understanding distributed systems andHadoop, Comparing SQL databases and Hadoop, Understanding MapReduce, Data in the Warehouse and Data in Hadoop, Hadoop versions.

UNIT-II: Introduction to Hadoop Architecture: Hadoop Components, Hadoop Echo system, Building blocks of Hadoop: NameNode, DataNode, Secondary NameNode, JobTrackerand Task Tracker, Data Types In Hadoop, I/O in Hadoop, Analysing data with Hadoop, Map Reduce implementation architecture, Casestudy: Counting words with Hadoop.

UNIT-III: MapReduce -A Weather Dataset, Analyzing theData with Hadoop, Scaling Out, Hadoop Streaming, Hadoop Pipes, Developing a MapReduce Application - The Configuration API, Configuring the Development Environment, Running Locally on Test Data, Running on a Cluster, Tuning a Job: Map side tuning & Reduce side tuning.

UNIT-IV: HDFS: Anatomy of aMapReduce program, Reading and writing the Hadoop Distributed File system - The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop Filesystem, Data Flow, Parallel Copying with distcp, Hadoop Archives.

MapReduce Programming: Writing basic Map Reduce programs, Counting things, Adapting for Hadoop‟s AP changes, Streaming in Hadoop, Improving performance with Combiners, Chaining MapReduce jobs, Partitioning into multiple output files.Casestudy: Patentdata set.

UNIT-V: MapReduce Advanced Programming: Advanced MapReduce, creating a Bloom filter, Passing job-specific parameters to your tasks, , Inputting from and outputting to a database. Modeling data and solving problems withgraphs, Shortest Path Algorithm, Friends-of-Friends Algorithm, PageRank Algorithm.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16IT4102	
Course Title: BIG DATA ANALYTICS	
CO-1	Understand Big Data and its characteristics.
CO-2	Understand basic Building Blocks of Hadoop and its functionalities.
CO-3	Understand how the big data is stored in HDFS and how Map Reduce processes this data stored in HDFS.
CO-4	Design Map Reduce programs to handle basic and advanced problems by using Hadoop architecture.
CO-5	Identify the challenges in Big Data with respect to IT Industry.

SYLLABUS: PRINCIPLES OF ECONOMICS & MANAGEMENT(B16 ENG 4101)

UNIT-I: Introduction to Managerial Economics: Wealth, Welfare and Scarce Definitions of Economics;micro and Macro Economics; Demand- Law of Demand, Elasticity of Demand, types of Elasticity and factors of determining price elasticity of Demand: utility- Law of Diminishing Marginal Utility and its limitations.

UNIT-II: Conditions of Different Market Structures: Perfect Competition, Monopolistic Competition, Monopoly, Oligopoly, and Duopoly.

UNIT-III: Forms of Business Organizations: Sole Proprietorship, Partnership, Joint Stock Company-Private Limited and Public Limited Companies, Public Enterprises and their types.

UNIT-IV: Introduction to Management: Functions of Management- Taylors Scientific management; Henry Fayols Principle of Management; Human Resource Management- basic Functions of HR Manager; Man Power Planning, Recruitment, Selection, Training, Development, Placement, Compensation and performance Appraisal(in brief).

UNIT-V: Production Management: Production Planning and Control, plant Location, Break- Even Analysis, assumptions and applications.

UNIT-VI: Financial Management: Types of Capital: Fixed and Working Capital, and Methods of RainingFinance; Depreciation: Straight Line and Diminishing Balance Methods. Marketing Management: Functions of marketing and Distribution Channels.

UNIT-VII: Entrepreneurship: Entrepreneurial Functions, Entrepreneurial Development: Objectives, Training, Benefits: Phases of Installing a project

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16ENG4101	
Course Title: PRINCIPLES OF ECONOMICS & MANAGEMENT	
CO-1	Understand the links between production costs and the economic models of supply.
CO-2	Represent supply, in graphical form, including the upward slope of the supply curve and whatshifts the supply curve.
CO-3	Understand the efficiency and equity implications of market interference, includinggovernment policy.
CO-4	Understand how different degrees of competition in a market affect pricing and output.
CO-5	Apply economic reasoning to individual and firm behavior.

SYLLABUS: KNOWLEDGE ENGINEERING LAB(B16IT4103)

1. Load the „iris. CSV" file and display the names and type of each column. Find statistics such as min, max, range, mean, median, variance, standard deviation for each column of data.
2. Write R program to normalize the variables into 0 to 1 scale using min-max normalization.
3. Generate histograms for any one variable (sepal length/ sepal width/ petal length/ petal width)and generate scatter plots for every pair of variables showing each species in different color.
4. Generate box plots for each of the numerical attributes. Identify the attribute with the highest variance.
5. Study of homogeneous and heterogeneous data structures such as vector, matrix, array, list, data frame in R.
6. Write R Program using „apply" group of functions to create and apply normalization functionon each of the numeric variables/columns of iris dataset to transform them into a value around0 with z-score normalization.
7. a) Use R to apply linear regression to predict evaporation coefficient in terms of air velocityusing the data given below:

Air Velocity (cm/sec)	20,60,100,140,180,220,260,300,340,380
Evaporation Coefficient (sqmm/sec)	0.18, 0.37, 0.35, 0.78, 0.56, 0.75, 1.18, 1.36, 1.17, 1.65

   b) Analyze the significance of residual standard-error value, R-squared value, F-statistic. Find the correlation coefficient for this data and analyze the significance of the correlation value.

   c) Perform a log transformation on the „Air Velocity 'column, perform linear regression again, and analyze all the relevant values

WEKA Knowledge Extraction toolkit:

8. Create an ARFF (Attribute-Relation File Format) file and read it in WEKA. Explore the purpose of each button under the preprocess panel after loading the ARFF file. Also, try to interpret using a different ARFF file, *weather.arff*, provided with WEKA**.**

9. Performing data preprocessing in Weka: Study **Unsupervised Attribute Filters** such as ***Replace Missing Values*** to replace missing values in the given dataset, ***Add*** to add the new attribute *Average*, ***Discretize*** to discretize the attributes into bins. Explore ***Normalize*** and ***Standardize*** options on a dataset with numerical attributes.
10. Classification using the WEKA toolkit
    Demonstration of classification process using id3 algorithm on categorical dataset (weather). Demonstration of classification process using naïve Bayes algorithm on categorical dataset(„vote"). Demonstration of classification process using Random Forest algorithm on datasetscontaining large number of attributes.
11. Classification using the WEKA toolkit – Part 2
    Demonstration of classification process using J48 algorithm on mixed type of dataset after discretizing numeric attributes.
    Perform cross-validation strategy with various fold levels. Compare the accuracy of theresults.

12. Performing clustering in WEKA

    Apply hierarchical clustering algorithm on numeric dataset and estimate cluster quality. Apply DBSCAN algorithm on numeric dataset and estimate cluster quality.

13. Association rule analysis in WEKA

    Demonstration of Association Rule Mining on supermarket dataset using Apriori Algorithmwith different support and confidence thresholds.

    Demonstration of Association Rule Mining on supermarket dataset using FP-GrowthAlgorithm with different support and confidence thresholds.

Building Knowledge based Inference Systems:

14. Implement AI problem solving through Rule based forward chaining inference using public domain software tool like CLIPS
15. Implement AI problem solving through Rule based Backward chaining inference using PROLOG.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16IT4103	
Course Title: KNOWLEDGE ENGINEERING LAB	
CO-1	Student will be able to write R programs to perform several data analytics operations on datasets
CO-2	Ability to extract patterns by applying appropriate data mining techniques from different typesof datasets using WEKA.
CO-3	Ability to apply knowledge represented in the form of rules to draw conclusions using either forward or backward chaining using CLIPS /PROLOG.

SYLLABUS: NETWORK PROGRAMMING LAB (B16 IT 4104)

1. Create to identify well known ports on a Local/Remote System.
2. Design and create One-to-One chat application by opening socket connection and displayingwhat is written by one party to the other.
3. Design and create Many-to-Many chat (Broad cast) Each client opens a socket connection tothat chat server and writes to the socket. Whatever is written by one party can be seen by all other parties.
4. Design Data retrieval from a Remote database:
   At the remote database a server listens for client connections. The server accepts SQL Queries f From the client executes it on the database and sends the responses to the client.
5. Design Mail SMTP Client: Gives the server name, send email to the recipient using SMTP commands.
6. Design and create POP Client: Gives the server name, user name and password, retrieve themails and allow manipulation of mailbox using POP commands.
7. Design Simulation of Telnet:Provide a user interface to contact well known ports so thatclient server interaction can be seen by the user.
8. Design Simple file transfer between two systems (without protocols):
9. By opening socket connection to our server on one system and sending a file from one system to another.
10. Design Download load an Image file using URL Commands.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16IT4104	
Course Title: NETWORK PROGRAMMING LAB	
CO-1	Students will be able to design and create well known ports on a Local/Remote System.
CO-2	Students will be able to design One-One and many-many chat application by socket connection and displaying what is written by one party to the other
CO-3	Students will be able to design data retrieval from a Remote database.
CO-4	Students will be able to design SMTP Mail Client: Gives the server name, send email to the recipient
CO-5	Using SMTP commands and POP Client for retrieve the mails.

SYLLABUS: PROJECT PHASE-I(B16IT4105)

The phase-I of the project shall comprise of

- Problem identification in close collaboration with industry.
- Literature survey.
- Deriving work content and carry out of project requirement analysis.
- Submission of interim report.
- Presentation to an expert committee.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16IT4105	
Course Title: PROJECT PHASE-I	
CO-1	Identify a current problem through literature/field/case studies and define the background objectives and methodology for solving the same.
CO-2	Write report and present it effectively.

SYLLABUS: EMBEDDED SYTEMS (B16 IT 4201)

UNIT-I: Introduction to Embedded Systems: Examples, Typical Hardware, Memory, Microprocessors, Busses; Introduction to 8051 Microcontroller, Architecture, Instruction set, Programming.
Interrupts: Interrupt Basics, Shared-Data problem, Interrupt Latency.

UNIT-II: Software Architectures: Round-Robin Architecture, Round-Robin with Interrupts Architecture, Function-Queue Scheduling Architecture, Real-Time Operating Systems Architecture, Selection of Architecture.

UNIT-III: Real Time Operating System: Tasks and Task States, Tasks and Data, Semaphores and Shared Data, Semaphore Problems, Semaphore variants.

UNIT-IV: Inter Task Communication: Message Queues, Mailboxes, Pipes, Timer Functions, Events, and Memory Management, Interrupt Routines in RTOS Environment.

UNIT-V: Design issues of RTOS: Principles, Encapsulation Semaphores and Queues, Hard Real-Time Scheduling Considerations, Saving Memory Space, Saving Power.

UNIT-VI: Embedded Software development Tools: Host and Target Machines, Linker/Locator for Embedded Software, Getting Embedded Software into the Target System.

UNIT-VII: Embedded Software Debugging Techniques: Testing on your Host Machine, Instruction Set Simulators, and Laboratory Tools used for Debugging.

UNIT-VIII: Introduction to the Internet of Things: History of IoT, IoT Architecture, M2M–Machine to Machine, Web of Things, IoT protocols, The Layering concepts, IoT Communication Pattern, IoT protocol Architecture.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16IT4201	
Course Title: EMBEDDED SYTEMS	
CO-1	Student will be understand the basic architecture of 8051 micro controller.
CO-2	Ability to write ALP programs using 8051 instruction set.
CO-3	Ability to understand the concepts related to RTOS and its Inter Task Communication methods.
CO-4	Ability to understand various design issues of RTOS.
CO-5	Understand about embedded software development tools.

SYLLABUS: ARTIFICIAL INTELLIGENCE (B16 IT 4202)

UNIT-I: Introduction to Artificial Intelligence, Artificial Intelligence Technique, Representation of a problem as State space search, production systems, Problem characteristics, Production System characteristics.

UNIT-II: Heuristic Search Technologies: Generate & Test Hill Climbing, Best First search, Problem reduction, Constraint satisfaction, Means End Analysis.

UNIT-III: Predicate Logic Proof with Backward Chaining, Resolution, question answering.

UNIT-IV: Representing Knowledge Using Rules: Procedural vs Declarative knowledge, Logic Programming, Forward vs Backward Reasoning, Matching, and Control Knowledge.

UNIT-V: Symbolic Reasoning with uncertainty: Non-monotonic Reasoning, Dependency – Directed Backtracking TMS. Statistical Reasoning with Bayes Theorem, certainty Factors &Rule Based System, DS-Theory.

UNIT-VI: Weak & Strong Slot Filler Structures: Semantic nets, Frames, Conceptual dependencies, Scripts.

Planning: Block world, Components of a Planning System, Goal State Planning, Non Linear Planning, and Hierarchical Planning.

UNIT-VII: Natural Language Processing and Expert Systems: Syntactic Analysis, Semantic Analysis, Discuses and Pragmatic Processing. Representing and Using Domain Knowledge, Expert Systems Shells, Explanation.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16IT4202	
Course Title: ARTIFICIAL INTELLIGENCE	
CO-1	Possess the ability to formulate an efficient problem space for a problem expressedin English.
CO-2	Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
CO-3	Possess the skill for representing knowledge using the appropriate technique.
CO-4	Possess the ability to apply AI techniques to solve problems of Game Playing,Expert Systems, Machine Learning and Natural Language Processing

SYLLABUS: INFORMATION RETRIEVAL (Elective-III) (B16 IT 4203)

UNIT-I: Introduction to Information Storage and Retrieval System: structures, Algorithms Introduction Domain Analysis of IR systems and other types of Information Systems, IR System Evaluation. Introduction to Data Structures and Algorithms related to Information Retrieval: Basic Concepts, Data.

UNIT-II: Inverted files: Introduction, Structures used in Inverted Files, Building Inverted file using a sorted array, Modifications to Basic Techniques.

UNIT-III: Signature Files: Introduction, Concepts of Signature Files, Compression, Vertical Partitioning, Horizontal Partitioning.

UNIT-IV: New Indices for Text: PAT Trees and PAT Arrays: Introduction, PAT Tree structure, Algorithms on the PAT Trees, Building PAT trees as PATRICA Trees, PAT representation as arrays.

UNIT-V: Stemming Algorithms: Introduction, Types of Stemming Algorithms, Experimental Evaluations of Stemming to Compress Inverted Files

UNIT-VI: Thesaurus Construction: Introduction, Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16IT4203	
Course Title: INFORMATION RETRIEVAL(Elective-III)	
CO-1	Identify basic theories in information retrieval systems
CO-2	Identify the analysis tools as they apply to information retrieval systems
CO-3	Understands the problems solved in current IR systems
CO-4	Understand the difficulty of representing and retrieving documents.
CO-5	Explain the concepts of indexing, vocabulary, normalization and dictionary in informationretrieval.
CO-6	Implement retrieval systems for web search tasks.

SYLLABUS: ADVANCED OPERATING SYSTEMS (Elective-III) (B16 IT 4204)

UNIT-I: Introduction to Distributed Systems: Goals – Advantages of distributed systems over centralized systems – disadvantages of distributed systems, Hardware & Software Concepts, loosely coupled systems, Network operating systems, True Distributed System, Multiprocessor time sharing system. Design Issues: Transparency – Flexibility – Performance – Scalability-- Reliability. ATM networks.

UNIT-II: The Client – Server Model: Clients and Servers, Example, Addressing, Blocking, Buffering, Reliability, Implementing the Client-Server model. Remote Procedure Calling: Introduction, Basic Operation, Parameter passing, Dynamic binding, RPC semantics in the presence of failures, Implementation issues, RPC problem areas.

UNIT-III: Synchronization in Distributed systems: Clock synchronization, Logical Clocks, Physical Clocks, Clock synchronization algorithms, Mutual exclusion: Centralized algorithm, Distributed algorithm, Token ring algorithm, comparison of the three algorithms, Election algorithms: The Bully algorithm, Ring algorithm, Dead Locks in distributed systems, Distributed deadlock detection.

UNIT-IV: Process and Processors in distributed systems: Threads, Introduction, Usage, Design issues for thread packages, System models, The workstation model, The processor pool model, The hybrid model , Processor allocation, Allocation models, Design issues, Implementation issues.

UNIT-V: Distributed File Systems: Introduction, Distributed file system design, Distributed file system implementation, Sun"s network file system.

UNIT-VI: Distributed shared memory: Introduction, Bus based multiprocessors, Ring based multiprocessors, Switched multiprocessors, Consistency models, Page based Distributed shared memory, Shared variable Distributed shared memory, Object based Distributed Shared Memory.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16IT4204	
Course Title: ADVANCED OPERATING SYSTEMS(Elective-III)	
CO-1	Students will be able to understand distributed systems and hardware and software conceptsand their combinations.
CO-2	Students will be able to understand communication in ATM networks and Client – Server architecture.
CO-3	Students will be able to understand principles of remote procedure execution and addressrelated issues and discuss related problems.
CO-4	Students will be able to understand clock synchronization and mutual exclusion indistributedsystems and relevant protocols.
CO-5	Students will be able to understand multiple processors organization and their allocation.

SYLLABUS: SOFTWARE PROJECT MANAGEMENT (Elective-III) (B16 IT 4205)

UNIT-I: Introduction Project, Management, Software Project Management activities, Challenges in software projects, Stakeholders, Objectives & goals Project Planning: Step-wise planning, Project Scope, Project Products & deliverables, Project activities, Effort estimation, Infrastructure.

UNIT-II: Project Approach Lifecycle models, Choosing Technology, Prototyping Iterative & incremental Process Framework: Lifecycle phases, Process Artifacts, Process workflows

UNIT-III: Effort estimation & activity Planning Estimation techniques, Function Point analysis, SLOC,COCOMO, Use case-based estimation , Activity Identification Approaches, Network planning models, Critical path analysis

UNIT-IV: Risk Management Risk categories, Identification, Assessment, Planning and management, PERT technique, Monte Carlo approach

UNIT-V: Project Monitoring & Control , Resource Allocation Creating a framework for monitoring & control, Progress monitoring, Cost monitoring, Earned value Analysis, Defects Tracking, Issues Tracking, Status reports, Types of Resources, Identifying resource requirements, Resource scheduling

UNIT-VI: Software Quality Planning Quality, Defining Quality – ISO 9016, Quality Measures, Quantitative Quality Management Planning, Product Quality & Process Quality Metrics, Statistical Process Control Capability Maturity Model, Enhancing software Quality

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16IT4205	
Course Title: SOFTWARE PROJECT MANAGEMENT (Elective-III)	
CO-1	To match organizational needs to the most effective software development model
CO-2	To understand the basic concepts and issues of software project management
CO-3	To effectively Planning the software projects
CO-4	To implement the project plans through managing people, communications and change
CO-5	To select and employ mechanisms for tracking the software projects
CO-6	To conduct activities necessary to successfully complete and close the Software projects
CO-7	To develop the skills for tracking and controlling software deliverables
CO-8	To create project plans that address real-world management challenges

SYLLABUS: E-COMMERCE (Elective-III) (B16 IT 4206)

UNIT-I: Electronic commerce environment and opportunities: Back ground–The Electronic commerce Environment–Electronic Market Place Technologies. Modes of electronic commerce: Overview– EDI–Migration to open EDI–Ecommerce with WWW/Internet– Commerce Net Advocacy–Web commerce going forward.

UNIT-II: Approaches to safe electronic Commerce: Overview– Source–Transport Protocols–Secure Transactions– Secure Electronic Payment Protocol–Secure Electronic Transaction–Certificates for Authentication–Security on Web Servers and enterprise networks.

UNIT-III: Electronic cash and electronic payment schemes: Internet Monitory Payment and Security requirements–payment and purchase order process–online electronic cash.

UNIT-IV: Master card/ Visa Secure electronic transaction: Introduction – Business requirements - Concepts - Payment Processing. Email and Secure Email Technologies for Electronic Commerce: Introduction –The means of Distribution –A model for Message Handling –How Does an Email Work.

UNIT-V: Internet Resources for Commerce: Introduction –Technologies for Web Servers –Internet Applications for commerce – Internet Charges –Internet Access and Architecture–Searching the Internet.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16IT4206	
Course Title: E-COMMERCE (Elective-III)	
CO-1	Ability to discuss the e-Commerce process. Describe an example of system architecture for ane-Business. List the seven major elements of web design.
CO-2	Ability to Identify and explain fundamental web site tools including design tools, Programming tools, and data processing tools. Identify the major electronic payment issues and options.
CO-3	Ability to discuss security issues and explain procedures used to protect against security threats.
CO-4	Ability to Identify and discuss management issues underlying e-Commerce issues including organizational structure, strategic planning, goal setting, corporate social responsibility, changing market intermediaries, resource allocation and customer service.

SYLLABUS: INTERNET OF THINGS LAB (B16 IT 4207)

1. Study of Various Network Protocols Used In Iot.
2. Application of WifiInIot Systems.
3. Application of 6lowpan InIot Systems.
4. Application of Bluetooth InIot Systems.
5. Application of 802.15.4 Zigbee. In Iot Systems.
6. Design A Simple Iot System Comprising Sensors, Wireless Network Connection,Data Analytics.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16IT4207	
Course Title: INTERNET OF THINGS LAB	
CO-1	Ability to interpret the vision of IoT from a global context.
CO-2	Ability to determine the Market perspective of IoT.
CO-3	Ability to Compare and Contrast the use of Devices, Gateways and Data Management in IoT.
CO-4	Implement state of the art architecture in IoT.
CO-5	Illustrate the application of IoT in Industrial Automation and identify Real World DesignConstraints.

SYLLABUS: PROJECT PHASE-II (B16IT4208)

The phase-II of the project shall consists of

Implementing, Testing and validation.
Report Writing.

Sessional (50 Marks) will be awarded by the Project Guide based on continuous evaluation. External Evaluation (100 marks) of project report and viva voce will be conducted by acommittee consisting of HOD, Guide and External Examiner.

May be carried out using in-house facilities or in an industry by specified number of students in a group.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16 IT 4208	
Course Title: PROJECT PHASE-II	
CO-1	Identify a current problem through literature/field/case studies and define the background objectives and methodology for solving the same.
CO-2	Analyze, design and develop a technology/ process.
CO-3	Implement and evaluate the technology at the laboratory level.
CO-4	Write report and present it effectively.

MECHANICAL ENGINEERING

MECHANICAL ENGINEERING

SYLLABUS: ENGLISH (B16 ENG 1101)

(Common to All Branches)

Listening Skills

Conversations: Life in a Hostel – Eating Away those Blues – Meeting Carl Jung – A Documentary on the Big Cat – A Consultant Interviewing Employees – A Conversation about a Business Idea.

Speaking Skills

Your Favorite Holiday Destination – Describe Yourself – Why we need to save our Tiger – A Dialogue – Your First Interview – Pair Work: Setting up a New Business.

Reading Skills

Reading Comprehension: Famous People – What is Personality, Personality based on Blood Groups – News Report, Magazine Article, Mobile Towers and Health – An Excerpt from a Short Story, An Excerpt from a Biography – Open Letter to Prime Minister, Business Dilemmas: An Email Exchange – A Review of IPL: The Inside Story, Mark Zukerberg: World‟s Youngest Billionaire.

Writing Skills

Letter Writing, Essay Writing, Email Writing, Report Writing, Paragraph Writing, Drafting a Pamphlet, Argument Writing, Dialogue Writing.

Grammar

Types of Sentences, Articles, Prepositions, Gerunds and Infinitives, Conjunctions, Tense, Quantifiers, Punctuations, Correction of Sentences, Fill-in the Blanks.

Vocabulary

Synonyms, Antonyms, Idioms, One Word Substitution.

Life Skills and Core Skills

Self-Awareness and Self-Motivation – Communication, Adaptability – Motivation, Problem Solving – Personal Presentation Skills, Stress Management – Professionalism – Ethics.

Course Outcomes for Fourth Year Second Semester Courses	
Course code: B16 ENG 1101	
Course Name: ENGLISH	
CO-1	The overall performance of the students will be enhanced after the course; they will be in a position to make presentations on topics of current interests – politics, famous personalities, science and technology, tourism, work and business environment, with increased public speaking skills.
CO-2	Students will be able to read, listen, speak and write effectively in both academic and non-academic environment
CO-3	The students will be updated with certain real life situations, which they can handle when, come face to face.

SYLLABUS: MATHEMATICS – I (B16ENG 1102)

(Common to all Branches)

Partial Differentiation

Functions of two or more variables – Partial derivatives – Homogeneous Functions – Euler's Theorem – Total Derivative – Change of Variables – Jacobians – Geometrical Interpretation: Tangent Plane and Normal to a Surface.

Applications of Partial Differentiation

Taylor's Theorem for functions of two variables – Errors and Approximations – Total Differential – Maxima and Minima of functions of two variables – Lagrange's Method of Undetermined Multipliers – Differentiation Under the Integral Sign – Leibnitz's Rules.

Ordinary Differential Equations of First Order and First Degree

Formation of ordinary differential equations (ODEs) – Solution of an ordinary differential equation – Equations of the First Order and First Degree – Linear Differential Equation – Bernoulli's Equation – Exact Differential Equations – Equations Reducible to exact equations.

Applications of Differential Equations of First Order

Orthogonal Trajectories – Simple electric (LR & CR) Circuits – Newton's Law of Cooling – Law of Natural growth and decay.

Linear Differential Equations of Higher Order

Solutions of Linear Ordinary Differential Equations With Constant Coefficients – Rules for finding Complimentary Function – Rules for finding the particular integral – Method of variation of parameters – Cauchy's linear equation – Legendre's Linear Equation – Simultaneous linear equations.

Fourier series

Introduction - Euler's Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series – Parseval's Formula.

Course Outcomes for First Year First Semester Courses	
Course Code : B16 ENG 1102	
Course Title: MATHEMATICS - I	
CO-1	Find partial derivatives, expand a function of more than one variable in a Taylor series and utilize them for errors and approximations, maxima and minima.
CO-2	Solve a first order ODE and also find orthogonal trajectories and solve problems related to simple applications.
CO-3	Solve a given higher order ODE, an equation with constant coefficients, a Cauchy's equation or a Legendre's equation.
CO-4	Utilize knowledge of Fourier series for solving partial differential equations and also in understanding courses like Signals & Systems

SYLLABUS: MATHEMATICS – II (B16 ENG 1103)

(Common to all Branches)

Matrices – I

Rank of a matrix - Normal Form – Solutions of Linear System of Equations- Consistency of Linear System of Equations – Rouche's Theorem (statement) - Direct Methods: Gauss Elimination Method, LU Factorization Method – Eigen Values and Eigen Vectors of a Matrix– Properties - Cayley – Hamilton Theorem – Inverse and Powers of a Matrix using Cayley – Hamilton Theorem.

Matrices – II

Diagonalization of a Matrix – Quadratic Forms – Reduction of Quadratic Form to Canonical Form – Nature of a Quadratic Form – Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

Laplace Transforms-I

Introduction – Existence Conditions – Transforms of Elementary Functions – Properties of Laplace Transforms – Transforms of Derivatives – Transforms of Integrals – Multiplication by t – Division by t – Evaluation of Integrals by Laplace Transforms – Laplace Transforms of Unit Step Function, Unit Impulse Function and Periodic Functions.

Laplace Transforms-II

Inverse Laplace Transform – different methods - Convolution Theorem – Applications of Laplace Transforms to Ordinary Differential Equations, Simultaneous Linear Differential Equations with Constant Coefficients.

Difference Equations

Definition - order and solution of a difference equation - Formation of difference equations - Linear difference equations - Rules for finding C.F. - Rules for finding P.I.- Simultaneous difference equations with constant coefficients. Application to deflection of a loaded string.

Z-transforms

Z-transforms – definition - some standard Z-transforms - Linear property, damping rule - some standard results - shifting rules - initial and final value theorems - convolution theorem

- Evaluation of inverse transforms - Applications of Z-transform to difference equation.

Course Outcomes for First Year First Semester Courses	
Course Code: B16 ENG 1103	
Course Title: MATHEMATICS – II	
CO-1	Utilizing the knowledge of matrices for solving linear simultaneous equations, find Eigen values and Eigen vectors and handle quadratic forms
CO-2	Utilizing the knowledge of Laplace Transforms to find transforms of important functions that arise in applications and also solve ODE
CO-3	Also utilizing the knowledge of Laplace Transforms in courses like Net Works, Signals & Systems and Control Systems
CO-4	Utilizing the knowledge of difference equations and Z-transforms in understanding courses like Discrete Mathematical Structures and also Signals & Systems

SYLLABUS: PHYSICS (B16 ENG 1105)

(Common to CIVIL, CSE & IT)

Thermodynamics

Introduction, Heat and Work, First Law of Thermodynamics and applications, Reversible and Irreversible Process, Carnot Cycle and Efficiency, Second Law of Thermodynamics, Carnot's Theorem, Entropy, Second Law in terms of entropy, Entropy and disorder, Third Law of Thermodynamics (Statement Only).

Electromagnetism

Effect of Magnetic Field on – moving charges, current in long straight wire and rectangular Current Loop, Hall Effect, Biot-Savart's Law, B near a Long Wire, B for a Circular Current Loop, Ampere's Law, B for a Solenoid, Faraday's Law of electromagnetic induction, Lenz's law, Inductance of a solenoid, L-R Circuit, Displacement Current, Maxwell's Equations (integral form) and their significance (without derivation).

Interference

Principle of Super Position – Young's Experiment – Coherence – Inference in thin transparent films, Newton's Rings, Michelson Interferometer and its applications.

Lasers

Introduction, spontaneous and stimulated emissions, requirements of laser device, Ruby Laser, Gas Laser (He-Ne Laser), Semiconductor diode Laser, Characteristics and applications of Lasers.

Optical Fibers

Introduction, Principles of light propagation in optical fiber, Acceptance angle, Numerical aperture, types of fiber, Applications of Optical Fibers, Optical Fiber in Communications, advantages.

Ultrasonics

Definition, Production of Ultrasonics by Magnetostriction and Piezoelectric methods, detection methods, acoustic grating, characteristics and applications of Ultrasonics.

Modern Physics

Introduction, de Broglie concept of matter waves, Properties of matter waves, experimental verification (Davisson-Germer experiment), Heisenberg uncertainty principle, Wave function and its physical significance, Schrodinger time independent wave equation, application to a particle in a box, Band theory of Solids, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semiconductors and insulators .

Nano phase Materials

Definition, Synthesis – Synthesis methods, Condensation and Ball milling, chemical vapor deposition method – sol-gel methods, Characterization, analysis and applications of Nano materials.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1105	
Course Title: PHYSICS	
CO-1	Students learn in depth about the topics of Lasers, fiber optics, quantum mechanical theory and classical theories of thermodynamics and electromagnetism,
CO-2	Students understand the classical and modern concepts.

SYLLABUS: ENGINEERING GRAPHICS (B16 ENG 1107)

(Common to CIVIL, CSE & IT)

Introduction

Lines, Lettering and Dimensioning. Geometrical Constructions.

Curves

Conic sections: General construction of ellipse, parabola and hyperbola. Construction of involutes Normal and Tangent.

Projections of Points

Principal or Reference Planes, Projections of a point situated in any one of the four quadrants

Projections of Straight Lines

Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of straight line inclined to both the reference planes:

Projections of Planes

Projection of Perpendicular planes: Perpendicular to both reference planes, perpendicular to one reference plane and parallel to other reference plane, perpendicular to one reference plane and inclined to other reference plane. Projection of Oblique planes. Introduction to Auxiliary Planes.

Projections of Solids

Types of solids: Polyhedra and Solids of revolution. Projection of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to other and axes inclined to both the reference planes.

Projections of Section of Solids

Section Planes: Parallel and inclined section planes, Sections and True shape of section, Sections of Solids: Prism, Pyramid, Cylinder and Cone.

Development of Surfaces

Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

Isometric Views

Introduction to Isometric projection, Isometric scale and Isometric view. Isometric views of simple planes. Isometric view of Prisms, Pyramids, cylinder and cone. Isometric view of a combination of solids.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1103	
Course Title: ENGINEERING GRAPHICS	
CO-1	Apply principles of drawing to represent dimensions of an object.
CO-2	Construct polygons and engineering curves.
CO-3	Draw projections of points, lines, planes and solids.
CO-4	Represent sectional views of solids.
CO-5	Develop the surfaces of regular solids.
CO-6	Draw the isometric views of solids and combination of solids.

SYLLABUS: PROFESSIONAL ETHICS AND MORAL VALUES (B16 ENG 1109)

(Common to CIVIL, CSE & IT)

Ethics and Human Values

Ethics and Values, Ethical Vision, Ethical Decisions, **Human Values** – Classification of Values, Universality of Values.

Engineering Ethics

Nature of Engineering Ethics, Profession and Professionalism, Professional Ethics, Code of Ethics, Sample Codes – IEEE, ASCE, ASME and CSI.

Engineering as Social Experimentation

Engineering as social experimentation, Engineering Professionals – life skills, Engineers as Managers, Consultants and Leaders, Role of engineers in promoting ethical climate, balanced outlook on law.

Safety Social Responsibility and Rights

Safety and Risk, moral responsibility of engineers for safety, case studies – Bhopal gas tragedy, Chernobyl disaster, Fukushima Nuclear disaster, Professional rights, Gender discrimination, Sexual harassment at work place.

Global Issues

Globalization and MNCs, Environmental Ethics, Computer Ethics, Cyber Crimes, Ethical living, concept of Harmony in life.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1109	
Course Title: PROFESSIONAL ETHICS AND MORAL VALUES	
CO-1	By the end of the course student should be able to understand the importance of ethics and values in life and society.

SYLLABUS: PHYSICS LAB (B16 ENG 1111)

(Common to CIVIL, CSE & IT)

LIST OF EXPERIMENTS

1. Sonometer – verification of laws of transverse vibrations in stretched strings.
2. Melde’s Experiment – Determination of the frequency of an electrically maintainedtuning fork.
3. Newton’s Rings – Determination of radius of curvature of a convex lens.
4. Diffraction Grating – Determination of Wavelengths of lines of mercury spectrum usingspectrometer by normal incidence method.
5. Determination of Cauchy’s constants of the material of the given prism usingSpectrometer and mercury light.
6. Wedge Method – Determination of thickness of a paper by forming parallel interferencefringes.
7. Variation of magnetic field along the axis of current carrying circular coil – Stewart and Gee’s apparatus.
8. Carey Foster’s bridge – Verification of laws of resistance.
9. Lee’s Method – Determination of coefficient of thermal conductivity of a bad conductor.
10. Calibration of voltmeter using potentiometer.
11. Calibration of low range Ammeter using potentiometer.
12. Laser – Diffraction.

SYLLABUS: WORKSHOP (B16 ENG 1113)

(Common to CIVIL, CSE & IT)

Carpentry

Bench Work, tools used in carpentry.

Jobs for Class work – half lap joint, mortise and tenon joint, half – lap dovetail joint, cornerdovetail joint, central bridle joint.

Sheet Metal

Tools used in sheet metal work, Laying development of the sheet metal jobs, soldering.

Jobs for class works – Square tray, taper tray (sides), funnel, elbow pipe joint, 60^0 pipe joint.

Fitting

Tools used in fitting work, Different files, chisels, hammers and bech vice.

Jobs for class work – Square, hexagon, rectangular fit, circular fit and triangular fit.

Course Outcomes for First Year First Semester Courses	
Course code: B16 ENG 1113	
Course Name: WORKSHOP	
CO-1	Use various tools to prepare basic carpentry and fitting joints.
CO-2	Fabricate simple components using tin smithy.

SYLLABUS: MATHEMATICS – III (B16 ENG 1201)

(Common to all Branches)

Solid Geometry

Equations of a plane, Normal form, Intercept form, Equations of Straight Line – Conditions for a line to lie in a Plane – Coplanar lines – Shortest distance between two skew lines - Intersection of three Planes – Equations of Sphere – Tangent Plane to a Sphere –Cone – Cylinder.

Multiple Integrals-1

Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

Multiple Integrals-2

Beta Function - Gamma Function - Relation between Beta and Gamma Functions-Error Function - Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of mass - Center of gravity of a plane lamina- Moment of inertia.

Fourier Transforms

Introduction – definition - Fourier integral - Sine and Cosine integrals - Complex form of Fourier integral - Fourier transform - Fourier Sine and Cosine transforms -Finite Fourier Sine and Cosine transforms - properties of Fourier transforms, Convolution theorem for Fourier transforms - Perceval's identity for Fourier transforms - Fourier transforms of derivatives of a function.

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG 1201	
Course Title: MATHEMATICS – III	
CO-1	Utilize knowledge of line, sphere etc. in his engineering subjects
CO-2	Utilize the knowledge of Beta and Gamma functions and multiple integrals to evaluate the integrals they come across in their applications
CO-3	Utilize the knowledge of Fourier Transform in courses like Signals and Systems and in the solution of partial differential equations at a later stage

SYLLABUS: CHEMISTRY (B16 ENG 1203)

(Common to CIVIL, CSE & IT)

Water Chemistry

Source of water- impurities- Hardness and its determination by EDTA method- Boiler troubles and their removal. Water softening methods- lime soda, zeolite and ion exchange. Municipal water treatment- Break point chlorination. Desalination of sea water – electro dialysis and reverse osmosis methods.

Building Materials

Portland cement: Manufacture-Chemistry involved in setting and hardening of cement – Cement concrete -RCC – Decay of concrete.

Refractories: Classification-Properties and Engineering applications. Ceramics: Classification-Properties and uses.

Solid State Chemistry

Classification of solids-Types of crystals-properties-Imperfections in crystals. Band theory of solids. Chemistry of semiconductors –Intrinsic, Extrinsic, compound and defect. Organic semiconductors Purification of solids by Zone refining-Single crystal growth – epitaxial growth. Elementary ideas on Liquid crystals.

Corrosion Chemistry

Definition of corrosion- Types of corrosion-chemical & electrochemical corrosion –Pitting, stress corrosion, Galvanic corrosion, Water line corrosion Factors affecting corrosion – Prevention of corrosion- Cathodic protection. Corrosion inhibitors Protective coatings- Metallic coatings, electro plating, electroless plating, chemical conversion coatings- phosphate coatings, chromate coatings, anodizing. Organic coatings-Paints.

Polymers And Plastics

Definition-Types of polymerization – mechanism of free radical polymerization. plastics- Thermosetting and thermoplastic resins cellulose derivatives, vinyl resins, nylon 6,6, bakelite-Compounding of plastics-Fabrication of plastics. Fiber reinforced plastics – conducting polymers -Engineering applications of polymers.

Fuels And Lubricants

Solid fuels: Coal –Analysis of coal – Metallurgical coke- manufacture-Engineering applications.

Petroleum-refining-Knocking and Octane number of gasolilne-Cetane number of diesel oil. Synthetic petrol – LPG-CNG–Applications. Rocket fuels – Propellants-classification.

LUBRICANTS: Principles of lubrications, classification of lubricants and properties of lubricants (any five)

Course Outcomes for First Year First Semester Course	
Course Code: B16 ENG 1104	
Course Title: CHEMISTRY	
CO-1	Students learn in-depth about the topics of desalination of sea water, CNG, LPG Biogas, Semiconductors, Liquid crystals, Conducting polymers, fiber reinforced plastics, building materials
CO-2	Students understand the basic and advanced applied concepts.
CO-3	Students learn to interrelate the theory and with the relevant experiment.
CO-4	Students learn experimental techniques and understand the theory about experiments

SYLLABUS: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS (B16 ENG 1212)

(Common to CIVIL, CSE & IT)

Introduction to C

Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations, Formatted Input, Formatted Output.

Decision Making, Branching, Looping, Arrays & Strings: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else. If ladder, switch statement, the (?:) operator, the GOTO statement., The while statement, the do statement, The for statement, Jumps in Loops ,One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

Functions

Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, The scope, visibility and lifetime of variables. .

Pointers

Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications

Structure and Unions

Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

File handling

Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments- Program Applications.

Numerical Methods

Solutions of Algebraic and Transcendental Equations: Bisection Method, Newton Raphson Method.

Interpolation - Newton's forward and backward Interpolation, Lagrange's Interpolation in unequal intervals.

Solutions of Linear Equations: Gauss Elimination Method, Jacobi and Gauss Seidel Methods. Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule.

Solutions of Ordinary First Order Differential Equations: Euler's Method, Modified Euler's Method and Runge-Kutta Method.

Course Outcomes for First Year Second Semester Courses	
Course code: B16 ENG 1212	
Course Title: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS	
CO-1	Student can understand basic terminology used in C programming. 2. 3. 4. 5.
CO-2	Student can write programs by applying elementary algorithms to solve problems in C language.
CO-3	Student can write, compile and debug programs in C language.
CO-4	Student can Write programs to solve numerical methods.
CO-5	Student can be familiar with finite precision computation.

SYLLABUS: ELECTRONIC DEVICES AND CIRCUITS (B16 EC 1208)
(For ECE)

Transport Phenomena in Semiconductors:

Mobility and conductivity, intrinsic and extrinsic semiconductors, mass action law, charge densities in a semiconductors, Hall Effect, generation and recombination of charges, drift and diffusion currents, continuity equation, injected minority carrier charge, potential variation in graded semiconductors.

PN junction diode:

Open circuited PN junction , PN junction as a rectifier, current components in a PN diode, V-I characteristics and its temperature dependence, transition capacitance, charge control description of a diode, diffusion capacitance, junction diode switching times, Zener diode, Tunnel Diode, Photo diode, Point Contact diode, Schottky barrier diode, varactor diode, PIN diode, LED.

Diode Rectifiers:

Half wave, Full wave and Bridge Rectifiers with and without filters, Ripple factor and regulation characteristics

Bipolar junction transistors:

Introduction to BJT, operation of a transistor and transistor biasing for different operating conditions, transistor current components, transistor amplification factors: α,β,γ relation between α and β,γ early effect or basewidth modulation, common base configuration and its input and output characteristics, common emitter configuration and its input and output characteristics, common collector configuration and its input and output characteristics, Comparison of CE, CB and CC Configurations, Break- down in transistors, Photo Transistor.

Field Effect transistors

JFET and its characteristics, pinch off voltage, FET small signal model, MOSFET and its characteristics

Transistor Biasing Circuits

The operating point, Bias stability, different types of biasing techniques, stabilization against variation in I_{co} , V_{BE}, & β. Bias compensation, thermal runaway, thermal stability, Biasing of FETs.

Transistors at low and High frequencies

Transistor hybrid model, h-parameters, Analysis of transistor amplifier circuits using h- parameters, comparison of transistor amplifier configurations, analysis of single stage amplifier, effects of bypass and coupling capacitors, frequency response of CE amplifier, Emitter follower, High frequency model of transistor.

Course Outcomes for First Year Second Semester Courses	
Course code:**B16 EC 1208**	
Course Title: **ELECTRONIC DEVICES AND CIRCUITS**	
CO-1	Understand the physical structure, principles of operation, electrical characteristics and circuit models of diodes, BJTs and FETs.
CO-2	Use this knowledge to analyse and design basic electronic application circuits.
CO-3	Extend the understanding of how electronic circuits and their functions fit into larger electronic systems.

SYLLABUS: CIRCUIT THEORY (B16 EE 1208)
(For EEE)

Fundamentals of Electric Circuits

Concepts of Electric circuit: EMF, Current, Potential difference, Power and Energy; Concepts of Network: Active and Passive elements, classification of Linear, Non-linear, Unilateral, Bilateral Lumped and Distributed elements; Reference directions for current and voltage; Voltage and Current sources; Voltage-Current Relations of R, L, C elements; Voltage and Current division; Series and Parallel combinations of Resistance, Inductance and Capacitance

D.C Circuits

Kirchhoff's Laws; Nodal Analysis, Mesh Analysis, Source Transformation, Linearity and Superposition Theorem, Thiamin's And Norton's Theorems, Reciprocity theorem, Maximum Power Transfer Theorem, Star-Delta Transformation.

AC Circuits

The Sinusoidal Forcing Function, Phasor Concept, Average and Effective Values of Voltage and Current, Instantaneous and Average Power, Complex Power, Steady State Analysis using Mesh and Nodal Analysis, Resonance.

Three Phase Circuits

Advantages of Three Phase Circuits, Balanced and Unbalanced systems, Relation between Line and Phase Quantities in Star and delta connected circuits, Analysis of Balanced & Unbalanced Three Phase Circuits, Measurement of Power in Three Phase Power Circuits.

Magnetic Circuits

Magneto motive force(MMF), Reluctance, Magnetic flux; Analysis of magnetic circuit, Analogy between Electric & Magnetic circuits, Series Magnetic circuits, Magnetic leakage, B-H curve, Faraday's Laws of Electromagnetic Induction, Induced EMF, Dynamically Induced EMF, Statically Induced EMF, Self-Inductance, Mutual Inductance.(simple numerical problems)

Course Outcomes for First Year Second Semester Courses	
Course code:**B16 EE 1208**	
Course Name: **CIRCUIT THEORY**	
CO-1	Able to develop an understanding of the basic fundamental electrical laws, elements of electric Networks and learn the techniques to measure voltage and current.
CO-2	Develops the ability to apply circuit theorems to DC and AC circuits.
CO-3	Able to analyse the coupled & three phase circuits.

Structure of crystalline solids

Atomic structure & bonding in solids- Crystal structures-calculations of radius, Coordination Number and Atomic Packing Factor for different cubic structures - Imperfection in solids, point defects, Linear defects, Planar defects and Volume defects- Concept of Slip & twinning.

Phase diagrams

Basic terms- phase rule- Lever rule & free energy of phase mixtures cooling curves- Phase diagram & phase transformation - construction of phase diagrams- binary phase diagrams - Brass, Bronze, Al-Cu and AlSi phase diagrams- Invariant reactions, eutectic, ,peritectic, eutectoid, peritectoid, metatectic&monotectic reactions, Iron carbon phase diagram & microstructures of plain carbon steel & cast iron

Heat treatment

Heat treatment of steel- Annealing, and its types, normalizing, hardening, tempering, martemering, austempering - TTT diagrams, drawing of TTT diagram, TTT diagram for hypo-& hypereutectoid steels, effect of alloying elements, CCT diagram- Martensitic transformation, nature of martensitic transformation- Surface hardening processes like case hardening, carburizing, cyaniding, nitriding Induction hardening, hardenability, Jominy end-quench test, Age hardening of Al & Cu alloys Precipitation Hardening

Engineering Alloys

Properties, composition, microstructure and uses of low carbon, mild medium & high carbon steels. stainless steels, high speed steels, Hadfield steels, tool steels - Cast irons, gray CI, white CI, malleable CI, SC iron-The light alloys-Al & Mg & Titanium alloys- Copper & its alloys: brasses & bronzes- super alloys, Smart materials- Nano materials.

Composite Materials

Classification of composite materials, dispersion strengthened, particle reinforced and fiber reinforced composite laminates properties of matrix and reinforcement materials and structural applications of different types of composite materials.

Course Outcomes for First Year Second Semester Courses	
Course code: B16 ME 1208	
Course Title: METALLURGY AND MATERIALS ENGINEERING	
CO-1	Understand crystalline solids and their atomic structures.
CO-2	Suggest and recommend necessary engineering materials for specific applications keeping in view of the cost, design, reliability, life, working conditions and properties of the products.
CO-3	Understand different phase transformations in Iron-Iron Carbide diagram and distinguish between steels and cast irons.
CO-4	Select different materials for tools and components based on functional requirements.
CO-5	Use composite materials for different engineering applications like aerospace, automobile, ship building industry, sports item etc.

SYLLABUS: CHEMISTRY LAB (B16 ENG 1110)

(Common to CIVIL, CSE & IT)

LIST OF PRACTICAL EXPERIMENTS:

1. Estimation of Sodium hydroxide with HCl (Na_2CO_3 primary standard).
2. Estimation of Iron as Ferrous iron in an Ore Sample.
3. Estimation of Oxalic acid by a redox method
4. Estimation of Calcium in a sample of Portland cement.
5. Estimation of Volume strength of Hydrogen Peroxide.
6. Estimation of Mohr's salt by Potassium dichromate
7. Determination of Hardness of an underground water sample.
8. Estimation of Zinc by EDTA method.
9. Determination of Alkalinity of water sample.

DEMONSTRATION EXPERIMENTS:

10. Determination of Viscosity and Viscosity index of a lubricant.
11. Printed Circuit Board
12. Determination of dissolved oxygen in given water sample.
13. Potentiometric titrations.
14. P^H Determination by using P^H meter.

SYLLABUS: COMPUTER PROGRAMMING USING C & NUMERICAL METHODS LAB (B16 ENG 1112)

LIST OF PROGRAMMES:

1. Write a program to read x, y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line.

2. Write a program which generates 100 random numbers in the range of 1 to 100. Store them in an array and then print the array. Write 3 versions of the program using different loop constructs (eg. for, while and do-while).

3. Write a set of string manipulation functions e.g. for getting a sub-string from a given position, copying one string to another, reversing a string and adding one string to another.

4. Write a program which determines the largest and the smallest number that can be stored in different data types like short, int, long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?

5. Write a program which generates 100 random real numbers in the range of 10.0 to 20.0 and sort them in descending order.

6. Write a function for transporting a square matrix in place (in place means that your are not allowed to have full temporary matrix).

7. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their mean and standard deviation.

8. Implement bisection method to find the square root of a given number to a given accuracy.

9. Implement Newton Raphson Method to determine a root of polynomial equation.

10. Given a table of x and corresponding f(x) values, write a program which will determine f(x) value at an intermediate x value using Lagrange’s Interpolation.

11. Write a function which will invert a matrix.

12. Implement Simpson’s 1/3rd rule for numerical integration.

13. Implement Trapezoidal rule for numerical integration.

14. Write a program to solve a set of linear algebraic equations.

15. Write a program to solve a differential equation using Runge-Kutta Method.

SYLLABUS: ENGLISH LANGUAGE LAB (B16 ENG 1213)

(Common to All Branches)

1. English Sound Pattern – Letters
2. Sounds of English
3. Pronunciation
4. Stress and Intonation

Laboratory Practice Sessions:

1. Letters and Sounds, Worksheet-1
2. Interactions-1, Worksheet-2
3. The Sounds of English, Worksheet-3
4. Interactions-2, Worksheet-4
5. Pronouncing Words-Some Important Patterns, Worksheet-5
6. Interactions-3, Worksheet-2
7. Stress and Intonation, Worksheet-2

Course Outcomes for First Year Second Semester Courses	
Course code: B16 ENG 1213	
Course Title: ENGLISH LANGUAGE LAB	
CO-1	Students will be sensitized towards recognition of English sound pattern.
CO-2	The fluency in speech will be enhanced.

SYLLABUS: MATHEMATICS IV (B16 ENG 2101)

(Common to CE, ECE, EEE & ME)

Vector Calculus-1

Definitions of Scalar and Vector point functions, Differentiation of vectors, Vector differential operator del, Del applied to scalar point function – gradient, Del applied to vector point function- divergence and curl, physical interpretation of gradient, divergence and curl(without proof), Del applied twice to a point function, Del applied to product of two functions, Irrotational and Solenoidal Fields, scalar potential

Vector Calculus-2

Integration of vectors, line integral, circulation, work done, surface integral, Flux, Green's, Stokes and Gauss Divergence Theorems (Without proofs). Introduction to orthogonal curvilinear coordinates, cylindrical polar coordinates and spherical polar coordinates.

Applications Of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables, One –dimensional wave equation- vibrations of a stretched string (no derivation)-, one-dimensional heat equation – Heat flow along a long horizontal bar (no derivation) (problems on heat equation involving homogeneous end conditions only), two dimensional Laplace equation in Cartesian coordinates.

Complex Variables-1

Review- Cartesian form and polar form of a complex variable, Real and imaginary parts of z^n, e^z, sin z, sinh z and log z**.**

Limit and continuity of a function of the complex variable, derivative, analytic function, properties of Analytic functions, Cauchy- Riemann equations, Harmonic functions and Orthogonal system, application of analytic function to flow problems, geometric representation of w=f(z), conformal mapping – Bilinear transformation only.

Complex Variables-2

Integration of complex functions, Cauchy's theorem, Cauchy's integral formula (statements only) Taylor and Laurent series expansions of functions (statement of theorems only), zeros and singularities, Residue, calculation of residues, Cauchy's Residue theorem (without proof), Evaluation of real and definite integrals- integration around a unit circle.

Course Outcomes for Second Year First Semester Courses	
Course code: B16 ENG 2101	
Course Title: MATHEMATICS – IV	
CO-1	Apply the concepts of Gradient, Divergence, Curl, Directional derivative, solenoidal and Irrotational fields
CO-2	Determine scalar potential, circulation and work done.
CO-3	Evaluate integrals using Green's, Stokes and Divergence theorems.
CO-4	Obtain the solution of 1-D wave equation and 1-D heat equation.
CO-5	Determine the zeroes and poles of functions and residues at poles.
CO-6	Evaluate certain real definite integrals that arise in applications by the use of Residue theorem.

SYLLABUS: CIRCUIT ANALYSIS & SYNTHESIS (B16 EE 2104)

Analysis of DC Circuits:

Active elements, Passive elements, Reference directions for current and voltage, Kirchhoff's Laws, Voltage and Current Division Nodal Analysis, Mesh analysis, Linearity and superposition, Thevinin's theorem and Norton's theorem, Reciprocity theorem, Z,Y,H,S- parameters.

DC transients:

Inductor, Capacitor, source free RL, RC and RLC response, Evaluation of Initial conditions, Application of unit-step function to RL, RC and RLC circuits, concepts of Natural, Forced and Complete response.

Sinusoidal Steady State Analysis:

The sinusoidal forcing function, Phasor Concept, Average and Effective value of Voltage and Current, Instantaneous and Average Power, Complex Power, Steady State Analysis using mesh and node analysis, Application of network theorems to AC circuits, resonance, Concept of Duality.

Network Functions:

Network functions for single port and two port, Calculation of Network functions for Ladder and General Networks, Poles and Zeroes, Restriction of Poles and Zeroes for Driving point and Transfer functions, Time Domain Behavior from Pole Zero plot, Transfer Functions in terms of Y and Z functions, Scaling Network Functions.

Positive Real Functions:

Positive real function and other properties, Herwitz polynomials, Computation of residues, even and Odd functions, Test for Positive Real Functions.

Course Outcomes for Second Year First Semester Courses	
Course code:**B16 EE 2104**	
Course Name: **CIRCUIT ANALYSIS& SYNTHESIS**	
CO-1	Students will learn circuit conventions and analyze DC circuits using various techniques like mesh analysis, nodal analysis and theorems.
CO-2	Students will learn the significance of energy storing elements (Inductance & Capacitance) in circuits and analyse transient and steady state responses.
CO-3	Students will learn the concepts of single and three-phase balanced circuits and analyze sinusoidal steady-state using phasor concept.
CO-4	Student will learn the concept of network functions and analyze poles, zeros and time domain behavior from pole-zero plots.
CO-5	Student will learn the concept of positive real functions and test whether the given network function is Hurwitz and positive real or not.

SYLLABUS: ELECTRICAL TECHNOLOGY (B16 EE 2105)

Magnetic Circuits:

Definitions of magnetic circuit, Reluctance, MMF, Magnetic flux, Hysteresis loss. Faraday's laws of Electromagnetic induction, Induced E.M.F., Dynamically induced E.M.F., Statically induced E.M.F., Self-inductance, Mutual inductance, Lenz's law

DC Machines:

Principle of operation DC Generator - EMF equation - types - DC motor types - torque equation – speed control methods- applications - three point starter-Testing-Load test on D.C Shunt Motor, D.C Series Motor, Swinburne's test.

Transformers:

Principle of operation of single phase transformers - EMF equation - equivalent circuit –losses - efficiency and regulation-Testing- Open circuit and Short circuit tests.

Induction Motors:

Construction - Principle of operation of induction motor - slip - torque characteristics - Power flow diagram.

Synchronous Machines:

Construction-Principle of operation of alternators – EMF equation of alternator- regulation by synchronous impedance method, Principle of operation of synchronous motors, methods of starting, applications.

Course Outcomes for Second Year First Semester Courses	
Course Code: B16 EE 2105	
Course Name: ELECTRICAL TECHNOLOGY	
CO-1	Classify the parts of DC Machines, Transformers, Three Phase Induction motors & Three Phase Synchronous machines.
CO-2	Interpret the operation and working principle of DC Machines, Transformers, Three Phase Induction motors, Three Phase Synchronous machines.
CO-3	Develop performance characteristics of various machines.
CO-4	Construct experiments on various machines.
CO-5	Analyze the application of electrical machines in various fields of engineering.

SYLLABUS: ANALOG ELECTRONIC CIRCUITS (B16 EC 2101)

Multistage Amplifiers

Transistor at high frequencies, CE short circuit current gain and concept of Gain Bandwidth Product. BJT and FET RC Coupled Amplifiers at low and high frequencies. Frequency Response and calculation of Band Width of Multistage Amplifiers.

Feed Back Amplifiers

Concept of Feed Back Amplifiers - Effect of Negative Feedback on the amplifier characteristics. Four feedback topologies, Method of analysis of Voltage Series, Current Series, Voltage Shunt and Current Shunt feedback Amplifiers.

Sinusoidal Oscillators

Condition for oscillations –LC Oscillators – Hartley, Colpitts, Clapp and Tuned Collector Oscillators – Frequency and amplitude Stability of Oscillators – Crystal Oscillators – RC Oscillators -- RC Phase Shift and Weinbridge Oscillators.

Power Amplifiers

Classification of Power Amplifiers – Class A, Class B and Class AB power Amplifiers. Series Fed, Single Ended Transformer Coupled and Push Pull Class A and Class B Power Amplifiers. Cross-over Distortion in Pure Class B Power Amplifier, Class AB Power Amplifier – Complementary Push Pull Amplifier with trickle Bias, Derating Factor – Heat Sinks.

Tuned Voltage Amplifiers

Single Tuned and Stagger Tuned Amplifiers – Analysis – Double Tuned Amplifier – Bandwidth Calculation.

Operational Amplifiers

Concept of Direct Coupled Amplifiers. Ideal Characteristics of an operational Amplifier – Differential Amplifier - Calculation of common mode Rejection ratio – Differential Amplifier supplied with a constant current – Normalized Transfer Characteristics of a differential Amplifier – Applications of OP-Amp as an Inverting and Non-Inverting Amplifier, Integrator, Differentiator Summing and Subtracting Amplifier and Logarithmic Amplifier. Parameters of an Op-Amp, Measurement of OP-Amp Parameters.

Course Outcomes for Second Year First Semester Courses	
Course code: **B16 EC 2101**	
Course Title: **ANALOG ELECTRONIC CIRCUITS**	
CO-1	Know the equivalent circuit of multistage amplifier and its analysis.
CO-2	Identify the different feedback topologies and analyze them.
CO-3	Explain the principle of oscillator and design different types of sinusoidal oscillators.
CO-4	Define the difference between voltage and power amplifiers and design different classes.
CO-5	Know that Tuned amplifiers amplify a narrow band of frequencies and will also be able to analyze them.
CO-6	Identify that Op-amp not amplifies but also perform different operations and analyze some applications.

SYLLABUS: ELEMENTARY DATA STRUCTURES (B16CS2104)

Revision of C language:

Overview Arrays and Functions:

Organization and use of one Dimensional, Two dimensional and Multi-dimensional Arrays, Handling of character strings, string operations, Concept of function, Parameter passing, Recursion.

Structures, Pointers and Files:

Definition of structure and Union, Programming examples, Pointers , Pointer Expressions, Programming examples, Dynamic Memory Allocation, Preprocessor Directives

Linear Data structures:

Stack -Representation, Operations, Queue- representation, Operations, Circular Queue, Linked List-Representation, Operations, Double Linked List and Circular List.

Non-linear Data Structures:

Trees, Binary Tree Representation, Tree Traversals, Conversion of a General Tree to Binary Tree.

Graphs

Representation of Graphs, Linked Representation of Graphs, Graph Traversals and Spanning Trees**.**

Searching & Sorting:

Basic search Techniques- Linear and Binary searching, Tree searching, Sorting-Insertion, Selection, Bubble, Quick and Merge Sorting.

Course Outcomes for Second Year First Semester Courses	
Course code: B16 CS 2104	
Course Title: ELEMENTARY DATA STRUCTURES	
CO-1	Be able to write programs and class libraries given a specification.
CO-2	Implement various data structures.
CO-3	Implement and analyse various sorting algorithms.
CO-4	Understand abstract data types and how they are implemented in C.

SYLLABUS: PROBABILITY THEORY & RANDOM PROCESSES (B16 EC 2102)

Probability Theory

Definitions of Probability, Axioms of Probability, Probability Spaces, Properties of Probabilities, Joint and Conditional Probabilities, Independent Events

Random Variables

Probability Distribution Functions, Probability Density Functions, Joint Distribution of Two Variables, Conditional Probability Distribution and Density, Independent Random Variables.

Statistical Averages

Functions of Random Variables and Random Vectors, Statistical Averages, Characteristic Function of Random Variables, Inequalities of Chebyshev and Schwartz, Convergence Concepts, Central Limit Theorem.

Random Processes

Stationarity, Ergodicity, Covariance Function and their Properties, Spectral Representation, Weiner-Kinchine Theorem.

Linear Systems and Random Noise Processes

Linear operations, Gaussian processes, Poisson Processes**,** Low-pass and Band-pass Noise Representation.

Course Outcomes for Second Year First Semester Courses	
Course code:**B16 EC 2102**	
Course Name: **PROBABILITY THEORY & RANDOM PROCESSES**	
CO-1	Understand the axiomatic formulation of modern probability theory.
CO-2	Characterize Probability Models and functions of Random variables based on single and multiple random variables.
CO-3	Evaluate and apply moments and characteristic functions and understand the concept of Inequalities and probabilistic limits.
CO-4	Understand the concept of Random process and determine covariance and spectral density of stationary random processes.
CO-5	Demonstrate the specific applications to Poisson and Gaussian process and representation of low pass and band pass noise models.
CO-6	Analyze the response of random inputs to linear time invariant systems.

SYLLABUS: ELECTRONIC DEVICES & CIRCUITS LAB (B16 EC 2105)

(Common to ECE & EEE)

LIST OF EXPERIMENTS

1. V-I characteristics of semiconductor diode, LED and Zener diode.
2. Half wave and full wave rectifier with and without filters.
3. Input and output characteristics of transistor in CE configuration.
4. Transistor biasing circuits and transistor as a switch.
5. CE amplifier.
6. JFET common source amplifier.

LIST OF SIMULATION EXPERIMENTS

7. V-I characteristics of semiconductor diode, LED and Zener diode.
8. Regulation characteristics of Zener diode.
9. Input and output characteristics of transistor in CB configuration
10. JFET Characteristics.
11. CC amplifier
12. JFET common source amplifier

Course Outcomes for Second Year First Semester Courses	
Course code: B16 EC 2105	
Course Title: ELECTRONIC DEVICES & CIRCUITS LAB	
CO-1	To understand the role of basic electronic devices like ordinary Pn diodes, Zener diodes, LEDs, BJTS and JFETs in achieving various functionalities like rectification, voltage regulation, amplification, switching action etc. in various electronic circuits.
CO-2	To construct and simulate different electronic circuits using Multisim.
CO-3	To have the hardware skills and software skills required in the design of electronic systems for various applications.

SYLLABUS: ENGLISH PROFICIENCY (B16 ENG 2104)

Speaking Skills

PPT

Describing

Event/place/thingPicture

Description Extempore

Debate Telephonic Skills

Analyzing Proverbs

Vocabulary

Affixes

Pairs of Words

Reading Skills

Reading Comprehension

Reading/Summarizing News Paper Artic

Writing Skills

Designing Posters

Essay writing

Resume Writing

Course Outcomes for Second Year First Semester Courses	
Course code: **B16 ENG 2104**	
Course Title: **ENGLISH PROFICIENCY**	
CO-1	Students enhance their vocabulary and use it in the relevant contexts.
CO-2	They improve speaking skills.
CO-3	They learn and practice the skills of composition writing.
CO-4	They enhance their reading and understanding of different texts.
CO-5	They enrich their communication both in formal and informal contexts.
CO-6	They strengthen their confidence in presentation skills.

SYLLABUS: INDUSTRY ORIENTED TRAINING (B16 ENG 2106)

(Common to ECE & EEE)

BASIC CONCEPTS

System Life Cycle, Algorithm Specification, Recursive Algorithms, Data Abstraction, Performance Analysis, Space Complexity, Time Complexity, Asymptotic Notation, Comparing Time Complexities

IMPLEMENTATION (Using C)

Arrays

Stacks

Queues

Linked List

Double linked listsTrees

Graphs

Applications of linear and nonlinear data structures and solving simple to complex problemsin perspective of industry requirements.

Basic Concepts of OOP

Procedural Paradigms, Object Oriented Paradigm, OOP Principles and Terminology, OOPbenefits, Procedure and Object Oriented programming languages, advantages and disadvantages, creating class, defining objects in C++ and JAVA.

Applications using OOP in solving simple to complex problems in perspective of industryrequirements.

(Note: Total Marks will be evaluated based on Continuous Evaluation - 25 Marks, CodingContest- 25 Marks)

Course Outcomes for Second Year First Semester Courses	
Course code:**B16 ENG 2106**	
Course Title: **INDUSTRY ORIENTED TRAINING**	
	Academic Year : 2**017-18**
CO-1	Application using implementation of Data structures.
CO-2	Application using implementation of Linear and nonlinear Data structures in view of industry.
CO-3	Applications using Object Oriented Concepts in view of industry.

SYLLABUS: MATHEMATICS IV (B16 ENG 2101)

(Common to CE, ECE, EEE& ME)

Vector Calculus-1

Definitions of Scalar and Vector point functions, Differentiation of vectors, Vector differential operator del, Del applied to scalar point function – gradient, Del applied to vector point function- divergence and curl, physical interpretation of gradient, divergence and curl(without proof), Del applied twice to a point function, Del applied to product of two functions, Irrotational and Solenoidal Fields, scalar potential

Vector Calculus-2

Integration of vectors, line integral, circulation, work done, surface integral, Flux, Green's, Stokes and Gauss Divergence Theorems (Without proofs). Introduction to orthogonal curvilinear coordinates, cylindrical polar coordinates and spherical polar coordinates.

Applications Of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables, One –dimensional wave equation- vibrations of a stretched string (no derivation)-, one-dimensional heat equation – Heat flow along a long horizontal bar (no derivation) (problems on heat equation involving homogeneous end conditions only), two dimensional Laplace equation in Cartesian coordinates.

Complex Variables-1

Review- Cartesian form and polar form of a complex variable, Real and imaginary parts of z^n, e^z, sin z, sinh z and log z **.**Limit and continuity of a function of the complex variable, derivative, analytic function, properties of Analytic functions, Cauchy- Riemann equations, Harmonic functions and Orthogonal system, application of analytic function to flow problems, geometric representation of w=f(z), conformal mapping – Bilinear transformation only.

Complex Variables-2

Integration of complex functions, Cauchy's theorem, Cauchy's integral formula (statements only) Taylor and Laurent series expansions of functions (statement of theorems only), zeros and singularities, Residue, calculation of residues, Cauchy's Residue theorem (without proof), Evaluation of real and definite integrals- integration around a unit circle.

Course Outcomes for Second Year First Semester Course	
Course Code: B16ENG 2101	
Course Title: Mathematics-IV	
CO-1	ApplytheconceptsofGradient,Divergence,Curl,Directionalderivative,solenoidalandIrrotationalfields
CO-2	Determines calar potential, circulation and work done
CO-3	EvaluateintegralsusingGreen‟s,Stokes‟andDivergencetheorems
CO-4	Obtainthesolutionof 1-Dwave equationand 1-Dheatequation
CO-5	Determinethezeroesandpolesoffunctionsand residuesatpoles
CO-6	EvaluatecertainrealdefiniteintegralsthatariseinapplicationsbytheuseofResiduetheorem

SYLLABUS: MECHANICS OF SOLIDS (B16 ME 2101)

Simple Stresses:

Stress, Strain, Stress- Strain curve, Lateral strain, Relationship between elastic constants, Bars of varying cross-section, Compound bars, and Temperature stresses in bars.

Complex Stresses:

Stresses on an inclined plane under different uniaxial, biaxial and general case of plane stress systems, Principal planes and principal stresses, Mohr's circle, Strain energy, Impact loading.

Bending Moments and Shear Forces:

Beam - Types of loads, Types of supports, S.F. and B.M. diagrams for Cantilever, Simply supported and over hanging beams.

Deflections of Beams:

Relation between curvature, slope and deflection - simple cases in Cantilever, Simply supported and Over hanging beams.

Stresses in Beams:

Theory of bending, Flexural formula, Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections, Shear stresses in beams, Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T, angle sections.

Torsional Stresses in Shafts:

Analysis of torsional stresses, Power transmitted, combined bending and torsion.

Cylinders and Spherical Shells:

Stresses and strains in thin cylinders, Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses –hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders and Thin spherical shell.

Course Code: B16 ME 2101	
Course Title: MECHANICS OF SOLIDS	
CO-1	Fundamental understanding of the concepts of stress and strain in mechanics of solids andstructuresandmaterial properties.
CO-2	Apply the fundamental concepts of principle of superposition, equilibrium, compatibility,force-deformation, and stress-strain relationships to the solid and structural mechanicsproblems.
CO-3	Analyze determinate bars, beams, to determine axial forces, torques, shear forces, andbendingmoments.
CO-4	Physicalinsightintodistributionofstressesandstrainsinstructuralmembersbydetermining stress, strain, and deformation of bars, and beams, and performing stress andstraintransformations.
CO-5	Basic understanding of the method of superposition, flexibility method, and stiffnessmethodas applied tostaticallydeterminateaxialand torsional members, andbeams.
CO-6	Ability to design structural members given the dimensions, material properties such asforce-displacement relationships, boundary conditions, loading, allowable stresses, andfactorofsafety.

SYLLABUS: THERMODYNAMICS (B16 ME 2102)

Introduction:

Basic concepts; Thermodynamic systems; Micro & Macro systems; Homogeneous and heterogeneous systems; Concept of continuum; Pure substance; Thermodynamic equilibrium; State; Property; Path; Process; Reversible and irreversible cycles; Work; Heat; Point function; Path function; Heat transfer;

Perfect gas laws-

Equation of state- Universal gas constant, various non-flow processes-Properties of end states- Heat transfer and work transfer- Change in internal energy-throttling and free expansion- Flow processes- Deviations from perfect gas model-Vanderwall's equation of state- Compressibility charts- Variable specific heats.

Zeroth and First law of thermodynamics:

Concept of equality of temperatures- Joule's experiments-First law of thermodynamics- Isolated systems and steady flow systems- Specific heats at constant volume and pressure - Enthalpy- First law applied to flow systems- Systems undergoing a cycle and change of state- First law applied to steady flow processes-Limitations of first law of thermodynamics.

Second law of thermodynamics-

Kelvin Plank statement and Clasius statement and their equivalence, Corollaries- Perpetual motion machines of first kind and second kind-Reversibility and irreversibility- Cause of irreversibility- Carnot cycle- Heat engines and heat pumps- Carnot efficiency- Clasius theorem- Clasius inequality- Concept of entropy-Principles of increase of entropy- Entropy and disorder.

Air Standard Cycles

Only P-V and T-S diagrams along with air standard efficiencies of Otto cycle, Diesel cycle, Dual combustion cycle, Comparison of Otto-Diesel and Dual cycles based on same compression ratio- same maximum pressure and same maximum temperature.

General Relations, Availability and Unavailability

Helmholtz function and Gibbs function, Maxwell's equations- Tds relations, relation between specific heats, Available energy, unavailable energy, Available and unavailable forms of energy for a flow and non-flow process.

Gases and Vapour Mixtures –

Daltons law and Gibbs-Dalton law, Volumetric Analysis of gas mixtures, Apparent molecular weight and gas constant, specific heats of gas mixture, Adaibatic mixing of perfect gases, Gas and vapour mixtures.

Course Outcomes for Second Year First Semester Course	
Course Code: B16 ME 2102	
Course Title: Thermodynamics	
CO-1	Students realize the practical importance of ideal gas theory and the use of real gases in combustion engines such as IC Engines and Gas turbines
CO-2	Students are able to calculate the properties of the gases such as internal energy, enthalpy and entropy.
CO-3	Students are able to estimate the losses which occur during operation of the heat engines, and their maximum possible operating efficiencies under STP conditions.
CO-4	Students can estimate the maximum work-output delivered by the heat engines and maximum work consumed by the reversed heat engines

SYLLABUS: MANUFACTURING PROCESS (B16 ME 2103)

Manufacturing concepts:
Product cycle, Job, batch and mass production, Primary and secondary manufacturing processes.

Metal Casting Process:
Principle of metal casting, Pattern: Materials, Allowances and Types, Core boxes, Moulding sands: ingredients, properties, preparation, types, Moulding tools, Sand testing, Sand moulding, Machine moulding, Core making, Melting and pouring-Classification of furnaces, Cupola furnace, pouring laddels; Element of gating system.

Special Casting Techniques:
Permanent mould casting, Pressure die casting, Centrifugal casting, Shell mold casting, Investment casting and CO_2 process, casting defects.

Metal Forming:
Hot & Cold working, Rolling, Extrusion, metal spinning, Drawing, Piercing.

Sheet Metal Forming:
Concept of spring back, Materials, tools, operations, embossing, coining, stretch forming, Progressive and Compound Dies.

Forging Processes:
Forgability, Forging Materials, Classification: smith, drop, press and machine forging, Forging tools, Forging Operations, High energy rate forming, Swaging.

Welding Processes:
Welding metallurgy, Weldability, Classification: Plastic welding (Forge, Resistance & Thermit welding), Fusion welding (Gas, Arc & Thermit welding), Solid state welding (Friction, Ultrasonic, Diffusion and Explosive welding), Soldering and Brazing, Weld defects, Weld inspection and testing.

Course Outcomes for Second Year First Semester Course	
Course Code: B16 ME 2103	
Course Title: Manufacturing Process	
CO-1	Student will be able to recognize various manufacturing materials, manufacturing process and types of productions.
CO-2	Student will be able to identify various casting processes, metal forming process and welding process.
CO-3	Student will be able to design of gating system, patterns and cores for various casting processes.
CO-4	Student will be able to apply knowledge of casting process for manufacturing of products
CO-5	Student will be able to apply knowledge of rolling, forging, extrusion for manufacturing of products.
CO-6	Student will be able to apply knowledge of welding, brazing and soldering for joining of metals

SYLLABUS: ENGINEERING MECHANICS (B16 ME 2104)

Basic Concepts:

Scalar and vector quantities- Representation vectors- Free vector force, Specification of force- Effect of force on rigid body- Free body diagram. Concurrent Forces and Parallel Forces in a Plane: Principles of statics-Resolution and Composition of forces in a plane- Equilibrium of concurrent forces in a plane- Method of projections- Equilibrium of three forces in a plane Method of moments.

Centroid & Moment of Inertia - Centroid & M.I – Arial & Mass M.I – Radius of Gyration, Parallel axis– Perpendicular axis theorem – Simple Problems.

General Case of Forces in a Plane: Resultant and equilibrium of general case of parallel forces in a plane, Statically determinate plane trusses-Method of joints and Method of sections.

Friction – Coulombs laws of dry friction – Limiting friction, Problems on Wedge friction, Belt Friction-problems.

Dynamics of Particles - Rectilinear Motion – Kinematics Problems, D-Alembert's principle, Kinetics – Problems, Work & Energy – Impulse Moment, Direct Central Impact – coefficient of restitution.

Curvilinear Motion – Projectile Motion, Moment of momentum, Work & Energy in Curvilinear motion.

Dynamics of Rigid Bodies - Rigid body rotation – Kinematics - Kinetics, Problems – Work & Energy in Rigid body rotation, Plane Motion – Kinematics, Problem – Instantaneous center of rotation, work-energy principle in plane motion

Course Outcomes for Second Year First Semester Course	
Course Code:B16 ME 2104	
Course Title: ENGINEERING MECHANICS	
CO-1	Usescalarandvectoranalyticaltechniquesforanalyzingforcesinstaticallydeterminatestructures.
CO-2	Applyfundamentalconceptsofkinematicsandkineticsofparticlestotheanalysisofsimple,practical problems.
CO-3	Applybasicknowledgeof maths and physics tosolve real-world problems

SYLLABUS: MECHANICAL ENGINEERING DRAWING (B16 ME 2105)

Screw threads, Screw Fastenings, keys, and Riveted joints using standard Empirical formulae.

Cotter-joints, Shaft couplings: Box and split muff couplings, Flanged, Flexible, Universal and Oldham couplings, Assembly drawing of various engine components and machine tool components (Simple eccentric, swivel bearing, plumber block, Screw Jack, Stuffing Box).

Conventional representations, Limits, Fits and Tolerances, Geometrical Tolerances, Indication of surface roughness, Production Drawings.

Course Outcomes for Second Year First Semester Course	
Course Code:B16 ME 2105	
Course Title: MECHANICAL ENGINEERING DRAWING	
CO-1	KnowdrawingofScrewthreadsandScrewFasteningsusingstandardEmpiricalformulae.
CO-2	DrawRivetedjoints,Keys,Cotterjoint,DrawCouplings(Shaftcouplings:Boxandsplitmuffcouplings,Flanged,Flexible, UniversalandOldham couplings).
CO-3	Drawthedimensionalandgeometricaltolerancesandsurfaceroughnesssymbols.
CO-4	Draw Assembly and production drawings of various engine components and machine toolcomponents.

SYLLABUS: MECHANICAL ENGINEERING LAB (B16 ME 2107)

LIST OF EXPERIMENTS

1. Study and valve timing diagrams for four-stroke and study & PTD of two-stroke engines.
2. Determination of volumetric efficiency of the given air compressor by (i) plate orifice method and (ii) tank capacity method.
3. Calibration of the given pressure gauge.
4. Determination of flash and fire points and b) Canradsons carbon residue test.
5. Determination of calorific value of flues (solid, liquid and gaseous) by Bomb calorimeter/Gas calorimeter.
6. Determination of the kinematic and absolute viscosity of the given sample oils.
7. Determination of inertia of the given flywheel and connecting rod.
8. Determination of modulus of rigidity of the given wire with torsion pendulum.
9. Study of boilers, various mountings and accessories.
10. Assembling of the given two-stroke petrol engine. (Instead of engine, any mechanical unit can be given for this experiment.)

Course Outcomes for Second Year First Semester Course	
Course Code: B16 ME 2107	
Course Title: Mechanical Engineering Lab	
CO-1	Students are now aware of the use of drawing valve timing diagrams of an engine and method to evaluate the volumetric efficiency of air compressor.
CO-2	They are also aware of method of calibrating pressure gauge, the importance of flash and fire points and calorific values of fuels.
CO-3	The importance and application by calculating viscosities of oil samples are understood.
CO-4	The use of moment of inertia and modulus of rigidity is understood.
CO-5	They are also now able to identify the parts of boiler and engines etc.

SYLLABUS: MECHANICS OF SOLIDS LAB (B16 CE 2108)

LIST OF EXPERIMENTS:

1. To study the stress strain characteristics (tension and compression) of metals by using UTM.
2. To study the stress strain characteristics of metals by using Hounsefield Tensometer.
3. Determination of compression strength of wood.
4. Determination of hardness using different hardness testing machines-Brinnels, Vickers and Rockwell"s.
5. Impact test by using Izod and Charpy methods.
6. Deflection test on beams using UTM.
7. Tension shear test on M.S. Rods.
8. To find stiffness and modulus of rigidity by conducting compression tests on springs.
9. Torsion tests on circular shafts.
10. Bulking of sand.
11. Punch shear test, hardness test and compression test by using Hounsefield tensometer.
12. Sieve Analysis and determination of fineness number.

Course Outcomes for Second Year First Semester Course	
Course Code: B16 ME 2108	
Course Title: AutoCAD	
CO-1	AutoCADscreenandvariousToolbarsandmenusandExplainaboutDimensioningandHatching
CO-2	Drawthe2D–drawingslikeknucklejoint,screwjack,flangecoupling,lathetoolpost,eccentricetc.,
CO-3	Explainabout3D solidsand solidstoolbar optionsandDrawingof 3D–componentslikebolt&nut, screw jack
CO-4	Renderingof3Dimages

ENGLISH PROFICIENCY (B16 ENG 2104)

(Common to All Branches)

Speaking Skills

PPT

Describing event/place/thing Picture Description Extempore

Debate Telephonic Skills

Analyzing Proverbs

Vocabulary

Affixes

Pairs of Words

Reading Skills

Reading Comprehension Reading/Summarizing News Paper Artic

Writing Skills Designing Posters Essay writing Resume Writing

Course Outcomes for Second Year First Semester Course	
Course Code: B16 ENG 2104	
Course Title: English Proficiency	
CO-1	Students enhance their vocabulary and use it in the relevant contexts .
CO-2	They improve speaking skills.
CO-3	They learn and practice the skills of composition writing.
CO-4	They enhance their reading and understanding of different texts.
CO-5	They enrich their communication both in formal and informalcontexts.
CO-6	They strengthen their confidence in presentation skills

SYLLABUS: Auto CAD (B16 ME 2108)

LIST OF EXERCISES

1. Study the Auto CAD screen, various toolbars and menus
2. Exercises on usage of Draw and modify tool bar.
3. Exercises on mirror, rotate, array and move commands
4. Exercises on dimension and hatching
5. Draw the 2D knuckle joint with full details & dimensioning
6. Draw the screw jack 2D drawing
7. Study the 3D solids (primitives) and solids tool bar options
8. Draw bolt and nut in 3D
9. Draw various parts of screw jack in assemble them as 3D component
10. Render the 3D images already generated and apply materials and light.

(Note: Total Marks will be evaluated based on Continuous Evaluation - 25 Marks, Design Contest -25 Marks)

Course Outcomes for Second Year First Semester Course	
Course Code: B16 ME 2108	
Course Title: AutoCAD	
CO-1	AutoCADscreenandvariousToolbarsandmenusandExplainaboutDimensioningandHatching
CO-2	Drawthe2D–drawingslikeknucklejoint,screwjack,flangecoupling,lathetoolpost,eccentricetc.,
CO-3	Explainabout3D solidsand solidstoolbar optionsandDrawingof 3D–componentslikebolt&nut, screw jack
CO-4	Renderingof3Dimages

SYLLABUS: ADVANCED STRENGTH OF MATERIALS (B16 ME 2201)

Fixed Beams:

Fixing moments for a fixed beam of uniform and variable sections, Effect of sinking support, slope and deflection.

Continuous beams:

Analysis of continuous beam, Reactions at the supports, Effect of sinking of supports.

Columns and Struts:

Columns with one end free and the other fixed, Both ends fixed, One end fixed and other hinged, Limitation of Euler's formula, Column carrying eccentric load, Empirical formulae.

Bending of Curved Bars:

Stresses in bars of circular, rectangular and trapezoidal sections.

Stresses due to rotation:

Wheel rim, disc of uniform thickness, disc of uniform strength.

Thick cylinders subjected to internal and external pressure and compound cylinders.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 ME 2201	
Course Title: ADVANCED STRENGTH OF MATERIALS	
CO-1	Studentsareableto evaluate thestressesacrossthecross-sections ofthecurvedbeam.
CO-2	Calculatetheradialstressandcircumferentialstressforrotatingcirculardisc(bothhollowandsolid) ofuniform thickness
CO-3	Modelingthethicknessof circularrotatingdisc havinguniformstrength
CO-4	Calculatetheradialandcircumferentialstressforboththickandcompoundcylindersunderdifferent pressurized conditions
CO-5	Evaluatethedeflectionandslopeofsimplysupportedbeamsandcantileverbeamsusingdifferentenergymet hods

SYLLABUS: THERMAL ENGINEERING (B16 ME 2202)

Properties of Pure Substance:

Definition of pure substance, phase change of a pure substance, p-T (Pressure-Temperature) diagram for a pure substance, p-V-T(Pressure-Volume-Temperature) surface, phase change terminology and definitions, property Diagrams in common use, Formation of steam, Important terms relating to steam formation, Thermodynamic properties of steam and steam tables, External work done during evaporation, Internal latent heat, Internal energy of steam, Entropy of water, Entropy of evaporation, Entropy of wet steam, Entropy of superheated steam, Enthalpy-Entropy (h-s) charts for Mollier diagram, Determination of dryness fraction- Tank or bucket calorimeter, throttling calorimeter, separating and throttling calorimeter.

Vapor Power Cycles

Vapor power cycle- Rankine cycle- Reheat cycle- Regenerative cycle- Thermodynamic variables effecting efficiency and output of Rankine and Regenerative cycles- Improvements of efficiency, Binary vapor power cycle.

Steam Nozzles:

Type of nozzles- Flow through nozzles- Condition for maximum discharge- Nozzle efficiency- Super saturated flow in nozzles- Relationship between area velocity and pressure in nozzle flow- Steam injectors.

Steam Turbines:

Classification of steam turbines- Impulse turbine and reaction turbine- Compounding in turbines- Velocity diagrams in impulse and reaction turbines- Degree of reaction- Condition for maximum efficiency of reaction turbines- Effect of friction on turbines constructional features governing of turbines.

Condensers:

Classification of condenser- Jet, Evaporative and surface condensers- Vacuum and its measurement- Vacuum efficiency- Sources of air leakage in condensers- Condenser efficiency- Daltons law of partial pressures- Determination of mass of cooling water- Air pumps.

Steam Boilers –

Working principle of various boilers their accessories and mountings (Simple vertical, Cochran, Babcock & Wilcox and Lancashire Boiler), Performance of boilers (simple problems)

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 ME 2202	
Course Title: Thermal Engineering	
CO-1	The student gets complete knowledge of steam and its properties.
CO-2	The student learns the complete calculation procedures for designing steam turbines, steam condensers, nozzles etc. used in thermal power plants, steam engines, water turbines and many other industrial applications.
CO-3	The student is prepared to work in industry immediately after his course

SYLLABUS: METAL CUTTING & MACHINE TOOLS (B16 ME 2203)

Mechanics of Metal Cutting:

Orthogonal and oblique cutting, mechanics of chip formation, types of chips; classification, nomenclature, signature (ASA & ISO systems) of single point cutting tools, tool materials; tool wear and tool life; Cutting forces-Merchant's circle, Machinability, Cutting fluids.

Machine tools using Single point cutting tools:

Engine lathe; Capstan and turret lathe, shaper, planner, Slotter and boring-Types, Parts, Specifications, Mechanisms, Operations and machining parameters.

Machine tools using Multi point cutting tools:

Drilling machine-Types, Parts, Specifications, Mechanisms, Types of drills, Nomenclatures of twist drill, Operations and machining parameters

Milling machine-Types, Parts, Specifications, Mechanisms, Attachments, Types of Milling cutters, Nomenclature of plain milling cutter, Operations, machining parameters and Indexing methods.

Broaching machine-Types, Parts, Specifications, Types of Broaches, Nomenclature of pull broach, Operations and machining parameters

Machine tools using Abrasive wheels:

Grinding Machine- Types, Parts, Specifications, Manufacturing of grinding wheel-bonding processes, grit, grade and structure, selection of grinding wheels, mounting of grinding wheels, glazing, loading, dressing and truing of grinding wheel, Operations and machining parameters

Micro finishing Operations-Lapping, honing, super finishing, polishing and buffing

Unconventional Methods of Machining:

Process, Characteristics, Advantages, Limitations, Applications of Abrasive Jet Machining (AJM), Ultrasonic Machining (USM), Water Jet Machining (WJM), Electro Discharge Machining (EDM), Wire-cut EDM, Electron Beam Machining (EBM), Plasma Arc Machining (PAM), Laser Beam Machining (LBM), Chemical milling; Photochemical milling, Electro Chemical Machining (ECM), Electro Chemical Grinding (ECG)

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 ME 2203	
Course Title: Metal Cutting & Machine Tools	
CO-1	Students will be able to describe the mechanisms of metal cutting.
CO-2	Students will be able to calculate cutting forces, tool life and machining parameters.
CO-3	Students will be able to design the single point and multi-point cutting tools.
CO-4	Students will be able to demonstrate the working of various machine tools like lathe, milling machine and grinding machine etc.
CO-5	Students will be able to identify different micro finishing operations.
CO-6	Students will be able to assess the advantages, limitations and applications of unconventional methods of machining.

SYLLABUS: ENGINEERING ECONOMICS (B16 ENG 2202)

Introduction to Economics and Demand Analysis:

Definition of economics; Micro and Macro Economics. Demand-Law of Demand; Elasticity of Demand – Measurement of elasticity of demand and types of elasticity of demand.

Economic Systems and Factors of Production:

Economic Systems – Capitalism, Socialism and mixed Economy. Factors of Production – Classification of Factors of Production – Meaning and characteristics of land, labor, capital and organization.

Markets:

Perfect Competition – features and price determination under perfect competition; Imperfect Competition-Monopoly, Monopolistic Competition. Duopoly and Oligopoly (in brief).

Business Cycles (trade Cycles) and Inflation:

Business Cycles – Meaning, phases of Business Cycle, causes and consequences of Business Cycle: Inflation – types, causes and effects of Inflation.

Cost classification and Break-even Analysis:

Costs – Classification of Costs, Elements of Cost. Components of Total Cost: Methods of costing – Job Costing, process costing and unit costing. Break-even Analysis-determination of Break-even point and application of Break-even Analysis.

Forms of Business Organizations:

Sole Proprietorship, Partnership, Co-operative Society, Joint Stock Company (Private and Public Ltd) – Features, Merits and Demerits. Public enterprises and their types.

Depreciation and Financial Accounting:

Depreciation – Causes and Methods of Depreciation. Financial Accounting – Preparation of Trading Account, Profit & Loss Account and Balance Sheet of a Sole Proprietor.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 ENG2202	
Course Title: ENGINEERING ECONOMICS	
CO-1	Awarenessabouthowresourcesshouldbeallocatedandutilizedefficientlyandtypesofdemand.
CO-2	Determinetypesofeconomicsystemswiththeirrespectivepros&consandhowfactorsofproduction will help engineers to achieve their goals.
CO-3	Develop the capability to understanddifferentmarketstructuresand actaccordingly.
CO-4	Understand thestagesof businesscyclesandcausesandeffectsofinflation.
CO-5	Examinethenatureofcostandlearnhowtoconstructabreak-evencharttoknownoprofit– no loss point.
CO-6	Evaluateforms ofbusiness organizationalongwiththeirprosand cons.
CO-7	Constructafinancialstatementtoknowthefinancialpositionandcalculationofdepreciationbyusingdifferent methods.

SYLLABUS: BASIC ELECTRICAL & ELECTRONICS ENGINEERING (B16 EE 2204)

Electrical And Magnetic Circuits:

Basic definitions, Types of network elements, Ohms Law, Kirchhoffs Laws, series and parallel circuits and star-delta and delta-star transformations-simple problems.

Magnetic flux, MMF, Reluctance, Faradays laws, Lenzs Law, statically induced emf, dynamically induced emf, Hysteresis.

DC Machines:

Principal of operation of DC generation- EMF equation-Types-DC motor Types-Torque equation-Applications-Swinburne‟s Test, Speed control methods.

Transformers:

Principal of operation of Single phase Transformers- EMF equation-losses-Efficiency and Regulation.

AC Machines:

Principal of operation of three phase Induction motor-Slip-Torque characteristics-Efficiency- applications-Principal of operation of Alternators-EMF equation, regulation of alternator by synchronous impedance method.

Diodes & Rectifers: PN junction diode-Forward bias and reverse bias operation, V-I characteristics-Diode applications (Half wave, Full wave and bridge rectifier), Zener diode.

Transistors: PNP and NPN junction Transistors, Transistor as an amplifier, single stage CE amplifier, Frequency response of CE amplifier.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 EE 2204	
Course Title: BASIC ELECTRICAL&ELECTRONICS ENGINEERING	
CO-1	Abletoanalyzethe variousElectricalnetworks.
CO-2	Abletounderstand thebasicsofMagneticCircuits.
CO-3	AbletounderstandtheoperationofDCgenerators,3-PointstarterandconducttheSwinburne‟stest.
CO-4	AbletoanalyzethePerformanceofTransformers.
CO-5	Abletoexplain theoperationofthreephaseinductionmotors andalternator.
CO-6	AbletoanalyzetheoperationofHalf-waveandFull-waverectifiers.
CO-7	Abletoexplainthe operationofsingle stageCEamplifier.

SYLLABUS:MANUFACTURING PROCESS LAB(B16 ME 2205)

LIST OF EXPERIMENTS

1. Use of basic tools and operations of the following trades

S.No.	Trade/Machine	No. of exercises
1	Moulding	3
2	Welding	3
3	Lathe Machine	3
4	Milling Machine	1
5	Shaping Machine	1

2. Moulding sand testing (Not for examination only for demonstration purpose)
3. Forging (Not for examination only for demonstration purpose)

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 ME 2205	
Course Title: Manufacturing Process Lab	
CO-1	Student will be able to prepare moulds for a given component.
CO-2	Student will be able to apply the knowledge of arc welding to join two metal pieces.
CO-3	Student will be able to practice plain turning, facing, step turning, taper turning, and thread cutting operations on the lathe machine.
CO-4	Student will be able to generate horizontal, vertical and angular surfaces on a given work piece using shaper.
CO-5	Student will be able to generate spur gear on milling machine.
CO-6	Student will be able to demonstrate Capstan and Turret lathe, cylindrical grinder and surface grinding machine.

SYLLABUS: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB (B16 EE 2206)

LIST OF EXPERIMENTS

Part-A: Electrical Engineering

1. Verification of KCL and KVL
2. Verification of Ohms law (draw the V-I characteristics for a particular resistor)
3. Swinburne test on D.C shunt Machine (predetermination of efficiency when working as motor and generator)
4. Brake test on D.C shunt motor. (determination of performance characteristics)
5. Brake test on D.C series motor. (determination of performance characteristics)
6. Brake test on three phase induction motor.(determination of performance characteristics)
7. Speed control of D.C shunt by (a) Armature voltage control (b) Field flux control Method.
8. OC and SC test on single phase Transformer (predetermination of efficiency and regulation at given power factor).

Part- B: Electronics Engineering

1. PN junction Diode Characteristics (a) Forward bias (b) Reverse bias. (cut in voltage and resistance calculations)
2. Half wave rectifier with and without filters.
3. Full wave rectifier with and without filters.
4. Transistor CE characteristics (Input and Output)
5. Characteristics CE amplifier
6. Zener diode characteristics
7. Regulation characteristics of Zener diode.

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 EE 2206	
Course Title: BASIC ELECTRICAL AND ELECTRONICSENGINEERINGLAB	
CO-1	Distinguish various machining operations on Lathe, Shaper and Milling.
CO-2	Analyze the shear angle, tool tip temperature and surface roughness by applying the knowledgeofmetal cutting.

INDUSTRY ORIENTED TECHNOLOGY LAB (B16 ME 2206)

CATIA

LIST OF EXERCISES

1. Study the CATIA CAD screen, various toolbars and menus
2. Exercises on usage of Draw and modify tool bar.
3. Exercises on mirror, rotate, array and move commands
4. Exercises on dimension and hatching
5. Draw the 2D knuckle joint with full details & dimensioning
6. Draw the screw jack 2D drawing
7. Study the 3D solids (primitives) and solids tool bar options
8. Draw bolt and nut in 3D
9. Draw various parts of screw jack in assemble them as 3D component
10. Render the 3D images already generated and apply materials and light.

(Note: Total Marks will be evaluated based on Continuous Evaluation - 25 Marks, Record/Report-10 Marks, Exam-10 Marks and Attendance-5 Marks)

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 ME 2206	
Course Title: INDUSTRYORIENTED TECHNOLOGY LAB	
CO-1	CATIAscreenandvariousToolbarsandmenusandExplainaboutDimensioningandHatching
CO-2	Drawthe2D–drawingslikeknucklejoint,screw jack, flange coupling, lathetoolpost, eccentricetc.,
CO-3	Explainabout3D solids and solids toolbar options and Drawing of 3D–components like bolt&nut, screw jack.
CO-4	Renderingof3Dimages

SYLLABUS: OPERATIONS RESEARCH (B16 ME 3101)

Introduction to OR: Definition of OR, Characteristics and phases of OR, Scope of OR, OR Models, General Methods for Solving OR Models, Role of Computers in OR.

Linear Programming: Formulation, Graphical Solution, Simplex Method, Artificial Variable Technique – Big M method, Duality.

Transportation Model: Mathematical Formulation, Tabular Representation, Balanced and unbalanced transportation Problems - Initial Solution by VAM and Optimality test by MODI Method, Degeneracy in TP.

Assignment Model: Mathematical Formulation, Hungarian Algorithm, Balanced and unbalanced Assignment Problems, Travelling Salesman Problem.

Job Sequencing: Introduction, Assumptions, Johnson's Algorithm for Sequencing n - jobs through 2 machines, Problem with n- jobs and 3 machines, Problems with n - jobs and m - machines, Graphical Solution for 2 - Jobs and m - machines problem.

Inventory Models: Definition of inventory, costs associated with inventory problems, classification of inventory models, Deterministic inventory models - EOQ model without and with shortages, Production inventory model without and with shortages, Inventory models with price - breaks.

Games Theory: Introduction, Basic definitions, Two - Person zero - sum games - Minimax (maximin) criterion, saddle point, value of a game, Solution of games with Saddle point, Mixed strategy games - Arithmetic method for (2 x 2) games, Dominance principle to reduce size of game, solution of (2 x n) and (m x 2) games, Algebraic Solution to rectangular games.

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Queuing Models: Structure of queuing models, characteristics of Queuing process, Kendall's notation, Single channel systems - (M/M/1: /FIFO) model and (M/M/1:N/FIFO) model.

Network Analysis: Introduction, Project Scheduling by CPM and PERT, Network diagram representation, rules for drawing network diagram, Labeling by Fulkerson's rule, Network calculations - EST, EFT, LST, LFT, Float/Slack and critical path, PERT calculations.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 ME 3101	
Course Title: Operations Research	
CO-1	Findthebestuseofanorganization'sresources.
CO-2	Designanoptimumdistributionscheduleofproductsfromdifferentsourcestodifferentdestinations.
CO-3	Allocatevariousresources tovariousactivities onaonetoonebasis.
CO-4	Assigna rightjob toarightperson usingjobsequencing.
CO-5	Designoptimumschedulesforprojects.
CO-6	Makerightdecisionsandstrategiesinoperationsmanagementusinggametheoryandqueuingtheory.
CO-7	Defineoptimum inventorypolicies suitableto agiven situation.

SYLLABUS: FLUID MECHANICS (B16ME3102)

Properties of fluids- Introduction-Viscosity- Pressure and its measurement, Absolute, Gauge, Atmospheric and Vacuum pressure – Manometers, Simple manometers, Differential manometers. Hydrostatic forces on surfaces-Total Pressure and Pressure Centre- Vertical, Horizontal, inclined and Curved plane surfaces submerged in liquid-Buoyancy and Floatation.

Fluid Kinematics & Fluid Dynamics: Types of fluid flow- Continuity equation- Velocity potential function and Stream Function- Types of Motion, Linear Translation, Linear deformation, Angular deformation, Rotation, Vorticity and circulation-Vortex flow, forced and Free Vortex – Equation of Motion- Euler's equation - Bernoulli's equation and its applications- Venturimeter, Orifice Meter, Pitot tube-Momentum Equation-Momentum of momentum Equation.

Viscous Flow: Favourable pressure gradient and adverse pressure gradient-Power absorbed in Viscous Flow- Flow through pipes & Plates,- Hagen Poiseulle flow- Darcy's Weisbach friction factor- Loss of head due to friction in pipes, Minor Losses and Major losses - Flow through branched pipes- Power transmission through pipes-.

Dimensional and Modeling Analysis: Fundamental and derived dimensions- Dimensionless groups- Rayleigh method- Buckingham □-theorem- Model Analysis - Types of similarity- Geometric, Kinematic and Dynamic similarities- Dimensionless numbers- Modal Laws.

Laminar Boundary Layer: Definition**-** Laminar Boundary Layer- **Turbulent Boundary Layer** -Laminar Sub layer- Boundary Layer thickness-Displacement thickness, Momentum thickness and Energy thickness-Momentum integral equation- Flow over a flat plate.

Turbulent Boundary Layer: Laminar- Turbulent transition- Momentum equations and Renold's stresses- Fully developed turbulent flow through a pipe- Turbulent boundary layer on a flat plate- Laminar sub-layer- Boundary layer separation and control.

Compressible Fluid Flow: Thermodynamic relations- Continuity, Momentum and Energy equations- Velocity of sound in a compressible fluid- Mach number and its significance- Limits of incompressibility- Pressure field due to a moving source of disturbance- Propagation of pressure waves in a compressible fluids- Stagnation properties-Stagnation pressure, Temperature and density- Area velocity relationship for compressible flow

Course Outcomes for Third Year First Semester Course	
Course Code: B16 ME 3102	
Course Title: FLUIDMECHANICS	
CO-1	Apply the Bernoulli equation to solve problems in fluid mechanics.
CO-2	Apply the concepts of momentum equation for finding the forces acting on the vanes of the turbines.
CO-3	Apply control volume analysis to problems in fluid mechanics.
CO-4	Apply potential flow theory to solve problems in fluid mechanics.
CO-5	Identifytherecentdevelopmentsinfluidmechanics,withapplicationtoaerospacesystems

SYLLABUS: IC ENGINES & GAS TURBINES (B16ME3103)

I.C. engines: classification-comparison of two stroke and four stroke engines- comparison of S.I. and C.I. engines-Air cycles-Otto, Diesel, Dual, Stirling, Ericson and Atkinson cycles and their analysis Valve timing and port timing diagrams- Efficiencies- air standard efficiency, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency, volumetric efficiency and relative efficiency-Testing and performances of I.C. engines-Basic principles of carburetion and fuel injection.

Combustion in S.I. Engines- Normal combustion and abnormal combustion Importance of flame speed and effect of engine variables-types of abnormal combustion pre-ignition and knock, Fuel requirements and fuel rating, anti-knock additions- Combustion chamber requirements and Types of combustion chamber- Design principles of combustion chambers.

Combustion in C.I. Engines- Stages of combustion- Delay period and its importance- effect of engine variables, diesel knock, suction compression and combustion induced turbulence, open and divided combustion chambers.

Reciprocating Compressors: Reciprocating compressors-effect of clearance in compressors, volumetric efficiency-single stage and multi stage compressors-effect of inter cooling in multi stage compressors.

Rotary Compressors: Classification- Roots blower- Vane type blower-centrifugal compressor- Adiabatic efficiency- Diffuser - Axial flow compressors- Velocity diagrams, degree of reaction, performance characteristics.

Gas Turbines: Simple gas turbine plant- Ideal cycle, closed cycle and open cycle for gas turbines Efficiency, work ratio and optimum pressure ratio for simple gas turbine cycle- Parameters of performance- Actual cycle, regeneration, Inter-cooling and reheating, closed and semi-closed cycle, Jet propulsion and Rockets.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 ME 3103	
Course Title: IC ENGINES &GAS TURBINES	
CO-1	Applytheknowledgeof gaspower cycles adequatelyandcancalculatetheir efficiencies.
CO-2	Explainthe processes involvedin combustion in S.IEngines.
CO-3	Explaintheprocesses involvedincombustion inC.IEngines.
CO-4	Applythe knowledgeofreciprocatingcompressors inengineeringapplications.
CO-5	Calculatetheperformanceofrotarycompressorsinvarious engineeringapplications.
CO-6	Computeanddevelopvariousmethodstoimprovetheefficiencyofgasturbinepowerplants,and can explain jet propulsions.

SYLLABUS: INDUSTRIAL MEASUREMENTS & METROLOGY (B16ME3104)

Instrumentations: Concepts of measurements, static performance, characteristics accuracy of measurement and its analysis. Instrumentation, for measurement: Force, torque, strain. pressure, flow, Temperature and vibration.

Optical Methods of Measurement: Introduction, Laser beam as a light pointer, length/displacement measurement, temperature sensors, seismographic measurement.
Introduction to fiber optics, fiber types, properties of optical fibres and a fibre optic sensor configuration.

ISO system of limits, Fits and Tolerances, Interchangeability, Plain limit gauges, Measurement of screw threads, major diameters, Minor diameters and effective diameter, Pitch, Limit gauges for internal and external threads, Measurement of spur gears, pitch, profile, lead, backlash, tooth thickness.

Tool maker's microscope, Straightness measurement, Slip gauges, Twisted strip mechanical comparator, Optical lever comparator, Optical projector, Electric comparator, Pneumatic comparator, Squareness testing, Optical bevel protractor, Sine bar, Angle gauges, Precision level, Autocollimeter, Angle dekkor, Optical dividing heads and rotary tables, Flatness measurement, Roundness measurement.co-ordinate measuring machines.

Surface texture: Parameters, sampling length, Specification, Stylus instruments for surface roughness measurement. Acceptance tests on machine tools: Lathe, Milling machine, Radial drilling machine, laser equipment

Course Outcomes for Third Year First Semester Course	
Course Code: B16 ME 3104	
Course Title: INDUSTRIALMEASUREMENTS & METROLOGY	
CO-1	identifytheuncertaintiesindimensionalmetrologyandthedefinethemeasurementstandards;
CO-2	Describe the fundamentals of dimensional and geometrical tolerances;
CO-3	measurelengthandanglesusingline-graduatedinstruments,i.e.verniercalipers,micrometers,bevel protractor, sine bar and surface plates;
CO-4	use comparative length-measuring instruments, i.e. dial indicator, to measure variations in the distance between two or more surfaces;
CO-5	useeffectivemethodsofmeasuringstraightness,flatness,roundness,profile,screwthreadsandgear teeth;
CO-6	measuredimensionsofshafts,bearingsandlinearsurfacesinmetricandimperialunitsusingcalibers, micrometers, and scales;
CO-7	usecontourprojectorandcoordinatemeasuringmachinetorecordmeasurementsofcomplexprofiles with high sensitivity;
CO-8	usegageblocks,fixedgages,pneumaticgagesgageblockstomeasurevariousworkpieces;
CO-9	Explain the effect of environmental conditions on the accuracy of measurements;
CO-10	demonstratethecorrectmethodsforadjustmentandcalibrationofvariousmeasuringinstruments;
CO-11	Usappropriatemethodfordeterminationofaccuracybasedonproductfunctionandmanufacturingcapability.

SYLLABUS: KINEMATICS OF MACHINES (B16 ME 3105)

Mechanisms and Machines: Introduction; Mechanism and machine; Rigid and resistant bodies; Link; Kinematic pair; Degrees of freedom; Classification of kinematic pairs; Kinematic chain; Linkage, mechanism and structure; Mobility of mechanisms; The four-bar chain; Mechanical advantage; Transmission angle; The slider-crank chain; Double slider- crank chain; Miscellaneous mechanisms.

Velocity Analysis: Introduction; Absolute and relative motions; Vectors; Additional and subtraction of vectors; Motion of a link; Four-link mechanism; Velocity images; Angular velocity of links; Velocity of rubbing; Slider-crank mechanism; Crank and slotted lever mechanism; Algebraic methods; Instantaneous center (I-center); Kennedy‘s theorem; Locating I-centers; Angular velocity ratio theorem; centrode.

Acceleration Analysis: Introduction; Acceleration; Four-link mechanism; Four-link mechanism; Acceleration of intermediate and offset points; Slider-crank mechanism; Corriolis acceleration component; Crank and slotted lever mechanism; Algebraic methods; Klein‘s construction; Velocity and acceleration from displacement-time curve.

Lower Pairs: Introduction; Pantograph; Straight line mechanisms; Engine indicators; Automobile steering gears; Types of steering gears; Hooke‘s joint; Double Hooke‘s joint.

Friction: Introduction; Kinds of friction; Laws of friction; Coefficient of friction; Inclined plane; Screw threads; Wedge; Pivots and collars; Friction clutches; Rolling friction; Antifriction bearings; Greasy friction; Film friction; Mitchell thrust bearing.

Dynamic Force Analysis: Introduction; D‘Alembert‘s principle; Equivalent offset inertia force; Dynamic analysis of four-link mechanism; Dynamic analysis of slider-crank mechanism; Velocity and acceleration of piston; Angular velocity and angular acceleration of connecting rod; Turning moment on crankshaft; Turning-moment diagrams; Fluctuations of energy; Flywheels.

Governors: Introduction; Types of governors; Wait governor (simple conical governor); Portor governor; Proell governor; Hartnell governor; Hartung governor; Wilson-Hartnell governor (radial-spring governor); Pickering governor; Spring-controlled gravity governor; Inertia governor; Sensitiveness of a governor; Hunting; Isochronism; Stability; Effort of a governor; Controlling force.

Course Outcomes for Third Year First Semester Course	
Course Code:B16 ME 3105	
Course Title: KINEMATICS OF MACHINES	
CO-1	Understandthebasicprinciplesofmechanismsinmechanicalengineeringapplications
CO-2	Apply kinematic and dynamic analysis of various machine components
CO-3	Understandtheturningmomentdiagramsandflywheelinvariousapplications
CO-4	Understand the importance of governors,bearings,clutches and their applications
CO-5	Analyze the effect of in Certiain mechanism and in ertia torque

SYLLABUS: FINITE ELEMENT ANALYSIS (B16ME3106)
(Elective-I)

Introduction: stress and equilibrium, strain – displacement relations, stress – strain relations, plane stress and plane strain conditions, The potential energy approach; Rayleigh-Ritz method Finite Element Method: Discretization, Types of elements, band width, node numbering, interpolation functions, local and global coordinates, convergence requirements, Types of boundary conditions, Steps in Finite Element Method, Applications of Finite Element Method .

One Dimensional Bar Problems: 1-D bar element - shape functions – Stiffness matrix and load vector– assembly of Matrices – Treatment of boundary conditions One dimensional quadratic element.

Trusses: Introduction; Plane trusses; shape functions – Stiffness matrix and load vector– assembly of Matrices – Treatment of boundary conditions; simple problems on trusses.

Analysis of Beams: Beam Element - Shape functions and Element stiffness matrix, load vector for concentrated and Uniformly Distributed Load, simple problems on beams.

Two Dimensional Problems: Finite element modeling of two dimensional Problems - constant strain triangle Element - treatment of boundary conditions 2D four noded iso parametric element, numerical integration , Gaussian Quadrature Approach.

Axisymmetric Solids Subjected to Axisymmetric Loading: Introduction; Axisymmetric formulation; Finite element modeling - triangular element; Problem modeling and boundary conditions.

Course Outcomes for Third Year First Semester Course	
Course Code:B16 ME 3106	
Course Title: FINITE ELEMENT ANALYSIS	
CO-1	Understandtheprinciplesandconceptsrelatedtofiniteelementmethods.
CO-2	Implementfiniteelementmethodsforsimpleanalysisof1-Dproblemssuchasbar,truss and beam either by hand calculation or by programming.
CO-3	Numerically solve for deformation, stresses and strains of a structural component subjected to axial and bending loads.
CO-4	Usecommercialsoftwarepackagetoperformstructuralanalysisandareabletoconductengineeringdesign.

SYLLABUS: AUTOMATION IN MANUFACTURING (B16 ME 3107)

(Elective-I)

Overview of Manufacturing and Automation: Production systems, automation in production systems, automation principles and strategies, manufacturing operations, production facilities, basic elements of an automated system, levels of automation, hardware components for automation and process control, programmable logic controllers and personal computers.

Material Handling and Identification Technologies: Material handling, equipment, analysis, storage systems, performance and location strategies. Automated storage systems, AS/RS, types, automatic identification methods, Barcode technology, RFID.

Manufacturing Systems and Automated Production Lines: Manufacturing systems- components of a manufacturing system, single station manufacturing cells; manual assembly lines, line balancing algorithms, mixed model assembly lines, alternative assembly systems, automated production lines, applications, analysis of transfer lines.

Automated Assembly Systems: Fundamentals, analysis of assembly systems, cellular manufacturing, part families, coding and production flow analysis, group technology and flexible manufacturing systems, quantitative Analysis.

Quality Control and Support Systems: Quality in design and manufacturing, inspection principles and strategies, automated inspection, contact vs non-contact, CMM, manufacturing support systems, quality function deployment, computer aided process planning, concurrent engineering, shop floor control, just in time and lean production.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 ME 3107	
Course Title: AUTOMATION IN MANUFACTURING	
CO-1	Understandthebasicprinciplesofautomationanditscomponentswhichareimplementedinproduction systems.
CO-2	Identifytheimportanceofmaterialhandlingandvariousautomaticidentificationmethodsusedin production systems.
CO-3	Understandthecomponentsofmanufacturingsystemsanddifferentproductionlines.
CO-4	Understandcellularmanufacturing,formingpartfamilies,grouptechnologyandtheirinvolvementin flexiblemanufacturingsystems.
CO-5	UnderstandvariousautomatedinspectionmethodologiesandmanufacturingsupportsystemslikeCAPP, shop floor control, etc.

SYLLABUS: TOOL DESIGN (B16ME3108)

(Elective-I)

Locating and Clamping Devices: Principles of Jigs and Fixtures design-Locating principles- Locating elements-Standard parts-Clamping devices-Mechanical actuation-Pneumatic & hydraulic actuation-Analysis of clamping forces-Tolerance and error analysis.

Jigs & Fixtures: Drill bushes-Different types of Jigs-Plate latch, channel, box, post, angle plate, angular post, turnover, pot jigs- Automatic drill jigs-Rack & Pinion Operated, Air operated Jigs Components. General principles of lathe, milling and broaching fixtures- Grinding, Drilling and shaping fixtures, Assembly, Inspection and Welding fixtures-Modular fixtures. Design and development of Jigs and fixtures for simple components.

Press Tools: Press working terminology-Presses and Press accessories-Computation of capacities and tonnage requirements-Design and development of various types of cutting, forming and drawing dies. Bending dies – Introduction, bend allowance, spring back, edge bending die design. Drawing dies – Single action, double action and triple action dies, factors affecting drawing, drawing die design.

Die Casting Dies: Basic Terminology, Types of Dies: Single cavity, multicavity dies, combination dies, unit dies, advantages and disadvantages of types of dies, defects in die casting. **Injection Moulding:**Basic Terminology, Injection moulding machine and its elements, general configuration of a mould. 2 plate and 3 plate mould. Introduction to compression, transfer, blow moulding, extrusion, forming and calendaring.

Design of Limit Gauges: Elements, types and application of limit gauges, Gauge materials, their selection, Taylor‘s principles of gauge design, Types and methods to provide gauge tolerances. Design steps and design of plug & ring / snap gauge for given dimension and application.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 ME 3108	
Course Title: TOOLDESIGN	
CO-1	DesigningInjectionMouldingDiesand DieCastingDies,Jigs&Fixtures
CO-2	Designjigsand fixturesforconventionalandNC machining.
CO-3	Selectanddesignprogressive,compoundorcombinationdiesforpressworkingoperations.
CO-4	CanapplyknowledgeofdesigningLimitgauges andtheuseof gaugematerials.

SYLLABUS: NON CONVENTIONAL ENERGY RESOURCES (B16 ME 3109)

(Elective-I)

(Common to all Branches)

Introduction to Energy Sources: Energy sources and their availability-introduction, commercial or conventional energy sources, new energy technologies; renewable energy sources, prospects of renewable energy resources

Solar Energy: Solar radiation, solar constant, solar geometry, radiation measurements; orientation and different types of solar collectors, applications of solar energy.

Wind Energy: Introduction; basic principles of wind energy conversion, site selection, basic components, classification, advantages & disadvantages.

Energy from Biomass: Conversion technologies, photosynthesis, bio-gas generation, classification of biogas plants, advantages and disadvantages.

Geothermal Energy: Geothermal sources, hydrothermal resources, geopressured resources, applications, advantages and disadvantages of geothermal energy.

Energy from the Oceans: Ocean thermal electric conversion (OTEC)-methods, site selection.

Energy from Tides: Basic principle, components, site requirements advantages and limitation of tidal power generation.

Ocean Waves: Introduction, advantages & disadvantages of wave energy, energy and power from the waves, wave energy conversion devices.

Small scale hydro-electric: Introduction, nature, classification and components.

Alternate Energy Sources: MHD-generator, principles, MHD systems, advantages. Thermo electric power: Basic principles, thermo electric power generator

Thermo nuclear fusion energy: Introduction, basic nuclear fusion and reactions, requirements for nuclear fusion, advantages of nuclear fusion.

Energy conservation: Principles of energy conservation, co-generation, waste heat utilization, combined cycle power generation, heat recuperates, regenerators, heat pipes, heat pumps, renewable energy sources/devices.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 ME 3109	
Course Title: NON CONVENTIONAL ENERGY RESOURCES	
CO-1	Analyze the significance of renewable energy.
CO-2	Understand the principles of solar radiation and design the solar collectors.
CO-3	Know the functioning of basic components of wind energy and understand the utilization of biomass in power generation.
CO-4	Understand the working principles of geothermal, ocean, tidaland waveenergytechniques.
CO-5	Know the functioning of direct energy conversion techniques.

SYLLABUS: PRODUCTION PLANNING AND CONTROL(B16ME3110)

(Elective-I)

Introduction: Definition – Objectives of production Planning and Control – Functions of production planning and control – Types of production – Organization of production planning and control department.

Forecasting: Importance – Types of forecasting– Forecasting techniques – qualitative methods and quantitative methods

Inventory management: Functions of inventories – relevant inventory costs – EOQ model – Inventory control systems: Fixer order quantity system and Periodic review system - ABC analysis -VED analysis- Material Requirement Planning, Bill of material, MRP II - Master Production Scheduling.

Aggregate planning: Chase planning, Expediting, controlling aspects.

Routing: Definition – Routing procedure –Route sheets — Factors affecting routing, procedure – Difference with loading

Scheduling: Policies – Types of scheduling - Forward and Backward Scheduling – Gantt Charts – Flow shop Scheduling – n jobs and 2 machines, n jobs and 3 machines – Job shop Scheduling – 2 jobs and n machines – Line of Balance.

Dispatching: Activities of dispatcher – Dispatching procedure – follow up – priorit y rules for dispatching jobs - Applications of computer in production planning and control.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 ME 3110	
Course Title: PRODUCTION PLANNING AND CONTROL	
CO-1	Student is able to participate and can interact in real world scenario regarding production planning and production control and suggest the type of production required for specific real world requirement
CO-2	Student can undertake the responsibility of doing forecasting in real world situation is able to suggest correct forecasting method/technique for a specific real world situation and can also able to judge the suitability of the method for a real world situation depending on the error associated with the method.
CO-3	Student can understand the need of inventory control and can able to undertake activities relatingto inventory management
CO-4	The student is knowledgeable about MRP-I & II, Aggregate planning can able to implement them in real world situation.
CO-5	Student can understand and participate in the design of both forward and backward scheduling and Master scheduling and can able to evaluate different job shop scheduleswithreferenceto priority scheduling rules.

SYLLABUS: RAPID PROTOTYPING (B16ME3111)

(Elective-I)

Introduction: Need - Development of RP systems-, – RP process chain - Impact of Rapid Prototyping and Tooling on Product Development – History of RP systems and their classification- Benefits Applications – Digital prototyping - Virtual prototyping.

Liquid Based And Solid Based Rapid Prototyping Systems: Stereo lithography Apparatus, Fused deposition Modeling, Laminated object manufacturing, three dimensional printing: Working Principles, details of processes, products, materials, advantages, limitations and applications.

Powder Based Rapid Prototyping Systems: Selective Laser Sintering, Direct Metal Laser Sintering, Three Dimensional Printing, Laser Engineered Net Shaping, Selective Laser Melting, Electron Beam Melting: Processes, materials, products, advantages, applications and limitations.

Reverse Engineering And Cad Modeling

Basic concept- Digitization techniques – Model Reconstruction – Data Processing for Rapid Prototyping: CAD model preparation, Data Requirements – geometric modeling techniques: Wire frame, surface and solid modeling – data formats – Data interfacing, Part orientation and support generation, Support structure design, Model Slicing and contour data organization, direct and adaptive slicing, Tool path generation.

Rapid Tooling: Classification: Soft tooling, Production tooling, Bridge tooling; direct and indirect – Fabrication processes, Applications**.**

Course Outcomes for Third Year First Semester Course	
Course Code: B16 ME 3111	
Course Title: RAPID PROTOTYPING	
CO-1	Assesstheneedof RPTinProductdevelopment.
CO-2	JudgethecorrectRPProcessforProduct/Prototypedevelopment.
CO-3	Predictthetechnicalchallengesin3Dprinting.
CO-4	ListtheapplicationsofRPT

1. Calibration of the following instruments using slip gauges:
   (a) Calibration of Micrometer;
   (b) Calibration of Mechanical Comparator;
   (c) Calibration of Vernier Caliper;
   (d) Calibration of Dial Gauge.
2. Measurement of taper angle using: (a) Bevel Protractor; (b) Dial Gauge; (c) Sine-Bar; (d) Auto-Collimator.
3. Alignment tests: (a) Parallelism of the spindle; (b) Circularity & Concentricity of the spindle; (c) Trueness of running of the spindle.
4. Measurement of following Gear parameters: (a) diameter, pitch/module; (b) Pitch circle diameter; (c) Pressure angle; (d) Tooth thickness.
5. Check the flatness of a surface plate using: (a) spirit level; (b) Auto-collimator.
6. Study on flatness of slip gauges and finding the height of a slip gauge using light wave interference.
7. Measurement of following using Tool Maker's Microscope: (a) Thread details; (b) Cutting tool angles.
8. Determining the diameter of a cylindrical piece, taper angle of a V-block and central distance of two holes of a specimen.

MECHATRONICS LAB EXPERIMENTS

1. Training on Programmable Logic Controller to control the following using ladder logic program: (a) Lift Control; (b) Traffic Signal Control.

2. Training on Programmable Logic Controller Sensor Training Kit to study the operation of the following devices: (a) Proximity Switch; (b) Photo Electric Switch; (c) Limit Switch.

3. Training on Sensor and Transducer to study the operation of (a) Linear position or Force applications (LVDT and strain gauge transducer); (b) Rotational Speed or Position Measurement (The inductive Transducer); (c) Linear or Rotational Motion (D.C. Solenoid & D.C. Relay)

4. Training on actuation of hydraulic cylinder operation for Punching Machine application.

5. Training on control of conveyor operation for material handling equipment.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 ME 3111	
Course Title: INDUSTRIAL METROLOGY &MECHATRONICSLAB	
CO-1	Students will be able to understand the various logics involved in controlling mechanical industry equipment.
CO-2	The student will be able to operate measurement instruments on their own and test different components for their dimensional accuracy.
CO-3	Aprojectinvolvingwritingladderlogicforcontrollingamechanicaldevice,executingthe program is required from each student and graded by the instructor, so that the student will be able to understand the Mechatronics concept, practically and from the application point of view

LIST OF EXPERIMENTS

1. Load test on single cylinder diesel Engine.
2. Morse test on multi-cylinder engine.
3. Heat balance sheet on I.C. Engines
4. Study of multi-cylinder engines and determination of its firing order
5. Study of automobile mechanisms
6. Performance test on multi cylinder diesel engine
7. Verification of laws of balancing.
8. (a) Determination of ratios of angular speeds of shafts connected by Hooke's joint. (b) Determination of the ratio of times and ram velocities of Whitworth quick return motion mechanism.
9. To draw curves of slider displacement and crank angle and linear velocities w.r.t. time fora slider crank mechanism and compare with theoretical values.
10. To determine the relation of gyroscopic couple and compare with the theoretical values.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 ME 3113	
Course Title: IC ENGINES LAB	
CO-1	Studentswouldappreciatethefundamentalsofthermodynamicsbeingextendedtorealtimeapplications
CO-2	Students might come out with innovative ideas which may be extended in the form of projects

SYLLABUS: VERBAL & QUANTITATIVE APTITUDE – I (B16 ENG 3102)

(Common to All Branches)

Part-A: Verbal and Soft Skills-I

Grammar: (VA)

Parts of speech(with emphasis on appropriate prepositions, co-relative conjunctions, pronouns-number and person, relative pronouns), articles(nuances while using definite and indefinite articles), tenses(with emphasis on appropriate usage according to the situation), subject – verb agreement (to differentiate between number and person) , clauses(use of the appropriate clause , conditional and relative clauses), phrases(use of the phrases, phrasal verbs) to-infinitives, gerunds, question tags, voice, direct & indirect speech, degrees of comparison, modifiers, determiners, identifying errors in a given sentence, correcting errors in sentences.

Vocabulary: (VA)

Synonyms and synonym variants (with emphasis on high frequency words), antonyms and antonym variants(with emphasis on high frequency words), contextual meanings with regard to inflections of a word, frequently confused words, words often mis-used, multiple meanings of the same word (differentiating between meanings with the help of the given context), foreign phrases, homonyms, idioms, pictorial representation of words, word roots, collocations.

Reasoning: (VA)

Critical reasoning (understanding the terminology used in CR- premise, assumption, inference, conclusion), Analogies (building relationships between a pair of words and then identifying similar relationships), Sequencing of sentences (to form a coherent paragraph, to construct a meaningful and grammatically correct sentence using the jumbled text), odd man (to use logical reasoning and eliminate the unrelated word from a group), YES-NO statements (sticking to a particular line of reasoning Syllogisms.

Usage: (VA)

Sentence completion (with emphasis on signpost words and structure of a sentence), supplying a suitable beginning/ending/middle sentence to make the paragraph coherent, idiomatic language (with emphasis on business communication), and punctuation depending on the meaning of the sentence.

Soft Skills:

Introduction to Soft Skills – Significance of Inter & Intra-Personal Communication – SWOT Analysis – Creativity & Problem Solving – Leadership & Team Work - Presentation Skills Attitude – Significance – Building a positive attitude – Goal Setting – Guidelines for Goal Setting – Social Consciousness and Social Entrepreneurship – Emotional Intelligence - Stress Management, CV Making and CV Review.

Part-B: Quantitative Aptitude -I

Numbers, LCM and HCF, Chain Rule, Ratio and Proportion

Importance of different types of numbers and uses of them: Divisibility tests, finding remainders in various cases, Problems related to numbers, Methods to find LCM, Methods to find HCF, applications of LCM, HCF. Importance of chain rule, Problems on chain rule, introducing the concept of ratio in three different methods, Problems related to Ratio and Proportion.

Time and work, Time and Distance

Problems on man power and time related to work, Problems on alternate days, Problems on hours of working related to clock, Problems on pipes and cistern, Problems on combination of the some or all the above, Introduction of time and distance, Problems on average speed, Problems on Relative speed, Problems on trains, Problems on boats and streams, Problems on circular tracks, Problems on polygonal tracks, Problems on races.

Percentages, Profit Loss and Discount, Simple interest, Compound Interest, Partnerships, shares and dividends

Problems on percentages-Understanding of cost price, selling price, marked price, discount, percentage of profit, percentage of loss, percentage of discount, Problems on cost price, selling price, marked price, discount. Introduction of simple interest, Introduction of compound interest, Relation between simple interest and compound interest, Introduction of partnership, Sleeping partner concept and problems, Problems on shares and dividends, and stocks.

Introduction, number series, number analogy, classification, Letter series, ranking, directions

Problems of how to find the next number in the series, Finding the missing number and related sums, Analogy, Sums related to number analogy, Ranking of alphabet, Sums related to Classification, Sums related to letter series, Relation between number series and letter series, Usage of directions north, south, east, west, Problems related to directions north, south, east, west.

Data sufficiency, Syllogisms

Easy sums to understand data sufficiency, frequent mistakes while doing data sufficiency, Syllogisms Problems.

Course Outcomes for Third Year First Semester Course	
Course Code: B16 ENG 3102	
Course Title: VERBAL & QUANTITATIVE APTITUDE–I	
CO-1	Detect grammatical errors in the text/sentences and rectify them while answering their competitive/ company specific tests and frame grammatically correct sentences while writing.
CO-2	Answer questions on synonyms, antonyms and other vocabulary based exercises while attempting CAT, GRE, GATE and other related tests.
CO-3	Use their logical thinking ability and solve questions related to analogy, syllogisms and other reasoning based exercises.
CO-4	Choose the appropriate word/s/phrases suitable to the given context in order to make the sentence/paragraph coherent.
CO-5	Apply softskills in the workplace and build better personal and professional relationships making informed decisions.

Syllabus: Introduction to Abrasive Machining and Finishing Processes (B16 ME 3114A)

(MOOCS-I)

Week 1:	Introduction conventional abrasive processes, Introduction to abrasive processes, Grinding Process
Week 2 :	Conventional abrasive finishing processes (CAFP): Honing & Wire Brushing, CAFP: Lapping, Buffing & Super finishing, Practical Conventional abrasive finishing processes
Week 3 :	Adv. abrasive machining processes (AAMP),AAMP
Week 4 :	Hybrid Adv. Abrasive Machining Processes, Advanced Finishing
Week 5 :	Adv. Finishing: Abrasive Flow Finishing
Week 6 :	Adv. Finishing: Magnetic Abrasive Finishing
Week 7 :	Adv. Finishing: Magnetic Rheological Finishing
Week 8 :	Hybrid abrasive finishing, Finishing of Advanced Materials

SYLLABUS: PRINCIPLES OF CASTING TECHNOLOGY (B16 ME 3114B)

(MOOCS-I)

Course Plan:

Week 1: Introduction to Casting technology, Solidification analysis for metals and alloys

Week 2: Technology of patternmaking, study of molding sands and their testing methods

Week 3: Technology of mould making and core making, Special sand moulding processes

Week 4: Principles of gating design for castings

Week 5: Principles of risering design for castings

Week 6: Special casting methods, Melting furnaces

Week 7: Melting and pouring practices for production of Cast Iron family, steel and non- ferrous metals and alloys

Week 8: Fettling and Heat treatment of castings, Casting defect and its diagnostic methods

SYLLABUS: PRINCIPLES OF METAL FORMING TECHNOLOGY (B16ME3114C)

(MOOCS-I)

Course Layout:

Week 1: Introduction and classification of metalworking processes, Behavior of materials

Week 2: Concept of stress and strain, Hydrostatic and deviator stresses

Week 3: Flow curve Yield criteria for ductile materials, plastic stress strain relationships

Week 4: Yielding and ductility during instability, Effect of strain rate and temperature on flow properties

Week 5: mechanics of metalworking, Analysis methods, Hot and cold working

Week 6: Introduction, classification and analysis of forging and rolling operations

Week 7: Defects in rolled and forged components, Analysis of extrusion process

Week 8: Classification and analysis of wire and tube drawing and sheet metal working, Powder metallurgy forming

SYLLABUS: MECHANICS OF MACHINING (B16 ME 3114D)

(MOOCS-I)

Course Layout:

Week 1: Deformation of metals, Mechanism of plastic deformation, Machining processes: Single edge tool, types of chips

Week 2: Tool geometry: single point cutting tool specifications, Tool specifications, conversion of tool angles, Multi-point cutting tools, Mechanics of orthogonal cutting, force relationships

Week 3: Determination of stress, strain, and strain rate, Measurement of shear angle, Other analysis for force relationships

Week 4: Mechanics of oblique cutting, Measurement of cutting forces

Week 5: Thermal aspects of machining: Temperatures in orthogonal cutting, Tool wear and tool life and tool life equations, Economics in machining

Week 6: Practical machining operations: Turning and shaping & planning operation, Practical machining operations: milling and drilling, Grinding of metals and mechanics of grinding process

Week 7: Abrasive machining and finishing operations, CNC machines and CNC programming

Week 8: Introduction to advanced machining processes

SYLLABUS: MANUFACTURING OF COMPOSITES (B16 ME 3115A)

(MOOCS-II)

Course Plan:

Week 1- Introduction to Composites

- Introduction to Composites
- Function of the Matrix and Reinforcement in Composites
- Matrices: Thermosets and Thermoplastic
- Fiber Reinforcement

Week 2- Properties and testing composites

- Properties of Composites
- Composites testing
- Composites design: Laminate theory, Rule of mixtures, symmetry and balance

Week 3- Thermoset Composites manufacturing processes

- Material selection process cont.
- Material selection process cont.
- Design for manufacturing.

Week 4- Thermoset composite manufacturing processes

- Thermoset Composite manufacturing: Lay-up processes, Spray up process
- Thermoset Composite manufacturing:Fiber placement process
- Thermoset Composite manufacturing: Resin transfer moulding

Week 5- Thermoplastic composite manufacturing processes

- Thermoset Composite manufacturing:Vaccum assisted resin transfer moulding
- Thermoset Composite manufacturing: Compression molding process
- Thermoset composites manufacturing: Filament winding

Week 6- Thermoplastic composite manufacturing processes

- Thermoplastic Composite manufacturing: Sheet moulding
- Thermoplastic Composite manufacturing: Injection moulding, sheet moulding, Calendaring
- Thermoplastic Composite manufacturing: Extrusion, Blow molding, rotational molding, Thermoforming

Week 7- Metal and ceramic matrix composites

- Metal Matrix Composites: Metal matrix and reinforcement
- Manufacturing processes for Metal Matrix Composites: Dispersion hardened and particle composite
- Manufacturing processes for Metal matrix composites: Layer composites and infiltration method

Week 8- Prevention of Damage, repair of Composites and selection of processes

- Ceramic matrix composites: Hot isostatic processing
- Non – destructive testing of Composites
- Manufacturing process selection: Cost, performance, size shape, rate of production. Steps for process selection

SYLLABUS: PROCESSING OF POLYMERS AND POLYMER COMPOSITES (B16ME3115B)

(MOOCS-II)

Course Plan:

Week1: Introduction to course, Engineering materials and processing techniques, Thermoplastics and thermosets, Processing of polymers, Thermoforming process.

Week 2: Extrusion, Compression molding, Injection molding.

Week 3: Transfer molding, Rotational molding, Blow molding, Composite materials: basic concepts, Classification of composite materials.

Week 4: Processing of polymer composites, Hand-layup, Spray-layup, Compression molding Injection molding.

Week 5: Reaction injection molding, Autoclaving, Resin transfer molding, Filament winding, Pultrusion.

Week 6: Sheet molding, Pre-pegging and challenges in primary processing of composites, Secondary processing of polymer composites, Joining of polymer composites, Adhesive joining.

Week 7: Mechanical joining, Microwave joining, Induction and resistance welding, Drilling of polymer composites.

Week 8: Conventional vs ultrasonic drilling, Remedies for reducing drilling induce damages, Research tools for secondary processing, Numerical problems and case studies.

SYLLABUS: ROBOTICS (B16 ME 3115C)

(MOOCS-II)

Course Layout:

Week 1: Introduction to Robots and Robotics

Week 2: Introduction to Robots and Robotics; Robot Kinematics

Week 3: Robot Kinematics

Week 4: Robot Kinematics; Trajectory Planning

Week 5: Robot Dynamics

Week 6: Control Scheme; Sensors; Robot Vision

Week 7: Robot Vision; Robot Motion Planning

Week 8: Intelligent Robot; Biped Walking; Summary

Suggested Reading Materials:

1. Fundamentals of Robotics by D.K. Pratihar, Narosa Publishing House, New-Delhi, 2017.
2. Robotics by K.S. Fu, R.C. Gonzalez, C.S.G. Lee, McGraw-Hill Book Company, 1987
3. Introduction to Robotics by J.J. Craig, Addison-Wesley Publishing Company, 1986

SYLLABUS: ANALYSIS AND MODELING OF WELDING (B16 ME 3115D)

(MOOCS – II)

COURSE LAYOUT

Week 1:

1. Introduction to fusion welding processes
2. Heat sources
3. Heat removal

Week 2:

4. Thermal modeling
5. Single domain approach - handling phase change
6. Analytical solutions

Week 3:

7. Fluid flow in the weld pool
8. Zones in a weld ment
9. Numerical Solutions

Week 4:

10. Conduction mode and Keyhole mode
11. Solute transfer – Macroscale
12. Solute transfer – Microscale

Week 5:

13. Solute segregation profiles
14. Microstructure evolution
15. Defects in fusion welds

Week 6:

16. Effects of dilution 16 Weld Cladding
17. Distortion in welding

Week 7:

18 Dissimilar welding

19. Solutions to Dissimilar welding 20 Integrated approach.

Regulation: 16							IV/ IV - B.TECH I- Semester		
MECHANICAL ENGINEERING (under Choice Based Credit System / Elective Course System)									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2016-17 admitted Batch onwards)									
CodeNo.	**Course**	**C**	**Cr**	**L**	**T**	**Lab**	**Sessional Marks**	**Exam Marks**	**Total Marks**
B16 ME4101	Computer Aided Design	ES	4	3	1	-	30	70	100
B16 ME4102	Machine Design	ES	4	3	1	-	30	70	100
B16 ME4103	Heat and Mass Transfer	ES	4	3	1	-	30	70	100
# ELE-III	ELECTIVE-III	ES	4	3	1	-	30	70	100
B16 ME4110	Heat Transfer Lab	ES	2	-	-	3	50	50	100
B16 ME4111	Project Phase-I	ES	2	--	--	3	50	--	50
Total			**20**	**12**	**4**	**6**	**220**	**330**	**550**

Cr-CREDITS

C_CATEGORY

L – LECTURE HOURS

T – TUTORIAL HOURS

Lab – LAB HOURS

# ELE-III	B16 ME 4104	Mechanical Vibrations
	B16 ME 4105	Project Management
	B16 ME 4106	Non-Destructive Testing
	B16 ME 4107	Power Plant Engineering
	B16 ME 4108	Mechatronics
	B16 ME 4109	Design for Manufacturing

SYLLABUS: COMPUTER AIDED DESIGN (B16 ME 4101)

Fundamentals of CAD - Introduction - The design process - Application of computers for design - Operating systems - Hardware in CAD: The design work station - I/O Devices - CAD system configuration - Creating database for manufacturing - Benefits of CAD.

Interactive Computer Graphics - Graphic display devices- Graphics system- Graphics standards - Graphical user interface- Transformation systems- windowing - clipping - 2D and 3D transformations - Linear transformation- Display files for 3D data - Geometric Modeling - Modeling Techniques - Wire frame Modeling - Surface Modeling - 3 D Solid Modeling.

Introduction to Finite Element Analysis - CAD techniques to finite element data preparation- Automatic mesh generation- presentation of results - 3-dimensional shape description and mesh generation- CAD applications of FEM.

CAD applications and exposure to CAD packages: Simple examples of computer aided drafting, design and analysis - Introduction to simple machine elements - Analysis of cross sectional area, centroid & moment of inertia- Kinematics of crank- slider mechanism and other simple design applications. Introduction to CAD packages like ANSYS, NASTRAN, NISA-II.

Introduction to Artificial Intelligence – Applications of AI in design and CAD.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16 ME 4101	
Course Title: COMPUTER AIDED DESIGN	
CO-1	Analyze and use engineering computer graphics and geometric modelling techniques for mechanical engineering applications.
CO-2	Able to understand and apply theories, methods and procedures for complex-shapes part design.
CO-3	Apply advanced modelling and computational tools for complex part and shaped sign and analysis.
CO-4	Select and use various engineering design procedures for mechanical design problems involving complex shapes.
CO-5	Execute professional engineering CAD projects for mechanical engineering applications in the current industrial practice.

SYLLABUS: MACHINE DESIGN (B16 ME 4102)

Gears: Classification of gears, Standard tooth systems. Spur, Helical and Bevel gears. Terminology of each. Tooth failure. Face width and beam strength. Lewis equation. Design for dynamic and wear loads. Force analysis of Bevel gears

Engine parts: I.C. engine design. Design of cylinders and heads. Design of pistons. Design of cross-head, connecting rods

Clutches: Torque capacity, single and multi-plate clutches. Design considerations. Energy considerations and Temperature rise friction materials. Centrifugal clutches.

Brakes: Energy equations. Band and block brakes. Internal expanding shoe brakes, self-locking, brake design.

Bearings: Sliding contact bearings, Lubrication modes. Temperature effect on viscosity. Journal bearing design. Bearing modulus. McKee equations. Heating of bearings. Collar and thrust bearings. Roller and ball bearings. Static and dynamic load capacity. Equivalent bearing load. Load-life relationships. Load factor. Selection of bearings from manufacturer's catalogue.

Wire Ropes: Construction and classification. Stresses in wire ropes, Design of Wire rope

Chain drives: Nomenclature, Design of chain drives

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16 ME 4102	
Course Title: MACHINEDESIGN	
CO-1	Classifydifferenttypesofgearsandapplythedesignconceptstoevaluatethestrengthofgears.
CO-2	DesignvariouspartsofICEnginessuchascylinders,pistonsand connectingrods
CO-3	Applythedesignconceptstodeterminethevariousparameters ofclutches.
CO-4	Applythe designconcepts todeterminethetorque anddimensions relatedto brakes
CO-5	Designtheslidingand roller contactbearingsunder variousenvironmentaland serviceConditions
CO-6	ClassifyandAnalyzedifferent typesofstressesinduced inwireropes and chaindrives

SYLLABUS: HEAT AND MASS TRANSFER (B16 ME 4103)

Introduction: Basic modes of heat transfer- Rate equations- Generalized heat conduction equation in Cartesian, Cylindrical and Spherical coordinate systems.

Steady state heat conduction solution for plain and composite slabs, cylinders and spheres- Critical thickness of insulation- Heat conduction through fins of uniform cross section- Fin effectiveness and efficiency.

Unsteady steady state heat conduction- Transient heat conduction- Lumped system analysis, and use of Heisler charts.

Convection: Continuity, momentum and energy equations- Dimensional analysis- Boundary layer theory concepts- Free, and Forced convection- Approximate solution of the boundary layer equations- Laminar and turbulent heat transfer correlation- Momentum equation and velocity profiles in turbulent boundary layers- Application of dimensional analysis to free and forced convection problems- Empirical correlation.

Radiation: Black body radiation- radiation field, Kirchoff's laws- shape factor- Stefan Boltzmann equation- Heat radiation through absorbing media- Radiant heat exchange, parallel and perpendicular surfaces- Radiation shields.

Heat Exchangers: Types of heat exchangers- Parallel flow- Counter flow- Cross flow heat exchangers- Overall heat transfer coefficient- LMTD and NTU methods- Fouling in heat exchangers- Heat exchangers with phase change.

Boiling: Different regimes of boiling-Nucleate, Transition and Film boiling. Condensation: Laminar film condensation- Nusselt's theory- Condensation on vertical flat plate and horizontal tubes- Dropwise condensation.

Mass Transfer: Conservation laws and constitutive equations- Isothermal equimass, Equimolar diffusion- Fick's law of diffusion- diffusion of gases, Liquids- Mass tr ansfer coefficient

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16ME4103	
Course Title: HEAT AND MASS TRANSFER	
CO-1	Understand the basic laws of heat transfer.
CO-2	Apply principles of heat and mass transfer to basic engineering systems.
CO-3	Will be able to do basic calculations involving heat and mass transfer as is typical for a mechanical engineer. This includes conduction, convection and radiation heat transfer as well a sheat exchanger design.
CO-4	Calculatefluidtemperatures,massflowrates,pressuredrops,heatexchangeandeffectivenessduring parallel, counter and crossflow in simple and baffled–shell and tube type heat exchangers, condensers, evaporators, etc.

SYLLABUS: MECHANICAL VIBRATIONS (B16 ME 4104)

(Elective-III)

Single degree of Freedom systems: Undamped and damped free vibrations: forced vibrations ; coulomb damping; Response to harmonic excitation; rotating unbalance and support excitation, Vibration isolation and transmissibility, Vibrometers, velocity meters & accelerometers.

Two Degrees of Freedom Systems: Introduction, Principal modes of vibration, Natural Frequencies of a tightly stretched string, having two masses, Double pendulum, Torsional System, Systems with damping, undamped forced vibration with harmonic excitation.

Multi-degree of Freedom Systems – Exact Analysis: Introduction, free vibrations, Equation of motion, Influence Co efficient, Natural frequencies and mode shapes (Eigen values and Eigen vectors)

Numerical Methods: Rayliegh’s, Stodola’s, Matrix iteration, Rayleigh-Ritz Method and Holzer’s methods

Application of concepts: Free vibration of strings – longitudinal oscillations of bars-transverse vibrations of beams- Torsional vibrations of shafts. Critical speeds without and with damping, secondary critical speed.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16ME4104	
Course Title: MECHANICAL VIBRATIONS	
CO-1	Develop a mathematical model for a physical system and derive the governing differential equations.
CO-2	Determine the natural frequencies of single and two degrees of freedom systems without and with damping.
CO-3	Determine and analyze there sponse of machine members or structures in forced vibration with different excitation frequencies.
CO-4	Apply the techniques of vibration isolation to minimize the transmission of vibrating forces.
CO-5	Determine the natural frequencies and mode shapes of bars in elongation and torsion and beam sin bending.

SYLLABUS: PROJECT MANAGEMENT (B16 ME 4105)

(Elective-III)

Overview of Project Management: Characteristics of projects, Need and evolution of project management, Definition and Objectives of project management, Project management: the person, the team, the system; The Project Life Cycle, Stages and different forms of Project Management.

Project Planning and Scheduling: Work breakdown structure, Gantt charts, CPM/PERT networks, Resource allocation: resource loading and levelling, GERT.

Project Risk Management: Risk concepts, Risk identification: Sources of risks and identification techniques, Risk Assessment, Risk response planning, Risk analysis methods.

Project Control: Introduction, Cost accounting systems for project control, Project control process, Project control emphasis, Performance analysis, Controlling changes, and Control problems.

Project Evaluation, Reporting and Termination: Project evaluation, Project review meetings,Reporting, Terminating the project, Closure of contract, Project extensions.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16ME4105	
Course Title: PROJECTMANAGEMENT	
CO-1	UnderstandthatPMskillsarecriticaltomostcareersandtheycanbeappliedatmostbusinessesand professions.
CO-2	Acquirethoroughknowledgeonvariousanalyticaltoolsrequiredduringdifferentstagesofprojectlifecycle.
CO-3	Theywillbeabletoapplyvarioustoolsandtechniquesforplanningandschedulingtheprojects.
CO-4	Learnhowtobeproactivetotherisksandbeabletomanagethemthatoccurduringtheprogressivestages of the projects.
CO-5	Acquire thorough knowledge on cost accounting systems and key performance indicators.
CO-6	Learnallpossiblepracticalsituationsthatleadtodifferentchangesduringthecourseofprojectexecution and the problems related to controlling the changes.
CO-7	Possess full knowledge on how to evaluate the projects, terminate the projects and finally how to close the contract.
CO-8	Finally, students will acquire all the key skills to become effective project managers across various industries.

SYLLABUS: NON-DESTRUCTIVE TESTING (B16 ME 4106)

(Elective-III)

INTRODUCTION: Introduction to destructive and non-destructive testing. Scope and limitations of NDT.

VISUAL INSPECTION - Physical Principles, Methodology, Limitations, Applications.

DYE PENETRANT TESTING/ LIQUID PENETRANT TESTING: Principle, procedure, Characteristics of penetrant, types of penetrants, penetrant testing materials, different washable systems, fluorescent penetrant testing method– sensitivity, Developers, application and limitations

MAGNETIC PARTICLE TESTS: Important terminologies related to magnetic properties of material, principle, magnetizing technique, procedure, equipment, Methods of production of magnetic fields, fluorescent magnetic particle testing method, sensitivity, application and limitations

RADIOGRAPHIC TESTING: X-ray and Gamma-Ray radiography, Their principles, methods of generation, Types of films, screens and penetrometers, Interpretation of radiographs, Safety in industrial radiography Sources of ray-x-ray production, properties of d and x rays, film characteristics, exposure charts, contrasts, operational characteristics of x ray equipment, Industrial radiography techniques, inspection techniques, applications, limitations applications.

ULTRASONIC TESTING: Basic principles of sound propagation, types of sound waves, Production of ultrasonic waves, general characteristics of waves, Principle of UT, methods of UT, their advantages and limitations, Piezoelectric Material, Various types of transducers/probe, technique for normal beam inspection, flaw characterization technique, defects in welded products by UT, Thickness determination by ultrasonic method, Study of A, B and C scan presentations, principles of AET and techniques, Ultrasonic and acoustic emission techniques - pulse echo method advantage, limitations acoustic emission testing

EDDY CURRENT TESTING: Principle, instrument, techniques, sensitivity, application, limitation.

THERMAL METHODS - Principles of thermography and approaches in NDT, Sources and detectors, capabilities and limitations, measurement of diffusivity and wall thickness.

OPTICAL METHODS - Principles of Shearography and holography, applications in NDT.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16 ME 4106	
Course Title: NON-DESTRUCTIVE TESTING	
CO-1	Classify various non-destructive testing.
CO-2	Check different metals and alloys by visual inspection method
CO-3	Explain and perform non-destructive tests like: Liquid penetrant test, Magnetic particle test, Ultrasonic test, X-ray and Gamma ray radiography, Leak Test, Eddy current test.
CO-4	Identify defects by using relevant NDT methods

SYLLABUS: POWER PLANT ENGINEERING (B16 ME 4107)

(Elective-III)

Introduction to the sources of energy – resources and development of power in India.

STEAM POWER PLANT: Plant layout, working of different circuits, fuel and handling equipment, types of coals, coal handling, choice of handling equipment, coal storage, ash handling systems. Combustion: properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, dust collectors, cooling towers and heat rejection. Corrosion and feed water treatment.

INTERNAL COMBUSTION AND GAS TURBINE POWER PLANTS:

DIESEL POWER PLANT: Plant layout with auxiliaries – fuel supply system, air starting equipment, super charging.

GAS TURBINE PLANT: Introduction – classification - construction – layout with auxiliaries, combined cycle power plants and comparison.

HYDRO ELECTRIC POWER PLANT: Water power – hydrological cycle / flow measurement – drainage area characteristics – hydrographs – storage and pondage –classification of dams and spill ways. HYDRO PROJECTS AND PLANT: Classification – typical layouts – plant auxiliaries – plant operation pumped storage plants.

NUCLEAR POWER STATION: Nuclear fuel – breeding and fertile materials – nuclear reactor– reactor operation. TYPES OF REACTORS: Pressurized water reactor, boiling water reactor, sodium-graphite reactor, fast breeder reactor, homogeneous reactor, gas cooled reactor, radiation hazards and shielding – radioactive waste disposal.

POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDE RATIONS: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, load curves, load duration curve, definitions of connected load, maximum demand, demand factor, average load, load factor, diversity factor – related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – methods of pollution control.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16ME4107	
Course Title: POWER PLANT ENGINEERING	
CO-1	principle of operation and performance of steam power plant along with their economics and their impact on environment
CO-2	principle of operation and performance of internal combustion and gas turbine power plants along with their economics and their impact on environment.
CO-3	principle of operation and performance of hydro electric power plant along with their economics and their impact on environment.
CO-4	principle of operation and performance of nuclear power plant along with their economics and their impact on environment.

SYLLABUS: MECHATRONICS (B16ME4108)

(Elective-III)

Mechatronics system design: Introduction to Mechatronics: What is mechatronics, Integrated design issues in mechatronics, Mechatronics key elements, the mechatronics design process, advanced approaches in mechatronics.

Modelling and simulation of physical systems: Simulation and block diagrams, Analogies and impedance diagrams, Electrical systems, Mechanical translational systems, Mechanical rotational systems, electromechanical coupling, Fluid systems.

Sensors and transducers: An introduction to sensors and transducers, Sensors for motion and position measurement, Force, torque and tactile sensors, Flow sensors, Temperature-sensing devices. Actuating devices: Direct current motor, Permanent magnet stepper motor, Fluid power actuation.

Signals, systems and controls: Introduction to signals, systems and controls, System representation, Linearization of nonlinear systems, Time delays.
Real time interfacing: Introduction, Elements of a data acquisition and control system, Overview of the I/O process, Installation of the I/O card and software.

Advanced applications in mechatronics: Sensors for condition monitoring, Mechatronic control in automated manufacturing, Artificial intelligence in mechatronics, Micro sensors in mechatronics.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16ME4108	
Course Title: MECHATRONICS	
CO-1	Model and analyze electrical and mechanical systems and their interconnection.
CO-2	Integrate mechanical, electronics, control and computer engineering in the design of mechatronics systems.
CO-3	Do the complete design building, interfacing and actuation of a mechatronic system for a set of specifications.

SYLLABUS: DESIGN FOR MANUFACTURING (B16 ME 4109)

(Elective-III)

Introduction: Design philosophy-steps in design process-general design rules for manufacturability-basic principles of designing for economical production – creativity in design.

Machining processes: Overview of various machining processes-general design rules for machining-dimensional tolerance and surface roughness- Design for machining – ease – redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

Metal casting: Appraisal of various casting processes, selection of casting process,-general design considerations for casting-casting tolerance-use of solidification, simulation in casting design-product design rules for sand casting.

Metal joining: Appraisal of various welding processes, factors in design of weldments – general design guidelines-pre and post treatment of welds- effects of thermal stresses in weld joints- design of brazed joints. Forging: Design factors for forging – closed die forging design – parting lines of dies – drop forging die design – general design recommendations.

Extrusion & Sheet metal work: Design guide lines extruded sections- design principles for punching, blanking, bending, deep drawing-Keeler Goodman forging line diagram – component design for blanking.

Plastics: Visco elastic and creep behavior in plastics-design guidelines for plastic components- design considerations for injection moulding – design guidelines for machining and joining of plastics.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16ME4109	
Course Title: DESIGN FOR MANUFACTURING	
CO 1	Select the design principle, suitable material, mechanism, fit and tolerance for designing a product/component.
CO 2	Select the appropriate material, proper working principle and a feasible design.
CO 3	Design (optimum) a component which requires less material removal, easy to machine, assemble, access and cost effective.
CO 4	Redesign the uneconomical casting design and know the applications of DFMA.
CO 5	Incorporate the Environmental Objectives, issues and guidelines into the design.

SYLLABUS: HEAT TRANSFER LAB (B16 ME 4110)

LIST OF EXPERIMENTS

1. Determination of Heat Transfer through Lagged Pipe.
2. Measurement of Thermal Conductivity for a given Asbestos Insulating powder.
3. Determination of Thermal Conductivity for a Given Copper Metal Rod.
4. Determination of Heat Transfer through Pin-Fin.
5. Experimentation on Transient Heat Conduction.
6. Determination of Heat Transfer through Forced Convection.
7. Determination of Heat Transfer through Natural Convection.
8. Determination of overall heat transfer coefficient for Parallel and Counter Flow Heat Exchanger.
9. Emissivity Measurement.
10. Measurement of Stefan Boltzmann constant.
11. Determination of Heat Transfer through Drop Wise and Film Wise Condensation.
12. Determination of Two phase heat Transfer.
13. Determination of Overall Heat Transfer Co-Efficient for Composite Wall.
14. Study of Refrigeration Test Rig.
15. Study of Air Conditioning Test Rig.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16ME4110	
Course Title: HEAT TRANSFER LAB	
CO-1	Understand the basic laws of heat transfer, account for the consequence of heat transfer in thermal analyses of engineering systems.
CO-2	WillbeabletoapplytheirknowledgeofDimensionalAnalysistoforcedandfreeconvection.
CO-3	Analyze heat exchanger performance by using the method of log mean temperature difference, heat exchanger, effectiveness.
CO-4	Calculate radiation heat transfer between black body surfaces and gray body surfaces.
CO-5	Demonstrate and explain mechanism of boiling and condensation.

SYLLABUS: PROJECT PHASE-I(B16ME4111)

The phase-I of the project shall comprise of

- Problem identification in close collaboration with industry.
- Literature survey.
- Deriving work content and carry out of project requirement analysis.
- Submission of interim report.
- Presentation to an expert committee.

(Note: Sessionals 50 marks will be awarded based on Continuous evaluation - 25 Marks Seminar and Viva voce - 25 Marks.)

SYLLABUS: COMPUTER AIDED MANUFACTURING (B16 ME 4201)

Introduction to CNC and CAM, CNC retrofitting, Adoptive control machining, NC part program preparation through computer languages. Group technology: Merits & demerits, Organization, Classification and Coding systems, Facilities layout.

Computer aided process planning: Introduction to process planning, Methods of process planning, Computer aided process planning, CAPP systems, and case studies.

Computer aided material handling and production planning: Robots: Structure and operation of Robots, robot sensors and applications. Automatic conveyor systems. Automated guided vehicles. Aid of computer in production planning and control, Inventory control and material requirement planning.

Computer aided inspection and quality control: Developments and practice, Quality assurance and quality control. Coordinate measuring machine. Non-contact inspection.

FMS & CIMS: Building blocks of Flexible Manufacturing Systems (FMS), machining systems of FMS, Tool management systems, Advantages of FMS, Computer integrated manufacturing systems (CIMS).

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16ME4201	
Course Title: COMPUTERAIDED MANUFACTURING	
CO-1	After completion of the course students can Handle various NC machines,
CO-2	Write G.T codes for any complex component
CO-3	Apply techniques on various old machines and converted into retrofitted,
CO-4	Gain knowledge on various types of robots, AGV’S, Automated conveyors systems, FMS centers

SYLLABUS: QUALITY CONTROL AND ASSURANCE (B16 ME 4202)

Quality control in Perspective -Introduction to quality, quality assurance, quality control; quality of design, quality of conformance and quality of performance; quality characteristics – variables and attributes, growth of quality control, Statistical quality control, Taguchi's loss function, examples of off-line and on-line quality control techniques, quality costs, Deming's philosophy, introduction to six sigma concept.

Control charts for Variables: Shewart's norm bowl, $\overline{X}$ and R charts, $\overline{X}$ and σ charts, Statistical control of processes, group control chart, $\overline{X}$ chart with linear trend, warning limits.

Control charts for Attributes: Defect and defective, fraction defective and percent defective, p- chart, 100p -chart, np-chart, c-chart, u-chart, ku-chart, demerit control charts.

Process capability analysis: Determination of process capability, PCR, Design specifications and tolerances, PCR for nominal the better type, smaller the better type and larger the better type product specifications; Tolerances for sub-assemblies, setting tolerances for intermediate steps in production.

Acceptance sampling plans: Single, double, multiple and sequential sampling plans, OC curve, rectifying inspection, AOQ, AOQL, ASN and ATI, Use of Dodge Romig Tables, Design of single and sequential sampling plans.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16ME4202	
Course Title: QUALITY CONTROL AND ASSURANCE	
CO-1	Stewarts normal bowl,control charts for variables,X,Randsigma controlcharts.
CO-2	Control charts for attributes, p-chart, standardized p –chart, np-chart, c-chart, u-chart, demeritcontrolchart.
CO-3	Type-IandType-IIerrors, Processcapabilityanalysis.
CO-4	Sampling palns: single, double, multiple and sequential sampling plans, rectifying inspection,AOQ,AOQL,andATI.UseofDodgeRomigTables,Designofsingleandsequentialsamplingplans.

SYLLABUS: CAD/CAM LAB (B16ME4203)

CAD Exercises:

1. Initiating the graphics package; Setting the paper size, space; setting the limits, units; use of snap and grid commands.
2. Drawing of primitives (line, arc, circle, ellipse, triangle etc.)
3. 3D GEOMETRIC MODELING: Creation of 3D Models, Wire Frame, Surface, Solid modeling Techniques Using CAD Packages – CSG, B-Rep Approaches in Solid Modeling Feature Based Modeling Technique – Assembly –Detailing Exposure to Industrial Components – Application of GD&T.
4. Drawing a flange.
5. Drawing a Bushing assembly.
6. Dimensioning the drawing and adding text.
7. Setting the layers and application of the layers.
8. Isometric and orthographic projections.
9. Viewing in Three dimensions.
10. Removal of hidden lines - Shading and rendering.

CAM Exercises:

1. Preparation of manual part programming for CNC turning/Milling.
2. Part programming preparation through AutoCAD.
3. APT part programming for 2D - contour.
4. Machining of one job on CNC machine tool.
5. Robot programming through Teaching Box method.
6. Robot programming through computer.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16ME4203	
Course Title :CAD/CAMLAB	
CO-1	Studentswillbeabletoknowtoproducetheindustrialdrawingsbyusing CAD/CAMsoftware's.
CO-2	Aftersuccessfulcompletionofthislaboratorystudentcandothejobin CAD/CAMindustryasa design engineer.

SYLLABUS: PROJECT PHASE-II (B16ME4204)

The phase-II of the project shall consists of

Implementing, Testing and validation. Report Writing.

Sessionals (50 Marks) will be awarded by the Project Guide based on continuous evaluation. External Evaluation (100 marks) of project report and viva voce will be conducted by a committee consisting of HOD, Guide and External Examiner.

May be carried out using in-house facilities or in an industry by specified number of students in a group.

Format for Preparation of Project Thesis for B. Tech:

Arrangement Of Contents: The sequence in which the project report material should be arranged and bound should be as follows:

1. Cover Page & Title Page .
2. Bonafide Certificate
3. Abstract.
4. Table of Contents
5. List of Tables
6. List of Figures
7. List of Symbols, Abbreviations and Nomenclature
8. Chapters
9. Appendices
10. References

*The table and figures shall be introduced in the appropriate places.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16ME4204	
Course Title: PROJECTPHASE-II	
CO-1	Identifyacurrentproblemthroughliterature/field/casestudiesanddefinethebackgroundobjectives and methodology for solving the same.
CO-2	Analyze, design and develop a technology/process.
CO-3	Implement and evaluate the technology at the laboratory level.
CO-4	Write report and present it effectively.

Regulation: 16									IV/ IV - B.TECH I- Semester
MECHANICAL ENGINEERING (under Choice Based Credit System / Elective Course System)									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2016-17 admitted Batch onwards)									
CodeNo.	**Course**	**C**	**Cr**	**L**	**T**	**Lab**	**Sessional Marks**	**Exam Marks**	**Total Marks**
B16 ME4101	Computer Aided Design	ES	4	3	1	-	30	70	100
B16 ME4102	Machine Design	ES	4	3	1	-	30	70	100
B16 ME4103	Heat and Mass Transfer	ES	4	3	1	-	30	70	100
# ELE-III	ELECTIVE-III	ES	4	3	1	-	30	70	100
B16 ME4110	Heat Transfer Lab	ES	2	-	-	3	50	50	100
B16 ME4111	Project Phase-I	ES	2	--	--	3	50	--	50
Total			**20**	**12**	**4**	**6**	**220**	**330**	**550**

Cr-CREDITS

C_CATEGORY

L – LECTURE HOURS

T – TUTORIAL HOURS

Lab – LAB HOURS

# ELE-III	B16 ME 4104	Mechanical Vibrations
	B16 ME 4105	Project Management
	B16 ME 4106	Non-Destructive Testing
	B16 ME 4107	Power Plant Engineering
	B16 ME 4108	Mechatronics
	B16 ME 4109	Design for Manufacturing

SYLLABUS: COMPUTER AIDED DESIGN (B16 ME 4101)

Fundamentals of CAD - Introduction - The design process - Application of computers for design - Operating systems - Hardware in CAD: The design work station - I/O Devices - CAD system configuration - Creating database for manufacturing - Benefits of CAD.

Interactive Computer Graphics - Graphic display devices- Graphics system- Graphics standards - Graphical user interface- Transformation systems- windowing - clipping - 2D and 3D transformations - Linear transformation- Display files for 3D data - Geometric Modeling - Modeling Techniques - Wire frame Modeling - Surface Modeling - 3 D Solid Modeling.

Introduction to Finite Element Analysis - CAD techniques to finite element data preparation- Automatic mesh generation- presentation of results - 3-dimensional shape description and mesh generation- CAD applications of FEM.

CAD applications and exposure to CAD packages: Simple examples of computer aided drafting, design and analysis - Introduction to simple machine elements - Analysis of cross sectional area, centroid & moment of inertia- Kinematics of crank- slider mechanism and other simple design applications. Introduction to CAD packages like ANSYS, NASTRAN, NISA-II.

Introduction to Artificial Intelligence – Applications of AI in design and CAD.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16 ME 4101	
Course Title: COMPUTER AIDED DESIGN	
CO-1	Analyze and use engineering computer graphics and geometric modelling techniques for mechanical engineering applications.
CO-2	Able to understand and apply theories, methods and procedures for complex-shapes part design.
CO-3	Apply advanced modelling and computational tools for complex part and shaped sign and analysis.
CO-4	Select and use various engineering design procedures for mechanical design problems involving complex shapes.
CO-5	Execute professional engineering CAD projects for mechanical engineering applications in the current industrial practice.

SYLLABUS: MACHINE DESIGN (B16 ME 4102)

Gears: Classification of gears, Standard tooth systems. Spur, Helical and Bevel gears. Terminology of each. Tooth failure. Face width and beam strength. Lewis equation. Design for dynamic and wear loads. Force analysis of Bevel gears

Engine parts: I.C. engine design. Design of cylinders and heads. Design of pistons. Design of cross-head, connecting rods

Clutches: Torque capacity, single and multi-plate clutches. Design considerations. Energy considerations and Temperature rise friction materials. Centrifugal clutches.

Brakes: Energy equations. Band and block brakes. Internal expanding shoe brakes, self-locking, brake design.

Bearings: Sliding contact bearings, Lubrication modes. Temperature effect on viscosity. Journal bearing design. Bearing modulus. McKee equations. Heating of bearings. Collar and thrust bearings. Roller and ball bearings. Static and dynamic load capacity. Equivalent bearing load. Load-life relationships. Load factor. Selection of bearings from manufacturer's catalogue.

Wire Ropes: Construction and classification. Stresses in wire ropes, Design of Wire rope

Chain drives: Nomenclature, Design of chain drives

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16 ME 4102	
Course Title: MACHINEDESIGN	
CO-1	Classifydifferenttypesofgearsandapplythedesignconceptstoevaluatethestrengthofgears.
CO-2	DesignvariouspartsofICEnginessuchascylinders,pistonsand connectingrods
CO-3	Applythedesignconceptstodeterminethevariousparameters ofclutches.
CO-4	Applythe designconcepts todeterminethetorque anddimensions relatedto brakes
CO-5	Designtheslidingand roller contactbearingsunder variousenvironmentaland serviceConditions
CO-6	ClassifyandAnalyzedifferent typesofstressesinduced inwireropes and chaindrives

SYLLABUS: HEAT AND MASS TRANSFER (B16 ME 4103)

Introduction: Basic modes of heat transfer- Rate equations- Generalized heat conduction equation in Cartesian, Cylindrical and Spherical coordinate systems.

Steady state heat conduction solution for plain and composite slabs, cylinders and spheres- Critical thickness of insulation- Heat conduction through fins of uniform cross section- Fin effectiveness and efficiency.

Unsteady steady state heat conduction- Transient heat conduction- Lumped system analysis, and use of Heisler charts.

Convection: Continuity, momentum and energy equations- Dimensional analysis- Boundary layer theory concepts- Free, and Forced convection- Approximate solution of the boundary layer equations- Laminar and turbulent heat transfer correlation- Momentum equation and velocity profiles in turbulent boundary layers- Application of dimensional analysis to free and forced convection problems- Empirical correlation.

Radiation: Black body radiation- radiation field, Kirchoff's laws- shape factor- Stefan Boltzmann equation- Heat radiation through absorbing media- Radiant heat exchange, parallel and perpendicular surfaces- Radiation shields.

Heat Exchangers: Types of heat exchangers- Parallel flow- Counter flow- Cross flow heat exchangers- Overall heat transfer coefficient- LMTD and NTU methods- Fouling in heat exchangers- Heat exchangers with phase change.

Boiling: Different regimes of boiling-Nucleate, Transition and Film boiling. Condensation: Laminar film condensation- Nusselt's theory- Condensation on vertical flat plate and horizontal tubes- Dropwise condensation.

Mass Transfer: Conservation laws and constitutive equations- Isothermal equimass, Equimolar diffusion- Fick's law of diffusion- diffusion of gases, Liquids- Mass tr ansfer coefficient

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16ME4103	
Course Title: HEAT AND MASS TRANSFER	
CO-1	Understand the basic laws of heat transfer.
CO-2	Apply principles of heat and mass transfer to basic engineering systems.
CO-3	Will be able to do basic calculations involving heat and mass transfer as is typical for a mechanical engineer. This includes conduction, convection and radiation heat transfer as well a sheat exchanger design.
CO-4	Calculatefluidtemperatures,massflowrates,pressuredrops,heatexchangeandeffectivenessduring parallel, counter and crossflow in simple and baffled–shell and tube type heat exchangers, condensers, evaporators, etc.

SYLLABUS: MECHANICAL VIBRATIONS (B16 ME 4104)

(Elective-III)

Single degree of Freedom systems: Undamped and damped free vibrations: forced vibrations ; coulomb damping; Response to harmonic excitation; rotating unbalance and support excitation, Vibration isolation and transmissibility, Vibrometers, velocity meters & accelerometers.

Two Degrees of Freedom Systems: Introduction, Principal modes of vibration, Natural Frequencies of a tightly stretched string, having two masses, Double pendulum, Torsional System, Systems with damping, undamped forced vibration with harmonic excitation.

Multi-degree of Freedom Systems – Exact Analysis: Introduction, free vibrations, Equation of motion, Influence Co efficient, Natural frequencies and mode shapes (Eigen values and Eigen vectors)

Numerical Methods: Rayliegh’s, Stodola’s, Matrix iteration, Rayleigh-Ritz Method and Holzer’s methods

Application of concepts: Free vibration of strings – longitudinal oscillations of bars-transverse vibrations of beams- Torsional vibrations of shafts. Critical speeds without and with damping, secondary critical speed.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16ME4104	
Course Title: MECHANICAL VIBRATIONS	
CO-1	Develop a mathematical model for a physical system and derive the governing differential equations.
CO-2	Determine the natural frequencies of single and two degrees of freedom systems without and with damping.
CO-3	Determine and analyze there sponse of machine members or structures in forced vibration with different excitation frequencies.
CO-4	Apply the techniques of vibration isolation to minimize the transmission of vibrating forces.
CO-5	Determine the natural frequencies and mode shapes of bars in elongation and torsion and beam sin bending.

SYLLABUS: PROJECT MANAGEMENT (B16 ME 4105)

(Elective-III)

Overview of Project Management: Characteristics of projects, Need and evolution of project management, Definition and Objectives of project management, Project management: the person, the team, the system; The Project Life Cycle, Stages and different forms of Project Management.

Project Planning and Scheduling: Work breakdown structure, Gantt charts, CPM/PERT networks, Resource allocation: resource loading and levelling, GERT.

Project Risk Management: Risk concepts, Risk identification: Sources of risks and identification techniques, Risk Assessment, Risk response planning, Risk analysis methods.

Project Control: Introduction, Cost accounting systems for project control, Project control process, Project control emphasis, Performance analysis, Controlling changes, and Control problems.

Project Evaluation, Reporting and Termination: Project evaluation, Project review meetings,Reporting, Terminating the project, Closure of contract, Project extensions.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16ME4105	
Course Title: PROJECTMANAGEMENT	
CO-1	UnderstandthatPMskillsarecriticaltomostcareersandtheycanbeappliedatmostbusinessesand professions.
CO-2	Acquirethoroughknowledgeonvariousanalyticaltoolsrequiredduringdifferentstagesofprojectlifecycle.
CO-3	Theywillbeabletoapplyvarioustoolsandtechniquesforplanningandschedulingtheprojects.
CO-4	Learnhowtobeproactivetotherisksandbeabletomanagethemthatoccurduringtheprogressivestages of the projects.
CO-5	Acquire thorough knowledge on cost accounting systems and key performance indicators.
CO-6	Learnallpossiblepracticalsituationsthatleadtodifferentchangesduringthecourseofprojectexecution and the problems related to controlling the changes.
CO-7	Possess full knowledge on how to evaluate the projects, terminate the projects and finally how to close the contract.
CO-8	Finally, students will acquire all the key skills to become effective project managers across various industries.

SYLLABUS: NON-DESTRUCTIVE TESTING (B16 ME 4106)

(Elective-III)

INTRODUCTION: Introduction to destructive and non-destructive testing. Scope and limitations of NDT.

VISUAL INSPECTION - Physical Principles, Methodology, Limitations, Applications.

DYE PENETRANT TESTING/ LIQUID PENETRANT TESTING: Principle, procedure, Characteristics of penetrant, types of penetrants, penetrant testing materials, different washable systems, fluorescent penetrant testing method– sensitivity, Developers, application and limitations

MAGNETIC PARTICLE TESTS: Important terminologies related to magnetic properties of material, principle, magnetizing technique, procedure, equipment, Methods of production of magnetic fields, fluorescent magnetic particle testing method, sensitivity, application and limitations

RADIOGRAPHIC TESTING: X-ray and Gamma-Ray radiography, Their principles, methods of generation, Types of films, screens and penetrometers, Interpretation of radiographs, Safety in industrial radiography Sources of ray-x-ray production, properties of d and x rays, film characteristics, exposure charts, contrasts, operational characteristics of x ray equipment, Industrial radiography techniques, inspection techniques, applications, limitations applications.

ULTRASONIC TESTING: Basic principles of sound propagation, types of sound waves, Production of ultrasonic waves, general characteristics of waves, Principle of UT, methods of UT, their advantages and limitations, Piezoelectric Material, Various types of transducers/probe, technique for normal beam inspection, flaw characterization technique, defects in welded products by UT, Thickness determination by ultrasonic method, Study of A, B and C scan presentations, principles of AET and techniques, Ultrasonic and acoustic emission techniques - pulse echo method advantage, limitations acoustic emission testing

EDDY CURRENT TESTING: Principle, instrument, techniques, sensitivity, application, limitation.

THERMAL METHODS - Principles of thermography and approaches in NDT, Sources and detectors, capabilities and limitations, measurement of diffusivity and wall thickness.

OPTICAL METHODS - Principles of Shearography and holography, applications in NDT.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16 ME 4106	
Course Title: NON-DESTRUCTIVE TESTING	
CO-1	Classify various non-destructive testing.
CO-2	Check different metals and alloys by visual inspection method
CO-3	Explain and perform non-destructive tests like: Liquid penetrant test, Magnetic particle test, Ultrasonic test, X-ray and Gamma ray radiography, Leak Test, Eddy current test.
CO-4	Identify defects by using relevant NDT methods

SYLLABUS: POWER PLANT ENGINEERING (B16 ME 4107)

(Elective-III)

Introduction to the sources of energy – resources and development of power in India.

STEAM POWER PLANT: Plant layout, working of different circuits, fuel and handling equipment, types of coals, coal handling, choice of handling equipment, coal storage, ash handling systems. Combustion: properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, dust collectors, cooling towers and heat rejection. Corrosion and feed water treatment.

INTERNAL COMBUSTION AND GAS TURBINE POWER PLANTS:

DIESEL POWER PLANT: Plant layout with auxiliaries – fuel supply system, air starting equipment, super charging.

GAS TURBINE PLANT: Introduction – classification **-** construction – layout with auxiliaries, combined cycle power plants and comparison.

HYDRO ELECTRIC POWER PLANT: Water power – hydrological cycle / flow measurement – drainage area characteristics – hydrographs – storage and pondage –classification of dams and spill ways. HYDRO PROJECTS AND PLANT: Classification – typical layouts – plant auxiliaries – plant operation pumped storage plants.

NUCLEAR POWER STATION: Nuclear fuel – breeding and fertile materials – nuclear reactor– reactor operation. TYPES OF REACTORS: Pressurized water reactor, boiling water reactor, sodium-graphite reactor, fast breeder reactor, homogeneous reactor, gas cooled reactor, radiation hazards and shielding – radioactive waste disposal.

POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDE RATIONS: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, load curves, load duration curve, definitions of connected load, maximum demand, demand factor, average load, load factor, diversity factor – related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – methods of pollution control.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16ME4107	
Course Title: POWER PLANT ENGINEERING	
CO-1	principle of operation and performance of steam power plant along with their economics and their impact on environment
CO-2	principle of operation and performance of internal combustion and gas turbine power plants along with their economics and their impact on environment.
CO-3	principle of operation and performance of hydro electric power plant along with their economics and their impact on environment.
CO-4	principle of operation and performance of nuclear power plant along with their economics and their impact on environment.

SYLLABUS: MECHATRONICS (B16ME4108)

(Elective-III)

Mechatronics system design: Introduction to Mechatronics: What is mechatronics, Integrated design issues in mechatronics, Mechatronics key elements, the mechatronics design process, advanced approaches in mechatronics.

Modelling and simulation of physical systems: Simulation and block diagrams, Analogies and impedance diagrams, Electrical systems, Mechanical translational systems, Mechanical rotational systems, electromechanical coupling, Fluid systems.

Sensors and transducers: An introduction to sensors and transducers, Sensors for motion and position measurement, Force, torque and tactile sensors, Flow sensors, Temperature-sensing devices. Actuating devices: Direct current motor, Permanent magnet stepper motor, Fluid power actuation.

Signals, systems and controls: Introduction to signals, systems and controls, System representation, Linearization of nonlinear systems, Time delays.

Real time interfacing: Introduction, Elements of a data acquisition and control system, Overview of the I/O process, Installation of the I/O card and software.

Advanced applications in mechatronics: Sensors for condition monitoring, Mechatronic control in automated manufacturing, Artificial intelligence in mechatronics, Micro sensors in mechatronics.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16ME4108	
Course Title: MECHATRONICS	
CO-1	Model and analyze electrical and mechanical systems and their interconnection.
CO-2	Integrate mechanical, electronics, control and computer engineering in the design of mechatronics systems.
CO-3	Do the complete design building, interfacing and actuation of a mechatronic system for a set of specifications.

SYLLABUS: DESIGN FOR MANUFACTURING (B16 ME 4109)

(Elective-III)

Introduction: Design philosophy-steps in design process-general design rules for manufacturability-basic principles of designing for economical production – creativity in design.

Machining processes: Overview of various machining processes-general design rules for machining-dimensional tolerance and surface roughness- Design for machining – ease – redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

Metal casting: Appraisal of various casting processes, selection of casting process,-general design considerations for casting-casting tolerance-use of solidification, simulation in casting design-product design rules for sand casting.

Metal joining: Appraisal of various welding processes, factors in design of weldments – general design guidelines-pre and post treatment of welds- effects of thermal stresses in weld joints- design of brazed joints. Forging: Design factors for forging – closed die forging design – parting lines of dies – drop forging die design – general design recommendations.

Extrusion & Sheet metal work: Design guide lines extruded sections- design principles for punching, blanking, bending, deep drawing-Keeler Goodman forging line diagram – component design for blanking.

Plastics: Visco elastic and creep behavior in plastics-design guidelines for plastic components- design considerations for injection moulding – design guidelines for machining and joining of plastics.

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16ME4109	
Course Title: DESIGN FOR MANUFACTURING	
CO 1	Select the design principle, suitable material, mechanism, fit and tolerance for designing a product/component.
CO 2	Select the appropriate material, proper working principle and a feasible design.
CO 3	Design (optimum) a component which requires less material removal, easy to machine, assemble, access and cost effective.
CO 4	Redesign the uneconomical casting design and know the applications of DFMA.
CO 5	Incorporate the Environmental Objectives, issues and guidelines into the design.

SYLLABUS: HEAT TRANSFER LAB (B16 ME 4110)

LIST OF EXPERIMENTS

1. Determination of Heat Transfer through Lagged Pipe.
2. Measurement of Thermal Conductivity for a given Asbestos Insulating powder.
3. Determination of Thermal Conductivity for a Given Copper Metal Rod.
4. Determination of Heat Transfer through Pin-Fin.
5. Experimentation on Transient Heat Conduction.
6. Determination of Heat Transfer through Forced Convection.
7. Determination of Heat Transfer through Natural Convection.
8. Determination of overall heat transfer coefficient for Parallel and Counter Flow Heat Exchanger.
9. Emissivity Measurement.
10. Measurement of Stefan Boltzmann constant.
11. Determination of Heat Transfer through Drop Wise and Film Wise Condensation.
12. Determination of Two phase heat Transfer.
13. Determination of Overall Heat Transfer Co-Efficient for Composite Wall.
14. Study of Refrigeration Test Rig.
15. Study of Air Conditioning Test Rig.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16ME4110	
Course Title: HEAT TRANSFER LAB	
CO-1	Understand the basic laws of heat transfer, account for the consequence of heat transfer in thermal analyses of engineering systems.
CO-2	WillbeabletoapplytheirknowledgeofDimensionalAnalysistoforcedandfreeconvection.
CO-3	Analyze heat exchanger performance by using the method of log mean temperature difference, heat exchanger, effectiveness.
CO-4	Calculate radiation heat transfer between black body surfaces and gray body surfaces.
CO-5	Demonstrate and explain mechanism of boiling and condensation.

SYLLABUS: PROJECT PHASE-I(B16ME4111)

The phase-I of the project shall comprise of

- Problem identification in close collaboration with industry.
- Literature survey.
- Deriving work content and carry out of project requirement analysis.
- Submission of interim report.
- Presentation to an expert committee.

(Note: Sessionals 50 marks will be awarded based on Continuous evaluation - 25 Marks Seminar and Viva voce - 25 Marks.)

SYLLABUS: COMPUTER AIDED MANUFACTURING (B16 ME 4201)

Introduction to CNC and CAM, CNC retrofitting, Adoptive control machining, NC part program preparation through computer languages. Group technology: Merits & demerits, Organization, Classification and Coding systems, Facilities layout.

Computer aided process planning: Introduction to process planning, Methods of process planning, Computer aided process planning, CAPP systems, and case studies.

Computer aided material handling and production planning: Robots: Structure and operation of Robots, robot sensors and applications. Automatic conveyor systems. Automated guided vehicles. Aid of computer in production planning and control, Inventory control and material requirement planning.

Computer aided inspection and quality control: Developments and practice, Quality assurance and quality control. Coordinate measuring machine. Non-contact inspection.

FMS & CIMS: Building blocks of Flexible Manufacturing Systems (FMS), machining systems of FMS, Tool management systems, Advantages of FMS, Computer integrated manufacturing systems (CIMS).

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16ME4201	
Course Title: COMPUTERAIDED MANUFACTURING	
CO-1	After completion of the course students can Handle various NC machines,
CO-2	Write G.T codes for any complex component
CO-3	Apply techniques on various old machines and converted into retrofitted,
CO-4	Gain knowledge on various types of robots, AGV’S, Automated conveyors systems, FMS centers

SYLLABUS: QUALITY CONTROL AND ASSURANCE (B16 ME 4202)

Quality control in Perspective -Introduction to quality, quality assurance, quality control; quality of design, quality of conformance and quality of performance; quality characteristics – variables and attributes, growth of quality control, Statistical quality control, Taguchi's loss function, examples of off-line and on-line quality control techniques, quality costs, Deming's philosophy, introduction to six sigma concept.

Control charts for Variables: Shewart's norm bowl, $\bar{X}$ and R charts, $\bar{X}$ and σ charts, Statistical control of processes, group control chart, $\bar{X}$ chart with linear trend, warning limits.

Control charts for Attributes: Defect and defective, fraction defective and percent defective, p- chart, 100p -chart, np-chart, c-chart, u-chart, ku-chart, demerit control charts.

Process capability analysis: Determination of process capability, PCR, Design specifications and tolerances, PCR for nominal the better type, smaller the better type and larger the better type product specifications; Tolerances for sub-assemblies, setting tolerances for intermediate steps in production.

Acceptance sampling plans: Single, double, multiple and sequential sampling plans, OC curve, rectifying inspection, AOQ, AOQL, ASN and ATI, Use of Dodge Romig Tables, Design of single and sequential sampling plans.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16ME4202	
Course Title: QUALITY CONTROL AND ASSURANCE	
CO-1	Stewarts normal bowl,control charts for variables,X,Randsigma controlcharts.
CO-2	Control charts for attributes, p-chart, standardized p –chart, np-chart, c-chart, u-chart, demeritcontrolchart.
CO-3	Type-IandType-IIerrors, Processcapabilityanalysis.
CO-4	Sampling palns: single, double, multiple and sequential sampling plans, rectifying inspection,AOQ,AOQL,andATI.UseofDodgeRomigTables,Designofsingleandsequentialsamplingplans.

SYLLABUS: CAD/CAM LAB (B16ME4203)

CAD Exercises:

1. Initiating the graphics package; Setting the paper size, space; setting the limits, units; use of snap and grid commands.
2. Drawing of primitives (line, arc, circle, ellipse, triangle etc.)
3. 3D GEOMETRIC MODELING: Creation of 3D Models, Wire Frame, Surface, Solid modeling Techniques Using CAD Packages – CSG, B-Rep Approaches in Solid Modeling Feature Based Modeling Technique – Assembly –Detailing Exposure to Industrial Components – Application of GD&T.
4. Drawing a flange.
5. Drawing a Bushing assembly.
6. Dimensioning the drawing and adding text.
7. Setting the layers and application of the layers.
8. Isometric and orthographic projections.
9. Viewing in Three dimensions.
10. Removal of hidden lines - Shading and rendering.

CAM Exercises:

1. Preparation of manual part programming for CNC turning/Milling.
2. Part programming preparation through AutoCAD.
3. APT part programming for 2D - contour.
4. Machining of one job on CNC machine tool.
5. Robot programming through Teaching Box method.
6. Robot programming through computer.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16ME4203	
Course Title :CAD/CAMLAB	
CO-1	StudentswillbeabletoknowtoproducetheindustrialdrawingsbyusingCAD/CAMsoftware’s.
CO-2	AftersuccessfulcompletionofthislaboratorystudentcandothejobinCAD/CAMindustryasa design engineer.

SYLLABUS: PROJECT PHASE-II (B16ME4204)

The phase-II of the project shall consists of

Implementing, Testing and validation. Report Writing.

Sessionals (50 Marks) will be awarded by the Project Guide based on continuous evaluation. External Evaluation (100 marks) of project report and viva voce will be conducted by a committee consisting of HOD, Guide and External Examiner.

May be carried out using in-house facilities or in an industry by specified number of students in a group.

Format for Preparation of Project Thesis for B. Tech:

Arrangement Of Contents: The sequence in which the project report material should be arranged and bound should be as follows:

1. Cover Page & Title Page .
2. Bonafide Certificate
3. Abstract.
4. Table of Contents
5. List of Tables
6. List of Figures
7. List of Symbols, Abbreviations and Nomenclature
8. Chapters
9. Appendices
10. References

*The table and figures shall be introduced in the appropriate places.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16ME4204	
Course Title: PROJECTPHASE-II	
CO-1	Identifyacurrentproblemthroughliterature/field/casestudiesanddefinethebackgroundobjectives and methodology for solving the same.
CO-2	Analyze, design and develop a technology/process.
CO-3	Implement and evaluate the technology at the laboratory level.
CO-4	Write report and present it effectively.