SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(AUTONOMOUS)
(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)
UG Programmes CE,CSE,ECE,EEE,IT & ME are Accredited by NBA
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204
Estd:1980

LIST OF OPEN ELECTIVES
OFFERED BY VARIOUS DEPARTMENTS TO OTHER DEPARTMENTS
IN
IV YEAR I SEMESTER

Offered by	Course Code	Course Name	Offered to
CIVIL ENGINEERING	B19CEOE03	Building Services	**CSE, IT & ME**
	B19CEOE04	Green Buildings	**CSE, IT & ME**
COMPUTER SCIENCE & ENGINEERING	B19CSOE04	Data Base Management Systems	**CE & ME**
	B19CSOE05	Object Oriented Programming Through C++	**CE & ME**
	B19CSOE06	Python Programming	**CE**
ELECTRONICS & COMMUNICATION ENGINEERING	B19ECOE03	Digital Signal Processing	**CE, CSE, IT & ME**
	B19ECOE04	Microprocessors and Interfacing	**CE, CSE & ME**
ELECTRICAL & ELECTRONICS ENGINEERING	B19EEOE01	Introduction to Electrical Systems	**CE, CSE, IT & ME**
	B19EEOE02	Electrical Estimation And Costing	**CE, CSE, IT & ME**
	B19EEOE03	Priniciples of Control Systems	**CE, CSE, IT & ME**
	B19EEOE04	Basic Power Electronics	**ME**
	B19EEOE05	Electrical Vehicles	**ME**
	B19EEOE06	Matlab Programming for Engineering Applications	**CE, CSE, IT & ME**
INFORMATION TECHNOLOGY	B19ITOE04	Web Technologies	**CE, ME**
MECHNAICAL ENGINEERING	B19MEOE04	Introduction to Robotics	**CE, CSE & IT**
ENGINEERING MATHEMATICS & HUMANITIES	B19BSOE03	Mathematics for Machine Learning	**CE, CSE, IT & ME**

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CEOE03	OE	3	--	--	3	25	75	3Hrs.

BUILDING SERVICES

(offered by CE)

(offered to CSE, IT & ME)

Course Objectives:

1	Introduce the various electro-mechanical systems that are found in modern buildings
2	Explain the role of various Mechanical, Electrical, Plumbing, Firefighting systems in providing occupant comfort, safety and security in their working and living environment.
3	Emphasise the role of resource conservation in reducing the impact of built environment by integration of renewable energy, resource recycling and biophilic design.

Course Outcomes: The Student will be able to

S.No	Outcome	Knowledge Level
1	Identify the functional requirements of various types of buildings and rooms in buildings.	K2
2	Explain the significance of fire safety systems and their regular audit in buildings.	K2
3	Layout the plumbing and drainage systems for different types of buildings	K2
4	Summarise the various lighting, ventilation and acoustic design elements in buildings.	K2
5	Propose the resource conservation strategies for buildings such as rainwater harvesting and Solar Energy utilization.	K2

SYLLABUS

UNIT-I (8 Hrs)	**Introduction** Types of buildings, functional requirements – Role of building Service professionals. **Vertical Transportation** Lifts: Different types of lifts and its uses – Component parts of Lift – Lift Well, Travel, Pit, Hoist way, Machine, Buffer, Lift Car, landing, door, Call indicators, Design Provisions for basic size calculations of enclosure space. Escalators: Different types of escalators and their uses – Components, space calculation, safety measures Ramp: Necessity, gradient calculation, special features to aid movement of physically handicapped and elderly.

UNIT-II (8Hrs)	**Fire Safety** Fire protection requirements for multi-storeyed building. Causes of fire in buildings. Fire detection and fighting systems. Working principles of various fire protection systems. Safety requirements in various types of buildings – Fire resistant design and materials – Fire inspection – Provisions for evacuation.
UNIT-III (8Hrs)	**Plumbing systems for water supply and sanitation** Types and function of plumbing fixtures, sizes, capacities, traps, interceptors. Storage of water, hot and cold water supply systems. Drainage systems – One Pipe System, Two Pipe Systems, Vents and purpose of venting, wastewater reclamation.
UNIT-IV (8Hrs)	**Lighting - Ventilation and Acoustics** Natural and electrical lighting, Different lighting schemes, direct light, diffuse light, glare. Different control mechanisms for achieving comfortable light conditions. Lumen and Lux considerations in selecting luminaires. Natural Ventilation and Mechanical Ventilation. Concept of Thermal comfort, Cooling Degree Days, Air changes. Building Acoustics, Acoustic design of buildings and appropriate materials selections
UNIT-V (8Hrs)	**Natural Resource Conservation** Rainwater Harvesting. Components – Catchments, gutters, conduits, filters, storage, recharge or storage structures. Potential of RWH for various locations and building roof and landscape designs. – Domestic Hot Water from Solar Water heaters – Basics of heat transfer, passive and direct heating systems, sizing, cost benefit analysis of using solar water heaters
TextBooks:	
1	The A – Z of practical building construction and it Management, Mantri, Sandeep, Satya Prakashan, New Delhi
2	Plumbing Design and Practise, Deolalikar, S.G. McGraw hill, New Delhi
3	Principle of Fire Safety Engineering: Understanding Fire and Fire Protection, Akhil Kumar Das, PHI Learning Pvt. Ltd. New Delhi
4.	Textbook Of Refrigeration And Air-Conditioning, R S Khurmi, S.Chand Publishers
ReferenceBooks:	
1	National Building Code Part 1, 4, 8, 9 Bureau of Indian Standards
2	IS 12783 (Part 1) Code of Practise for plumbing in multistoried buildings, Bureau of Indian Standards
3	2008 Uniform Plumbing Code – India , Bureau of Indian Standards

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CEOE04	OE	3	--	--	3	25	75	3Hrs.

GREEN BUILDINGS

(offered by CE)

(offered to CSE, IT & ME)

Course Objectives:

1	To introduce students to the concept of a 'Green' Building
2	To familiarize students with the 'voluntary environmental building rating systems' (VERS) operating in India.
3	To communicate the logic behind the rating categories in IGBC, GRIHA, LEED, EDGE, and WELL rating systems.

Course Outcomes: The Student will be able to

S.No	Outcome	Knowledge Level
1	Emphasise the importance of site selection and preparation in sustainability of built environment.	K2
2	Suggest appropriate construction materials and finishes that meet green requirements of various rating systems.	K2
3	Elaborate on the design options available to conserve energy and water in buildings during their operation.	K2
4	Relate the building design to the quality of the indoor environment and specify electro-mechanical interventions for achieving occupant comfort.	K2
5	Paraphrase the requirements of various voluntary green rating systems of buildings for achieving various levels of rating.	K2

SYLLABUS

UNIT-I (8 Hrs)	**Site Selection and Preparation:** Typical features of Green Buildings, benefits of green buildings – Sustainable Site Selection, Preserving the natural resources, maximising comfort, integration of daylight, optimising ventilation; rainwater harvesting, recharge, reuse strategies
UNIT-II (8Hrs)	**Appropriate Materials and Design:** Renewable Materials, FSC (Forest Stewardship Council) certification – Rapid Renewal, bamboo, eucalyptus, poplar, rubberwood, linoleum – Low energy walling; rammed earth, stabilised mud, Adobe–Post Consumer, Post Industrial Waste recycling – Hollow blocks, lime, pozzolona cements, agri residues – Ferro cement, Ferro concrete – Alternative

	roofing systems; Vaults, Domes High albedo paints
UNIT-III (8Hrs)	**Water & Energy Conservation in Buildings :** Need for energy conservation in buildings, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes – Water Conservation systems in Buildings, water harvesting in buildings, waste to energy in residential complexes, Modular wastewater treatment systems
UNIT- IV (8Hrs)	**Indoor Environment Quality :** Weather data collection, temperature, humidity, wind speed, direction–Climate change and Built Environment, how they affect each other – Occupant Comfort, design, codes, thermal comfort, lighting comfort, acoustic comfort - Mechanical Ventilation and Air Conditioning concepts – Energy Efficient Lighting Design – Passive cooling strategies, green roofs – Case studies from actual buildings - Building Automation and BMS
UNIT-V (8Hrs)	**Measuring Sustainability 'voluntary environmental building rating Systems' :** National Building Code of India - LEED Introduction, process, rating system, variants and levels–GRIHA Introduction, process, rating system, variants and levels– IGBC Introduction, process, rating system, variants and levels–
Text Books:	
1	Alternative Building Materials and Technologies, K.S.Jagadish, B.V.Venkatarama Reddy and K.S.Nanjunda Rao, 2nd Edition, New Age International
2	GRIHA Manual and Reference Guides
3	LEED Reference Guides
4	IGBC Reference Guides
Reference Books:	
1	Sun, Wind, and Light: Architectural Design Strategies, Mark DeKay, G.Z.Brown, 3rd Edition, John Wiley & Sons
2	National Building Code of India (2016), Bureau of Indian Standards.
3	https://app.edgebuildings.com/user/welcome

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CSOE04	OE	3	0	0	3	25	75	3 Hrs.

DATA BASE MANAGEMENT SYSTEMS

(offered by CSE)

(offered to CE & ME)

Course Objectives:

1.	To introduce about database management systems
2.	To give a good formal foundation on the relational model
3.	To introduce the concepts of basic SQL as a universal Database language
4.	To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design and normalization
5.	To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques
6.	To explain Transaction management techniques

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Describe fundamental concepts a relational database	K2
2.	Create, maintain and manipulate a relational database using SQL	K3
3.	Apply Conceptual and Logical database design	K3
4.	Apply normalization for database design	K3
5.	Illustrate Storage management and Transaction management techniques.	K2

SYLLABUS

UNIT-I (10 Hrs)	**Introduction**: Database system, Characteristics (Database Vs File System), Database Users (Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.
UNIT-II (10 Hrs)	**Relational Model**: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance **BASIC SQL**: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using

	where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion).
UNIT-III (10 Hrs)	**Entity Relationship Model**: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, Generalization/specialization ,Aggregation. **SQL:** Creating tables with relationships, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, views(updatable and non-updatable), relational set operations.
UNIT-IV (10 Hrs)	**Schema Refinement (Normalization**): Purpose of Normalization or schema refinement, concept of functional dependency, Closure of functional dependency and attribute closure, Normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).
UNIT-V (10 Hrs)	**Transaction Concept**: Transaction State, Implementation of Atomicity and Durability, Schedules, Serializability, Recoverability, Implementation of Isolation levels, 2Pl and Time stamp ordering protocols, Failure Classification, Recovery and Atomicity, ARIES Recovery algorithm. **Indexing Techniques**: Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing, B+ Trees: Searching, Insertion, Deletion

Text Books:	
1.	Database System Concepts by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 7th Edition, McGraw-Hill Education, 2019.
2.	Database Management Systems by Raghu Ramakrishnan, Johannes Gehrke, 3rd Edition., McGraw-Hill Education (India), 2014.
Reference Books:	
1.	Database Principles: Fundamentals of Design, Implementation, and Management by Steven Morris, Keeley Crockett, Carlos Coronel, Craig Blewett, Cengage, 2020.
2.	Fundamentals of Database Systems by Ramez Elmasri, Shamkant B. Navathe, 7th Edition, Pearson Education India, 2015.
3.	Introduction to Database Systems by C J Date, 8th Edition, Pearson Education, 2009.
e-Resources:	
1.	https://nptel.ac.in/courses/106/105/106105175/
2.	https://www.geeksforgeeks.org/introduction-to-nosql/

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CSOE05	OE	3	0	0	3	25	75	3 Hrs.

OBJECT ORIENTED PROGRAMMING THROUGH C++

(offered by CSE)

(offered to CE & ME)

Course Objectives:

1.	Understand the syntax and principles of Object Oriented Programming.
2.	Design and development of secure and extendable C++ applications.
3.	Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.
4.	Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.
5.	Demonstrate the use of various OOP's concepts with the help of programs.

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Illustrate the process of Object Oriented Paradigm.	K2
2.	Demonstrate classes, member functions, constructors and their importance in developing real world applications.	K2
3.	Apply C++ features such as Inheritance, operator overloading to make programs reusable.	K3
4.	Understand Dynamic Memory Management techniques using pointers.	K2
5.	Apply the concept of Generic Programming and Exception handling to built an efficient and error free code.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Introduction to C++**: Difference between C and C++, Evolution of C++, The Object Oriented Technology, Disadvantage of Conventional Programming, Key Concepts of Object Oriented Programming, Advantage of OOP, Object Oriented Language.
UNIT-II (10 Hrs)	**Classes and Objects**: Classes in C++, Declaring Objects, Access Specifiers and their Scope, Defining Member Function, Overloading Member Function, Nested class **Constructors and Destructor:** Constructors and Destructors, Introduction, Constructors and Destructor, Characteristics of Constructor and Destructor, Application with Constructor, Constructor with Arguments parameterized Constructor, Destructors,

	Anonymous Objects
UNIT-III (10 Hrs)	**Operator Overloading and Type Conversion & Inheritance**: The Keyword Operator, Overloading Unary Operator, Operator Return Type, Overloading Assignment Operator (=), Rules for Overloading Operators, Inheritance, Reusability, Types of Inheritance, Virtual Base Classes- Object as a Class Member, Abstract Classes, Advantages of Inheritance, Disadvantages of Inheritance.
UNIT-IV (10 Hrs)	**Pointers:** Pointer, Features of Pointers, Pointer Declaration, Pointer to Class, Pointer Object, The this Pointer, Pointer to Derived Classes and Base Class **Binding Polymorphisms and Virtual Functions**: Binding Polymorphisms and Virtual Functions, Introduction, Binding in C++, Virtual Functions, Rules for Virtual Function, Virtual Destructor.
UNIT-V (10 Hrs)	**Generic Programming with Templates & Exception Handling**: Definition of class Templates, Normal Function Templates, Over Loading of Template Function, Bubble Sort Using Function Templates, Difference between Templates and Macros, Linked Lists with Templates, Exception Handling, Principles of Exception Handling, The Keywords try throw and catch, Multiple Catch Statements, Specifying Exceptions. Overview of Standard Template Library, STL Programming Model, Containers, Sequence Containers, Associative Containers, Algorithms, Iterators, Vectors, Lists, Maps.

Text Books:	
1.	A First Book of C++, 4th Edition, Gary Bronson, Cengage Learning.
2.	The Complete Reference, C++, 5th Edition, Herbert Schildt, McGraw-Hill Education.
Reference Books:	
1.	Object Oriented Programming C++, Joyce Farrell, Cengage Learning.
2.	C++ Programming: from problem analysis to program design, 6th Edition, DS Malik, Cengage Learning
3.	Programming in C++, Ashok N Kamthane, and Pearson.
4.	Object Oriented Programming using C++, 8th Edition, E.Balaguruswamy, PHI
e-Resources:	
1.	https://nptel.ac.in/courses/106/105/106105151/
2.	https://github.com/topics/object-oriented-programming

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19CSOE06	OE	3	0	0	3	25	75	3 Hrs.

PYTHON PROGRAMMING

(offered by CSE)

(offered to CE)

Course Objectives:

1.	To learn about Python syntax, semantics, and the runtime environment.
2.	To learn the use of lists, tuples, dictionaries and sets in Python programs.
3.	To learn the python package building and Python modules for reusability.
4.	To be familiarized in general coding techniques and object-oriented programming.
5.	To develop the skills of designing GUI and handling exceptions in python.

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1.	Understand the basic principles of python programming.	K2
2.	Apply the knowledge of python programming to perform operations on data structures.	K3
3.	Develop the coding tasks using functions and modular programming.	K3
4.	Use OOP principles and File concepts to solve different problems.	K3
5.	Handle different exceptions raised in python and apply GUI for providing interface to various problems.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Introduction**: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output. **Data Types, and Expression**: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules. **Decision Structures and Boolean Logic**: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. **Repetition Structures**: Introduction, while loop, for loop, Input Validation Loops, Nested Loops.

UNIT-II (10 Hrs)	**Strings and Text Files**: Accessing Character and Substring in Strings, Strings and Number Systems, String Methods Text Files. **Data structures**: **Lists**- creating a list, accessing, slicing and other operations **Tuples**- creating a tuple, accessing and other operations **Dictionaries**- creating a dictionary, accessing keys and values and other operations, Sets- creating a set, modifying, removing and other operations.
UNIT-III (10 Hrs)	**Design with Function:** Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function. **Modules**: Modules, Standard Modules, Packages.
UNIT-IV (10 Hrs)	**File Operations**: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations **Object Oriented Programming:** Concept of class, object and instances, Constructor, class attributes and destructors, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes.
UNIT-V (10 Hrs)	**Errors and Exceptions**: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions **Graphical User Interfaces**: The Behaviour of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.

Text Books:	
1.	Fundamentals of Python First Programs, Kenneth. A. Lambert, 2nd Edition, Cenagage learning,2018.
2.	Python Programming: A Modern Approach, Vamsi Kurama, Pearson,2018.
Reference Books:	
1.	Introduction to Python Programming, Gowrishankar.S, Veena A, first edition ,CRC Press,2018.
2.	Introduction to Programming Using Python, Y. Daniel Liang, Pearson,2013.
e-Resources:	
1.	https://www.tutorialspoint.com/python3/python_tutorial.pdf

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19ECOE03	OE	3	--	--	3	25	75	3 Hrs.

DIGITAL SIGNAL PROCESSING

(offered by ECE)

(offered to CE, CSE, IT & ME)

Course Objectives:

1.	This course introduces students to the fundamental principles of Digital Signal Processing and develops essential analysis and design tools required for signal processing systems & implementations
2.	This subject is an introduction to the graduate-level courses in a broad range of disciplines spanning communications, speech processing & image processing.

Course Outcomes: The student will be able to

S.No	Outcome	Knowledge Level
1.	Outline the basic concepts of signals and systems and describe the DSP fundamental theory and components	K 2
2.	Carry-out LTI system analysis using Z-transform	K 4
3.	Carryout data analysis & spectrum analysis using FFT	K 4
4.	Design of IIR digital filters to meet specifications.	K 4
5.	Design of FIR digital filters to meet specifications.	K 4

SYLLABUS

UNIT-I (8 Hrs)	**Discrete-Time Signals and Systems:** Introduction to Digital Signal Processing, Basic elements of a DSP system, Advantages of Digital SP over Analogy SP, Discrete-time signals and systems, DT-LTI systems described by Linear constant–coefficient difference equations, Properties & Analysis of DT-LTI systems.
UNIT-II (8 Hrs)	**Z-Transform:** Introduction to Z-transform, Properties, Inverse Z-transform, Analysis of DT-LTI systems in Z-Domain, System function, Structures and Realization of Digital Filters using Direct-I, II.
UNIT-III (8 Hrs)	**Discrete Fourier Transform (DFT) and Fast Fourier Transform Algorithms (FFT):** DFT, Properties of DFT, Circular and linear convolution of sequences using DFT, Radix–2 Decimation–in–Time (DIT) & Decimation–in–Frequency (DIF) FFT Algorithms.

UNIT-IV (8 Hrs)	**Design of IIR Digital Filters:** Low-pass analog filter design (using only Butterworth approximation), Design of IIR digital filters from analog filters, Bilinear Transformation Method, Impulse Invariance Technique.
UNIT-V (Hrs)	**Design of FIR Digital Filters:** Characteristics of FIR Digital Filters, Design of Linear Phase FIR digital Filters using Fourier series method, Windowing method (using only Rectangular, Hamming &Hanning windows), Criteria for Window selection, Comparison of IIR and FIR Filters.

Text Books:	
1.	Alan V. Oppenheim, Ronald W. Schafer, "**Digital Signal Processing**" – PHI Ed., 2006
2.	John G. Proakis, D.G. Manolakis, "**Digital Signal Processing: Principles, Algorithms and Applications"**, 3rd Ed., PHI, 1996.
Reference Books:	
1.	A Anand Kumar, "**Digital Signal Processing**" - Prentice Hall of India
2.	P. Ramakrishna Rao, "**Signals & Systems**", McGraw-Hill Education
e-Resources:	
1.	https://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/index.html
2.	https://nptel.ac.in/courses/117/102/117102060/

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19ECOE04	**OE**	**3**	**--**	**--**	**3**	**25**	**75**	**3 Hrs.**

MICROPROCESSORS AND INTERFACING

(offered by ECE)

(offered to CE, CSE & ME)

Course Objectives:

1.	To understand the architecture of 8085 Microprocessor.
2.	To be familiar with Addressing modes and Instruction set of the 8085 microprocessor
3.	To understand the concept of interfacing peripheral devices and memory to 8085 Microprocessor.
4.	To understand the architecture of 8086/8088 Microprocessor.
5.	To be familiar with Addressing modes and Instruction set of the 8086 microprocessor

Course Outcomes: On the completion of this course, the students will be able to:

S.No	Outcome	Knowledge Level
1.	Illustrate architecture of the 8085 microprocessor**.**	K2
2.	Describe Addressing modes and Instructions of the 8085 microprocessor.	K2
3.	Illustrate the concept of interfacing peripheral devices and memory to 8085 Microprocessor.	K3
4.	Illustrate architecture of the 8086 microprocessor	K2
5.	Describe Addressing modes and Instructions of the 8086 microprocessor.	K2

SYLLABUS

UNIT-I (12 Hrs.)	**8085 Architecture:** Introduction to microprocessors, Bus structure of 8085,internal architecture and functional description of INTEL 8085 Microprocessor, pin out & signals, flag register, Fetch cycle ,memory Read /Write and I/O Read /Write Cycles with Timing Diagrams , Stack memory organization, Interrupt structure of 8085,Vectored, non-vectored, maskable and non maskable interrupts.
UNIT-II (08 Hrs)	**8085 Addressing Modes & Instruction set:** Programming model of 8085 and specific function of each register, addressing modes of 8085 with examples, Classification of 8085 instructions based on length and operation with examples, Stack memory operation using PUSH and POP instructions, Data Transfer, Arithmetic and Logical Instructions of 8085 microprocessor with examples.

UNIT-III (09 Hrs)	**8085 Interfacing:** Classification of Read / Write and Read only memories, RAM/ROM Memory chips interfacing and I/O devices interfacing with 8085 using 74LS138.Functional description, control word formats, modes of operation of Intel Programmable Peripheral Interface(PPI) chip 8255 and Programmable Interval Timer/Counter (PIT) chip 8253 and their interfacing with 8085 microprocessor**.**
UNIT-IV (08 Hrs)	**8086/8088 Architecture:** Internal Architecture and Functional description of INTEL 8086/8088 microprocessor, and their comparison. Memory segmentation and physical memory address generation, pipeline architecture and instruction queue .Register organization, Status flags and machine control flags of 8086, 8086 memory Banks and Byte /Word transfers.
UNIT-V (08 Hrs)	**8086 Addressing Modes & Instruction set:** Programmable register array of 8086 and specific function of each register, Data addressing modes of 8086 with examples, fixed and variable I/O addressing. Stack memory operation, Data transfer, and Arithmetic and Logical instructions of 8086 microprocessor with examples.
Text Books:	
1.	Microprocessors: The 8086/8088, 80186/80286, 80386/80486 and the Pentium Family .NileshB.Bahadure, Phi Learning Pvt.Ltd.,2010
2.	The 8051 Microcontroller and Embedded Systems using assembly and C- Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D.Mc Kinlay;PHI,2013/ Pearson, 2013
Reference Books:	
1	Architecture Programming and Applications. Ramesh S.Goankar.New Age International Pvt.Ltd.,(3rd Edition)
2	Fundamentals of Microprocessors and Microcontrollers by B Ram
e-Resources:	
1.	archive.nptel.ac.in/courses/108/105/108105102/

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19EEOE01	OE	3	--	--	3	25	75	3 Hrs.

INTRODUCTION TO ELECTRICAL SYSTEMS

(offered by EEE)

(offered to CE, CSE, IT & ME)

Course Objectives: Students will learn

1.	To study the various aspects of electricity generation and power generation scenario in India
2.	To study the various aspects of transmission and distribution of electrical energy and Indian Power grid scenario
3.	To study the utilization of electricity in various applications.
4.	To study the power conversion and energy storage of electricity
5.	To study the electrical hazards, electrical safety measures and equipment protection devices

Course Outcomes: Students will be able to

Sl.No	Outcome	Knowledge Level
1.	**Apply** basic knowledge to understand principles of power generation and its scenario in India.	K3
2.	**Identity** different components of transmission and distribution substations and understand the Indian Power grid scenario.	K3
3.	**Apply** energy conversion principles to understand operation of electrical utility components	K3
4.	**Apply** basic knowledge to understand operation of rectifier, Inverter, batteries and uninterrupted power supply	K3
5.	**Understand and apply** the Electrical safety measures while handling electrical equipment.	K3

SYLLABUS

UNIT-I (10 Hrs)	**ELECTRICITY GENERATION** History of Electricity generation, Basic electrical quantities-Voltage, Current, Power and energy, DC and AC power supplies, frequency and rms value of sinusoidal voltage, Electric generator - principle of operation, Major sources ofelectricity generation: schematics of conventional power plants (Thermal and Hydro), Non-conventional sources (solar and wind)-principles and advantages, Power generation scenario in India.

UNIT-II (10 Hrs)	**TRANSMISSION AND DISTRIBUTION OF ELECTRICITY** Transmission of Electrical Energy: Layout of power system**,** Overhead lines and cables, Power transmission at high voltage, Transformer - Working principle, Construction,Distribution of electrical energy - schematics diagrams of radial and ring main distribution,Substations - substation layout, substation equipment and their purpose. Overview of Indian power grid.
UNIT-III (10 Hrs)	**ELECTRICAL ENERGY CONSUMPTION** Conversion to mechanical energy - Classification of Electrical motors and their applications, DC motor - Working principle, Torque equation, AC motor - Working principle of 3-phase Induction motor, slip, Illumination- laws of illumination, fluorescent lamp, LED lamp, Electrical energy consumption in India
UNIT-IV (10 Hrs)	**POWER CONVERTERS AND STORAGE** Need of power conversion, Rectifier- Single phase full wave diode rectifier with C-filter, rectifier applications, Inverter- Single phase full bridge inverter operation, Inverter Applications, Electricity storage- Batteries, types of batteries, Lead acid battery, Li ion batteries, Ratings and basic parameters of batteries, battery pack, Domestic Uninterrupted power supply(UPS) system.
UNIT-V (10 Hrs)	**ELECTRICAL SAFETY AND EQUIPMENT PROTECTION**. Hazards in electrical systems, Different types of hazards, Electric Shock, Electrical safety measures, Earthing, Different methods of earthing. Domestic Protective Devices - Fuses and their ratings, Miniature Circuit Breaker (MCB), Earth Leakage Circuit Breaker(ELCB), Power ratings of different domestic loads - Fans, Lights, Air conditioners, Refrigerators, etc.

Text Books:	
1.	Basic Electrical Engineering- S. K. Sahdev, Pearson Publications, ISBN 978-93-325-4216-7
2.	Dr P.S. Bimbhra, Power Electronics - 4th Edition, Kanna Publisher
Reference Books:	
1.	Iqbal Husain, “Electric and Hybrid Vehicles Design Fundamentals”, CRC Press, Taylor & Francis Group, 2011
2.	Generation Distribution and Utilization of Electrical Energy by C.L Wadhwa.3rd Edition

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19EEOE02	OE	3	--	--	3	25	75	3 Hrs.

ELECTRICAL ESTIMATION AND COSTING

(offered by EEE)

(offered to CE, CSE, IT & ME)

Course Objectives: Students will learn

1.	The electrical symbols and simple electrical circuits.
2.	The design of electrical installations.
3.	The design of electrical installation for different types of buildings and small industries.
4.	The basic components of electrical substations.
5.	The design of overhead and underground Transmission and Distribution lines.

Course Outcomes: Students will be able to

Sl.No	Outcome	Knowledge Level
1.	Identify the various electrical apparatus and their interconnections.	K3
2.	Select suitable electrical supply system and design earthing systems of various electric loads.	K4
3.	Estimate the cost for installation of wiring for different types of buildings and small industries.	K3
4.	Identify the components of electrical substations.	K3
5.	Design overhead and underground Transmission and Distribution lines.	K4

SYLLABUS

UNIT-I (10 Hrs)	**Electrical Symbols and Simple Electrical Circuits:** Need of electrical symbols, list of symbols, Electrical Diagrams, Methods of representation for wiring diagrams, introduction to simple light and fan circuits, system of connection of appliances and accessories, simple examples on light and fan circuits.
UNIT-II (10 Hrs)	**Design Considerations of Electrical Installations:** Electric supply system, Three-phase four wire distribution system, protection of electric installation against overload, short circuit and earth fault, Earthing, neutral and earth wire, types of loads, systems of wiring, Service connections, Service Mains, Sub-Circuits, Location of Outlets, Location of Control Switches, Location of Main Board and Distribution board, Guide lines for Installation of Fittings, Load Assessment, estimating and costing of electrical installations

UNIT-III (10 Hrs)	**Electrical Installation for Different Types of Buildings and Small Industries:** Electrical installations for residential buildings, estimating and costing of material, simple examples on electrical installation for residential buildings, electrical installations for commercial buildings, Electrical installations for small industries.
UNIT-IV (10 Hrs)	**Substations** Introduction, types of substations, outdoor substations-pole mounted type, indoor substations-floor mounted type, simple examples on quantity estimation.
UNIT-V (10 Hrs)	**Overhead and Underground Transmission and Distribution Lines:** Introduction, supports for transmission lines, Distribution lines — Materials used, Underground cables, Mechanical Design of overhead lines, Design of underground cables, Estimation and cost for 1000 Meter 400/230 Volt overhead transmission line with street lightning.
Text Books:	
1.	Electrical Design and Estimation Costing - K. B. Raina and S.K.Bhattacharya – New Age International Publishers.
Reference Books:	
1.	Electrical wiring estimating and costing – S.L.Uppal and G.C.Garg – Khanna publishers, sixth edition, 1987.
2.	A course in electrical installation estimating and costing – J.B.Gupta –Kataria SK & Sons.

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19EEOE03	**OE**	**3**	**--**	**--**	**3**	**25**	**75**	**3 Hrs.**

PRINICIPLES OF CONTROL SYSTEMS

(offered by EEE)

(offered to CE, CSE, IT & ME)

Course Objectives: Students will learn

1.	About modelling of linear systems using transfer functions and obtain transfer functions using block diagrams and signal flow graphs.
2.	About the significance of time response and find it for system analysis in transient and steady state.
3.	The concept of stability and know different techniques of stability analysis.
4.	The concept of frequency domain analysis, Bode plots, Polar plots,
5.	The concept of state space analysis

Course Outcomes: Students will be able to

Sl.No	Outcome	Knowledge Level
1.	Model electrical and mechanical physical systems by **applying** laws of physics and **derive** transfer functions from block diagrams & Signal Flow Graphs.	K3
2.	**Apply** and **Analyse** systems in time domain for transient and steady-state behaviour.	K3,K4
3.	**Apply** the concept of stability on Systems and **analyse** the stability of a system by RH criterion and Root locus.	K3,K4
4.	Understand the concept of frequency response and **apply** and **analyse** it for stability studies.	K3,K4
5.	**Change** the system into state space of the system and **analyse** them.	K3,K4

SYLLABUS

UNIT-I (10 Hrs)	**Introduction to control systems** Open loop, closed loop systems-Effect of Feedback. Modelling of Systems: Electrical and Mechanical Systems-Block diagram representation-Block diagram reduction technique-Signal flow graph-Mason's gain Formula (Simple Problems)
UNIT-II (10 Hrs)	**Time Domain Analysis of Control Systems** Standard test signals-Unit step response of First order and Second order systems-Time response specification of second order systems-steady state errors and error constants.

UNIT-III (10 Hrs)	**Stability analysis** Concept of stability-Routh Hurwitz Stability Criterion-Relative Stability-Introduction to Root locus-construction of root locus-analysis of control system using root locus (Simple Problems).
UNIT-IV (10 Hrs)	**Frequency Domain Analysis of control systems** Frequency Response-Bode Plot-Polar Plots-Log Magnitude versus Phase Plots- Correlation between Time and Frequency Responses-Frequency domain specifications-Relative stability measures in frequency domain-definitions of Gain margin and Phase margin.
UNIT-V (10 Hrs)	**State Space Analysis** Concept of state and State variables - state space models for dynamic systems-Conversion between state space models and transfer functions -solution of state equations- State transition Matrix-concepts of Controllability and observability.
Text Books:	
1.	I. J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers (6th Edition).
2.	Norman S. Nise, 'Control Systems Engineering', Wiley publications (8th Edition)
Reference Books:	
1.	Benjamin C. Kuo, 'Automatic Control Systems' , PHI (5th Edition).
2.	Richard C. Dorf and Robert H. Bishop, 'Modern Control Systems', Addison-WesleyPublishers(8th Edition)

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19EEOE04	OE	3	--	--	3	25	75	3 Hrs.

BASIC POWER ELECTRONICS

(offered by EEE)

(offered to ME)

Course Objectives: Students will learn

1.	The power electronic switching devices.
2.	The characteristics of power electronic switching devices
3.	The performances of uncontrolled AC-DC converters
4.	The performance and control of DC-DC converters
5.	The operation of DC-AC converters

Course Outcomes: Students will be able to

Sl.No	Outcome	Knowledge Level
1.	**Explain** the principle of operation of thyristor, modern power semiconductor devices.	K3
2.	**Illustrate** the phase-controlled rectifiers with different loads.	K3
3.	**Acquire** the knowledge on DC-DC choppers.	K3
4.	**Analyse** Cyclo-converter and AC voltage Controller configurations.	K3
5.	**Evaluate** the operation of inverters.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Thyristors** Silicon Controlled Rectifiers (SCRs)-Construction Operating principle with two transistor analogy – Static V-I characteristics of SCR – Turn on methods -dv/dt triggering, gate triggering, Temperature triggering, light triggering, forward voltage triggering, turn-off methods-load commutation, line commutation, Thyristor family devices IGBT and MOSFET- V-I characteristics.
UNIT-II (10 Hrs)	**AC-DC Converters (Phase Controlled Rectifiers)** Principles of phase-controlled rectification -Study of Single-phase half wave controlled and full wave-controlled bridge rectifiers with R and RL load-Freewheeling Diode-Average output voltage expression- Numerical Problems.

UNIT-III (10 Hrs)	**DC-DC Converters (Choppers)** Step up and Step-down chopper- input and output voltage relationship-critical value of inductance and capacitance- Duty Cycle control strategies- Numerical Problems.)
UNIT-IV (10 Hrs)	**AC-AC Converters (Cycloconverters and AC Voltage Controllers)** Single phase to single-phase step up cycloconverter and step down cycloconverter with R and RL load-Bridge type. Operation of AC Voltage controllers with R and RL load, RMS value of output voltage. Numerical Problem
UNIT-V (10 Hrs)	**DC-AC Converters (Inverters)** Principle of operation of Single-phase half bridge and full bridge Inverters with R-load-Voltage control in single phase inverter- PWM Techniques-Single pulse modulation-multiple pulse modulation-sinusoidal pulse modulation.

Text Books:	
1.	Power electronics - P.S. Bimbhra- Khanna Publishers, 4th Edition
2.	Power Electronics: Circuits Devices and Applications – M.H. Rashid, Prentice Hall of India, 3rd edition.
Reference Books:	
1.	Power electronics – M.D. Singh & K.B. Kanchandhani, Tata McGraw – Hill Publishing Company, 2nd edition
2.	Power Electronics – Vedam Subramanyam, New Age International (p) Limited, Publishers.
3.	Power Electronics – P.C. Sen, Tata McGraw-Hill Publishing.
4.	Thyristorised power Controllers – G.K. Dubey, S.R Doradra, A. Joshi and R.M.K. Sinha, New Age international Pvt Ltd. Publishers latest edition
e-Resources:	
1.	https://www.youtube.com/watch?v=1Auay7ja2oY
2.	https://nptel.ac.in/courses/108/105/108105066/

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19EEOE05	**OE**	**3**	**--**	**--**	**3**	**25**	**75**	**3 Hrs.**

ELECTRICAL VEHICLES

(offered by EEE)

(offered to ME)

Course Objectives: Students will learn

1.	To study the introductory concepts of EVs and dynamic modelling equations of EVs
2.	To study the various configurations of EVs and HEVs and power train components.
3.	To study the drive systems of EVs and their control
4.	To study Various Energy storage systems for EVs and understand their characteristics.
5.	To understand the charging technology in EVs and EVs utilization in real time infrastructures.

Course Outcomes: Students will be able to

Sl.No	Outcome	Knowledge Level
1.	**Analyse** and understand dynamic modelling and design considerations of electrical vehicles.	K4
2.	**Analyse** and understand the architecture of electric vehicles and power train components	K4
3.	**Evaluate** Battery performance parameters for EVs and understand other energy storage methods for EVs.	K4
4.	**Analyse** and understand the electric drives using power electronic converters for EVs.	K4
5.	**Develop** the chargers for EVs and integrate EVs into grid	K4

SYLLABUS

UNIT-I (10 Hrs)	**INTRODUCTION TO ELECTRIC VEHICLES AND MODELLING** Introduction to Electric Vehicles (EV), Hybrid Electric Vehicles (HEV), EV History, EV Advantages, Performance of EVs, Comparisons of EV with Internal Combustion Engine vehicles, Vehicle Dynamics modelling with tractive effort and Design Considerations.
UNIT-II (10 Hrs)	**ARCHITECTURE OF EV's AND POWER TRAIN COMPONENTS** Architecture of EV's and HEV's – Plug-in Hybrid Electric Vehicles (PHEV), Fuel cell EV, Power train components of EVs--EV Transmission Configurations, Transmission Components, Ideal Gearbox: Steady State Model, and EV Motor Sizing,

UNIT-III (10 Hrs)	**ENERGY STORAGE FOR EV** Battery Basics, Different types, Battery Parameters, Battery modelling, Lead Acid Batteries Lithium Batteries, Battery Pack, Battery Management system.
UNIT-IV (10 Hrs)	**ELECTRIC VEHICLE MOTOR DRIVES& CONTROL** Electric Drive Components of EV, Permanent Magnetic Synchronous Motor (PMSM) Drives, Brushless DC(BLDC) Motor Drives, Switched Reluctance Motor (SRM) Drives, EV Motor drive Power Converters, EV Motor Drive Control system.
UNIT-V (10 Hrs)	**CHARGING TECHNOLOGY FOR EV**. Introduction to charging mechanism, Electric vehicle supply equipment (EVSE), Configurations of EV Chargers, DC Fast Charging, Components of DC Fast Charger, EVs in infrastructure system. Effects of EV load on the grid

Text Books:	
1.	Iqbal Husain**, "**Electric and Hybrid Vehicles Design Fundamentals", CRC Press, Taylor & Francis Group, 2011.
2.	John G. Hayes and A. Goodarzi, "Electric Powertrain - Energy Systems, Power electronics and drives for Hybrid, electric and fuel cell vehicles " Wiley Publication.
3.	Ali Emadi, Mehrdad Ehsani, John M. Miller, "Vehicular Electric Power Systems", Special Indian Edition, Marcel Dekker, Inc 2010.
4.	Y. Gao, S. Gay and A. Emadi, Modern Electric, Hybrid Electric, and Fuel Cell Vehicles, CRC Press, 2005.
Reference Books:	
1.	Bimal K Bose, "Modern Power Electronics and AC Drives", Pearson Education, Asia, 2002.
2.	Gopal K Dubey, "Power Semiconductor controlled Drives", Prentice Hall Inc, New Yersy, 1989.
e-Resources:	
1.	https://nptel.ac.in/courses/108/103/108103009/
2.	https://nptel.ac.in/courses/108/102/108102121/
3.	https://swayam.gov.in/nd1_noc20_ee99/preview

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19EEOE06	OE	3	--	--	3	25	75	3 Hrs

MATLAB PROGRAMMING FOR ENGINEERING APPLICATIONS

(offered by EEE)

(offered to CE, CSE, IT & ME)

Course Objectives: Students will learn

1.	About the MATLAB basics, built-in functions, matrix operations, plotting commands.
2.	Conditional and looping statements to write MATLAB programs.
3.	About the different statistical approaches for better interpretation of data using MATLAB.
4.	About the MATLAB programming to solve engineering systems described by the mathematical equations.
5.	About the MATLAB programming for numerical methods.

Course Outcomes: Students will be able to

S.No	Outcome	Knowledge Level
1.	**Use** the built-in functions, matrix operations, plotting commands, arithmetic operations in MATLAB programs.	K3
2.	**Apply** the conditional and looping statements to write MATLAB programs.	K3
3.	**Apply** different statistical approaches for better interpretation of data using MATLAB.	K3
4.	**Apply** MATLAB programming to solve engineering systems described by the mathematical equations.	K3
5.	**Apply** MATLAB programming for numerical methods.	K3

SYLLABUS

UNIT-I (10 Hrs)	**INTRODUCTION TO MATLAB** History, purpose and importance, data types, conversion of data types, operators, built-in functions, creating vectors, matrices, manipulation of vectors and matrices, Matrix Operations, addition, subtraction, multiplication, transpose, Inverse, Determinant, Identity matrix, using simple xy Plotting Functions, line plots, subplots, bar plots, surface plots, pie plots, Saving and loading data.
UNIT-II (10 Hrs)	**MATLAB PROGRAMMING** Program Design and Development, Relational Operators and Logical Variables, Logical Operators, If statement, Else-if statement, Else statement, Switch Statement, For Loops, While Loops, Debugging MATLAB Programs, Simple programming examples.

UNIT-III (10 Hrs)	**STATISTICS, PROBABILITY AND INTERPOLATION** Statistics and Histograms, The Normal Distribution, Mean, Mode, Median and Standard Deviation, Uniformly Distributed Numbers, Normally Distributed Random Numbers, Generating Random Integers, Interpolation, Two-Dimensional Interpolation, curve fitting using least square method.
UNIT-IV (10 Hrs)	**SOLVING EQUATIONS** Linear algebra, Rank, Eigen values, Eigen vectors, Linear algebraic equations solving using matrices (up to three variables), Gauss elimination method, Matrix inverse method, quadratic equation, ordinary differential equation (upto second order), solution of partial differential equation (two variable).
UNIT-V (10 Hrs)	**NUMERICAL METHODS** Gauss Seidel method, Newton Raphson method for solving nonlinear equations, Rungekutta-4 method for solving ordinary differential equations, Trapezoidal method for solving numerical integration.
Text Books:	
1.	MATLAB and Simulink Crash Course for Engineers by Eklas Hossain, Oregon Institute of Technology Klamath Falls, OR, USA, Springer publication, 2022.
2.	Applied Numerical Methods Using MATLAB, by Won Young Yang Chung, Wenwu Cao, Tae-Sang Chung, John Morris, A John Wiley & Sons, Inc., Publication, 2005
Reference Books:	
1.	MATLAB ® for Engineering Applications by William J. Palm III, Fourth edition, New York, NY: McGraw-Hill Education, 2018.
2.	MATLAB Programming for Engineers, Stephen J.Chapman, third edition, Thomson Learning publication, 2005.

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19ITOE04	**OE**	**3**	**--**	**--**	**3**	**25**	**75**	**3 Hrs.**

WEB TECHNOLOGIES

(offered by IT)

(offered to CE, ME)

Course Objectives:

1.	This course is designed to introduce students with no programming experience to the programming languages and techniques associated with the World Wide Web. The course will introduce web-based media-rich programming tools for creating interactive web pages.

Course Outcomes: By the end of the course, the student will be able to

S.No	Outcome	Knowledge Level
1	Illustrate the basic concept of HTML and CSS and apply those concepts to static web pages	K3
2	Identify and understand various concepts related to dynamic web page using java script	K3
3	Outline the concepts of XML and understand the server side scripting language PHP	K3
4	Programming through PERL and Ruby	K3

SYLLABUS

UNIT-I (10 Hrs)	**HTML, CSS** Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, HTML5 CSS: Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model, Conflict Resolution
UNIT-II (10 Hrs)	**Java script** The Basic of JavaScript: Objects, Primitives Operations and Expressions, Screen Output and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions DHTML: Positioning Moving and Changing Elements
UNIT-III (10 Hrs)	**XML:** Document type Definition, XML schemas, Document object model, XSLT,DOM and SAX Approaches, **Web Servers** – IIS (XAMPP,LAMP) and Tomcat Servers.

UNIT-IV (8 Hrs)	**PHP Programming: Introducing PHP:** Creating PHP script, Running PHP script. **Working with variables and constants:** Using variables, Using constants, Data Types, Operators. **Controlling program flow:** Conditional statements, Control statements, Arrays ,functions .Working with forms and Databases such as MySQL.
UNIT-V (12 Hrs)	Introduction to Ruby, Variables, types, simple I/O, Control, Arrays, Hashes, Methods, Classes, Iterators, Pattern Matching. Overview of Rails.
Text Books:	
1.	Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2.	Web Technologies, Uttam K Roy, Oxford
3	The Web Warrior Guide to Web Programming, Bai, Ekedahl, Farrelll, Gosselin, Zak, Karparhi, Maclntyre, Morrissey, Cengage
Reference Books:	
1.	Ruby on Rails Up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006).
2.	Web Technologies, HTML< JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
3.	An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning.
4.	http://www.upriss.org.uk/perl/PerlCourse.html

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19MEOE04	**OE**	**3**	**--**	**--**	**3**	**25**	**75**	**3 Hrs.**

INTRODUCTION TO ROBOTICS

(offered by ME)

(offered to CE, CSE & IT)

Course Objectives:

1.	This course is designed to equip the students with basic understanding of working of robot
2.	This course helps the students to understand robot frame assignment and transformations
3.	Students will learn kinematics of robot
4.	Students can formulate joint trajectory planning for robot
5.	Students can learn developing dynamic model and control for robot

Course Outcomes: At the end of the course, students will be able to

S.No	Outcome	Knowledge Level
1.	Understand basic components, terminology and applications of robot	K2
2.	Learn the Homogeneous transformation of robot	K3
3.	Formulate forward and inverse kinematics for robot manipulator	K3
4.	Develop proper joint trajectory for robot joint and analyze the dynamics robot manipulator using Lagrange method	K3
5.	Develop linear control for the robot	K3

SYLLABUS

UNIT-I (10 Hrs)	**Fundamentals of robotics:** Robot and robotics, classification of robotics, advantages and disadvantages, Robot-components, degrees of freedom, joints, coordinates, reference frames, programming modes, workspace, languages, applications. **Sensors:** potentiometers, encoders **Actuators:** Characteristics of actuation system and comparison of actuating systems
UNIT-II (10 Hrs)	**Robot position analysis:** Matrix transformations, Homogeneous transformations of matrix, Representations of transformations. **Forward and Inverse Kinematic Equations:** Orientation-RPY angles, Euler angles
UNIT-III (10 Hrs)	**Denavit-Hartenberg representation of forward kinematic equations of robots**- simple 2-DOF, 3-DOF robot., Inverse kinematic of 2-DOF robot.

	Differential Motions and Velocities: Differential relationships, Jacobian, Differential motions of frame, Differential changes between frames.
UNIT-IV (10 Hrs)	**Trajectory planning:** Joint space versus Cartesian space, Joint space trajectory planning: Third-order polynomial trajectory planning, Linear segments with parabolic blends **Dynamic analysis of robot:** Introduction to Lagrangian method, dynamic equation of 2-DOF robot manipulator (RR and RP).
UNIT-V (10 Hrs)	**Control of manipulators:** Feedback and closed loop control, Second order linear systems, Control of second order systems, control-law partitioning, trajectory following control **Nonlinear control of manipulators:** Nonlinear and time varying systems, the nonlinear control problem for manipulators, Lyapunov stability analysis.

Text Books:	
1.	Introduction to Robotics: Analysis, Control, Applications by Saeed B Niku
2.	Introduction to Robotics: Mechanics and Control by J J Craig
3.	Industrial Robotics /Groover M P /Pearson Edu.
Reference Books:	
1.	Introduction to Robotics by SK Saha, The McGrah Hill Company
2.	Robotics / Fu K S/ McGraw Hill
Web links:	
1.	https://nptel.ac.in/courses/112105249
2.	https://nptel.ac.in/courses/107106090

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B19BSOE03	OE	3		--	3	25	75	3 Hrs.

MATHEMATICS FOR MACHINE LEARNING

(offered by M&H)

(offered to CE, CSE, IT & ME)

Course Objectives: Students are expected to learn

1	Linear combinations, Bases, Dimensions, Vector Space
2	Inner product, Orthogonal Projections and Gram-Schmidt Orthogonalization in Vector spaces
3	using Limkage based clustering and K – means
4	Principal component analysis and Low rank Approximations
5	Primal support vector machine and Dual support vector machine.
6	Embedding into feature spaces, Kernal methods

Course Outcomes: After completion of the course, the student will be able to

S.No	Outcome	Knowledge Level
1	Calculating linear combinations, Dimensions, Vector Space, Applications to Difference Equations, Applications to Markov Chains	K3
2	Calculating the distance in inner product, Describe Orthogonality, Orthogonal Projection, Apply Gram-Schmidt Orthogonalization	K3
3	Describe minimization of clustering by using Linkage based clustering and K – means	K3
4	Illustrate Principal component analysis with certain applications	K3
5	Describe Primal support vector machine, Dual support vector machine.	K3
6	Describe Embedding into feature spaces by Kernal methods	K3

SYLLABUS

UNIT-I (12 Hrs)	**Vector Spaces:** Vector Spaces and Subspaces , Vectors and linear combinations, Linear Independent sets, Bases, Coordinate Systems, Dimensions, Rank, Change of Bases, Linear Mappings, Affine Spaces, Applications to Difference Equations, Applications to Markov Chains
UNIT-II (12Hrs)	**Inner Product Spaces:** Introduction, norm of vector, Normed vector spaces, Lengths and Distances in an inner product space. Angles and Orthogonality, Orthonormal Basis, Orthogonal Complement, Inner Product of Functions, Orthogonal Projections, Rotations, The Gram–Schmidt Orthogonalization.

UNIT-III (14Hrs)	**PCA:** Problem Setting, Maximum Variance Perspective, Projection Perspective, Eigenvector Computation and Low rank Approximations **Clustering:** Clustering, Linkage-Based Clustering Algorithms, *k*-Means and othercost minimization clustering.
UNIT-IV (12Hrs)	**Support Vector Machines:** Separating Hyper planes, Primal support vector machine, Dual support vector machine.
UNIT-V (12Hrs)	**Kernel Methods:** Embeddings into feature spaces, The Kernel trick, Kernels as a way to express prior knowledge

Text Books:	
1.	Linear Algebra and Its Applications, David C. Lay, Steven R. Lay and Judi J. Mcdonald
2.	Marc Peter Deisenroth, A.AldoFaisai, Cheng Soon Ong, Mathematics for machine learning, Cambridge University Press(2020).
3	Shai Shaley-Shwartz and Shai Ben-David, Understanding Machine Learning from Theory of Algorithm, Cambridge University Press, 2014.
Reference Books:	
1.	Linear Algebra and Optimization for Machine Learning, Charu C. Aggarwal, Springer publication
2	Pang-Ning Tan, Michael Steinbach, AnujKarpatne, Vipin Kumar, Introduction to Data Mining, Second Edition, Pearson Addison-Wesley
3	Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley &Sons,2006.