SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(AUTONOMOUS)
(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)
Accredited by NAAC with 'A' Grade, All UG Programmes 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 ALL DEPARTMENTS TO THE III Semester M.TECH. STUDENTS

S.No	Offered from	Course Code	Course Name	Offered to
1	CIVIL ENGINEERING	M19 ST 2107	Construction Management	**CST, CS, PSA,IT & CAD/CAM**
2		M19 ST 2108	Green Technology	
3		M19 ST 2109	Analysis of Offshore Structures	
4	COMPUTER SCIENCE & ENGINEERING	M19 CST 2106	Python Programming	**ST, CS, PSA & CAD/CAM**
5		M19 CST 2107	Artificial Intelligence	
6		M19 CST 2108	Advanced Data structures	
7	ELECTRONICS & COMMUNICATION ENGINEERING	M19 CS 2107	Signals and systems	**ST, CST, PSA, IT & CAD/CAM**
8		M19 CS 2108	Principles of Communication	
9		M19 CS 2109	Image and video Processing	
10	ELECTRICAL & ELECTRONICS ENGINEERING	M19PS2107	Electric And Hybrid Vehicles	**ST, CST, CS, IT & CAD/CAM**
11		M19PS2108	Energy From Waste	
12		M19PS2109	Energy Management and Auditing	
13	INFORMATION TECHNOLOGY	M19IT2108	Web Technologies	**ST, CS, PSA & CAD/CAM**
14		M19IT2109	Internet of Things	
15		M19IT2110	Machine Learning	
16	MECHNAICAL ENGINEERING	M19CAD 2107	Operations Research	**ST, CST, CS, PSA & IT**
17		M19CAD 2108	Nano Technology	
18		M19CAD 2109	Product Design & Manufacturing	
19	SCIENCE & HUMANITIES	M19BS2101	Management and Organisational Behaviour	**ST, CST, CS, PSA, IT & CAD/CAM**

Code	Category	L	T	P	C	I.M	E.M	Exam
M19 ST 2107	**PE**	**3**	**0**	**--**	**3**	**25**	**75**	**3 Hrs.**

CONSTRUCTION MANAGEMENT

(Offered by CE-Structural Engineering)

(Offered to- **CST, CS, PSA,IT & CAD/CAM**)

Course Objectives:

1.	To impart knowledge on Management theories, Classification of Construction projects
2.	To impart knowledge on Resource planning ,Contract and Management Information System

Course Outcomes

S.No	Outcome	Knowledge Level
1.	Able to plan, coordination, and control of a project from beginning to completion.	K3
2.	Adopting the most effect method for meeting the requirement in order to produce a functionally and financially viable project.	K3

SYLLABUS

UNIT-I (6 Hrs)	Management process- Roles. Management theories. Social responsibilities. Planning and strategic management. Strategy implementation. Decision making: tools and techniques – Organizational structure. Human resource management- motivation performance-leadership.
UNIT-II (8 Hrs)	Classification of Construction projects, Construction stages, Resources- Functions of Construction Management and its Applications. Preliminary Planning- Collection of Data-Contract Planning – Scientific Methods of Management: Network Techniques in construction management - Bar chart, Gant chart, CPM, PERT- Cost & Time optimization.
UNIT-III (6 Hrs)	Resource planning - planning for manpower, materials, costs, equipment. Labour - Scheduling - Forms of scheduling - Resource allocation. budget and budgetary control methods
UNIT-IV (8 Hrs)	Contract - types of contract, contract document, and specification, important conditions of contract – tender and tender document –Reverse tendering- Deposits by the contractor - Arbitration. negotiation - M.Book - Muster roll -stores.
UNIT-V (10 Hrs)	Management Information System - Labour Regulations: Social Security - welfare Legislation - Laws relating to Wages, Bonus and Industrial disputes, Labour Administration - Insurance and Safety Regulations - Workmen's Compensation Act -other labour Laws - Safety in construction: legal and financial aspects of accidents in construction. occupational and safety hazard assessment. Human factors in safety. Legal and financial aspects of accidents in construction. Occupational and safety hazard assessment.

Text Books:

1.	Ghalot, P.S., Dhir, D.M., Construction Planning and Management, Wiley Eastern Limited,1992.
2.	Chitkara,K.K., Construction Project Management¸ Tata McGraw Hill Publishing Co, Ltd., New Delhi,998

Reference Books:	
1.	Punmia,B,C., Project Planning and Control with PERT and CPM, Laxmi Publications, New Delhi,1987.
2.	Sengupta, B. &Guha, H, Construction Management and Planning by: Tata McGraw-hill publications.

Code	Category	L	T	P	C	I.M	E.M	Exam
M19 ST 2108	**PE**	**3**	**0**	**--**	**3**	**25**	**75**	**3 Hrs.**

GREEN TECHNOLOGY

(Offered by CE-Structural Engineering)

(Offered to- **CST, CS, PSA,IT & CAD/CAM)**

Course Objectives:

1.	To impart knowledge on Green Technology, Cleaner Production and Pollution Prevention
2.	To impart knowledge on conventional energy resources

Course Outcomes

S.No	Outcome	Knowledge Level
1.	Enlist different concepts of green technologies in a project	K3
2.	Understand the principles of Energy efficient technologies	K3
3.	Estimate the carbon credits of various activities	K3
4.	Recognize the benefits of green fuels with respect to sustainable development.	K3

SYLLABUS

UNIT-I (8 Hrs)	Introduction: Green Technology – definition- Importance – Historical evolution – advantages and disadvantages of green technologies-factors affecting green technologies-Role of Industry, Government and Institutions – Industrial Ecology – role of industrial ecology in green technology. Cleaner Production (CP): Definition – Importance – Historical evolution - Principles of Cleaner Production–Benefits–Promotion – Barriers – Role of Industry.
UNIT-II (8 Hrs)	Cleaner Production Project Development and Implementation: Government and Institutions – clean development mechanism, reuse, recovery, recycle, raw material substitution-Wealth from waste, case studies. Overview of CP Assessment Steps and Skills, Process Flow Diagram, Material Balance, CP Option Generation – Technical and Environmental Feasibility analysis – Economic valuation of alternatives - Total Cost Analysis – CP Financing – Preparing a Program Plan – Measuring Progress- ISO 14000.
UNIT-III (8 Hrs)	Pollution Prevention and Cleaner Production Awareness Plan – Waste audit – Environmental Statement, carbon credit, carbon sequestration, carbon trading, Life Cycle Assessment - Elements of LCA – Life Cycle Costing – Eco Labelling.
UNIT-IV (8 Hrs)	Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Non- conventional energy sources: Solar Energy-solar energy conversion technologies and devices, their principles, working and application.
UNIT-V (8 Hrs)	Green Fuels – Definition-benefits and challenges – comparison of green fuels with conventional fossil fuels with reference to environmental, economical and social impacts-

	public policies and market-driven initiatives. Biomass energy: Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in Indian context; tidal and geothermal energy.
Text Books:	
1.	'Pollution Prevention: Fundamentals and Practice' by Paul L Bishop (2000), McGraw Hill International.
2.	'Cleaner Production Audit' by Prasad Modak, C.Visvanathan and MandarParasnis (1995), Environmental System Reviews, No.38, Asian Institute of Technology, Bangkok
3.	'Non-conventional Energy Sources' by Rai G.D.
4.	'Energy, The Solar Hydrogen Alternative' by Bokris J.O.
Reference Books:	
1.	Waste Energy Utilization Technology' by Kiang Y. H.
2.	'Solar Energy' by Sukhatme S.P.
3.	'Pollution Prevention and Abatement Handbook – Towards Cleaner Production' by World Bank Group (1998), World Bank and UNEP, Washington D.C.
4	Handbook of Organic Waste Conversion' by Bew

Code	Category	L	T	P	C	I.M	E.M	Exam
M19ST2109	**PE**	**3**	**0**	**--**	**3**	**25**	**75**	**3 Hrs.**

ANALYSIS OF OFFSHORE STRUCTURES

(Offered by CE-Structural Engineering)

(Offered to- **CST, CS, PSA,IT & CAD/CAM)**

Course Objectives:

1.	To impart knowledge on different types of offshore structures ,Conservation mass and momentum
2.	To familiarize the student on Wave force estimation on small bodies and large bodies, Static and dynamic analysis of fixed offshore structures.

Course Outcomes

S.No	Outcome	Knowledge Level
1.	Perform concept development of off-shore structure	K4
2.	Find the wave force on vertical cylinder	K5
3.	Perform static and dynamic analysis of fixed offshore structure	K4

SYLLABUS

UNIT-I (8 Hrs)	Introduction to different types of offshore structures, Concept of fixed, compliant and floating structures, Law of floatation, fluid pressure and centre of pressure, estimation of centre of gravity, hydrostatic particulars, stability criteria of floating bodies, and motions of a floating body.
UNIT-II (8 Hrs)	Conservation mass and momentum, Euler equation, Bernoullis Equation, Potential flow, Classification of waves, small amplitude or Linear Airy‟s theory, dispersion relationship, water particle kinematics, wave energy.
UNIT-III (12 Hrs)	Wave force estimation- Wave force on small bodies- Morison equation, Estimation of wave force on a vertical cylinder, Force due to current, Effect of marine growth on vertical cylinders.
UNIT-IV (12 Hrs)	Wave force on large bodies- Froude- krylov theory, Diffraction theory.
UNIT-V (8 Hrs)	Static and dynamic analysis of fixed offshore structures.

Text Books:

1.	Graff, W. J., Introduction to Offshore Structures, Gulf Publ. Co.1981.
2.	Dawson, T. H., Offshore Structural Engineering, Prentice Hall, 1983.

Reference Books:	
1.	Hand book of offshore Engineering, Vol I, Subrata Chakrabarti, Offshore Structure Analysis, Inc., Plainfield, Illinois, USA.
2.	API RP 2A., Planning, Designing and Constructing Fixed Offshore Platforms, API.
3.	McClelland, B & Reifel, M. D., Planning & Design of fixed Offshore Platforms, Van Nostrand, 1986.

Code	Category	L	T	P	C	I.M	E.M	Exam
M19CST2106	**OE**	**3**	**0**	**0**	**3**	**25**	**75**	**3 Hrs.**

PYTHON PROGRAMMING

(Offered by CSE-Computer Science & Technology)

(Offered to- **ST, CS, PSA & CAD/CAM)**

Course Objectives:

1.	Knowledge and understanding of the different concepts of Python.
2.	Using the GUI Programming and Testing in real-time applications.
3.	Using package Python modules for reusability.

Course Outcomes

After completion of course, students would be able to:

S.No	Outcome	Knowledge Level
CO1	Understand and comprehend the basics of python programming.	**K2**
CO2	Demonstrate the principles of structured programming and be able to describe, design, implement, and test structured programs using currently accepted methodology.	**K3**
CO3	Explain the use of the built-in data structures list, sets, tuples and dictionary.	**K2**
CO4	Make use of functions and its applications.	**K3**
CO5	Identify real-world applications using oops, files and exception handling provided by python.	**K4**

SYLLABUS

UNIT-I (10 Hrs)	**Introduction-** History of Python, Python Language, Features of Python, Applications of Python, Using the REPL (Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.
UNIT-II (10 Hrs)	Types, Operators and Expressions-Types - Integers, Strings, Booleans; Operators-Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations, Control Flow- if, if-elif-else, for, while, break, continue, pass.
UNIT-III (10 Hrs)	**Data Structures**-Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences, Comprehensions.
UNIT-IV (10 Hrs)	**Functions**- Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables, Modules: Creating modules, import statement, from.. import statement, name spacing, Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions.

UNIT-V (10 Hrs)	**Object Oriented Programming OOP in Python**-Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Datahiding, Brief Tour of the Standard Library - Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics, Testing: Why testing is required ?, Basic concepts of testing, Unit testing in Python, Writing Test cases, Running Tests.
Text Books:	
1.	Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage
2.	Introduction to Programming Using Python, Y. Daniel Liang, Pearson
Reference Books:	
1.	Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press
2.	Think Python, Allen Downey, Green Tea Press
3.	Core Python Programming, W. Chun, Pearson

Code	Category	L	T	P	C	I.M	E.M	Exam
M19CST2107	**OE**	**3**	**0**	**0**	**3**	**25**	**75**	**3 Hrs.**

ARTIFICIAL INTELLIGENCE

(Offered by CSE-Computer Science & Technology)

(Offered to- **ST, CS, PSA & CAD/CAM)**

Course Objectives:

1.	Gain a historical perspective of AI and its foundations.
2.	Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
3.	Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
4.	Experience AI development tools such as an 'AI language', expert system shell, and/or data mining tool. Experiment with a machine learning model for simulation and analysis.
5.	Explore the current scope, potential, limitations, and implications of intelligent systems.

Course Outcomes

After completion of course, students would be able to:

S.No	Outcome	Knowledge Level
CO1	Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents	**K3**
CO2	Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.	**K4**
CO3	Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing	**K6**
CO4	Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.	**K3**
CO5	Solve problems with uncertain information using Bayesian approaches.	**K3**

SYLLABUS

UNIT-I (10 Hrs)	**Introduction to artificial intelligence:** Introduction , history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI, **Problem solving: state-space search and control strategies:** Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative-deepening a*, constraint satisfaction.
UNIT-II (10 Hrs)	**Problem reduction and game playing:** Introduction, problem reduction, game playing, alpha-beta pruning, two- player perfect information games, **Logic concepts:** Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic
UNIT-III (10 Hrs)	**Knowledge representation:** Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames, **advanced knowledge representation techniques:**

	Introduction, conceptual dependency theory, script structure, cyc theory, case grammars, semantic web, **Expert system and applications:** Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools
UNIT-IV (10 Hrs)	**Uncertainty measure: probability theory:** Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory , **Fuzzy sets and fuzzy logic:** Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.
UNIT-V (10 Hrs)	**Machine learning paradigms:** Introduction, machine learning systems, supervised and unsupervised learnings, inductive learning, deductive learning, clustering, support vector machines, case based reasoning and learning, **Artificial neural networks:** Introduction, artificial networks, single layer feed forward networks, multi layered forward networks, design issues of artificial neural networks.

Text Books:	
1.	Artificial Intelligence- Saroj Kaushik, CENGAGE Learning,
2.	Artificial intelligence, A modern Approach, 2nd ed, Stuart Russel, Peter Norvig, PEA
Reference Books:	
1.	Artificial Intelligence- 3rd ed, Rich, Kevin Knight, Shiv Shankar B Nair, TMH
2.	Introduction to Artificial Intelligence, Patterson, PHI
3.	Artificial intelligence, structures and Strategies for Complex problem solving, 5th ed, George F Lugar, PEA

Code	Category	L	T	P	C	I.M	E.M	Exam
M19CST2108	**OE**	**3**	**0**	**0**	**3**	**25**	**75**	**3 Hrs.**

ADVANCED DATA STRUCTURES

(Offered by CSE-Computer Science & Technology)

(Offered to- **ST, CS, PSA & CAD/CAM)**

Course Objectives:

1.	The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem.
2.	Students should be able to understand the necessary mathematical abstraction to solve problems.
3.	To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.
4.	Student should be able to come up with analysis of efficiency and proofs of correctness.

Course Outcomes

After completion of course, students would be able to:

S.No	Outcome	Knowledge Level
CO1	Understand the implementation of symbol table using hashing techniques.	**K2**
CO2	Develop and analyze algorithms for red-black trees, B-trees and Splay trees.	**K4**
CO3	Develop algorithms for text processing applications.	**K6**
CO4	Identify suitable data structures and develop algorithms for computational geometry problems.	**K2**

SYLLABUS

UNIT-I (10 Hrs)	**Dictionaries:** Definition, Dictionary Abstract Data Type, Implementation of Dictionaries. **Hashing:** Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.
UNIT-II (10 Hrs)	**Skip Lists:** Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists
UNIT-III (10 Hrs)	**Trees:** Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees
UNIT-IV (10 Hrs)	**Text Processing:** Sting Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth- Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem.
UNIT-V (10 Hrs)	**Computational Geometry:** One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quad trees, k-D Trees. Recent Trends in Hashing, Trees, and various computational geometry methods for efficiently solving the new evolving problem

Text Books:	
1.	Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
2.	M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002
Reference Books:	
1.	Data structures and algorithms in C++, by Adam Drozdek, Mc Graw Hill

Code	Category	L	T	P	C	I.M	E.M	Exam
M19CS2107	**OE**	**3**	**--**	**--**	**3**	**25**	**75**	**3 Hrs.**

SIGNALS AND SYSTEMS

(Offered by ECE-Communication Systems)

(Offered to- **ST, CST, PSA, IT & CAD/CAM)**

Course Objectives:

1.	To introduce the fundamental concepts and techniques associated with the understanding of signals and systems.
2.	To familiarize with techniques suitable for analyzing both continuous-time and discrete time LTI systems using transforms.
3.	To familiarize with development of the mathematical skills to solve problems involving convolution, filtering, and sampling.

Course Outcomes

S.No	Outcome	Knowledge Level
1	Outline the basic concepts of signals and systems.	**K2**
2	Analyse the spectral characteristics of Continuous Time and Discrete Time periodic and aperiodic signals using Fourier analysis.	**K4**
3	Analyse system properties based on impulse response and Fourier analysis.	**K4**
4	Apply Laplace- transforms for analysing Continuous -time signals and systems.	**K3**
5	Apply Z- transforms for analysing discrete-time signals and systems.	**K3**
6	Outline the process of sampling and the effects of under sampling.	**K2**

SYLLABUS

UNIT-I (10 Hrs)	**Introduction to Continuous –Time and Discrete –Time signals and 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 and their Periodicity, The Continuous–Time and Discrete–Time Unit Impulse and Unit step Functions, Continuous–Time and Discrete–Time Systems, Operations on signals, Interconnections of Systems, Basic System Properties, Continuous–Time and Discrete Time LTI Systems: The Graphical interpretation of Convolution Integral and The Convolution Sum, Causal LTI Systems Described by Differential and Difference Equations, Singularity Functions MATLAB Demos (one or two examples for illustration purpose only)*.
UNIT-II (8 Hrs)	**Fourier Series Representation of Periodic Signals:** Introduction, Fourier Series Representation of continuous time Periodic Signals (Complex Exponential and Trigonometric Fourier Series only), 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 (Elementary Level on DTFS).

UNIT-III (8 Hrs)	**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, Properties of the Discrete time Fourier Transform, Systems characterized by linear constant coefficient difference equations (Elementary Level on DTFT). MATLAB Demos(one or two examples for illustration purpose only)*
UNIT-IV (6 Hrs)	**Laplace Transform** Introduction, The Laplace Transform, Region of convergence for Laplace Transforms, The Inverse Laplace Transform, Properties of Laplace Transforms, the initial and Final value theorems, Analysis and characterization of LTI systems using the Laplace Transforms.
UNIT-V (8 Hrs)	**Sampling Theorem and Z-transform**: Introduction to Sampling Theorem, Statement of Sampling Theorem for Low pass and Band pass signals (Theorem Proof for Low Pass signals only), Reconstruction of a signal from its samples using interpolation, Discussion on Oversampling, Critical sampling and Under sampling (aliasing), The Z-Transform (Bilateral and unilateral), The Inverse Z-Transform, Properties of Z-Transform, Initial and Final Value theorems, Some common Z-transform pairs, Analysis and characterization of LTI discrete systems using the Z-Transforms. MATLAB Demos (one or two examples for illustration purpose only)*.
	**** Note: No questions are to be set on MATLAB demos ****

Text Books:	
1.	Signals Systems and Communication-B. P. Lathi, BS Publication.
2.	Signals and Systems- Alan V. Oppenheim, Alan S. Willsky and Ian T. Young, PHI, 2ndEdn.

Reference Books:	
1.	Signals and Systems – P. Rama Krishna Rao, TMH.
2.	Signals and Systems- A. Ananda Kumar, PHI.

E- Resources:	
1.	https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/video-lectures/
2.	https://swayam.gov.in/nd1_noc20_ee06/preview

Code	Category	L	T	P	C	I.M	E.M	Exam
M19CS2108	**OE**	**3**	**0**	**0**	**3**	**25**	**75**	**3 Hrs.**

PRINCIPLES OF COMMUNICATION

(Offered by ECE-Communication Systems)

(Offered to- **ST, CST, PSA, IT & CAD/CAM)**

Course Objectives: This course will enable students to:

1	Understand simple systems for generating and demodulating AM, DSB, SSB and VSB signals
2	Understand the concepts in Angle modulation for the design of communication systems
3	Study simple systems for generating and demodulating frequency modulated signals
4	Learn the concepts of random process and various types of noise.
5	Study the performance of the communication system in presence of noise.
6	Learn pulse modulation and sampling techniques

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

S.No	Outcome	Knowledge Level
1	Analyse the performance of Analog modulation schemes in time and frequency domains.	K3
2	Characterize Analog signals in time domain as random processes and noise	K2
3	Determine the performance of Analog communication systems in terms of SNR	K3
4	Analyse pulse amplitude modulation, pulse position modulation, pulse code modulation and TDM systems.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Amplitude modulation:** Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector. **Double side band-suppressed carrier modulation:** Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing. **Single side–band and vestigial sideband methods of modulation:** SSB Modulation, VSB Modulation, Frequency Translation, Frequency- Division Multiplexing, Theme Example: VSB Transmission of Analog and Digital Television
UNIT-II (10 Hrs)	**Angle modulation**: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing, **Phase–Locked Loop:** Nonlinear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Super heterodyne Receiver
UNIT-III (10 Hrs)	**Random variables & process**: Introduction, Probability, Conditional Probability, Random Variables, Several Random Variables. Statistical Averages: Function of a random variable, Moments, Random Processes, Mean, Correlation and Covariance function: Properties of Autocorrelation function, Cross–correlation functions. **Noise**: Shot Noise, Thermal noise, White Noise, Noise Equivalent Bandwidth, Noise Figure.

UNIT-IV (8 Hrs)	**Noise in Analog modulation:** Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasise in FM.
UNIT-V (10 Hrs)	**Digital representation of analog signals:** Introduction, Why Digitize Analog Sources?, The Sampling process, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, The Quantization Process, Quantization Noise, **Pulse Code Modulation:** Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing

Text Books:	
1.	Principles of Communication Systems – H Taub & D. Schilling, GautamSahe, TMH, 2007, 3rdEdition.
2.	Communication Systems – B.P. Lathi, BS Publication,2006.
Reference Books:	
1.	Principles of Communication Systems - Simon Haykin, John Wiley,2ndEdition.
2.	Electronics & Communication System – George Kennedy and Bernard Davis,TMH 2004
3.	Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH,2007.

Code	Category	L	T	P	C	I.M	E.M	Exam
M19CS2109	**OE**	**3**	**0**	**0**	**3**	**25**	**75**	**3 Hrs.**

IMAGE AND VIDEO PROCESSING

(Offered by ECE-Communication Systems)

(Offered to- **ST, CST, PSA, IT & CAD/CAM)**

Course Objectives:

1	The basic concepts and methods to develop foundation in digital image processing and video processing are introduced and The Importance of various image transforms, image transform properties are discussed.
2	Understanding the image enhancement techniques in both spatial domain and frequency domain.
3	The process of recovering image that has been degraded by noise or any other degradation phenomenon.
4	Understanding the importance of image segmentation and various methods used for segmentation, The importance of reducing the data for digital image representation by using various image compression techniques
5	To understand the importance of video processing in multimedia and the various video formation models, motion estimation techniques in video processing
6	Applications of motion estimation in video processing

Course Outcomes

S.No	Outcome	Knowledge Level
1	Defining the digital image, representation of digital image, importance of image resolution, applications in image processing.	K2
2	Know the advantages of representation of digital images in transform domain, application of various image transforms	K2
3	Know how an image can be enhanced by using histogram techniques, filtering techniques etc.	K3
4	Understand image degradation, image restoration techniques using spatial filters and frequency domain	K3
5	Know the detection of point, line and edges in images, edge linking through local processing, global processing.	K3
6	Understand the redundancy in images, various image compression techniques.	K2
7	Know the video technology from Analog colour TV systems to digital video systems, how video signal is sampled and filtering operations in video processing.	K2
8	Know the general methodologies for 2D motion estimation, various coding used in video processing	K3

SYLLABUS

UNIT-I (10 Hrs)	**Fundamentals of Image Processing and Image Transforms**: Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms.

UNIT-II (10 Hrs)	**Image Enhancement:** Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering. **Image Restoration:** Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind deconvolution.
UNIT-III (10 Hrs)	**Image Segmentation:** Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour **Image Compression:** Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Fundamentals of information theory, Run length coding, Shannon – Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression, Image compression standard, Wavelet-based image compression, JPEG Standards.
UNIT-IV (8 Hrs)	**Basic Steps of Video Processing:** Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.
UNIT-V (10 Hrs)	**2-D Motion Estimation:** Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

Text Books:

1.	Digital Image Processing – Gonzaleze and Woods, 3rd Ed., Pearson.
2.	Video Processing and Communication – Yao Wang, JoemOstermann and Ya–quin Zhang. 1st Ed., PH Int.
3.	S.Jayaraman, S.Esakkirajan and T.VeeraKumar, "Digital Image processing, Tata McGraw Hill publishers, 2009

Reference Books:

1.	Digital Image Processing and Analysis-Human and Computer Vision Application with CVIP Tools – ScotteUmbaugh, 2nd Ed, CRC Press, 2011.
2.	Digital Video Processing – M. Tekalp, Prentice Hall International.
3.	Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH, 2009.
4.	Multidimentional Signal, Image and Video Processing and Coding – John Woods, 2nd Ed, Elsevier.
5.	Digital Image Processing with MATLAB and Labview – Vipula Singh, Elsevier.
6.	Video Demystified – A Hand Book for the Digital Engineer – Keith Jack, 5th Ed., Elsevier.

Code	Category	L	T	P	C	I.M	E.M	Exam
M19PS2107	**OE**	**3**	**0**	**0**	**3**	**25**	**75**	**3 Hrs**

ELECTRIC AND HYBRID VEHICLES

(Offered by EEE-Power Systems & Automation)

(Offered to- **ST, CST, CS, IT & CAD/CAM)**

Course Objectives:

1	To understand upcoming technology used in hybrid electric vehicles
2	To understand different aspects of drives used in electric vehicles
3	To understand the different types of batteries used in electric vehicles

Course Outcomes:

S.No	Students are able to	Knowledge level
1	Acquire knowledge about fundamental concepts, principles, analysis and design of hybrid and electric vehicles.	**K2**
2	To learn electric drive in vehicles /traction.	**K2**

SYLLABUS

UNIT-I: (10 HOURS)	**Introduction** Early days The relative decline of electric vehicles after 1910 Uses for which battery electric vehicles have remained popular Developments Towards the End of the 20th Century Types of Electric Vehicle in Use Today Battery electric vehicles The IC engine/electric hybrid vehicle Fueled electric vehicles Electric vehicles using supply lines Solar powered vehicles Electric vehicles which use flywheels or super capacitors Electric Vehicles for the Future.
UNIT-II: (10 HOURS)	**Batteries** Battery Parameters Cell and battery voltages Charge (or Amp hour) capacity Energy stored Specific energy Energy density Specific power Amp hour (or charge) efficiency Energy efficiency Self-discharge rates Battery geometry Battery temperature, heating and cooling needs Battery life and number of deep cycles Lead Acid Batteries Lead acid battery basics Special characteristics of lead acid batteries Battery life and maintenance Battery charging Summary of lead acid batteries Nickel-based Batteries Introduction Nickel cadmium Nickel metal hydride batteries.
UNIT-III: (10 HOURS)	**Electric Vehicle Modelling** Introduction Tractive Effort Introduction Rolling resistance force Aerodynamic drag Hill climbing force Acceleration force Total tractive effort Modelling Vehicle Acceleration performance parameters Modelling the acceleration of an electric scooter Modelling the acceleration of a small car Modelling Electric Vehicle Range Driving cycles Range modelling of battery electric vehicles Constant velocity range modelling Range modelling of fuel cell vehicles Range modelling of hybrid electric vehicles.
UNIT-IV: (10 HOURS)	Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Introduction Motor drives configuration and control of Permanent Magnet Motor drives Configuration and control of Switch Reluctance, Motor drives, drive system efficiency

UNIT-V: (10 HOURS)	**5.Alternative and Novel Energy Sources and Stores** Introduction Solar Photovoltaic's Wind Power Flywheels Super Capacitors Supply Rails.
Text Books:	
1	James Larminie, John Lowry, Electric Vehicle Technology Explained Wiley, 2003
2	Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
Reference Books:	
1	MehrdadEhsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.

Code	Category	L	T	P	C	I.M	E.M	Exam
M19PS2108	**OE**	**3**	**0**	**0**	**3**	**25**	**75**	**3 Hrs**

ENERGY FROM WASTE

(Offered by EEE-Power Systems & Automation)

(Offered to- **ST, CST, CS, IT & CAD/CAM)**

Course Objectives:

1	To prepare the students for successful career in the energy industry, energy service companies, energy utility and consultancy agencies and in the academic and R&D institutions.
2	To produce graduates strong in understanding on energy resources, technologies and systems, energy management fundamentals, and capable in innovative technological intervention towards the present and potential future energy issues.
3	To produce energy professionals, who are sensitive to, and well aware of, the energy issues and concerns, and who can apply their specialized knowledge for the sustainable development.

Course Outcomes:

S.No	Upon the completion of the subject, the student will be able to	Knowledge level
1	Understood and acquired fundamental knowledge on the science and engineering of energy technologies and systems.	**K2**
2	Acquired the expertise and skills required for energy auditing and management, economical calculation of energy cost, development, implementation, maintenance of energy systems.	**K2**
3	Analysis and design of energy conversion systems.	**K2**
4	Acquired skills in the scientific and technological communications and project preparation, planning and implementation of energy projects	**K2**

SYLLABUS

UNIT-I: (10 HOURS)	Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors
UNIT-II: (10 HOURS)	Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.
UNIT-III: (10 HOURS)	Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.
UNIT-IV: (10 HOURS)	Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT-V: (10 HOURS)	Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.
Text Books:	
1	Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2	Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
Reference Books:	
1	Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991
2	Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

Code	Category	L	T	P	C	I.M	E.M	Exam
M19PS2109	**OE**	**3**	**0**	**0**	**3**	**25**	**75**	**3 Hrs**

ENERGY MANAGEMENT AND AUDITING

(Offered by EEE-Power Systems & Automation)

(Offered to- **ST, CST, CS, IT & CAD/CAM)**

Course Objectives:

1	To enable the students to understand the concept of energy management and energy management opportunities.
2	To understand the different methods used to control peak demand.
3	To know energy auditing procedure.
4	To understand the different methods used for the economic analysis of energy projects.

Course Outcomes:

S.No	Students are able to	Knowledge level
1	Understand the basics of Energy audit process.	**K2**
2	Understand the basics of energy management by cogeneration	**K2**
3	acquire knowledge on Energy management in lighting systems	**K3**
4	impact concepts behind economic analysis and Load management	**K3**
5	Analyse the importance of Energy management on various electrical equipment and metering.	**K3**

SYLLABUS

UNIT-I: (10 HOURS)	General principles of Energy management and Energy management planning, Peak Demand controls, Methodologies, Types of Industrial Loads, Optimal Load scheduling-Case studies.
UNIT-II: (10 HOURS)	Energy management opportunities in Lighting and Motors. Electrolytic Process and Electric heating, Case studies.
UNIT-III: (10 HOURS)	Types of boilers, Combustion in boilers, Performances evaluation, Feed water treatment, Blow down, Energy conservation opportunities in boiler. Properties of steam, Assessment of steam distribution losses, Steam leakages, Steam trapping, Condensate and flash steam recovery system, Identifying opportunities for energy savings. Classification, General fuel economy measures in furnaces, Excess air, Heat Distribution, Temperature control, Draft control, Waste heat recovery.
UNIT-IV: (10 HOURS)	HVAC system: Coefficient of performance, Capacity, Factors affecting Refrigeration and Air conditioning system performance and savings opportunities. Classification and Advantages of Waste Heat Recovery system, analysis of waste heat recovery for Energy saving opportunities.

UNIT-V: (10 HOURS)	Energy audit -Definition, Need, Types of energy audit, Energy audit Instruments. Cogeneration-Types and Schemes, Optimal operation of cogeneration plants- Case study. Computer aided energy management. Economic analysis methods-cash flow model, time value of money, evaluation of proposals, pay-back method, average rate of return method, internal rate of return method, present value method, life cycle costing approach, Case studies.
Text Books:	
1	Albert Thumann, William J. Younger, Handbook of Energy Audits, CRC Press, 2003.
2	Charles M. Gottschalk, Industrial energy conservation, John Wiley & Sons, 1996.
3	Craig B. Smith, Energy management principles, Pergamon Press.
4	D. Yogi Goswami, Frank Kreith, Energy Management and Conservation Handbook, CRC Press, 2007.
5	G.G. Rajan, Optimizing energy efficiencies in industry -, Tata McGraw Hill, Pub. Co., 2001.
Reference Books:	
1	IEEE recommended practice for energy management in industrial and commercial facilities.
2	IEEE std 739 - 1995 (Bronze book).
3	M Jayaraju and Premlet, Introduction to Energy Conservation And Management, Phasor Books, 2008
4	Paul O'Callaghan, Energy management, McGraw Hill Book Co.
5	Wayne C. Turner, Energy management Hand Book - - The Fairmount Press, Inc., 1997

Code	Category	L	T	P	C	I.M	E.M	Exam
M19IT2108	**OE**	**3**	**0**	**0**	**3**	**25**	**75**	**3 Hrs.**

WEB TECHNOLOGIES

(Offered by IT-Information Technology)

(Offered to- **ST, CS, PSA & CAD/CAM)**

Course Objectives:

1.	To develop the web applications for different end users by using set of development tools like XHTML, CSS, JavaScript, XML, Ajax, PHP, PERL and Ruby Rails.
2.	Students will gain the skills and project-based experience needed for entry into web application and development careers

Course Outcomes

After completion of course, students would be able to:

S.No	Outcome	Knowledge Level
1.	Understand the concepts of Java Script and develop a dynamic webpage by the use of Java Script.	**K3**
2.	Write a well formed / valid XML document.	**K3**
3.	Creating & Running PHP script and also to connect & working with DBMS such as MySql.	**K2**
4.	Understand the concepts PERL & RUBY and develop the web applications by using PERL & RUBY.	**K3**

SYLLABUS

UNIT-I (10 Hrs)	**Java script :** The Basic of Java script: Objects, Primitives Operations and Expressions, Screen Output and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Constructors, Patttern Matching using Regular Expressions
UNIT-II (10 Hrs)	**XML:** Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches, **AJAX A New Approach:** Introduction to AJAX, Integrating PHP and AJAX.
UNIT-III (10 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-IV (10 Hrs)	**PERL**: Introduction to PERL, Operators and if statements, Program design and control structures, Arrays, Hashs and File handling, Regular expressions, Subroutines, Retrieving documents from the web with Perl.
UNIT-V (10 Hrs)	**RUBY:** Introduction to Ruby, Variables, types, simple I/O, Control, Arrays, Hashes, Methods, Classes, Iterators, Pattern Matching. Overview of Rails. Names, Listening for TCP Connection, TCP Client Applications

Text Books:	
1.	Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2.	Web Technologies, Uttam K Roy,
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.	Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012)
3.	Web Technologies, HTML< JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
4.	An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning
5.	http://www.upriss.org.uk/perl/PerlCourse.html

Code	Category	L	T	P	C	I.M	E.M	Exam
M19IT2109	**OE**	**3**	**0**	**0**	**3**	**25**	**75**	**3 Hrs.**

INTERNET OF THINGS

(Offered by IT-Information Technology)

(Offered to- **ST, CS, PSA & CAD/CAM)**

Course Objectives:

1.	To assess the vision and introduction of IoT.
2.	To Understand IoT Market perspective.
3.	To Implement Data and Knowledge Management and use of Devices in IoT Technology.
4.	To Understand State of the Art - IoT Architecture.
5.	To classify Real World IoT Design Constraints, Industrial Automation in IoT.

Course Outcomes

After completion of course, students would be able to:

S.No	Outcome	Knowledge Level
1	Interpret the vision of IoT from a global context.	**K2**
2	Determine the Market perspective of IoT.	**K2**
3	Compare and Contrast the use of Devices, Gateways and Data Management in IoT	**K2**
4	Implement state of the art architecture in IoT and identify real world design constraints	**K3**

SYLLABUS

UNIT-I (10 Hrs)	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 Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.
UNIT-II (10 Hrs)	Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability
UNIT-III (10 Hrs)	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.
UNIT-IV (10 Hrs)	Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/Services/Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.
UNIT-V (10 Hrs)	Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the

	Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology ,Sensing the World.
Text Books:	
1.	Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2.	Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015
Reference Books:	
1.	Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2.	Getting Started with the Internet of Things CunoPfister , Oreilly.

Code	Category	L	T	P	C	I.M	E.M	Exam
M19IT2110	**OE**	**3**	**0**	**0**	**3**	**25**	**75**	**3 Hrs.**

MACHINE LEARNING

(Offered by IT-Information Technology)

(Offered to- **ST, CS, PSA & CAD/CAM)**

Course Objectives:

1.	Develop an appreciation for what is involved in learning from data.
2.	Demonstrate a wide variety of learning algorithms.
3.	Demonstrate how to apply a variety of learning algorithms to data.
4.	Demonstrate how to perform evaluation of learning algorithms and model selection.

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

S.No	Outcome	Knowledge Level
1.	Domain Knowledge for Productive use of Machine Learning and Diversity of Data.	**K4**
2.	Demonstrate on Supervised and Computational Learning	**K4**
3.	Analyze on Statistics in learning techniques and Logistic Regression	**K4**
4.	Illustrate on Support Vector Machines and Perceptron Algorithm	**K4**
5.	Design a Multilayer Perceptron Networks and classification of decision tree	**K3**

SYLLABUS

UNIT-I (10 Hrs)	Introduction-Towards Intelligent Machines, Well posed Problems, Example of Applications in diverse fields, Data Representation, Domain Knowledge for Productive use of Machine Learning, Diversity of Data: Structured / Unstructured, Forms of Learning, Machine Learning and Data Mining, Basic Linear Algebra in Machine Learning Techniques.
UNIT-II (10 Hrs)	Supervised Learning- Rationale and Basics: Learning from Observations, Bias and Why Learning Works: Computational Learning Theory, Occam's Razor Principle and Over fitting Avoidance Heuristic Search in inductive Learning, Estimating Generalization Errors, Metrics for assessing regression, Metris for assessing classification.
UNIT-III (10 Hrs)	Statistical Learning- Machine Learning and Inferential Statistical Analysis, Descriptive Statistics in learning techniques, Bayesian Reasoning: A probabilistic approach to inference, K-Nearest Neighbor Classifier. Discriminant functions and regression functions, Linear Regression with Least Square Error Criterion, Logistic Regression for Classification Tasks, Fisher's Linear Discriminant and Thresholding for Classification, Minimum Description Length Principle.
UNIT-IV (10 Hrs)	Support Vector Machines (SVM)- Introduction, Linear Discriminant Functions for Binary Classification, Perceptron Algorithm, Large Margin Classifier for linearly seperable data, Linear Soft Margin Classifier for Overlapping Classes, Kernel Induced Feature Spaces, Nonlinear Classifier, Regression by Support vector Machines. Learning with Neural Networks: Towards Cognitive Machine, Neuron Models, Network Architectures, Perceptrons, Linear neuron and the Widrow-Hoff Learning Rule, The error correction delta rule.

UNIT-V (10 Hrs)	Multilayer Perceptron Networks and error back propagation algorithm, Radial Basis Functions Networks. Decision Tree Learning: Introduction, Example of classification decision tree, measures of impurity for evaluating splits in decision trees, ID3, C4.5, and CART decision trees, pruning the tree, strengths and weakness of decision tree approach.
Text Books:	
1	Applied Machine Learning, M. Gopal, McGraw Hill Education
2	Machine Learning: A Probabilistic Perspective, Kevin Murphy, MIT Press 2012
3	The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer 2009 (freely available online)
Reference Books:	
1	Pattern Recognition and Machine Learning, Christopher Bishop, Springer,2007
2	Programming Collective Intelligence: Building Smart Web 2.0 Applications - Toby Segaran
3	Building Machine Learning Systems with Python - WilliRichert, Luis Pedro Coelho

Code	Category	L	T	P	C	I.M	E.M	Exam
M19CAD 2107	**OE**	**3**	**0**	**0**	**3**	**25**	**75**	**3 Hrs.**

OPERATIONS RESEARCH

(Offered by ME-CAD/CAM)

(Offered to- **ST, CST,CS, PSA & IT)**

Course Objectives:

1.	To impart knowledge in concepts and tools of Operations Research
2.	To understand mathematical models used in Operations Research
3.	Formulate a real-world problem as a mathematical programming model

Course Outcomes

S.No	Outcome	Knowledge Level
1	Apply the dynamic programming to solve problems of discreet and continuous variables	K3
2	Apply the concept of non-linear programming	K3
3	Carry out sensitivity analysis	K3
4	Able to model the real world problem and simulate it.	K3

SYLLABUS

UNIT-I (10 Hrs)	Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models.
UNIT-II (10 Hrs)	Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming
UNIT-III (10 Hrs)	Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT
UNIT-IV (8 Hrs)	Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.
UNIT-V (10 Hrs)	Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

Text Books:

1.	H.A. Taha, Operations Research, An Introduction, PHI, 2008
2.	H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3.	J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4.	Hitler Liebermann Operations Research: McGraw Hill Pub. 2009

Reference Books:

1.	Pannerselvam, Operations Research: Prentice Hall of India 2010
2.	Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

Code	Category	L	T	P	C	I.M	E.M	Exam
M19CAD2108	**OE**	**3**	**0**	**0**	**3**	**25**	**75**	**3 Hrs.**

NANO TECHNOLOGY

(Offered by ME-CAD/CAM)

(Offered to- **ST, CST, CS, PSA & IT)**

Course Objectives:

1.	This course introduces to the fundamentals of nano-scale engineering and manufacturing.
2.	Acquire knowledge on the synthesis of nanomaterials and their application and the impact of nanomaterials on environment.

Course Outcomes

S.No	Outcome	Knowledge Level
1.	Understand the fundamental principles of nanotechnology and their application	K2
2.	Identify and understand various top-down and bottom-up approaches for nanomaterial synthesis.	K2
3.	Understand basic principles of various Nanostructure characterization techniques.	K2
4.	Understand the basic concepts of synthesis of metal and semiconductor nanoparticles..	K2
5.	Obtain the knowledge on synthesis, characterization and application of various carbon based nanomaterials such as carbon nanotubes.	K2

SYLLABUS

UNIT-I (10 Hrs)	Introduction, Size and shape dependence of material properties at the nanoscale, scaling relations, can nanorobots walk and nanoplanes fly, Nano scale elements in conventional technologies, Mechanics at nanoscale Enhancement of mechanical properties with decreasing size, Nanoelectromechanical systems, nano machines, Nano fluidics, filtration, sorting, Molecular motors, Application of Nano Technology.
UNIT-II (10 Hrs)	Nano material Synthesis Techniques: Top-down and bottom-up nanofabrication, Synthesis of nano composites, The Intel-IBM approach to nanotechnology: lithography, etching, ion implantation, thin film deposition, nano coatings and nano indentation, Electron beam lithography, Soft lithography: nanoimprinting and micro contact printing, Solution/plasma-phase nanofabrication, sol-gel methods, template techniques.
UNIT-III (10 Hrs)	Imaging/characterization of nanostructures General considerations for imaging, Scanning probe techniques: XRD, SEM, TEM, AFM and NSOM.
UNIT-IV (10 Hrs)	Metal and semiconductor nanoparticles Synthesis, stability, control of size, Optical and electronic properties, Ultra-sensitive imaging and detection with nano particles, bioengineering applications, Catalysis. Semiconductor and metal nanowires Vapor/liquid/solid growth and other synthesis techniques, Nanowire transistors and sensors.
UNIT-V (8 Hrs)	Carbon nanotubes Structure and synthesis, Electronic, vibrational, and mechanical properties, How can C nanotubes enable faster computers, brighter TV screens, and stronger mechanical reinforcement?

Text Books:	
1.	Nanoscale Science and Technology by Kelsall, Hamley, and Geoghegan, Wiley (2005).
2.	Introduction to Nanoscale Science and Technology by Di Ventra, Evoy, and Heflin, Kluwer Academic Publishers (2004).
Reference Books:	
1.	Introduction to Nanotechnology by Poole and Owens, Wiley (2003)
2.	Nanochemistry: A Chemical Approach to Nanomaterials, Ozin and Arsenault, RSC Publishing (2006).

Code	Category	L	T	P	C	I.M	E.M	Exam
M19CAD2109	**OE**	**3**	**0**	**0**	**3**	**25**	**75**	**3 Hrs.**

PRODUCT DESIGN AND MANUFACTURING

(Offered by ME-CAD/CAM)

(Offered to- **ST, CST,CS, PSA & IT)**

Course Objectives:

1.	To introduce the objectives of product design and the requirements of a good product design.
2.	To expose the students to different design principles like designing for function, production, installation and handling, maintenance, packaging etc.

Course Outcomes

S.No	Outcome	Knowledge Level
1.	Understand the concepts of Engineering Materials and Identify various manufacturing processes and processing limitations.	K2
2.	Understand modern product development processes and explain various stages of product design and evaluation.	K2
3.	Understand the concept of Design for manufacture and assembly.	K2
4.	Prepare primary designs taking into consideration ergonomics and aesthetic aspects of the product.	K2

SYLLABUS

UNIT-I (10 Hrs)	Engineering materials, metals and their properties, uses, processing methods, design data and applications, selection criteria. Manufacturing and processing limitations, comparative studies; plastics and composites, types, classifications, properties, processing techniques and limitation, selection of plastics for specific applications, finishing and surface coating of different materials. processing of polymers and ceramics, surface modification of materials.
UNIT-II (10 Hrs)	An overview of three stages of product design, generating and evaluating conceptual alternatives from manufacturing point of view, selection of material and processes, evaluating part configuration for manufacturability, evaluating parametric design for manufacturability.
UNIT-III (10 Hrs)	Design for manufacture, influence of materials process and tooling on the design of components manufactured by metal casting, forming and joining, form design of components. Recent developments in casting, machining, forming and finishing
UNIT-IV (8 Hrs)	Product design for manual assembly, product design for high- speed automatic assembly and product design for robot assembly.
UNIT-V (10 Hrs)	Ergonomics and automated systems, expert systems for ergonomic design, anthropomorphic data and its application in ergonomic design, limitations of

	anthropomorphic data, use of computerized database Aesthetic Concepts : Concepts of Unity, concept of order with variety, concept of purpose, style and environment, aesthetic expression, style – components of style, house style, Observing style in capital goods.

Text Books:	
1.	Dieter, G.E, Engineering Design: A materials and Processing Approach, McGraw Hill, 1991.
2.	Ashby, M.F., Materials selection in mechanical design, Pergamon press, 1992.

Reference Books:	
1.	Oswaid, P.F and Begeman, M., Manufacturing Process, John Willy, 1987.
2.	Levy, S. and Dubois, L.H, Plastics production design Engineering Handbook, Methuen Inc, 1985.
3.	Product Design by Kevin otto, Kristin wood.

Code	Category	L	T	P	C	I.M	E.M	Exam
M19 BS 2101	**PE**	**3**	**0**	**--**	**3**	**25**	**75**	**3 Hrs.**

MANAGEMENT AND ORGANIZATIONAL BEHAVIOR

(Offered by BSH)

(Offered to- **ST, CST,CS, PSA, IT & CAD/CAM)**

Course Objectives:

1.	To familiarize with the concept of management, functions and principles.
2.	To provide conceptual knowledge on functional management that is on Human resource management and Marketing management.
3.	To provide basic insight into contemporary management practices and Strategic Management.
4.	To learn theories of motivation and also deals with individual behavior, their attitude and perception of individuals.
5.	To understand about organizations groups that affect the climate of an entire organization this helps employees in stress management.

Course Outcomes: After Completion of this course student will be able to

S.No	Outcome	Knowledge Level
1.	Know the salient features of management, its functions and principles.	K2
2.	Understand the concepts of functional management, particularly HRM and Marketing functions	K2
3.	Have a comprehensive view about vision, mission, goal, objective and a strategy based on which the corporate planning depends.	K2
4.	Recognize strategically contemporary management practices and describe corporate planning processes.	K2
5.	The learner will be in a position to inherent about the individual behavior and motivational theories.	K2
6.	Know how to address and redress the conflicts and stress.	K2

SYLLABUS

UNIT-I (8 Hrs)	**Introduction to Management:** **Management:** Concept, Nature and importance of Management, Functions of management, Evolution of Management thought, Taylor's Scientific Management, Fayol's principles of Management, Social Responsibility of Business.
UNIT-II (10 Hrs)	**Functional Management:** **Human Resource Management (HRM)**: Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Compensation & Performance Appraisal. **Marketing Management:** Concept, Functions of marketing; Marketing Mix - Product, Price, Place & Promotion; Marketing strategies based on Product life cycle, Channels of distribution.

UNIT-III (8 Hrs)	**Strategic Management:** Vision, Mission, Goal, Objective, Policy, Strategy. Elements of Corporate planning process; Environmental scanning; SWOT analysis; steps in Strategy formulation, implementation, evaluation & control; Bench Marking; Balanced Score Card.
UNIT-IV (8 Hrs)	**Organizational Behavior:** Individual Behavior: Perception-Perceptual process; Attitude- Attitutidinal change, Organizational Change, Factors Influencing Change, Types of Change. **Motivation**: Meaning, Theories of Motivation - Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation.
UNIT-V (8 Hrs)	**Group Dynamics:** Types of Groups, Stages of Group development; **Organizational conflicts** -Reasons for Conflicts, Consequences of Conflicts in Organization, Types of Conflicts, Strategies for Managing Conflicts, Stress - Causes and effects, coping strategies of stress.

Text Books:

1.	Subba Rao.P Management & Organizational Behaviour, Himalaya Publishing House. Mumbai
2.	A.R Aryasri - Management Science Mcgraw Hill Pvt Ltd, New Delhi

Reference Books:

1.	Fred Luthans Organizational Behaviour, TMH, New Delhi.
2.	Robins, Stephen P., Fundamentals of Management, Pearson, India.
3.	Kotler Philip & Keller Kevin Lane: Marketing Management 12/e, PHI.
4.	Koontz & Weihrich: Essentials of Management, 6/e, TMH