UGC AUTONOMOUS

B.Tech in Computer Science and Engineering

(AI&ML)

III AND IV YEAR Course Structure(2020-2021 Admitted Batch)

III YEAR I SEMESTER

S.No.	Course Code	Course Title	Periods Per weak			Credits	Scheme Of Examination Max.Marks		
			L	T	P		CIE	SEE	Total
THEORY									
1	AM3101PC	R Programming	3	0	0	3	25	75	100
2	AM3102PC	Design and Analysis of Algorithms	3	0	0	3	25	75	100
3	AM3103PC	Artificial Intelligence	3	0	0	3	25	75	100
4	AM3104PC	Natural Language Processing	3	0	0	3	25	75	100
PRACTICALS									
5	AM3105PC	R Programming Lab	0	0	3	1.5	25	75	100
6	AM3106PC	Design and Analysis of Algorithms Lab	0	0	3	1.5	25	75	100
7	EN3107HS	Advanced Communication Skills Lab	0	0	2	1	25	75	100
PROFESSIONAL ELECTIVE 1			3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE 2			3	0	0	3	25	75	100
		TotalCredits	**18**	**0**	**8**	**22**	**225**	**675**	**900**

Professional Elective-I

COURSE CODE	COURSE TITLE
AM3108PE	Information Theory & Coding
AM3109PE	Advanced Computer Architecture
AM3110PE	Data Analytics
AM3111PE	Image Processing
AM3112PE	Principles of Programming Languages

Professional Elective-II

COURSE CODE	COURSE TITLE
AM3113PE	Computer Graphics
AM3114PE	Advanced Operating Systems
AM3115PE	Information Retrieval Systems
AM3116PE	Distributed Databases
AM3117PE	Mobile Computing

III YEAR II SEMESTER

S.No.	Course Code	Course Title	Periods Per weak			Credits	Scheme Of Examination Max.Marks		
			L	T	P		CIE	SEE	Total
THEORY									
1	AM3201PC	Machine Learning	3	1	0	4	25	75	100
2	AM3202PC	Compiler Design	3	1	0	4	25	75	100
3	AM3203PC	Computer Networks	3	1	0	4	25	75	100
PRACTICALS									
4	AM3204PC	Machine Learning Lab	0	0	2	1	25	75	100
5	AM3205PC	Compiler Design Lab	0	0	3	1.5	25	75	100
6	AM3206PC	Computer Networks Lab	0	0	3	1.5	25	75	100
7	**PROFESSIONAL ELECTIVE III**		3	0	0	3	25	75	100
8	**OPEN ELECTIVE 1**		3	0	0	3	25	75	100
MANDATORY/VALUE ADDED COURSES									
9	MC3001*	Cyber Security	3	0	0	0	Ref:8.4 Academic Regulations,UG.20		
		TotalCredits	**18**	**3**	**8**	**22**	**200**	**600**	**800**

Professional Elective-III

COURSE CODE	COURSE TITLE
AM3207PE	AI and Analytics
AM3208PE	Reinforcement Learning
AM3209PE	Computer Vision
AM3210PE	Virtual Reality
AM3211PE	Robotics

Open Elective-I

COURSE CODE	COURSE TITLE	DEPARTMENT OFFERING COURSE
CS3211OE	Introduction to Data Science	Computer Science and Engineering
CS3212OE	Data mining	Computer Science and Engineering
CS3213OE	Computer Forensics	Computer Science and Engineering
EE3211OE	Electrical Installation and Costing	Electrical and Electronics Engineering
EE3212OE	Electrical Engineering Material	Electrical and Electronics Engineering
EC3211OE	Fundamentals of Internet of Things	Electronics and Communication Engineering
ME3211OE	Operation Research	Mechanical Engineering
ME3212OE	Fundamentals of Mechanical Engineering	Mechanical Engineering
ME3213OE	Metallurgy of Non-Metallurgists	Mechanical Engineering
CE3211OE	Basics of Civil Engineering	Civil Engineering
CE3212OE	Building Materials and Construction	Civil Engineering

IV YEAR I SEMESTER

S.No.	Course Code	Course Title	Periods Per weak			Credits	Scheme Of Examination Max.Marks		
			L	T	P		CIE	SEE	Total
THEORY									
1	AM4101PC	Information Security	3	0	0	3	25	75	100
2	AM4102PC	Deep Learning	2	0	0	2	25	75	100
3		**Professional Elective-IV**	3	0	0	3	25	75	100
4		**Professional Elective-V**	3	0	0	3	25	75	100
5		**Open Elective-II**	3	0	0	3	25	75	100
PRACTICALS									
6	AM4103PC	Deep Learning Lab	0	0	2	1	25	75	100
7	AM4104PC	Industrial Oriented MiniProject/Summer Internship	0	0	0	2	25	75	100
8	AM4105PC	Seminar	0	0	2	1	25	75	100
9	AM4106PC	Project Stage - I	0	0	6	3	25	75	100
MANDATORY/VALUE ADDED COURSES									
10	MC4001*	Intellectual Property Rights	3	0	0	0	Ref:8.4 Academic Regulations,UG. 20		
		Total redits	**17**	**0**	**10**	**21**	**225**	**675**	**900**

#Note: Industrial Oriented Mini Project/ Summer Internship is to be carried out during the summervacation between 6th and 7th semesters. Students should submit report of Industrial Oriented MiniProject/ Summer Internship for evaluation.

Professional Elective-IV

COURSE CODE	COURSE TITLE
AM4107PE	Graph Theory
AM4108PE	Introduction to Embedded Systems
AM4109PE	E-Commerce
AM4110PE	Cloud Computing
AM4111PE	Ad-hoc&SensorNetworks

Professional Elective-V

COURSE CODE	COURSE TITLE
AM4112PE	Advanced Algorithms
AM4113PE	RealTimeSystems
AM4114PE	SoftComputing
AM4115PE	Internet of Things
AM4116PE	SoftwareProjectManagement

Open Elective-II

COURSE CODE	COURSE TITLE	DEPARTMENT OFFERING COURSE
CS4121OE	Python Programming	Computer Science and Engineering
CS4122OE	R Programming	Computer Science and Engineering
CS4123OE	JAVA Programming	Computer Science and Engineering
EE4121OE	Renewable Energy Sources	Electrical and Electronics Engineering
EE4122OE	Reliability Engineering	Electrical and Electronics Engineering
EC4121OE	Principles of Computer Communications and Networks	Electronics and Communication Engineering
ME4121OE	Fabrication Processes	Mechanical Engineering
ME4122OE	Total Quality Management	Mechanical Engineering
ME4123OE	Energy Management and Conservation	Mechanical Engineering
CE4121OE	Environmental Impact Assessment	Civil Engineering
CE4122OE	Industrial Waste Water Treatment	Civil Engineering

IV YEAR II SEMESTER

S.No.	Course Code	Course Title	Periods Per weak			Credits	Scheme Of Examination Max.Marks		
			L	T	P		CIE	SEE	Total
THEORY									
1	SM4201MS	Organizational Behavior	3	0	0	3	25	75	100
2		**Professional Elective- VI**	3	0	0	3	25	75	100
3		**Open Elective- III**	3	0	0	3	25	75	100
4	AM4202PC	Project Stage - II	0	0	14	7	25	75	100
		Total Credits	**09**	**0**	**14**	**16**	**100**	**300**	**400**

Professional Elective-VI

COURSE CODE	COURSE TITLE
AM4203PE	Computational Complexity
AM4204PE	Distributed Systems
AM4205PE	Design Patterns
AM4206PE	Human Computer Interaction
AM4207PE	Cyber Forensics

Open Elective-III

COURSE CODE	COURSE TITLE	DEPARTMENT OFFERING COURSE
CS4231OE	Machine Learning	Computer Science and Engineering
CS4232OE	Cloud Computing	Computer Science and Engineering
CS4233OE	Natural Language Processing	Computer Science and Engineering
EE4231OE	Instrumentation and Control	Electrical and Electronics Engineering
EE4232OE	Energy Storage Systems	Electrical and Electronics Engineering
EC4231OE	Electronic Measuring Instruments	Electronics and Communication Engineering
ME4231OE	Reliability Engineering	Mechanical Engineering
ME4232OE	Industrial Management	Mechanical Engineering
ME4233OE	Renewable Energy Sources	Mechanical Engineering
CE4231OE	Remote Sensing and GIS	Civil Engineering
CE4232OE	Disaster Management	Civil Engineering

AM3101PC: R PROGRAMMING

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3101PC	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- Understanding and being able to use basic programming concepts
- Automate data analysis
- Working collaboratively and openly on code
- Knowing how to generate dynamic documents
- Being able to use a continuous test-driven development approach

Course Outcomes:

- be able to use and program in the programming language R
- be able to use R to solve statistical problems
- be able to implement and describe Monte Carlo the technology
- be able to minimize and maximize functions using R

UNIT – I

Introduction: Overview of R, R data types and objects, reading and writing data, sub setting R Objects, Essentials of the R Language, Installing R, Running R, Packages in R, Calculations, Complex numbers in R, Rounding, Arithmetic, Modulo and integer quotients, Variable names and assignment, Operators, Integers, Factors, Logical operations

UNIT – II

Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes

Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations

UNIT – III

Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, DATA FRAMES, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations

UNIT - IV

FACTORS AND TABLES, Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables , Extracting a Subtable,

Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions

UNIT - V

OBJECT-ORIENTED PROGRAMMING: S Classes, S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Function on an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation

TEXT BOOKS:

1. R Programming for Data Science by Roger D. Peng
2. The Art of R Programming by Prashanth singh, Vivek Mourya, Cengage LearningIndia.

AM3102PC: DESIGN AND ANALYSIS OF ALGORITHMS

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3102PC	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- Introduces the notations for analysis of the performance of algorithms.
- Introduces the data structure disjoint sets.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
- Describes how to evaluate and compare different algorithms using worst-, average-, and best-case analysis.
- Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

Course Outcomes:

- Ability to analyze the performance of algorithms
- Ability to choose appropriate data structures and algorithm design methods for a specifiedapplication
- Ability to understand how the choice of data structures and the algorithm design methodsimpact the performance of programs

UNIT - I

Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen'smatrix multiplication.

UNIT - II

Disjoint Sets: Disjoint set operations, union and find algorithms

Backtracking: General method, applications, n-queen's problem, sum of subsets problem, graphcoloring.

UNIT - III

Dynamic Programming: General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

UNIT - IV

Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem,Minimum cost spanning trees, Single source shortest path problem.

UNIT - V

Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsackproblem - LC Branch and Bound solution, FIFO Branch and Bound solution.

NP-Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, NP - Hard andNP-Complete classes, Cook's theorem.

TEXT BOOK:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan,University Press.

REFERENCE BOOKS:

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R.Tamassia, John Wiley and sons.

AM3103PC: ARTIFICIAL INTELLIGENCE

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3103PC	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- To learn the difference between optimal reasoning vs human like reasoning
- To understand the notions of state space representation, exhaustive search, heuristicsearch along with the time and space complexities
- To learn different knowledge representation techniques
- To understand the applications of AI: namely Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing

Course Outcomes:

- Possess the ability to formulate an efficient problem space for a problem expressed in English.
- Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique
- Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems, Machine Learning and Natural Language Processing

UNIT - I

Introduction, History, Intelligent Systems, Foundations of AI, Sub areas of AI, Applications. 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. Game Playing, Bounded Look-aheadStrategy and use of Evaluation Functions, Alpha-Beta Pruning

UNIT - II

Logic Concepts and Logic Programming: Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau System in Propositional Logic, Resolution Refutation in Propositional Logic, Predicate Logic, Logic Programming.

Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT - III

Expert System and Applications: Introduction, Phases in Building Expert Systems, Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and Tools.

Uncertainty Measure - Probability Theory: Introduction, Probability Theory, Bayesian Belief Networks, Certainty Factor Theory, Dempster-Shafer Theory.

UNIT-IV

Machine-Learning Paradigms: Introduction. Machine Learning Systems. Supervised and Unsupervised Learning. Inductive Learning. Learning Decision Trees (Text Book 2), Deductive Learning. Clustering, Support Vector Machines.

Artificial Neural Networks: Introduction, Artificial Neural Networks, Single-Layer Feed-Forward Networks, Multi-Layer Feed-Forward Networks, Radial-Basis Function Networks, Design Issues of Artificial Neural Networks, Recurrent Networks.

UNIT-V

Advanced Knowledge Representation Techniques: Case Grammars, Semantic Web

Natural Language Processing: Introduction, Sentence Analysis Phases, Grammars and Parsers, Types of Parsers, Semantic Analysis, Universal Networking Knowledge.

TEXT BOOKS:

1. Saroj Kaushik. Artificial Intelligence. Cengage Learning. 2011
2. Russell, Norvig: Artificial intelligence, A Modern Approach, Pearson Education, Second Edition. 2004

REFERENCE BOOK:

1. Rich, Knight, Nair: Artificial intelligence, Tata McGraw Hill, Third Edition 2009.
2. Introduction to Artificial Intelligence by Eugene Charniak, Pearson.
3. Introduction to Artificial Intelligence and expert systems Dan W.Patterson. PHI.
4. Artificial Intelligence by George Fluger rearson fifth edition.

AM3104PC: NATURAL LANGUAGE PROCESSING

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3104PC	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives: Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes:

- Show sensitivity to linguistic phenomena and an ability to model them with formalgrammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems.
- Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms.
- Able to design different language modeling Techniques.

UNIT - I

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

UNIT - II

Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

UNIT - III

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT - IV

Predicate- Argument Structure, Meaning Representation Systems, Software.

UNIT - V

Discourse Processing: Cohension, Reference Resolution, Discourse Cohension and Structure **Language Modeling:** Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modeling

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory to Practice –Daniel M. Bikel and Imed Zitouni, Pearson Publication.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

REFERENCE:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin,Pearson Publications.

AM3108PE: INFORMATION THEORY & CODING

(Professional Elective - I)

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3108PE	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- To acquire the knowledge in measurement of information and errors.
- Understand the importance of various codes for communication systems
- To design encoder and decoder of various codes.
- To known the applicability of source and channel codes

Course Outcomes:

- Upon completing this course, the student will be able to
- Learn measurement of information and errors.
- Obtain knowledge in designing various source codes and channel codes
- Design encoders and decoders for block and cyclic codes
- Understand the significance of codes in various applications

UNIT - I

Coding for Reliable Digital Transmission and storage

Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Source Codes: Shannon-fano coding, Huffman coding

UNIT - II

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system.

UNIT - III

Cyclic Codes: Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT - IV

Convolutional Codes: Encoding of Convolutional Codes- Structural and Distance Properties, state, tree, trellis diagrams, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT - V

BCH Codes: Minimum distance and BCH bounds, Decoding procedure for BCH codes, Syndrome computation and iterative algorithms, Error locations polynomials for single and double error correction.

TEXT BOOKS

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J.Costello,Jr, PrenticeHall, Inc 2014.
2. Error Correcting Coding Theory-Man Young Rhee, McGraw – Hill Publishing 1989

REFERENCE BOOKS

1. Digital Communications- John G. Proakis, 5th ed., , TMH 2008.
2. Introduction to Error Control Codes-Salvatore Gravano-oxford
3. Error Correction Coding – Mathematical Methods and Algorithms – Todd K.Moon, 2006, WileyIndia.
4. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Edition, 2009, TMH.

AM3109PE: ADVANCED COMPUTER ARCHITECTURE

(Professional Elective - I)

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3109PE	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives

- To impart the concepts and principles of parallel and advanced computer architectures.
- To develop the design techniques of Scalable and multithreaded Architectures.
- To Apply the concepts and techniques of parallel and advanced computer architectures todesign modern computer systems

Course Outcomes:

Gain knowledge of

- Computational models and Computer Architectures.
- Concepts of parallel computer models.
- Scalable Architectures, Pipelining, Superscalar processors, multiprocessors

UNIT - I

Theory of Parallelism, Parallel computer models, The State of Computing, Multiprocessors and Multicomputers, Multivector and SIMD Computers, PRAM and VLSI models, Architectural development tracks, Program and network properties, Conditions of parallelism, Program partitioning and Scheduling, Program flow Mechanisms, System interconnect Architectures.

UNIT – II Principals of Scalable performance, Performance metrics and measures, Parallel Processing applications, Speed up performance laws, Scalability Analysis and Approaches, Hardware Technologies, Processes and Memory Hierarchy, Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.

UNIT - III

Bus Cache and Shared memory, Backplane bus systems, Cache Memory organizations, Shared- Memory Organizations, Sequential and weak consistency models, Pipelining and

superscalar techniques, Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, superscalar pipeline design.

UNIT - IV

Parallel and Scalable Architectures, Multiprocessors and Multicomputers, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of Multicomputers, Message-passing Mechanisms, Multivetor and SIMD computers, Vector Processing Principals, Multivector Multiprocessors, Compound Vector processing, SIMD computer Organizations,The connection machine CM-5,

UNIT - V

Scalable, Multithreaded and Dataflow Architectures, Latency-hiding techniques, Principals of Multithreading, Fine-Grain Multicomputers, Scalable and multithreaded Architectures, Dataflow and hybrid Architectures.

TEXT BOOK:

1. Advanced Computer Architecture Second Edition, Kai Hwang, Tata McGraw Hill Publishers.

REFERENCE BOOKS:

1. Computer Architecture, Fourth edition, J. L. Hennessy and D.A. Patterson. ELSEVIER.
2. Advanced Computer Architectures, S.G. Shiva, Special Indian edition, CRC, Taylor &Francis.
3. Introduction to High Performance Computing for Scientists and Engineers, G. Hager and G.Wellein, CRC Press, Taylor & Francis Group.
4. Advanced Computer Architecture, D. Sima, T. Fountain, P. Kacsuk, Pearson education.
5. Computer Architecture, B. Parhami, Oxford Univ. Press.

AM3110PE: DATA ANALYTICS

(Professional Elective - I)

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3110PE	**Professional Elective - I**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and estimate theaccuracy of the algorithms.
- To understand the various search methods and visualization techniques.

Course Outcomes:

After completion of this course students will be able to

- Understand the impact of data analytics for business decisions and strategy
- Carry out data analysis/statistical analysis
- To carry out standard data visualization and formal inference procedures
- Design Data Architecture
- Understand various Data Sources

UNIT - I

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data) and Data Processing & Processing.

UNIT - II

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputationsetc. Need for Business Modeling.

UNIT - III

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization,and Model Building etc.

Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIT - IV

Object Segmentation: Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc. Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction

UNIT - V

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS:

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan KaufmannPublishers.

REFERENCE BOOKS:

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway LabsJeffrey D Ullman Stanford Univ.

AM3111PE: IMAGE PROCESSING

(Professional Elective - I)

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3111PE	**Professional Elective - I**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives

- Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts.
- The topics include image acquisition; sampling and quantization; preprocessing; enhancement;restoration; segmentation; and compression.

Course Outcomes

- Demonstrate the knowledge of the basic concepts of two-dimensional signal acquisition,sampling, and quantization.
- Demonstrate the knowledge of filtering techniques.
- Demonstrate the knowledge of 2D transformation techniques.
- Demonstrate the knowledge of image enhancement, segmentation, restoration and compression techniques.

UNIT - I

Digital Image Fundamentals: Digital Image through Scanner, Digital Camera. Concept of Gray Levels. Gray Level to Binary Image Conversion. Sampling and Quantization. Relationship between Pixels. Imaging Geometry. 2D Transformations-DFT, DCT, KLT and SVD.

UNIT - II

Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering,Enhancement in Frequency Domain, Image Smoothing, Image Sharpening.

UNIT - III

Image Restoration Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT - IV

Image Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding,Region Oriented Segmentation.

UNIT - V

Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

TEXT BOOK:

1. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/ Pearson Education,2nd Ed, 2004.

REFERENCE BOOKS:

1. Fundamentals of Digital Image Processing: A. K. Jain, PHI.
2. Digital Image Processing using MAT LAB: Rafael C. Gonzalez, Richard E. Woods, Steven L.Eddins: Pearson Education India, 2004.
3. Digital Image Processing: William K. Pratt, John Wilely, 3rd Edition, 2004.

AM3112PE: PRINCIPLES OF PROGRAMMING LANGUAGES

(Professional Elective - I)

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3112PE	**Professional Elective - I**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives

- Introduce important paradigms of programming languages
- To provide conceptual understanding of high-level language design and implementation
- Topics include programming paradigms; syntax and semantics; data types, expressions and statements; subprograms and blocks; abstract data types; concurrency; functional and logic programming languages; and scripting languages

Course Outcomes

- Acquire the skills for expressing syntax and semantics in formal notation
- Identify and apply a suitable programming paradigm for a given computing application
- Gain knowledge of and able to compare the features of various programming languages

UNIT - I

Preliminary Concepts: Reasons for Studying Concepts of Programming Languages, Programming Domains, Language Evaluation Criteria, Influences on Language Design, Language Categories, Language Design Trade-Offs, Implementation Methods, Programming Environments

Syntax and Semantics: General Problem of Describing Syntax and Semantics, Formal Methods of Describing Syntax, Attribute Grammars, Describing the Meanings of Programs

UNIT - II

Names, Bindings, and Scopes: Introduction, Names, Variables, Concept of Binding, Scope, Scope and Lifetime, Referencing Environments, Named Constants

Data Types: Introduction, Primitive Data Types, Character String Types, User Defined Ordinal Types, Array, Associative Arrays, Record, Union, Tuple Types, List Types, Pointer and Reference Types, TypeChecking, Strong Typing, Type Equivalence

Expressions and Statements: Arithmetic Expressions, Overloaded Operators, Type Conversions, Relational and Boolean Expressions, Short Circuit Evaluation, Assignment Statements, Mixed-Mode Assignment

Control Structures – Introduction, Selection Statements, Iterative Statements, Unconditional Branching, Guarded Commands.

UNIT - III

Subprograms and Blocks: Fundamentals of Sub-Programs, Design Issues for Subprograms, Local Referencing Environments, Parameter Passing Methods, Parameters that Are Subprograms, Calling Subprograms Indirectly, Overloaded Subprograms, Generic Subprograms, Design Issues for Functions, User Defined Overloaded Operators, Closures, Coroutines

Implementing Subprograms: General Semantics of Calls and Returns, Implementing Simple Subprograms, Implementing Subprograms with Stack-Dynamic Local Variables, Nested Subprograms,Blocks, Implementing Dynamic Scoping

Abstract Data Types: The Concept of Abstraction, Introductions to Data Abstraction, Design Issues, Language Examples, Parameterized ADT, Encapsulation Constructs, Naming Encapsulations

UNIT - IV

Concurrency: Introduction, Introduction to Subprogram Level Concurrency, Semaphores, Monitors, Message Passing, Java Threads, Concurrency in Function Languages, Statement Level Concurrency. Exception Handling and Event Handling: Introduction, Exception Handling in Ada, C++, Java, Introduction to Event Handling, Event Handling with Java and C#.

UNIT - V

Functional Programming Languages: Introduction, Mathematical Functions, Fundamentals of Functional Programming Language, LISP, Support for Functional Programming in Primarily Imperative Languages, Comparison of Functional and Imperative Languages

Logic Programming Language: Introduction, an Overview of Logic Programming, Basic Elements ofProlog, Applications of Logic Programming.

Scripting Language: Pragmatics, Key Concepts, Case Study: Python – Values and Types, Variables, Storage and Control, Bindings and Scope, Procedural Abstraction, Data Abstraction, Separate Compilation, Module Library. (Text Book 2)

TEXT BOOKS:

1. Concepts of Programming Languages Robert. W. Sebesta 10/E, Pearson Education.
2. Programming Language Design Concepts, D. A. Watt, Wiley Dreamtech, 2007.

REFERENCE BOOKS:

1. Programming Languages, 2nd Edition, A.B. Tucker, R. E. Noonan, TMH.
2. Programming Languages, K. C. Louden, 2nd Edition, Thomson, 2003

AM3113PE: COMPUTER GRAPHICS

(Professional Elective - II)

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3113PE	**Professional Elective - II**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives

- The aim of this course is to provide an introduction of fundamental concepts and theory of computer graphics.
- Topics covered include graphics systems and input devices; geometric representations and 2D/3D transformations; viewing and projections; illumination and color models; animation; rendering and implementation; visible surface detection;

Course Outcomes

- Acquire familiarity with the relevant mathematics of computer graphics.
- Be able to design basic graphics application programs, including animation
- Be able to design applications that display graphic images to given specifications

UNIT - I

Introduction: Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices

Output primitives: Points and lines, line drawing algorithms (Bresenham's and DDA Algorithm), mid- point circle and ellipse algorithms

Polygon Filling: Scan-line algorithm, boundary-fill and flood-fill algorithms

UNIT - II

2-D geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations betweencoordinate systems

2-D viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland algorithms, Sutherland –Hodgemanpolygon clipping algorithm.

UNIT - III

3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon rendering methods.

UNIT - IV

3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations,composite transformations.

viewing: Viewing pipeline, viewing coordinates, view volume and general projection transformsand clipping.

UNIT - V

Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications

Visible surface detection methods: Classification, back-face detection, depth-buffer, BSP-treemethods and area sub-division methods

TEXT BOOKS:

1. "Computer Graphics *C version*", Donald Hearn and M. Pauline Baker, Pearson Education
2. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner andHughes, Pearson Education.
3. Computer Graphics, Steven Harrington, TMH

REFERENCE BOOKS:

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.

AM3114PE: ADVANCED OPERATING SYSTEMS

(Professional Elective - II)

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3114PE	**Professional Elective - II**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives

- To study, learn, and understand the main concepts of advanced operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open source operating systems)
- Hardware and software features that support these systems.

Course Outcomes

- Understand the design approaches of advanced operating systems
- Analyze the design issues of distributed operating systems.
- Evaluate design issues of multi processor operating systems.
- Identify the requirements Distributed File System and Distributed Shared Memory.
- Formulate the solutions to schedule the real time applications.

UNIT - I

Architectures of Distributed Systems: System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives. Theoretical Foundations: Inherent Limitations of a Distributed System, Lamport's Logical Clocks, Vector Clocks, Causal Orderingof Messages, Termination Detection.

UNIT - II

Distributed Mutual Exclusion: The Classification of Mutual Exclusion Algorithms, Non-Token – Based Algorithms: Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm, Token-Based Algorithms: Suzuki-Kasami's Broadcast Algorithm, Singhal's Heurisric Algorithm, Raymond's Heuristic Algorithm.

UNIT - III

Distributed Deadlock Detection: Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for

Distributed Deadlock Detection, Centralized- Deadlock – Detection Algorithms, Distributed Deadlock Detection Algorithms, HierarchicalDeadlock Detection Algorithms

UNIT - IV

Multiprocessor System Architectures: Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures Multi Processor Operating Systems: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues, Threads, Process Synchronization, Processor Scheduling.

Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues

UNIT - V

Distributed Scheduling: Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration

Distributed Shared Memory: Architecture and Motivation, Algorithms for Implementing DSM, MemoryCoherence, Coherence Protocols, Design Issues

TEXT BOOK:

1. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjan G. Shivaratri, TataMcGraw-Hill Edition 2001

REFERENCE BOOK:

1. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall,Edition – 2, 2007

AM3115PE: INFORMATION RETRIEVAL SYSTEMS

(Professional Elective - II)

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3115PE	**Professional Elective - II**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- To learn the important concepts and algorithms in IRS
- To understand the data/file structures that are necessary to design, and implement informationretrieval (IR) systems.

Course Outcomes:

- Ability to apply IR principles to locate relevant information large collections of data
- Ability to design different document clustering algorithms
- Implement retrieval systems for web search tasks.
- Design an Information Retrieval System for web search tasks.

UNIT - I

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses

Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

UNIT - II

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction

Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models

UNIT - III

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages

Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

UNIT - IV

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext

Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies

UNIT - V

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval

TEXT BOOK:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition,Gerald J. Kowalski, Mark T. Maybury, Springer

REFERENCE BOOKS:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms,Prentice Hall, 1992.
2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval By Yates and Neto Pearson Education.

AM3116PE: DISTRIBUTED DATABASES

(Professional Elective - II)

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3116PE	**Professional Elective - II**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- The purpose of the course is to enrich the previous knowledge of database systems and exposing the need for distributed database technology to confront with the deficiencies of the centralized database systems.
- Introduce basic principles and implementation techniques of distributed database systems.
- Equip students with principles and knowledge of parallel and object-oriented databases.
- Topics include distributed DBMS architecture and design; query processing and optimization; distributed transaction management and reliability; parallel and object database management systems.

Course Outcomes:

- Understand theoretical and practical aspects of distributed database systems.
- Study and identify various issues related to the development of distributed database system.
- Understand the design aspects of object-oriented database system and related development.

UNIT - I

Introduction; Distributed Data Processing, Distributed Database System, Promises of DDBSs,Problem areas.

Distributed DBMS Architecture:Architectural Models for Distributed DBMS, DDMBS Architecture.

Distributed Database Design:Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.

UNIT - II

Query processing and decomposition: Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data.

Distributed query Optimization: Query optimization, centralized query optimization, distributed queryoptimization algorithms.

UNIT - III

Transaction Management: Definition, properties of transaction, types of transactions, distributed concurrency control: serializability, concurrency control mechanisms & algorithms, time - stamped & optimistic concurrency control Algorithms, deadlock Management.

UNIT - IV

Distributed DBMS Reliability: Reliability concepts and measures, fault-tolerance in distributed systems, failures in Distributed DBMS, local & distributed reliability protocols, site failures and network partitioning.

Parallel Database Systems: Parallel database system architectures, parallel data placement, parallelquery processing, load balancing, database clusters.

UNIT - V

Distributed object Database Management Systems: Fundamental object concepts and models, object distributed design, architectural issues, object management, distributed object storage, object query Processing.

Object Oriented Data Model: Inheritance, object identity, persistent programming languages,persistence of objects, comparison OODBMS and ORDBMS

TEXT BOOKS:

1. M. Tamer OZSU and Patuck Valduriez: Principles of Distributed Database Systems, PearsonEdn. Asia, 2001.
2. Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.

REFERENCE BOOK:

1. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: “Database Systems: The CompleteBook”, Second Edition, Pearson International Edition

AM3117PE: MOBILE COMPUTING

(PROFESSIONAL ELECTIVE - II)

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3117PE	**Professional Elective - II**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- To make the student understand the concept of mobile computing paradigm, its novelapplications and limitations.
- To understand the typical mobile networking infrastructure through a popular GSMprotocol
- To understand the issues and solutions of various layers of mobile networks, namelyMAC layer, Network Layer & Transport Layer
- To understand the database issues in mobile environments & data delivery models.
- To understand the ad hoc networks and related concepts.
- To understand the platforms and protocols used in mobile environment.

Course Outcomes:

- Able to think and develop new mobile application.
- Able to take any new technical issue related to this new paradigm and come up with asolution(s).
- Able to develop new ad hoc network applications and/or algorithms/protocols.
- Able to understand & develop any existing or new protocol related to mobileenvironment

UNIT - I

Introduction: Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices.

GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS, CSHSD, DECT.

UNIT – II

(Wireless) Medium Access Control (MAC): Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

Mobile Network Layer: IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, DHCP.

UNIT – III

Mobile Transport Layer: Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks.

Database Issues: Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models, Query processing, Data Recovery Process & QoS Issues.

UNIT - IV

Data Dissemination and Synchronization: Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data

Synchronization – Introduction, Software, and Protocols

UNIT - V

Mobile Adhoc Networks (MANETs): Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, etc. , Mobile Agents, Service Discovery.

Protocols and Platforms for Mobile Computing: WAP, Bluetooth, XML, J2ME, Java Card, Palm OS, Windows CE, Symbian OS, Linux for Mobile Devices, Android.

TEXT BOOKS:

1. Jochen Schiller, “Mobile Communications”, Addison-Wesley, Second Edition, 2009.
2. Raj Kamal, “Mobile Computing”, Oxford University Press, 2007, ISBN: 0195686772.

REFERENCE BOOKS:

1. Jochen Schiller, “Mobile Communications”, Addison-Wesley, Second Edition, 2004.
2. Stojmenovic and Cacute, “Handbook of Wireless Networks and Mobile Computing”, Wiley, 2002, ISBN 0471419028.
3. Reza Behravanfar, “Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML”, ISBN: 0521817331, Cambridge University Press, Oct 2004.

AM3105PC: R PROGRAMMING LAB

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3105PC	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		0	**0**	**3**	**1.5**	**25**	**75**	**100**
Contact Classes:NIL	**Tutorial classes:NIL**	**Practical classes: 36**				**Total Classes:36**		
Prerequisites:								

LIST OF PROGRAMS:

1. Write an R-Program to print Hello World
2. Write an R-Program to take input from user.
3. Write an R-Program to demonstrate working with operators (Arithmetic, Relational,Logical, Assignment operators).
4. Write an R Program to Check if a Number is Odd or Even
5. Write an R Program to check if the given Number is a Prime Number
6. Write an R Program to Find the Factorial of a Number
7. Write an R Program to Find the Factors of a Number
8. Write an R Program to Find the Fibonacci sequence Using Recursive Function
9. Write an R Program to Make a Simple Calculator
10. Write an R Program to Find L.C.M of two numbers
11. Write an R Program to create a Vector and to access elements in a Vector
12. Write an R Program to create a Matrix and access rows and columns using functions
    colnames() and *rownames()* .
13. Write an R Program to create a Matrix using *cbind()* and *rbind()* functions.
14. Write an R Program to create a Matrix from a Vector using *dim()* function.
15. Write an R Program to create a List and modify its components.
16. Write an R Program to create a Data Frame.
17. Write an R Program to access a Data Frame like a List.
18. Write an R Program to access a Data Frame like a Matrix.
19. Write an R Program to create a Factor.
20. Write an R Program to Access and Modify Components of a Factor.
21. Write an R Program to create an S3 Class and S3 Objects.
22. Write an R Program to write a own generic function in S3 Class.
23. Write an R Program to create an S4 Class and S4 Objects.
24. Write an R Program to write a own generic function in S4 Class.
25. Write an R Program to create Reference Class and modify its Methods.

AM3106PC: DESIGN AND ANALYSIS OF ALGORITHMS LAB

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3106PC	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		0	**0**	**3**	**1.5**	**25**	**75**	**100**
Contact Classes:NIL	**Tutorial classes:NIL**	**Practical classes: 36**				**Total Classes:36**		
Prerequisites:								

Course Objectives:

- To write programs in java to solve problems using divide and conquer strategy.
- To write programs in java to solve problems using backtracking strategy.
- To write programs in java to solve problems using greedy and dynamic programmingtechniques.

Course Outcomes:

- Ability to write programs in java to solve problems using algorithm design techniques such as Divide and Conquer, Greedy, Dynamic programming, and Backtracking.

List of Experiments:

1. Write a java program to implement Quick sort algorithm for sorting a list of integersin ascending order
2. Write a java program to implement Merge sort algorithm for sorting a list of integersin ascending order.
   i. Write a java program to implement the dfs algorithm for a graph.
   ii. Write a. java program to implement the bfs algorithm for a graph.
3. Write a java programs to implement backtracking algorithm for the N-queens problem.
4. Write a java program to implement the backtracking algorithm for the sum of subsetsproblem.
5. Write a java program to implement the backtracking algorithm for the HamiltonianCircuits problem.
6. Write a java program to implement greedy algorithm for job sequencing with deadlines.
7. Write a java program to implement Dijkstra's algorithm for the Single source shortestpath problem.
8. Write a java program that implements Prim's algorithm to generate minimum costspanning tree.
9. Write a java program that implements Kruskal's algorithm to generate minimum costspanning tree
10. Write a java program to implement Floyd's algorithm for the all pairs shortest pathproblem.
11. Write a java program to implement Dynamic Programming algorithm for the 0/1

Knapsack problem.

12. Write a java program to implement Dynamic Programming algorithm for the OptimalBinary Search Tree Problem.

REFERENCE BOOKS

1. Data structures, Algorithms and Applications in java, 2nd Edition, S. Sahani, Universities Press.
2. Data structures and Algorithms in java, 3rd edition, A. Drozdek, Cengage Learning.
3. Data structures with Java, J. R. Hubbard, 2nd edition, Schaum's Outlines, TMH.
4. Data structures and algorithms in Java, 2nd Edition, R. Lafore, Pearson Education.
5. Data Structures using Java, D. S. Malik and P.S. Nair, Cengage Learning.

EN3107HS: ADVANCED COMMUNICATIONS SKILLS LAB

III-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
EN3107HS	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		0	**0**	**2**	**1**	**25**	**75**	**100**
Contact Classes:NIL	**Tutorial classes:NIL**	**Practical classes: 36**				**Total Classes:36**		
Prerequisites:								

INTRODUCTION:

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

OBJECTIVES:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced

English Communication Skills (AECS) Lab:

1. Activities on Fundamentals of Inter-personal Communication and Building Vocabulary - Starting a conversation – responding appropriately and relevantly – using the right body language
    a. Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. Activities on Reading Comprehension –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effectivegoogling.
3. Activities on Writing Skills – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/Technical report writing/* – planning for writing – improving one's writing.
4. Activities on Presentation Skills – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/e-mails/assignments etc.
5. Activities on Group Discussion and Interview Skills – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and MockInterviews.

MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructuralfacilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner's Compass, 7th Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd.2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey,

Routledge, 5th Edition.

REFERENCE BOOKS:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata McGraw-Hill 2009.

AM3201PC: MACHINE LEARNING

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3201PC	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives

- This course explains machine learning techniques such as decision tree learning, Bayesianlearning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.

Course Outcomes

- Understand the concepts of computational intelligence like machine learning
- Ability to get the skill to apply machine learning techniques to address the real time problemsin different areas
- Understand the Neural Networks and its usage in machine learning application.

UNIT - I

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias**.**

Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

UNIT - II

Artificial Neural Networks-1– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

UNIT - III

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.

Computational learning theory – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning.

Instance-Based Learning- Introduction, *k*-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT- IV

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

Reinforcement Learning – Introduction, the learning task, *Q*–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT - V

Analytical Learning-1- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.

Analytical Learning-2-Using prior knowledge to alter the search objective, using prior knowledge toaugment search operators.

Combining Inductive and Analytical Learning – Motivation, inductive-analytical approaches tolearning, using prior knowledge to initialize the hypothesis.

TEXT BOOK:

1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCE BOOK:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

AM3202PC: COMPILER DESIGN

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3202PC	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives:

- Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directd translation, type checking use of symbol tables, code optimization techniques, intermediate code generation, code generation and data flow analysis.

Course Outcomes:

- Demonstrate the ability to design a compiler given a set of language features.
- Demonstrate the the knowledge of patterns, tokens & regular expressions for lexical analysis.
- Acquire skills in using lex tool & yacc tool for devleoping a scanner and parser.
- Design and implement LL and LR parsers
- Design algorithms to do code optimization in order to improve the performance of a program interms of space and time complexity.
- Design algorithms to generate machine code.

UNIT - I

Introduction: The structure of a compiler, the science of building a compiler, programming language basics

Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers.

UNIT - II

Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars and Parser Generators.

UNIT - III

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.

Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Switch-Statements, Intermediate Code for Procedures.

UNIT - IV

Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection.

Code Generation: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.

UNIT - V

Machine-Independent Optimization: The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.

TEXT BOOK:

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam,Ravi Sethi,
Jeffry D. Ullman.

REFERENCE BOOKS:

1. Lex & Yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
2. Compiler Construction, Louden, Thomson.

AM3203PC: COMPUTER NETWROKS

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3203PC	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives

- The objective of the course is to equip the students with a general overview of the conceptsand fundamentals of computer networks.
- Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

Course Outcomes

- Gain the knowledge of the basic computer network technology.
- Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
- Obtain the skills of subnetting and routing mechanisms.
- Familiarity with the essential protocols of computer networks, and how they can be applied innetwork design and implementation.

UNIT - I

Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET,Internet.

Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wirelesstransmission.

UNIT - II

Data link layer: Design issues, framing, Error detection and correction.

Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-freechannel, A simplex stop and wait protocol for noisy channel.

Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocolusing Selective Repeat, Example data link protocols.

Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

UNIT - III

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

UNIT - IV

Transport Layer: Transport Services, Elements of Transport protocols, Connection

management, TCPand UDP protocols.

UNIT - V

Application Layer –Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.

TEXT BOOK:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

AM3207PE: AI AND ANALYTICS

(PROFESSIONAL ELECTIVE –III)

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3207PE	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives

- The objective of the course is to equip the students with a general overview of the conceptsand fundamentals of AI & Analytics.
- Familiarize the students with the applications in the domains such as banking, retail and healthcare.

Course Outcomes

- Gain the knowledge of AI and Analytics.
- Able to apply to different domains.

UNIT – I

Analytics and AI Strategy for Business Transfer

Re-engineering Business to think AI and Analytics – Robust Data Monetization Strategy – Accelerated Decision-making with Real-Time Analytics – Analytics as a Service Model – Analytics-Led Enterprise Transformation.

UNIT – II

Banking Industry Transformed by Analytics and AI

Redifining Banking Industry – AI powered Financial services – Fraud Mitigation through AI – Reorienting Customer Retention and Risk Management – Advantage of AI in Fintech Companies – AI-Driven Transformations in Insurance – Adopting Digital Based Insurance Model.

UNIT – III

Redefining Healthcare and Life Sciences

AI adoption in Healthcare – Real-world Evidence Based Analytics improving Treatment outcomes – Leveraging Patient and Drug similarity Analytics – AI : A Boon to the Life Science Industry – Analytics and Genomics.

UNIT – IV

Analytics and AI in Retail

AI-powered shopping experience – Emergence of Smart Consumers – Recommendation

Engines for Personalizing Experiences – Evolution of Smart Retailers – Omnichannel Experiences – Fluid Supply Chain Transformation.

UNIT – V

Exponential Technologies underpinned by Analytics and AI

Beating Cyberattacks with Analytics – Connected Car Technology reshaping Automotive Industry – IoT Analytics – Cryptocurrency Analytics – Chatbots – Redefining the Talent Landscape.

REFERENCES:

1. Sameer Dhanrajani, "AI and Analytics", Wiley, 2018.
2. Stuart Russel and Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education Press, 2011.
3. Kevin Knight, Elaine Rich, B. Nair, "Artificial Intelligence", McGraw Hill, 2008.
4. George F. Luger, "Artificial Intelligence", Pearson Education, 2001.

AM3208PE: REINFORCEMENT LEARNING

(PROFESSIONAL ELECTIVE –III)

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3208PE	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives

The aim of the course will be to familiarize the students with the

- basic concepts
- state-of-the-art research literature in deep reinforcement learning.

Course Outcomes

After completion the students will be able to

- structure a reinforcement learning problem,
- understand and apply basic RL algorithms for simple sequential decision making problems in uncertain conditions.
- evaluate the performance of the solution
- Interpret state-of-the-art RL research and communicate their results.

UNIT – I

Monte-Carlo Methods

Monte-Carlo methods: policy evaluation, rollouts, on policy and off-policy learning, importance sampling

UNIT – II

Temporal Difference Learning

Temporal Difference learning: TD prediction, Optimality of TD(0), SARSA, Q-learning, Games and after states, Maximization Bias and Double Learning.

UNIT – III

Eligibility Traces

Eligibility traces: n-step TD prediction, TD(lambda), forward and backward views, Q(lambda), SARSA(lambda), replacing traces and accumulating traces.

UNIT – IV

Function Approximation

Function Approximation: Value prediction, gradient descent methods, linear function approximation, Control algorithms, Fitted Iterative Methods, Deep Q-learning.

UNIT – V

Computer Vision

Policy Gradient methods: non-associative learning - REINFORCE algorithm, exact gradient

methods, estimating gradients, approximate policy gradient algorithms, actor-critic methods,Asynchronous Advantage Actor-Critic.

Hierarchical RL: MAXQ framework, Options framework, HAM framework, Option discovery algorithms. Case studies: Elevator dispatching, Samuel's checker player, TD- gammon, Acrobot, Helicopter piloting, Alpha Go

REFERENCES:

1. R. S. Sutton and A. G. Barto. Reinforcement Learning - An Introduction. MIT Press.2nd Edition. 2018.
2. Video Lectures by Prof. David Silver
3. Video Lectures by Prof. B.Ravindran

AM3209PE: COMPUTER VISION

(PROFESSIONAL ELECTIVE –III)

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3209PE	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives

- To study the development of algorithms and techniques to analyze and interpret the visible worldaround us.
- Be familiar with both the theoretical and practical aspects of computing with images.
- To understand the basic concepts of Computer Vision.
- Understand the geometric relationships between 2D images and the 3D world.

Course Outcomes

- Understand the fundamental problems of computer vision.
- Implement various techniques and algorithms used in computer vision.
- Analyze and evaluate critically the building and integration of computer vision algorithms.
- Demonstrate awareness of the current key research issues in computer vision.

UNIT – I

Overview, computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and binary image analysis.

UNIT – II

Edge detection, Edge detection performance, Hough transform, corner detection.

UNIT – III

Segmentation, Morphological filtering, Fourier transform.

UNIT – IV

Feature extraction, shape, histogram, color, spectral, texture, using CVIP tools, Feature analysis, feature vectors, distance /similarity measures, data pre- processing.

UNIT – V

Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods.

Books and References

1. Computer Vision: Algorithms and Applications by Richard Szeliski.
2. Deep Learning, by Goodfellow, Bengio, and Courville.
3. Dictionary of Computer Vision and Image Processing, by Fisheretal.

AM3210PE: VIRTUAL REALITY

(PROFESSIONAL ELECTIVE –III)

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3210PE	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives

- This course is designed to give historical and modern overviews and perspectives on virtual reality.
- It describes the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.

Course Outcomes

- Describe how VR systems work and list the applications of VR.
- Understand the design and implementation of the hardware that enables VR systems to be built.
- Understand the system of human vision and its implication on perception and rendering.
- Explain the concepts of motion and tracking in VR systems.
- Describe the importance of interaction and audio in VR systems.

UNIT – I

Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the Virtual World-Input & output- Visual,Aural & Haptic Displays, Applications of Virtual Reality.

UNIT – II

Representation of the Virtual World, Visual Representation in VR, Aural Representation in VR and Haptic Representation in VR

UNIT – III

Geometric Models, Changing Position and Orientation, Axis-Angle Representations of Rotation,

Viewing Transformations, Chaining the Transformations, Human Eye, eye movements & implications for VR.

UNIT – IV

Visual Perception - Perception of Depth, Perception of Motion, Perception of Color,

CombiningSources of Information

Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions,Improving Latency and Frame Rates

UNIT – V

Motion in Real and Virtual Worlds- Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Mismatched Motion and Vection

Tracking- Tracking 2D & 3D Orientation, Tracking Position and Orientation, Tracking Attached

Bodies

Books and References

1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016
2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002
3. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009.
4. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.
5. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D User Interfaces,Theory and Practice", Addison Wesley, USA, 2005.
6. Oliver Bimber and Ramesh Raskar, "Spatial Augmented Reality: Meging Real and VirtualWorlds", 2005.
7. Burdea, Grigore C and Philippe Coiffet, "Virtual Reality Technology", Wiley Interscience, India, 2003.

AM3211PE: ROBOTICS

(PROFESSIONAL ELECTIVE –III)

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3211PE	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives

- The objective of this course is to enlighten the students about the fundamentals of robotic systems.
- To understand the basics of robot, Robot Transformations and Sensors, Micro/Nano robotic systems and to program them for functioning.

Course Outcomes

- The students will be able to identify components of robot.
- Will able to program robots.

UNIT – I

Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems- Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems-Robot Drive systems- Hydraulic, Pneumatic and Electric system.

UNIT – II

Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers-Vacuum grippers-Air operated grippers-Gripper force analysis-Gripper design-Simple problems-Robot controls-Point to point control, Continuous path control, Intelligent robot-Control system for robot joint-Control actions-Feedback devices-Encoder, Resolver, LVDT-Motion Interpolations-Adaptive control

UNIT – III

Robot kinematics-Types- 2D, 3D Transformation-Scaling, Rotation, Translation-Homogeneous coordinates, multiple transformation-Simple problems. Sensors in robot – Touch sensors-Tactile sensor – Proximity and range sensors – Robotic vision sensor-Force sensor-Light sensors, Pressure sensors.

UNIT – IV

Robot programming-Introduction-Types- Flex Pendant- Lead through programming, Coordinate systems of Robot, Robot controller- major components, functions-Wrist Mechanism-Interpolation- Interlock commands- Operating mode of robot, Jogging-Types, Robot specifications- Motion commands, end effectors and sensors commands.

UNIT – V

Robot Languages-Classifications, Structures- VAL- language commands motion control, hand control, program control, pick and place applications, palletizing applications using VAL, Robot welding application using VAL program-WAIT, SIGNAL and DELAY command for communications using simple applications. RAPID- language basic commands- Motion Instructions- Pick and place operation using Industrial robot- manual mode, automatic mode, subroutine command based programming. Move-master command language-Introduction, syntax, simple problems. VAL- II programming-basic commands, applications- Simple problem using conditional statements-Simple pick and place applications-Production rate calculations using robot. AML Language-General description, elements and functions, Statements, constants and variables-Program control statements-Operating systems, Motion, Sensor commands- Data processing.

Books and References

1. Craig. J. J. "Introduction to Robotics mechanics and control", Addison- Wesley,1999.
2. S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education., 2009
3. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012
4. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering anIntegrated Approach, Phi Learning.,2009.
5. Deb. S. R. "Robotics technology and flexible automation", Tata McGraw Hill publishingcompany limited, 1994
6. Mikell. P. Groover, "Industrial Robotics Technology", Programming and Applications, McGraw Hill Co, 1995.
7. Klafter. R.D, Chmielewski.T.A. and Noggin"s., "Robot Engineering : An Integrated Approach", Prentice Hall of India Pvt. Ltd.,1994.

CS3211OE: INTRODUCTION TO DATA SCIENCE
(Open Elective- I)

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CS3211OE	**Core**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives:

- Learn data science project concepts
- Learn to collect data and process
- Learn to visualize data

Course Outcomes:

- Able to collect data from various resources and process data
- Able to plot data using various methods
- Able to develop and evaluate models

Unit – I: Introduction

Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.

Unit – II: Data Collection and Data Pre-Processing

Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.

Unit – III: Exploratory Data Analytics

Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map – Correlation Statistics – ANOVA.

Unit – IV: Model Development

Simple and Multiple Regression – Model Evaluation using Visualization – Residual Plot Distribution Plot – Polynomial Regression and Pipelines – Measures for In-sampleEvaluation – Prediction and Decision Making.

Unit – V: Model Evaluation

Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Over fitting Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing multiple Parameters by using Grid Search.

REFERENCES:

1. Jojo Moolayil, “Smarter Decisions : The Intersection of IoT and Data Science”,PACKT, 2016.

2. Cathy O’Neil and Rachel Schutt , “Doing Data Science”, O'Reilly, 2015.

3. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”,EMC 2013

4. Raj, Pethuru, “Handbook of Research on Cloud Infrastructures for Big DataAnalytics”, IGI Global.

CS3212OE: DATA MINING
(Open Elective- I)

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
CS3212OE	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives:

- Learn data mining concepts understand association rules mining.
- Discuss classification algorithms learn how data is grouped using clustering techniques.
- To develop the abilities of critical analysis to data mining systems and applications.
- To implement practical and theoretical understanding of the technologies for data mining
- To understand the strengths and limitations of various data mining models

Course Outcomes:

- Ability to perform the preprocessing of data and apply mining techniques on it.
- Ability to identify the association rules, classification and cluster large datasets.
- Ability to solve real world problems in business and scientific information using data mining
- Ability to classify web pages, extracting knowledge from the web

UNIT-I

IntroductiontoDataMining: Introduction, What is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing, DataCleaning, Missing data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binaryzation, DataTransformation;Measures of Similarity and Dissimilarity-Basics.

UNIT-II

AssociationRules: Problem Definition, Frequent ItemSet Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIOIRI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set-Maximal Frequent Item Set, Closed Frequent Item Set.

UNIT-III

Classification: Problem Definition, General Approaches to solving a classification problem ,EvaluationofClassifiers,Classificationtechniques,DecisionTrees-DecisiontreeConstruction , Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction ; Naive-Bayes Classifier, Bayesian BeliefNetworks;K-Nearestneighborclassification-AlgorithmandCharacteristics.

UNIT-IV

Clustering: Problem Definition, Clustering Overview, Evaluation of Clustering Algorithms, Partitioning Clustering- K-Means Algorithm, K-Means Additional issues, PAM Algorithm; Hierarchical Clustering-Agglomerative Methods and divisive methods, Basic Agglomerative Hierarchical Clustering Algorithm, Specific techniques, Key Issues in Hierarchical Clustering, Strengths and Weakness; Outlier Detection.

UNIT-V

Web and Text Mining: Introduction,web mining,web content mining,web structure mining, we usage mining, Text mining –unstructured text, episode rule discovery for texts ,hierarchy of categories ,text clustering.

TEXTBOOKS:

1. DataMining-ConceptsandTechniques-JiaweiHan,MichelineKamber,MorganKaufmannPublishers,Elsevier,2Edition,2006.
2. IntroductiontoDataMining,Pang-NingTan,VipinKumar,MichaelSteinbanch,PearsonEducation.
3. DataminingTechniquesandApplications,HongboDuCengageIndiaPublishing

REFERENCEBOOKS:

1. Data Mining Techniques, Arun K Pujari, 3rdEdition, UniversitiesPress.
2. DataMiningPrinciples&Applications–T.VSvereshKumar, B.EswareReddy,JagadishSKalimani,Elsevier.
3. DataMining, VikaramPudi,PRadhaKrishna,OxfordUniversityPress

CS3213OE: COMPUTER FORENSICS
(Open Elective- I)

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Core	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CS3213OE		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives:

- **T**o understand the cyberspace.
- To understand the **forensics** fundamentals.
- To understand the evidence capturing process.
- To understand the preservation of **digital** evidence.

Course Outcomes:

- Students will understand the usage of computers in forensic, and how to use various forensic tools for a wide variety of investigations.
- It gives an opportunity to students to continue their zeal in research in computer forensics.

UNIT-I

Computer Forensics Fundamentals: What is Computer Forensics?

Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/ Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law Enforcement — Computer Forensic Technology — Types of Business Computer Forensic Technology Computer Forensics Evidence and Capture: Data Recovery Defined — Data Back-up and Recovery — The Role of Back-up in Data Recovery — The Data-Recovery Solution.

UNIT-II

Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options — Obstacles — Types of Evidence — The Rules of Evidence — Volatile Evidence — General Procedure — Collection and Archiving — Methods of Collection — Artifacts — Collection Steps — Controlling Contamination: The Chain of Custody Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene —Computer Evidence Processing Steps — Legal Aspects of Collecting and Preserving Computer Forensic Evidence ComputerImageVerificationandAuthentication:SpecialNeedsofEvidentialAuthentication— PracticalConsideration—PracticalImplementation.

UNIT-III

Computer Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools,examining the honey net project.

Processing Crime and Incident Scenes: Identifying digital evidence, collecting evidence inprivate-sector incident scenes, processing law enforcement crime scenes, preparing for asearch, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case

UNIT-IV

CurrentComputerForensictools:
evaluatingcomputerforensictoolneeds,computerforensics software tools, computer forensics hardware tools, validating and testing forensicssoftware E-Mail Investigations: Exploring the role of e-mail in investigation, exploring therolesoftheclientandserverine-mail,investigatinge-mailcrimesandviolations,understandinge-mailservers,usingspecializede-mailforensic tools.

Cellphoneandmobiledeviceforensics: Understanding mobile device forensics, understanding acquisition procedures for cellphones and mobile devices.

UNIT-V

Working with Windows and DOS Systems:understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

TEXTBOOKS

- ComputerForensics,ComputerCrimeInvestigationbyJohnR.Vacca,FirewallMedia,NewDelhi.
- ComputerForensicsandInvestigationsbyNelson,PhillipsEnfinger,Steuart,CENGAGE Learning

REFERENCEBOOKS

- RealDigitalForensicsbyKeithJ.Jones,RichardBejtiich,CurtisW.Rose,Addison-WesleyPearsonEducation
- ForensicCompiling,ATractitionerisGuidebyTonySammesandBrianJenkinson,SpringerInternationaledition.

- ComputerEvidenceCollection&PresentationbyChristopherL.T.Brown,FirewallMedia.
- HomelandSecurity,Techniques&TechnologiesbyJesusMena,FirewallMedia.
- SoftwareForensicsCollectingEvidencefromtheSceneofaDigitalCrimebyRobert
- M.Slade,TMH 2005
- WindowsForensicsbyChadSteel,WileyIndiaEdition.

EE3211OE: ELECTRICAL INSTALLATION AND COSTING
(Open Elective- I)

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Core	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EE3211OE		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: Basic Electrical Engineering								

CourseObjectives:

- To emphasize the estimation and costing aspects of all electrical equipment, installation and designs on the cost viability.
- To design and estimation of wiring
- To design over head and under ground distribution lines, substations and illumination

CourseOutcomes: After Completion of this course, student will be able to

- Understand the design considerations of electrical installations.
- Design electrical installation for buildings and small industries.
- Identify and design the various types of light sources for different applications.

UNIT-I

Design Considerations of Electrical Installations: Electric Supply System, Three phasefourwire distribution system, Protection of Electric Installation against over load, short circuitand Earthfault, Earthing, General requirements of electrical installations, testing of installations, Indian Electricity rules, Neutral and Earth wire, Types of loads, Systems ofwiring, Service connections , Service Mains, Sub-Circuits, Location of Outlets, Location of Control Switches,Location of Main Board and Distribution board, Guidelines for Installation of Fittings, Load Assessment, Permissible voltage drops and sizes of wires, estimating and costing of Electric installations.

UNIT-II

Electrical Installation for Different Types of Buildings and Small Industries: Electrical installations for residential buildings– estimating and costing of material, Electrical installations for commercial buildings, Electrical installations for small industries.

UNIT-III

Over head and Under ground Transmission and Distribution Lines: Introduction, Supports for transmission lines, Distribution lines – Materials used, Underground cables, Mechanical Design of over headlines, Design of under ground cables.

UNIT-IV

Substations: Introduction, Types of substations, Outdoor substation – Pole mounted type,Indoor substations–Floor mounted type.

UNIT-V

Design of Illumination Schemes: Introduction, Terminology inillumination, laws of illumination, various types of lights ources, Practical lighting schemes LED, CFL and OCFL differences.

Text Books:

1. "K.B.Raina,S.K.Bhattacharya","ElectricalDesignEstimatingandCosting",NewAgeInternationalPublisher,2010.
2. "Er.V.K.Jain,Er.AmitabhBajaj","DesignofElectricalInstallations",UniversitySciencePress.

Reference Books:

1. CodeofpracticeforElectricalwiringinstallations,(Systemvoltagenotexceeding650volts),IndianStandardInstitution,IS:732-1983.
2. GuideforElectricallayout inresidentialbuildings,IndianStandardInstitution,IS:4648-1968.
3. ElectricalInstallationbuildingsIndianStandardInstitution,IS:2032.
4. CodeofPracticeforselection,InstallationofMaintenanceoffuse(voltagenotexceeding650V),IndianStandardInstitution,IS:3106-1966.
5. CodeofPracticeforearthling, IndianStandardInstitution,IS:3043-1966.
6. CodeofPractice forInstallationandMaintenanceofinductionmotors,IndianStandardInstitution,IS:900-1965.
7. CodeofPracticeforelectricalwiring,Installations(systemvoltagenotexceeding650Volts), IndianStandardInstitution,IS:2274-1963.
8. "GuptaJ.B.,Katson,Ludhiana","Electrical Installation,estimatingandcosting",S.K.Katariaandsons,2013.

EE3212OE: ELECTRICAL ENGINEERING MATERIALS
(Open Elective- I)

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Core	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EE3212OE		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: **Engineering chemistry and Engineering Physics-II**								

Course Objective:

- To understand the importance of various materials used in electrical engineering and obtain a qualitative analysis of their behavior and applications.

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

- Understand various types of dielectric materials, their properties in various conditions.
- Evaluate magnetic materials and their behavior.
- Evaluate semi conductor materials and technologies.
- Acquire Knowledge on Materials used in electrical engineering and applications.

UNIT-I

Dielectric Materials: Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, break down voltage, break down in solid dielectrics, flash over, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics, Ferro magnetic materials, properties of ferro magnetic materials in static fields, spontaneous, polarization, curie point, anti-ferro magnetic materials, piezo electric materials, pyro electric materials.

UNIT– II

Magnetic Materials: Classification of magnetic materials, spontaneous magnetization inferro magnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, a geing of magnets. Factors effecting permeability and hysteresis

UNIT–III

Semiconductor Materials: Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques(VLSI)

UNIT– IV

Materials for Electrical Applications: Materials used for Resistors, rheostats, heaters,transmission line structures, stranded conductors, bimetals fuses, soft and hard solders,electric contact materials, electric carbon materials, thermocouple materials. Solid, Liquid and Gaseous insulating materials, Effect of moisture on insulation.

UNIT– V

Special Purpose Materials: Refractory Materials, Structural Materials, Radio active Materials, Galvanization and Impregnation of materials, Processing of electronic materials, Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformeroilas per ISI.

Text Books:

1. "RKRajput","A course inElectrical Engineering Materials", LaxmiPublications,2009
2. "TKBasak","A course in Electrical Engineering Materials", NewAgeSciencePublications2009

Reference Books:

1. TTTI Madras,"Electrical Engineering Materials", McGrawHillEducation,2004.
2. "Adrianus J.Dekker",Electrical Engineering Materials, PHIPublication,2006.
3. S.P.Seth,P.V.Gupta"A course in Electrical Engineering Materials", DhanpatRai&Sons,2011.

EC3211OE: FUNDAMENTALS OF INTERNET OF THINGS
(Open Elective- I)

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Core	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC3211OE		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives:

1. Understand the conceptsof Internet of Things and able to build IoT applications
2. Learn the programming and use of Arduino and Rasp berryPiboards.
3. Known about data handling and analytics in SDN.

Course Outcomes: Upon completing this course, the student will be able to

1. Known basic protocolsin sensor networks.
2. Programand configure Arduino boards for various designs.
3. Python programming and interfacing for RaspberryPi.
4. Design IoT applications in different domains.

UNIT–I

Introductionto Internet of Things, Characteristics of IOT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.

UNIT- II

Machine-to-Machine Communications, Difference between IOT and M2M, Interoperability in IOT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino,

UNIT–III

Introduction to Python programming, Introduction to RaspberryPi, Interfacing Raspberry Pi with basic peripherals, Implementation of IOT with Raspberry Pi

UNIT-IV

Implementation of IOT with Raspberry Pi, Introduction to Software defined Network(SDN), SDN for IOT, Data Handling and Analytics,

UNIT-V

Cloud Computing, Sensor- Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IOT,Case Study:Agriculture, Healthcare, Activity Monitoring

TEXTBOOKS:

1. "The Internet'ofThings:EnablingTechnologies,Platforms,and Use Cases",byPethuruRaj and AnupamaC. Raman (CRC Press)
2. “Make sensors”:Terokarvinen,kemo,karvinenandvilleyvaltokari,1stedition,makermedia,2014.
3. "InternetofThings:AHands-on Approach",byArshdeepBahgaand VijayMadisetti

REFERENCEBOOKS:

1. VijayMadisetti,ArshdeepBahga,“InternetofThings:AHands-On Approach”
2. WaltenegusDargie,ChristianPoellabauer,"FundamentalsofWirelessSensorNetworks: TheoryandPractice"
3. Beginning Sensornetworkswith Arduino and RaspberryPi– CharlesBell,Apress,2013

ME3211OE: OPERATIONS RESEARCH
(Open Elective- I)

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Core	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
ME3211OE		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Prerequisites: None

Course Objectives: Understanding them athematical importance of development of model in a particular optimization model for the issue and solving it.

Course Outcome: Understanding the problem, identifying variables & constants, Formulation of optimization model and applying appropriate optimization technique.

UNIT.I

Development-definition- characteristics and phases- Types of models- Operations Research models- applications.

Allocation: Linear Programming Problem Formulation-Graphical solution- Simplex method-Artificial variable techniques: Two-phase method, Big-M method.

UNIT.II

Transportation problem–Formulation- Optimal solution, unbalanced transportation problem- Degeneracy.

Assignment problem-Formulation- Optimal solution,-Variants of Assignment problem- Travelling salesman problem.

UNIT.III

Sequencing. Introduction- Flow-Shop sequencing- n jobs through two machines-n jobs through three machines- Job shop sequencing- two jobs through 'm' machines– graphical model Replacement: Introduction- Replacement of items that deteriorate with time- when money value is not counted and counted- Replacement of items that fail completely- Group Replacement.

UNIT.IV

Theory of Games: Introduction- Terminology- Solution of games with saddle points and without saddle points. 2x2 games- dominance

principle- mx2&2xn games- Graphical method.

Inventory: Introduction- Single item, Deterministic models- purchase inventory models with oneprice break and multiple pricebreaks- Stochastic models -Demand may be discrete variable or continuous variable- single period model and no setup cost.

UNIT.V

Waiting lines: Introduction- Terminology- Single channel- Poisson arrivals and Exponential service times with infinite population and finite population models.

Dynamic Programming: Introduction- Terminology, Bellman's principle of optimality Applications of Dynamic programming- shortest path problem- linear programming problem.

TEXTBOOK:

1. Operations Research/J.K.Sharma/MacMilan
2. Introduction to OR/Hillier&Libemann/TMH

REFERENCE BOOKS:

1. Introduction to OR/Taha/PHI
2. Operations Research/NVSRaju/SMSEducation/3rdRevisedEdition
3. Operations Research /A.M.Natarajan, P.Balasubramaniam, A.Tamilara si/Pearson Education.

ME3212OE: FUNDAMENTALS OF MECHANICAL ENGINEERING(Open Elective- I)

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Core	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
ME3212OE		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Objectives:

- Tounderstand the fundamentals of mechanical systems.
- To understand and appreciate significance of mechanical engineering in different Fields of engineering.

UNIT-I

Introduction: Prime movers and its types, Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity, Change of state, Path, Process, Cycle, Internalenergy, Enthalpy, Statements of Zeroth Law and Firstlaw.

Energy: Introduction and applications of Energy sources like Fossil fuels, Nuclear fuels, Hydel, Solar, wind, and bio- fuels, Environmental issues like Global warming and Ozone depletion.

UNIT-II

Properties of gases: Gaslaws, Boyle's law, Charle's law, Combined gas law, Gasconstant, Relation between Cp and Cv, Various non-flow processes like constant volume process, constant pressure process, Isothermal process, Adiabatic process, Poly-tropic process

Properties of Steam: Steam formation, Types of Steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of Steam tables, steam calorimeters.

Steam Boilers: Introduction, Classification, Cochran, Lancashireand Babcockand Wilcoxboiler, functioning of different mountings and accessories.

UNIT-III

Heat Engines:Heat Engine cycle and Heat Engine, working substances, Classification of heat engines, Description and thermal efficiency of Carnot; Rankine; Ottocycle and Dieselcycles.

Internal Combustion Engines: Introduction, Classification, Engine details, four- stroke/two-stroke cycle Petrol/ Diesel engines, Indicated power, Brake Power, Efficiencies.

UNIT-IV

Pumps: Types and operation of Reciprocating, Rotary and Centrifugl pumps, Priming

Air Compressors: Types and operationof Reciprocating and Rotary air compressors, significance of Multistage.

Refrigeration & Air Conditioning: Refrigerant, Vapor compression refrigeration system, vaporab sorption refrigeration system, Domestic Refrigerator, Window and splitair conditioners.

UNIT-V

Couplings, Clutches and Brakes: Construction and applications of Couplings (Box; Flange; Pintype flexible; Universal and Oldham), Clutches (Disc and Centrifugal), and Brakes (Block; Shoe;BandandDisc).

Transmission of Motion and Power: Shaft and axle, Belt drive, Chain drive, Friction drive, Geardrive.

Engineering Materials:Types and applications of Ferrous & Nonferrousmetals, Timber, Abrasive material, silica, ceramics, glass, graphite, diamond, plastican dpolymer.

TEXT BOOKS:

1. Basic Mechanical Engineering/ PravinKumar/ Pearson
2. Introduction to Engineering Materials /B.K.Agrawal/McGrawHill

REFERENCE BOOKS:

1. Fundamental of Mechanical Engineering/G.S.Sawhney/PHI
2. Thermal Science and Engineering/Dr.D.S.Kumar/Kataria

ME3213OE: METALLURGY OF NON METALLURGISTS
(Open Elective- I)

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Core	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
ME3212OE		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- To describe the basic principles of metallurgy and the importance of metallurgy invarious discipline of engineering.
- Gain athorough knowledge about heat treatment of steels.
- Gain knowledge about properties and uses of cast irons and non-ferrous metals.
- Gaina workingknowledge of basic testing methods for metals.

Course Outcomes:

At the end of the course Student would be able

- To use and apply metallurgy in his own branch of engineering.
- The student will be able to justify the various testing methods adopted for metals.

UNIT-I

Introduction: Crystal structure and defects, Crystal structure of metals, Classification of steels, Carbon steels.

Engineering Materials:Types and applications of Ferrous & Nonferrous metals, Timber, Abrasive material, silica, ceramics, glass, graphite, diamond, plastic and polymer.

UNIT-II

Heat Treatment of Steels: The Iron carbon systems, Common phases in steels, Annealing, Normalizing, Hardening and tempering.

UNIT-III

Castirons: Properties and applications of Ductile irons, Malleableirons, Compacted graphiteiron.

UNIT-IV

Non Ferrous Metals: Properties and applications of LightMetals (Al,Be,Mg,Ti), Superalloys.

UNIT-V

Testing of Metals: Hardness testing, Tensile Testing, Impact Testing, Fatigue Testing.

TEXT BOOKS:

1. Materials Science and Engineering,An introduction. WDCallister, Jr.,Adapted by R.Balasubramaniam, JohnWiley &Sons, NY, Indianedition, 2007
2. Introduction to Physical Metallurgy– SHAvner, TATAMcGRAWHILL, 1997
3. Mechanical Metallurgy– G.E.Dieter

REFERENCE BOOKS:

1. Engineering Physical Metallurgy and Heat treatment– YLakhtin
2. C.Suryanarayana, Experimental Techniques in Mechanics and Materials, John Wiley, JohnWiley, NJ,USA, 2006
3. Foundations of Materials Science and Engineering– WFSmith

CE3211OE: BASICS OF CIVIL ENGINEERING
(Open Elective–I)

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Core	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CE3211OE		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course objectives: The objectives of the course are:

- To explain the concepts of Civil Engineering.
- To Understand the Building Materials for construction
- To understand the concept of Transportation
- To explain the Soil Characteristics for best foundation
- To know the Drinking water Standards & Water Treatment Units.

Course Outcomes: On successful completion of this course, students should be able to:

- Identify different types of building materials for construction.
- Discuss types of Traffic Flow Characteristics.
- To know the soil classification and its properties.
- Distinguish and understand Drinking water and Waste water properties.

UNIT-I

Building Materials for Construction Bricks & Cement:qualities of good bricks, types of brick, ingredients of cement, types of cement, Grade of cement.

Concrete & Steel: Properties of cement concrete, types of concrete based on usage & properties and uses of various types of steel, Admixtures.

Building components: lintels, walls, staircases, typesof floors, types of roofs, doors, windows-material-types, Finishers-Plastering, Painting, Tiles.

UNIT-II

TransportationEngineering Highway: History and Importance of Highways, Classification of roads, highway cross section, typesof Pavement.

Traffic: Roadsafety- Traffic signals & its types. Road intersections & its types. Railway: Permanent way, Components parts its functions.

Airway: Typical Airport layout, Factors for airport site selection

UNIT–III GeotechnicalEngineering

Soil formation and its three phase diagram, I.S.Classification of soils. Permeability & its Factors affecting, capillary rise.

Compaction – factors affecting compaction.

Geology- Different types & its properties of Rocks & Minerals.

UNIT-IV WaterResources&IrrigationEngineering

Hydrologiccycle, Forms of precipitation, measurement of precipitation by Symons rain gauge.

Abstractions from precipitation: Infiltration, Evaporation & Runoff & their Factors affecting.

Irrigation: Water requirement of crops, canal & Its losses, Types of lining- Advantages and disadvantages. Types of dams, Factors affecting selection of adamsite. Tunneling- Purposes of tunneling.

UNIT–V Environmental Engineering

Drinking Water: types of water demand– factors affecting water quality and testing– drinking water standards.Layout and general outline of water treatment units.

Waste water: Waste water treatment plant Flow diagram. Waste water collection, man holes & house drainage.

Air & Sound pollution– Effects & Controlling methods.

TEXT BOOKS

1. Building Construction by B.C.Punmia, Ashok Kumar Jainand Arun Kumar Jain– Laxmi Publications (P) ltd., NewDelhi.
2. Transportation Engineering by Khanna&Justo
3. Geotechnical Engineering by Arora
4. Water Resources & Irrigation Engineering by SK Garg
5. Environmental Engineering by Dr.B.C.Punmia

CE3212OE: BUILDING MATERIALS AND CONSTRUCTION

(OpenElective–I)

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Core	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CE3212OE		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives: The objectives of the course is to

- List the construction material.
- Explain different construction techniques
- Understand the building bye-laws
- Highlight the smart building materials

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

- Define the Basic terminology that isused in the industry
- Categorize different building materials, properties and their uses

Unit-I

Cement: Introduction, ingredients of cement, types of cement, cement mortar uses. Concrete: Properties of cement concrete, materials, standard concrete mix proportions, curing of concrete, methods-effects of improper curing.

Unit-II

Bricks & Bricks masonry: qualities of good bricks, types of bricks, brick masonry and types of brick masonry

Timber: Structure of a tree, defects in timber, seasoning of timber, qualities of good timber, important Indian timber trees.

Unit-III

Construction Materials: Stone- type of building stones, glass- types based onusage, plastics- advantages and disadvantages, uses, ceramics- types used in building industry.

Structural steel: properties and uses of various types of steel, types. Girders-types & uses

Unit-IV

Building components:lintels, walls, staircases, types of floors, types of roofs, doors, windows- material- types.

Fire protection: hazards, classification of fire resistant materials and constructions.

Unit-V

Building planning: principles of building planning, classification of buildings and building bylaws. Building Services: Plumbing-water distribution, sanitary-lines and fittings, ventilations: functional requirements, system of ventilations.

TEXTBOOKS:

1. BuildingMaterialsand Construction–Arora &Bindra, Dhanpat Roy Publications.
2. Building Materials and Construction byGCSahu,JoygopalJenaMcGraw hill PvtLtd 2015.
3. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - LaxmiPublications(P) ltd., New Delhi.

REFERENCEBOOKS:

1. Building Materials by Duggal, New Age International.
2. Building Materials by P.C.Varghese,PHI.
3. Building Construction by PCVarghesePHI.
4. Construction Technology– Vol–I& IIbyR.Chubby,Longman UK.
5. Alternate Building Materials and Technology, Jagadish, Venkatarama Reddy and others; New Age Publications.

AM3204PC: MACHINE LEARNING LAB

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3204PC	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		0	**0**	**3**	**1.5**	**25**	**75**	**100**
Contact Classes:NIL	**Tutorial classes:NIL**	**Practical classes: 36**				**Total Classes:36**		
Prerequisites:								

Course Objective: The objective of this lab is to get an overview of the various machine learning techniques and can able to demonstrate them using python.

Course Outcomes: After the completion of the course the student can able to:

- Understand complexity of Machine Learning algorithms and their limitations;
- Understand modern notions in data analysis-oriented computing;
- Becapable of confidently applying common Machine Learning algorithms in practice and implementing their own;
- Becapable of performing experiments in Machine Learning using real-world data.

List of Experiments

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 schooldays in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result.(Ans:15%)

2. Extract the data from database using python

3. Implement k-nearest neighbours classification using python

4. Given the following data, whichh specify classifications fornine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k-means clustering with 3 means (i.e.,3 centroids)

VAR1	VAR2	CLASS
1.713	1.586	0

0.180	1.786	1
0.353	1.240	1
0.940	1.566	0
1.486	0.759	1
1.266	1.106	0
1.540	0.419	1
0.459	1.799	1
0.773	0.186	1

5. The following training examples map descriptions of individuals on to high, medium and lowcredit- worthiness.

medium skiing design single twenties no-> high Risk high golf trading married fortiesyes-> low Risk low speed way transport married thirtiesyes-> med Risk medium foot ball banking single thirties yes -> low Risk high flying media married fifties yes->high Risk low football security single twenties no-> med Risk medium golf media single thirties yes -> med Risk medium golf transport married fortiesyes -> low Risk high skiing banking single thirties yes -> high Risk low golf unemployed married forties yes->highRisk

Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `medRisk' in thedataset?

6. Implement linear regression using python.
7. Implement Naïve Bayes theorem to classify the English text
8. Implement an algorithm to demonstrate the significance of genetic algorithm
9. Implement the finite words classification system using Back-propagational gorithm

AMCS3205PC: COMPILER DESIGN LAB

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3204PC	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		0	**0**	**3**	**1.5**	**25**	**75**	**100**
Contact Classes:NIL	**Tutorial classes:NIL**	**Practical classes: 36**				**Total Classes:36**		
Prerequisites:								

Course Objectives:

- To provide hands-on experience on web technologies
- To develop client-server application using web technologies
- To introduce server-side programming with Java servlets and JSP
- To understand the various phases in the design of a compiler.
- To understand the design of top-down and bottom-up parsers.
- To understand syntax directed translation schemes.
- To introduce lex and yacc tools.

Course Outcomes:

- Design and develop interactive and dynamic web applications using HTML, CSS, JavaScriptandXML
- Apply client-server principles to develop scalable and enter prise web applications.
- Ability to design, develop, and implement a compiler for any language.
- Able to use lex and yacc tools for developing a scanner and a parser.
- Able to design and implement LL and LR parsers.

List of Experiments

Compiler Design Experiments

1. Write a LEX Program to scan reserved word & Identifiers of C Language
2. Implement Predictive Parsing algorithm
3. Write a C program to generate three address code.
4. Implement SLR(1) Parsing algorithm
5. Design LALR bottom up parser for the given language

<program>::= <block>

<block>::= {<variabledefinition><slist>}

|{<slist>}

<variable definition>::=int<var deflist>;

<var deflist>::=<var dec>|<var dec>,<var deflist>

<var dec>::=<identifier>|<identifier>[<constant>]

<slist>::=<statement>|<statement>;<slist>

<statement>::=<assignment>|<if statement>|<while statement>

|<block>|<print statement>|<empty>

<assignment>::=<identifier>=<expression>

|<identifier>[<expression>]=<expression>

<if statement> ::=if<bexpression> then<slist> else<slist> end if

|if<bexpression>then<slist>end if

<while statement>::=while<bexpression>do<slist>end do

<print statement>::=print(<expression>)

<expression>::=<expression><adding op><term>|<term>|<adding op><term>
<bexpression>::=<expression><relop><expression>

<relop>::= <|<= |==|>=|>|!=
<addingop>::=+|-
<term>::=<term><multop><factor>|<factor>
<multop>::=* |/
<factor>::=<constant>|<identifier>|<identifier>[<expression>]
| (<expression>)
<constant>::=<digit>|<digit><constant>
<identifier>::=<identifier><letterordigit>|<letter>
<letterordigit>::=<letter>|<digit>
<letter>::=a|b|c|d|e|f|g|h|i|j|k|l|m|n|o|p|q|r|s|t|u|v|w|x|y|z
<digit>::=0|1|2|3|4|5|6|7|8|9
<empty>hasthe obviousmeaning

Comments(zero or more characters enclosed between the standard C/Java-style comment brackets /*...*/) can be inserted.The language has rudimentary support for 1-dimensional arrays. The declaration int a[3] declares an array of three elements, referenced as a[0], a[1] and a[2]. Note also that you should worry about the scoping of names.

AM3206PC: COMPUTER NETWORKS LAB

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM3204PC	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		0	**0**	**3**	**1.5**	**25**	**75**	**100**
Contact Classes:NIL	**Tutorial classes:NIL**	**Practical classes: 36**				**Total Classes:36**		
Prerequisites:								

Course Objectives:

- To understand the working principle of various communication protocols.
- To understand the network simulator environment and visualize a network topology andobserve its performance.
- To analyze the traffic flow and the contents of protocol frames.

Course Outcomes:

- Implement data link layer farming methods.
- Analyze error detection and error correction codes.
- Implement and analyze routing and congestion issues in network design.
- Implement Encoding and Decoding techniques used in presentation layer.
- To be able to work with different network tools.

List of Experiments

1. Implement the data link layer framing methods such as character, character-stuffing and bitstuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Develop a simple data link layer that performs the flow control using the sliding windowprotocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijsktra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting technique used in buffers.
10. Wireshark
    i. Packet Capture Using Wire shark
    ii. Starting Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics & Filters.
11. How to run Nmap scan
12. Operating System Detection using Nmap
13. Do the following using NS2 Simulator
    i. NS2 Simulator-Introduction
    ii. Simulate to Find the Number of Packets Dropped
    iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    iv. Simulate to Find the Number of Packets Dropped due to Congestion
    v. Simulate to Compare Data Rate& Throughput.
    vi. Simulate to Plot Congestion for Different Source/Destination

vii. Simulate to Determine the Performance with respect to Transmission of Packets

MC3002: CYBER SECURITY

III-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
MC3002	**Mandatory course**	**3**	**0**	**0**	**0**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

Course Outcomes:

The students will be able to understand cyber-attacks, types of cyber crimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II

Cyber space and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy.

Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III

Cyber crime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley

2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCES:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group

B.Tech. IV Year I Sem.

AM4101PC: INFORMATION SECURITY

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM4101PC	**Mandatory course**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nil**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection
- Discuss the fundamental ideas of public-key cryptography.
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message.
- Discuss Web security and Firewalls

Course Outcomes:

- Student will be able to understand basic cryptographic algorithms, message and web Authentication and security issues.
- Ability to identify information system requirements for both of them such as client and server.
- Ability to understand the current legal issues towards information security.

UNIT - I

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT - II

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT - III

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric

Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

UNIT - IV

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)

Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

UNIT - V

E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange

Case Studies on Cryptography and security:Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

TEXT BOOKS:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

AM4102PC: DEEP LEARNING

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
AM4102PC	**Mandatory course**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives

- To introduce the fundamental techniques and principles of Neural Networks
- To study the different models in ANN and their applications
- To familiarize deep learning concepts with Convolutional Neural Network case studies

Course Outcomes

- Able to understand basic concepts in Neural Networks andapplications
- Distinguish different types of ANN architectures

UNIT – I

Artificial Neural Networks

The Neuron – Activation Function –Gradient Descent – Stochastic Gradient Descent – Back Propagation – Business Problem.

UNIT – II

Convolutional Neural Networks

Convolution Operation – ReLU layer – Pooling – Flattening – Full Conversion Layer – Softmax and Cross-Entropy.

UNIT – III

Recurrent Neural Networks

RNN intuition – Tackling Vanishing Gradient Problem – Long Short-Term Memory – Building a RNN – Evaluating the RNN – Improving the RNN – Tuning the RNN.

UNIT – IV

Boltzmann Machines

Introduction to Boltzmann Machine – Energy-Based Models – Restricted Boltzmann Machine – Contrastive Divergence – Deep Belief Networks – Deep Boltzmann Machine.

UNIT – V

Computer Vision

Viola-Jones Algorithm – Haar-like Features – Integral Image – Training Classifiers – Adaptive Boosting – Cascading – Face Detection with Open CV.

REFERENCES:

1. Ian Goodfellow, “Deep Learning”, MIT Press, 2017.
2. Josh Patterson, “Deep Learning: A Practitioner’s Approach”, PACKT, 2017.
3. Dipayan Dev, “ Deep Learning with Hadoop”, PACKT, 2017.
4. Francois Challot, “ Deep learning with Python”, Manning, 2017.
5. Hugo Larochelle’s Video Lectures.

AM4107PE: GRAPH THEORY
(PROFESSIONAL ELECTIVE-IV)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Mandatory	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
AM4107PE	**course**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- To learn important classes of graph theoretic problems;
- To learn central theorems about trees, matching, connectivity.

Course Outcomes:

- Know some important classes of graph theoretic problems;
- Be able to formulate and prove central theorems about trees, matching, connectivity, colouring and planar graphs;
- Be able to describe and apply some basic algorithms for graphs;
- Be able to use graph theory as a modelling tool.

UNIT - I

Introduction-Discovery of graphs, Definitions, Subgraphs, Isomorphic graphs, Matrix representations of graphs, Degree of a vertex, Directed walks, paths and cycles, Connectivity in digraphs, Eulerian and Hamilton digraphs, Eulerian digraphs, Hamilton digraphs, Special graphs, Complements, Larger graphs from smaller graphs, Union, Sum, Cartesian Product, Composition, Graphic sequences, Graph theoretic model of the LAN problem, Havel-Hakimi criterion, Realization of a graphic sequence.

UNIT - II

Connected graphs and shortest paths - Walks, trails, paths, cycles, Connected graphs, Distance, Cut-vertices and

cut-edges, Blocks, Connectivity, Weighted graphs and shortest paths, Weighted graphs, Dijkstra"s shortest path algorithm, Floyd-Warshall shortest path algorithm.

UNIT - III

Trees- Definitions and characterizations, Number of trees, Cayley"s formula, Kirchoↄ-matrix-tree theorem, Minimum spanning trees, Kruskal"s algorithm, Prim"s algorithm, Special classes of graphs, Bipartite Graphs,

Line Graphs, Chordal Graphs, Eulerian Graphs, Fleury"s algorithm, Chinese Postman problem, Hamilton Graphs, Introduction, Necessary conditions and sufficient conditions.

UNIT - IV

Independent sets coverings and matchings– Introduction, Independent sets and coverings: basic equations, Matchings in bipartite graphs, Hall"s Theorem, K¨onig"s Theorem, Perfect matchings in graphs, Greedy and approximation algorithms.

UNIT - V

Vertex Colorings- Basic definitions, Cliques and chromatic number, Mycielski"s theorem, Greedy

coloring algorithm, Coloring of chordal graphs, Brooks theorem, Edge Colorings, Introduction and Basics, Gupta-Vizing theorem, Class-1 and Class-2 graphs, Edge-coloring of bipartite graphs, Class-2 graphs, Hajos union and Class-2 graphs, A scheduling problem and equitable edge-coloring.

TEXT BOOKS:

1. J. A. Bondy and U. S. R. Murty. Graph Theory, volume 244 of Graduate Texts in Mathematics.
   Springer,1st edition, 2008.
2. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications.

REFERENCE BOOKS:

1. Lecture Videos: http://nptel.ac.in/courses/111106050/13
2. Introduction to Graph Theory, Douglas B. West, Pearson.
3. Schaum's Outlines Graph Theory, Balakrishnan, TMH
4. Introduction to Graph Theory, Wilson Robin j, PHI
5. Graph Theory with Applications to Engineering And Computer Science, Narsing Deo, PHI
6. Graphs - An Introductory Approach, Wilson and Watkins

AM4108PE: INTRODUCTION TO EMBEDDED SYSTEMS
(PROFESSIONAL ELECTIVE-IV)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
AM4108PE	**Mandatory course**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- To provide an overview of principles of Embedded System
- To provide a clear understanding of role of firmware, operating systems in correlation with hardware systems.

Course Outcomes:

- Expected to understand the selection procedure of processors in the embedded domain.
- Design procedure of embedded firm ware.
- Expected to visualize the role of realtime operating systems in embedded systems.
- Expected to evaluate the correlation between task synchronization and latency issues

UNIT - I

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification of Embedded Systems, Major application areas, Purpose of E bedded Systems, Characteristics and Quality attributes of Embedded Systems.

UNIT - II

The Typical Embedded System: Core of the Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware, Other System components.

UNIT - III

Embedded Firmware Design and Development: Embedded Firmware Design, Embedded Firmware Development Languages, Programming in Embedded C.

UNIT - IV

RTOS Based Embedded System Design: Operating System basics, Types of Operating Systems, Tasks, Process, Threads, Multiprocessing and Multi-tasking, Task Scheduling, Threads-Processes-Scheduling putting them together, Task Communication, Task Synchronization, Device Drivers, How to choose an RTOS

UNIT - V

Integration and Testing of Embedded Hardware and Firmware: Integration of Hardware and Firmware, Boards Bring up

The Embedded System Development Environment: The Integrated Development Environment (IDE), Types of files generated on Cross-Compilation, Disassembler/Decompiler, Simulators, Emulators and Debugging, Target Hardware Debugging, Boundary Scan.

TEXT BOOK:

1. Shibu K V, “Introduction to Embedded Systems”, Second Edition, Mc Graw Hill

REFERENCE BOOKS:

1. Rajkamal, Embedded Systems Architecture, Programming and Design, Tata McGraw-Hill
2. Frank Vahid and Tony Givargis, "Embedded Systems Design" - A Unified Hardware/Software Introduction, John Wiley
3. Lyla, "Embedded Systems" –Pearson
4. David E. Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.

AM4109PE: E-COMMERCE
(PROFESSIONAL ELECTIVE-IV)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
AM4109PE	**Mandatory course**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nil**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- Identify the major categories and trends of e-commerce applications.
- Identify the essential processes of an e-commerce system.
- Identify several factors and web store requirements needed to succeed in e-commerce.
- Discuss the benefits and trade-offs of various e-commerce clicks and bricksalternatives.
- Understand the main technologies behind e-commerce systems and how these technologies interact.
- Discuss the various marketing strategies for an online business.
- Define various electronic payment types and associated security risks and the ways to protect against them.

Course Outcomes:

- Ability to identify the business relationships between the organizations and their customers
- Ability to perform various transactions like payment, data transfer and etc.

UNIT - I

Electronic Commerce-Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications. Consumer Oriented Electronic commerce - Mercantile Process models.

UNIT - II

Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems. Inter Organizational Commerce - EDI, EDI Implementation, Value added networks. Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT - III

Corporate Digital Library - Document Library, digital Document types, corporate Data Warehouses. Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research. Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues, Information Filtering. Multimedia - key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing's, Desktop video conferencing

UNIT – IV

Web Marketing Strategies, Communicating with Different Market Segments, Beyond Market Segmentation: Customer Behavior and Relationship Intensity, Advertising on the Web, E- Mail Marketing, Search Engine Positioning and Domain Names, Selling to Businesses Online, Electronic Data Interchange, Supply Chain Management Using Internet Technologies, Electronic Marketplaces and Portals

UNIT - V

E-Business Revenue Models, Revenue Models for Online Business, Changing Strategies: Revenue Models in Transition, Revenue Strategy Issues for Online Businesses, Creating an Effective Business

Presence Online, Web Site Usability, Virtual Communities, Mobile Commerce, Online Auctions

TEXT BOOK:

1. Frontiers of electronic commerce – Kalakata, Whinston, Pearson. (UNITS 1, 2, 3)
2. E-Business by Gary P. Schneider, - Cengage India Learning (UNITS 4, 5)

REFERENCES:

1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang, John Wiley.
2. E-Commerce, S. Jaiswal – Galgotia.
3. E-Commerce, Efrain Turbon, Jae Lee, David King, H. Michael Chang.
4. Electronic Commerce – Gary P. Schneider – Thomson.
5. E-Commerce – Business, Technology, Society, Kenneth C. Taudon, Carol GuyericoTraver.

AM4110PE: CLOUD COMPUTING
(PROFESSIONAL ELECTIVE-IV)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM4110PE	**Mandatory course**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nil**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- This course provides an insight into cloud computing
- Topics covered include- distributed system models, different cloud service models, service-oriented architectures, cloud programming and software environments, resource management.

Course Outcomes:

- Ability to understand various service delivery models of a cloud computing architecture.
- Ability to understand the ways in which the cloud can be programmed and deployed.
- Understanding cloud service providers.

UNIT - I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT - II

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models

UNIT - III

Cloud Computing Architecture and Management:Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT - IV

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

UNIT V

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform

TEXT BOOK:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

REFERENCE BOOKS:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej
M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

AM4111PE: AD-HOC & SENSOR NETWORKS
(PROFESSIONAL ELECTIVE-IV)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
AM4111PE	**Mandatory course**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- To understand the concepts of sensor networks
- To understand the MAC and transport protocols for ad hoc networks
- To understand the security of sensor networks
- To understand the applications of adhoc and sensor networks

Course Outcomes:

- Ability to understand the state-of-the-art research in the emerging subject of Ad Hoc and Wireless Sensor Networks
- Ability to solve the issues in real-time application development based on ASN.
- Ability to conduct further research in the domain of ASN

UNIT - I

Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topology-based routing algorithms-Proactive: DSDV; Reactive: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-Location Services-DREAM, Quorum-based; Forwarding Strategies: Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

UNIT - II

Data Transmission - Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.

UNIT - III

Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR. TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT - IV

Basics of Wireless, Sensors and Lower Layer Issues: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

UNIT - V

Upper Layer Issues of WSN: Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN – 981–256–681–3.

2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas

Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

AM4112PE: ADVANCED ALGORITHMS

(PROFESSIONAL ELECTIVE - V)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM4112PE	**Mandatory course**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- Introduces the recurrence relations for analyzing the algorithms
- Introduces the graphs and their traversals.
- Describes major algorithmic techniques (divide-and-conquer, greedy, dynamic programming, Brute Force, Transform and Conquer approaches) and mention problems for which each technique is appropriate;
- Describes how to evaluate and compare different algorithms using worst-case, average-case and best-case analysis.
- Introduces string matching algorithms
- Introduces linear programming.

Course Outcomes:

- Ability to analyze the performance of algorithms
- Ability to choose appropriate data structures and algorithm design methods for a specifiedapplication
- Ability to understand how the choice of data structures and the algorithm design methodsimpact the performance of programs

UNIT - I

Introduction: Role of Algorithms in computing, Order Notation, Recurrences, Probabilistic Analysis and Randomized Algorithms. Sorting and Order Statistics: Heap sort, Quick sort and Sorting in Linear Time.

Advanced Design and Analysis Techniques: Dynamic Programming- Matrix chain Multiplication, Longest common Subsequence and optimal binary Search trees.

UNIT - II

Greedy Algorithms - Huffman Codes, Activity Selection Problem. Amortized Analysis.

Graph Algorithms: Topological Sorting, Minimum Spanning trees, Single Source Shortest Paths, Maximum Flow algorithms.

UNIT - III

Sorting Networks: Comparison Networks, Zero-one principle, bitonic Sorting Networks, Merging Network, Sorting Network.

Matrix Operations- Strassen's Matrix Multiplication, Inverting matrices, Solving system of linear Equations

UNIT - IV

String Matching: Naive String Matching, Rabin-Karp algorithm, matching with finite Automata, Knuth-Morris - Pratt algorithm.

UNIT- V

NP-Completeness and Approximation Algorithms: Polynomial time, polynomial time verification, NP-Completeness and reducibility, NP-Complete problems. Approximation Algorithms- Vertex cover Problem, Travelling Sales person problem

TEXT BOOK:

1. Introduction to Algorithms,'' T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, Third Edition, PHI.

REFERENCE BOOKS:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Galgotia
   publications pvt. Ltd.
2. Design and Analysis Algorithms - Parag Himanshu Dave, Himanshu Bhalchandra Dave Publisher**:** Pearson
3. Algorithm Design: Foundations, Analysis and Internet examples, M.T. Goodrich and R. Tomassia, John Wiley and sons.
4. Data structures and Algorithm Analysis in C++, Allen Weiss, Second edition, Pearson education.

AM4113PE: REAL TIME SYSTEMS

(PROFESSIONAL ELECTIVE - V)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
AM4113PE	**Mandatory course**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nil**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- To provide broad understanding of the requirements of Real Time Operating Systems.
- To make the student understand, applications of these Real Time features using case studies.

Course Outcomes:

- Be able to explain real-time concepts such as preemptive multitasking, task priorities, priority inversions, mutual exclusion, context switching, and synchronization, interrupt latency and response time, and semaphores.
- Able describe how a real-time operating system kernel is implemented.
- Able explain how tasks are managed.
- Explain how the real-time operating system implements time management.
- Discuss how tasks can communicate using semaphores, mailboxes, and queues.
- Be able to implement a real-time system on an embedded processor.
- Be able to work with real time operating systems like RT Linux, Vx Works, MicroC /OSII, TinyOs

UNIT – I

Introduction: Introduction to UNIX/LINUX, Overview of Commands, File I/O,(open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).

UNIT - II

Real Time Operating Systems: Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

UNIT - III

Objects, Services and I/O: Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem

UNIT - IV

Exceptions, Interrupts and Timers: Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

UNIT - V

Case Studies of RTOS: RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, and Tiny OS.

TEXT BOOK:

1. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011

REFERENCE BOOKS:

1. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH.
2. Advanced UNIX Programming, Richard Stevens
3. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh

AM4114PE: SOFT COMPUTING

(PROFESSIONAL ELECTIVE - V)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Mandatory course	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
AM4114PE		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- Familiarize with soft computing concepts
- Introduce and use the idea of fuzzy logic and use of heuristics based on human experience
- Familiarize the Neuro-Fuzzy modeling using Classification and Clustering techniques
- Learn the concepts of Genetic algorithm and its applications
- Acquire the knowledge of Rough Sets.

Course Outcomes:

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

- Identify the difference between Conventional Artificial Intelligence to Computational Intelligence.
- Understand fuzzy logic and reasoning to handle and solve engineering problems
- Apply the Classification and clustering techniques on various applications.
- Understand the advanced neural networks and its applications
- Perform various operations of genetic algorithms, Rough Sets.
- Comprehend various techniques to build model for various applications

UNIT - I

Introduction to Soft Computing: Evolutionary Computing, "Soft" computing versus "Hard" computing, Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft computing,Applications of Soft Computing Techniques.

UNIT-II

Fuzzy Systems: Fuzzy Sets, Fuzzy Relations, Fuzzy Logic, Fuzzy Rule-Based Systems

UNIT-III

Fuzzy Decision Making, Particle Swarm Optimization

UNIT-IV

Genetic Algorithms: Basic Concepts, Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm.

UNIT-V

Rough Sets, Rough Sets, Rule Induction, and Discernibility Matrix, Integration of Soft Computing Techniques

TEXT BOOK:

1. Soft Computing – Advances and Applications - Jan 2015 by B.K. Tripathy and J. Anuradha – Cengage Learning

REFERENCE BOOKS:

1. S. N. Sivanandam & S. N. Deepa, “Principles of Soft Computing”, 2nd edition, Wiley India, 2008.
2. David E. Goldberg, “Genetic Algorithms-In Search, optimization and Machine learning”, Pearson Education.
3. J. S. R. Jang, C.T. Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, Pearson Education, 2004.
4. G.J. Klir & B. Yuan, “Fuzzy Sets & Fuzzy Logic”, PHI, 1995.
5. Melanie Mitchell, “An Introduction to Genetic Algorithm”, PHI, 1998.
6. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, McGraw- Hill International editions, 1995

AM4115PE: INTERNET OF THINGS

(PROFESSIONAL ELECTIVE - V)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
AM4115PE	**Mandatory course**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web based services on IoT devices

Course Outcomes:

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect themto network.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.
- Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

UNIT - I

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs IoT enabaled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

UNIT - II

IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT - III

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Pythonpackages - JSON, XML, HTTPLib, URLLib, SMTPLib

UNIT - IV

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT - V

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015,
   ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014,
   ISBN:978935023975

AM4116PE: SOFTWARE PROJECT MANAGEMENT

(PROFESSIONAL ELECTIVE - V)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Mandatory	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
AM4116PE	**course**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- To acquire knowledge on software process management
- To acquire managerial skills for software project development
- To understand software economics

Course Outcomes:

- Gain knowledge of software economics, phases in the life cycle of software development, project organization, project control and process instrumentation
- Analyze the major and minor milestones, artifacts and metrics from management and technicalperspective
- Design and develop software product using conventional and modern principles of softwareproject management

UNIT - I

Software Process Maturity

Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process.

Process Reference Models

Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP).

UNIT - II

Software Project Management Renaissance Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way.

Life-Cycle Phases and Process artifacts Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model-based software architectures.

UNIT - III

Workflows and Checkpoints of process Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic statusassessments.

Process Planning Work breakdown structures, Planning guidelines, cost and schedule estimating process, iterationplanning process, Pragmatic planning.

UNIT - IV

Project Organizations Line-of- business organizations, project organizations, evolution of organizations, process automation. Project Control and process instrumentation

The seven-core metrics, management indicators, quality indicators, life-cycle expectations, Pragmaticsoftware metrics, metrics automation.

UNIT - V

CCPDS-R Case Study and Future Software Project Management Practices

Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

TEXT BOOKS:

1. Managing the Software Process, Watts S. Humphrey, Pearson Education
2. Software Project Management, Walker Royce, Pearson Education

REFERENCE BOOKS:

1. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000
2. Process Improvement essentials, James R. Persse, O'Reilly, 2006
3. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, TMH, 2006
4. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.
5. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007
6. Software Engineering Project Management, Richard H. Thayer & Edward Yourdon,2nd edition, Wiley India, 2004.
7. Agile Project Management, Jim Highsmith, Pearson education, 2004.

CS4121OE: PYTHON PROGRAMMING
(Open Elective- II)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Mandatory course	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CS4121OE		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- To be able to introduce core programming basics and program design with functions using Python programming language.
- To understand arrange of Object-Oriented Programming, as well as in-depth data and information processing techniques.
- To understand the high- performance programs designed to strengthen the practical expertise.

COURSE OUTCOMES:

- Able to write programs using classes and objects
- Able to develop GUI

UNIT-I

Introduction to Python, Installing Python. How a Program Works, Using 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. Decision Structures andBoolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, ComparingStrings,Logical Operators,Boolean Variables. Repetition Structures: Introduction, whileloop, forloop, Calculating a Running Total, Input Validation Loops, Nested Loops.

Data types and Expressions: Strings, Assignment and Comments, Numeric Data Types and Character Sets, Expressions, Functions and Modules.

UNIT-II

Control Statements: Definite Iteration, Formatting Text for Output, Selection, ConditionalIteration.

File and Exceptions: Introduction to File Input and Output, Using Loops to Process Files, Processing Records, Exceptions.

Functions: Introduction, Defining and Calling a Void Function, Designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and GlobalConstants, Value-Returning Functions-Generating Random Numbers, The math Module,Storing Functions in Modules.

UNIT-III

Strings and Text Files: Accessing Characters and Sub strings in a String,Strings

and Number System, String Methods, Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings. Text Files, Data Encryption,Lists, Introduction to Lists, Listslicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples Sequences, Tuples. Dictionaries and Sets: Dictionaries, Sets, Serializing Objects. Recursion: Introduction, Problem Solving with Recursion, Examples of Recursive Algorithms.

UNIT-IV

Design with Classes: Classes and Objects, Classes and Functions, Classes and Methods,WorkingwithInstances,InheritanceandPolymorphism.Object-OrientedProgramming:ProceduralandObject-OrientedProgramming,Classes,techniquesforDesigningClasses.

UNIT-V

Graphical User Interfaces: Behavior of terminal based programs and GUI-based programs, Coding simple GUI- based programs, other useful GUI resources. GUI Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.

Simple Graphics and Image Processing: Overview of Turtle Graphics, Two dimensional Shapes,Colors and RBG System, Image Processing.

TEXTBOOKS:

- KennethA.Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning.
- Think Python First Edition, by Allen B. Downey, Oriellypublishing

REFERENCEBOOKS:

- Introduction to Computation and Programming Using Python. John V. Guttag, The MIT Press.
- James Payne, Beginning Python using Python 2.6 and Python3, Wrox publishing
- PaulGries, Practical Programming: An Introduction to Computer Science using Python3, The Pragmatic Bookshelf, 2nd edition (4Oct.2013)
- Charles Dierach, Introduction to Computer Science using Python

CS4122OE: R PROGRAMMING
(Open Elective- II)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Mandatory course	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CS4122OE		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- Understanding and being able to use basic programming concepts
- Automate data analysis
- Working collaboratively and openly on code
- Knowing how to generate dynamic documents
- Being able to use a continuous test-driven development approach

Course Outcomes:

- Be able to use and programin the programming language R
- Be able to use R to solve statistical problems
- Be able to implement and describe Monte Carlo the technology
- Be able to minimize and maximize functions using R

UNIT–I

Introduction: Overview of R, R data types and objects, reading and writing data, sub setting R Objects, Essentials of the R Language, Installing R, Running R, Packages in R, Calculations, Complex numbers in R, Rounding, Arithmetic, Modulo and integer quotients, Variable names and assignment, Operators, Integers, Factors, Logical operations

UNIT– II

Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes

Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector usingsubscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Addingand Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations

UNIT–III

Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, DATA

FRAMES, Creating Data Frames, Accessing Data Frames, Other Matrix- Like Operations

UNIT-IV

FACTORS AND TABLES, Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/ Array- Like Operations on Tables, Extracting a Subtable, Finding the Largest Cells in a Table,Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions

UNIT-V

OBJECT-ORIENTEDPROGRAMMING:S Classes, S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Function on an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation

TEXTBOOKS:

- R Programming for Data Science by Roger D.Peng
- The Art of R Programming by Prashanth singh, Vivek Mourya, Cengage Learning India.

CS4123OE: JAVA PROGRAMMING
(Open Elective- II)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Mandatory course	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CS4123OE		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- To introduce the object-oriented programming concepts.
- To understand object-oriented programming concepts, and apply them in solving problems.
- To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes
- To introduce the implementation of packages and interfaces
- To introduce the concepts of exception handling and multithreading.
- To introduce the design of Graphical User Interface using applets and swing controls.

CourseOutcomes:

- Able to solve real world problems using OOP techniques.
- Able to understand the use of abstract classes.
- Able to solve problems using java collection frame work and I/o classes.
- Able to develop multithreaded applications with synchronization.
- Able to develop applets for web applications.
- Able to design GUI based applications

UNIT-I

Object-Oriented Thinking- Awayof viewing world – Agents and Communities, messages and methods, Responsibilities, Classes and Instances, Class Hierarchies- Inheritance, Method binding,Overriding and Exceptions, Summary of Object-Oriented concepts. Java buzzwords, An Overview of Java, Datatypes, Variables and Arrays, operators, expressions, control statements, Introducing classes, Methods and Classes, String handling.

Inheritance–Inheritance concept, Inheritance basics, Member access, Constructors, Creating Multilevel hierarchy, super uses, using final with inheritance, Polymorphism- adhoc polymorphism, pure polymorphism, method overriding, abstract classes, Object class, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance.

UNIT-II

Packages- Defining a Package, CLASSPATH, Access protection, importing packages.

Interfaces- defining an interface, implementing interfaces, Nested interfaces, applying interfaces, variables in interfaces and extending interfaces.

Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Readingconsole Input and Writing Console Output, File class, Reading and writing Files, Random access fileoperations, The Console class, Serialization, Enumerations, autoboxing, generics.

UNIT-III

Exception handling-Fundamentals of exception handling, Exception types, Termination or resumptive models, Un caught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built- in exceptions, creating own exception sub classes.

Multithreading- Differences between thread- based multi tasking and process-based multitasking, Java thread model, creating threads, thread priorities, synchronizing threads, inter thread communication.

UNIT-IV

The Collections Framework (java.util)- Collections overview, Collection Interfaces, The Collection classes- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Accessing a Collection via an Iterator, Using an Iterator, The For-Each alternative, Map Interfaces and Classes, Comparators, Collection algorithms, Arrays, The Legacy Classes and Interfaces- Dictionary, Hashtable, Properties, Stack, Vector More Utility classes, String Tokenizer, BitSet, Date, Calendar, Random, Formatter, Scanner

UNIT-V

GUI Programming with Swing –Introduction, limitations of AWT, MVC architecture, components, containers. Understanding Layout Managers, Flow Layout, Border Layout, Grid Layout, Card Layout, GridBag Layout.

Event Handling-The Delegation event model-Events, Event sources, Event Listeners, Eventclasses, Handling mouse and keyboard events, Adapter classes, Inner classes, Anonymous Inner classes.

A Simple Swing Application, Applets–Applets and HTML, Security Issues, Applets and Applications, passing parameters to applets. Creating a Swing Applet, Painting in Swing, A Paint example, Exploring Swing Controls- JLabel and Image Icon, JText Field, The Swing Buttons- JButton, JToggle Button, JCheckBox, JRadioButton, JTabbedPane, JScroll Pane, JList, JComboBox, Swing Menus, Dialogs.

TEXT BOOKS:

- Java The complete reference, 9th edition, HerbertSchildt, McGrawHill Education(India) Pvt.Ltd.
- Understanding Object-Oriented Programming with Java,updated edition,

T. Budd, Pearson Education.

REFERENCE BOOKS:

- An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch,John Wiley& sons
- Introduction to Java programming, Y.DanielLiang, Pearson Education.
- Object Oriented Programming through Java, P. Radha Krishna, University Press.
- Programming in Java, S.Malhotra, S.Chudhary, 2nd edition, Oxford Univ. Press.
- Java Programming and Object- oriented Application Development, R.A.Johnson, Cengage Learning.

EE4121OE: RENEWABLE ENERGY SOURCES
(Open Elective- II)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Mandatory course	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CS4123OE		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

- To recognize the awareness of energy conservation in students.
- To identify the use of renewable energy sources for electrical power generation.
- To collect different energy storage methods.
- To detect about environmental effects of energy conversion.

Course Outcomes: Attheend of the course the student will be able to:

- Understand the principles of wind power and solar photo voltaic power generation, fuel cells.
- Assess the cost of generation for conventional and renewable energy plants.
- Design suitable power controller for wind and solar applications.
- Analyze the issues involved in the integration of renewable energy sources to the grid.

UNIT-I

Introduction: Renewable Sources of Energy- Grid- Supplied Electricity-Distributed Generation- Renewable Energy Economics- Calculation of Electricity Generation Costs– Demand side Management Options –Supply side Management Options-Modern Electronic Controls of Power Systems.

Wind PowerPlants: Appropriate Location- Evaluation of Wind Intensity-To pography -Purpose of the Energy Generated - General Classification of Wind Turbines-Rotor Turbines- Multiple- Blade Turbines Drag Turbines -Lifting Turbines- Generators and Speed Control used in Wind Power Energy Analysis of Small Generating Systems.

UNIT-II

Photovoltaic Power Plants:Solar Energy-Generation of Electricity by Photovoltaic Effect -Dependence of a PV Cell Characteristic on Temperature-Solar cell Output Characteristics-Equivalent Models and Parameters for Photo voltaic Panels-Photo voltaic Systems- Applications of Photo voltaic Solar Energy-Economical Analysis of Solar Energy.

Fuel Cells: The Fuel Cell-Low and High Temperature Fuel Cells- Commercial and

Manufacturing Issues Constructional Features of Proton Exchange-Membrane Fuel Cells –Reformers-Electro-lyzer Systems and Related Precautions-Advantages and Disadvantages of Fuel Cells-Fuel Cell Equivalent Circuit- Practical Determination of the Equivalent Model Parameters- Aspects of Hydrogen as Fuel.

UNIT-III

InductionGenerators

Principles of Operation- Representation of Steady-State Operation- Power and Losses Generated- Self- Excited Induction Generator- Magnetizing Curves and Self-Excitation Mathematical Description of the Self-Excitation Process-Inter connected and Stand-alone operation -Speed and Voltage Control –Economical Aspects.

UNIT-IV

Storage Systems: Energy Storage Parameters- Lead– Acid Batteries- Ultra Capacitors- Fly wheels– Super conducting Magnetic Storage System- Pumped Hydro electric Energy Storage - Compressed Air Energy Storage - Storage Heat - Energy Storage as an Economic Resource.

UNIT-V

Integration of Alternative Sources of Energy: Principles of Power Injection-Instantaneous Active and Reactive Power Control Approach Integration of Multiple Renewable Energy Sources- Islanding and Inter connection Control-DG Control and Power Injection.

Inter connection of Alternative Energy Sources with the Grid: Inter connection Technologies - Standards and Codes for Inter connection – Inter connection Considerations –Inter connection Examples for AlternativeEnergy Sources.

TEXT BOOKS:

- Felix A.Farret, M.GodoySimoes, “Integration of Alternative Sources of Energy”, JohnWiley &Sons, 2006.
- Solanki: Renewable Energy Technologies: Practical Guide for Beginners, PHI Learning Pvt.Ltd., 2008.

REFERENCES:

- D. Mukherjee:Fundamentals of Renewable Energ Systems, New Age International publishers,2007.
- Remus Teodorescu, Marco Liserre,Pedro Rodríguez: Grid ConvertersforPhotovoltaicandWindPowerSystems,JohnWiley&Sons,2011.
- GilbertM.Masters:Renewable and Efficient Electric Power Systems, John Wiley&Sons, 2004.

EE4122OE:RELIABILITY ENGINEERING
(Open Elective- II)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Open Elective- II	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EE4122OE		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:Mathematics-III(Laplace Transforms, Numerical Methods and Complex variables).								

Course Objectives:

- To introduce the basic concepts of reliability, various models of reliability
- To analyze reliability of various systems
- To introduce techniques off requency and duration for reliability evaluation of repairable systems

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

- Model various systems applying reliability networks
- Evaluate the reliability of simple and complex systems
- Estimate the limiting state probabilities of repairable systems
- Apply various mathematical models for evaluating reliability of irreparable systems

UNIT-I

Basic Probability Theory: Elements of probability, probability distributions, Random variables, Densityand Distribution functions- Mathematical expected – variance and standarddeviation

Binomial Distribution: Concepts, properties, engineering applications.

UNIT-II

Network Modeling and Evaluation of Simple Systems: Basic concepts- Evaluation of network Reliability/ Unreliability- Series systems, Parallel systems- Series-Parallel systems- Partially redundant systems- Examples.

Network Modeling and Evaluation of Complex Systems

Conditional probability method- tie set, Cut-set approach- Event tree and reduced event tree methods-Relationships between tie and cut-sets-Examples.

UNIT-III

Probability Distributions In Reliability Evaluation: Distribution concepts, Terminology ofdistributions, General reliability functions, Evaluation of the reliability functions, shape of reliability functions– Poisson distribution–normal

distribution, exponential distribution, Weibull distribution.

Network Reliability Evaluation Using Probability Distributions: Reliability Evaluation ofSeries systems, Parallel systems – Partially redundant systems-determination of reliabilitymeasure-MTTF for series and parallel systems–Examples.

UNIT-IV

Discrete Markov Chains: Basic concepts- Stochastic transitional probability matrix- timedependent probability evaluation- Limiting State Probability evaluation- Absorbing states –Application.

Continuous Markov Processes: Modeling concepts- State space diagrams- Un reliability evaluation of single and two component repairable systems

UNIT-V

Frequency and Duration Techniques: Frequency and duration concepts, application to multi state problems, Frequency balance approach.

Approximate System Reliability Evaluation: Series systems – Parallel systems-Network reduction techniques- Cut set approach- Common mode failures modeling and evaluation techniques-Examples.

TEXT BOOKS:

- Roy Billinton and Ronald NAllan, Reliability Evaluation of Engineering Systems, Plenum Press.
- E.Balagurusamy, Reliability Engineeringby Tata McGraw-Hill Publishing Company Limited

REFERENCES:

- Reliability Engineering: Theory and Practice by Aless andro Birolini, Springer Publications.
- An Introduction to Reliability and Maintainability Engineering by Charles Ebeling, TMH Publications.
- Reliability Engineering by ElsayedA. Elsayed, PrenticeHall Publications.

EC4121OE: PRINCIPLES OF COMPUTER COMMUNICATIONS AND NETWORKS (Open Elective- II)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC4121OE	**Open Elective- II**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:Mathematics-III (Laplace Transforms, Numerical Methods and Complex variables).								

Course Objectives:

- To understand the concept of computer communication.
- To learn about the networking concept layered protocols.
- To understand various communications concepts.
- To get the knowledge of various networking equipment.

Course Outcomes:

- The student can get the knowledge of networking of computers, data transmission between computers.
- Will have the exposure about the various communication concepts.
- Will get awareness about the structure and equipment of computer network structures.

UNIT-I

Overview of Computer Communications and Networking: Introduction to Computer Communications and Networking, Introduction to Computer Network, Types of Computer Networks, Network Addressing, Routing, Reliability, Interoperability and Security, Network Standards, The Telephone System and Data Communications.

UNIT-II

Essential Terms and Concepts: Computer Applications and application protocols, Computer Communications and Networking models, Communication Service Methods and data transmission modes, analog and Digital Communications ,Speed and capacity of a Communication Channel, Multiplexing and switching, Network architecture and the OSI reference model.

UNIT-III

Analog and Digital Communication Concepts:Representing data as analog signals, representing data as digital signals, data rate and bandwidth reduction,

Digital Carrier Systems.

UNIT-IV

Physical and data link layer Concepts: The Physical and Electrical Characteristics of wire, Copper media, fiber optic media, wireless Communications. Introduction to datalinkLayer, the logical link control and medium access control sub-layers.

UNIT-V

Network Hardware Components: Introduction to Connectors, Transreceivers and media convertors, repeaters, network interference cards and PC cards, bridges, switches, switches Vs Routers.

TEXT BOOKS:

- Computer Communications and Networking Technologies, MichelA. Gallo and WilliamH.Hancock,Thomson Brooks/Cole.
- Data Communications and Networking– Behrouz A.Forouzan, FourthEditionMC GRAWHILL EDUCATION,2006.

REFERENCE BOOKS:

- Principles of Computer Networks and Communications, M.Barry Dumas, MorrisSchwartz, Pearson.
- Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kurose,K.W.Ross, 3rd Edition,PearsonEducation

ME4121OE: FABRICATION PROCESSES
(Open Elective- II)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Open	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC4121OE	**Elective- II**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:	**None**							

Course Objectives:

- To understand the philosophies of various Manufacturing process.

Course Outcomes:

- At the endof the course,forgiven product, one should be able identify the manufacturing process.

UNIT-I

Casting:Steps involved in making a casting–Advantage of casting and its applications;

Patterns-Pattern making, Types, Materials used for patterns, pattern allowances and their construction; Properties of mouldings ands.

Methods of Melting- Cruciblemelting and cupola operation– Defects incastings;

Casting processes – Types – Sand moulding, Centrifugal casting, die-casting, Investment casting,shell moulding; Principles of Gating – Requirements – Types of gates, Design of gating systems –Riser– Function,types of Riser and Riserd esign.

UNIT-II

Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gascutting. Arc welding, forge welding, submerge dark welding, Resistance welding, The rmite welding.

Inert Gas Welding - TIG Welding, MIG welding, explosive welding, LaserWelding; Soldering andBrazing; Heat affected zone in welding. Welding defects –causes and remedies; destructive andnon-destructive testing of welds.

UNIT-III

Hotworking, coldworking, strain hardening, recovery, recrystallisation, and grain growth. Stamping, forming, andother

cold working processes. Blankingand piercing– Bending andforming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and coldspinning. Types of presses and press tools. Forces and power requirement in the above operations.

UNIT-IV

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and coldextrusion-Forward extrusion and backward extrusion– Impact extrusion–Extruding equipment –Tube extrusion and pipe making, Hydro staticextrusion. Forces in extrusion.

UNIT-V

Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging,Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects – cold forging, swaging, Forces inforging operations.

TEXT BOOKS:

- Manufacturing Technology/P.N.Rao/McGrawHill
- Manufacturing Engineering and Technology /KalpakjinS /Pearson.

REFERENCE BOOKS:

- Metal Casting /T.VRamanaRao /NewAge
- Métal Fabrication Technology/ Mukherjee/PHI

ME4122OE:TOTAL QUALITY MANAGEMENT
(Open Elective- II)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Open	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
ME4122OE	**Elective- II**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:	**None**							

UNIT-I

Introduction: The concept of TQM, Quality and Business performance, attitude, and involvement of top management, communication, culture and management systems. Management of ProcessQuality: Definition of quality, Quality Control, a brief history, Product Inspection vs. Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.

UNIT-II

Customer Focus and Satisfaction: Process vs. Customer, internal customer conflict, quality focus, Customer Satisfaction, role of Marketing and Sales, Buyer– Supplier relationships.

Bench Marking: Evolution of Bench Marking, meaning of bench marking, benefits of benchmarketing, the bench marking procedure, pit falls of bench marketing.

UNIT-III

Organizing for TQM: The systems approach, organizing for quality implementation, making the transition from a traditional to a TQM organization, Quality Circles, seven Tools of TQM: Stratification, check sheet, Scatter diagram, lshikawa diagram, paneto diagram, Kepner &Tregoe Methodology.

UNIT-IV

The Cost of Quality: Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost information, Accounting Systems and Quality Management.

UNIT-V

ISO9000: Universal Standards of Quality: ISO around the world, The ISO9000 ANSI/ASQCQ- 90. Series Standards, benefits of ISO9000 certification, the third party audit, Documentation ISO9000 and services, the cost of certification implementing the

system.

TEXT BOOK:

- Total Quality Management/ Joel E. Ross /Taylor and Franscis Limited
- Total Quality Management/ P.N.Mukherjee /PHI

REFERENCE BOOKS:

- Beyond TQM/ Robert L.Flood
- Statistical Quality Control/E.L.Grant.
- Total Quality Management: A Practical Approach/ H.Lal
- Quality Management/ KanishkaBedi/ Oxford University Press/ 2011
- Total Engineering Quality Management/ Sunil Sharma/ Macmillan

ME4123OE:ENERGY MANAGEMENT AND CONSERVATION
(Open Elective- II)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Open	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
ME4123OE	**Elective- II**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:	**None**							

Course Objectives:

- To acquaint the student with the conventional energy sources and their utilization. To understand the importance of heat recovery and energy conservation methods and energy audit.

Course Outcomes:

- Students would have a good knowledge about conventional energy sources and their audit. Ability to apply the fundamentals of energy conservation and management.

UNIT-I

Introduction: Global& Indian Energy Scenario-Classification of Energy sources- Energy needs of growing economy-Energy sector reform, Energy and Environment: Global Environmental Concerns, Basics of Energy and its various forms.

UNIT-II

Energy Audit: Types of energy audit, Energy management(audit) approach understand in genergy costs, Benchmarking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments.

Material and Energy balance: Facility as an energy system, Methods for preparing process flow, Material and energy balance diagrams.

UNIT-III

Energy Action Planning, Financial Management: Financial analysis techniques- Risk and sensitivity analysis- Financing options, Energy performance contracts and role of ESCOs- Energy Monitoring and Targeting: Elements of monitoring & targeting, Data and information- analysis, Techniques- energy consumption, Production, Cumulative sum of differences (CUSUM).

UNIT-IV

Building Envelope – principles of analysis – Envelope performance - Envelope analysis ofExisting and new buildings – Building standards for new and Existing constructions. HVAC Systems types – Energy conservation opportunities – cooling equipment – Domestichot water Estimating HVAC Energy consumption.

UNIT-V

Principles of Electric Energy Management, Energy Management control systems – Energy systems maintenance. Energy management in water and waste water treatment – solid waste treatment- air pollution control systems .Energy Management in Boilers and Fired systems–Steam and condensate systems– cogeneration– Waste Heat recovery. Energy Management in Process Industries, Energy Security, Codes, Standards, Electricity Act, Energy Conservation Act.

TEXT BOOKS:

- Energy Management by Murfy
- General Aspects of Energy Management and Audit, National Productivity Council of India, Chennai (Course Material-National Certification Examination for Energy Management)

REFERENCE BOOKS:

- Energy Management Handbook, W.C.Turner, 5thEdition, MarcelDekker, Inc, NewYork,2005.
- Guide to Energy Management, B.L.Capehart, W.C.Turner, W.J.Kennedy, CRCPress, NewYork,2005.
- Energy Management by O.P.Collagan

CE4121OE: ENVIRONMENTAL IMPACT ASSESSMENT
(OpenElective-II)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CE4121OE	**Open Elective- II**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives: The objectives of the course are to

- Define and Classify Environmental Impacts and the terminology
- Understands the environmental Impact assessment procedure
- Explain the EIA methodology
- List and describe environmental audits

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

- Identify the environmental attributes to beconsidered for the EIA study
- Formulate objectives of the EIA studies
- Identify the methodology to prepare rapid EIA
- Prepare EIA reports and environmental management plans

UNIT-I

Introduction: The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.

UNIT-II

EIA Methodologies: Environmental attributes-Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation &Evaluation, impact communication, Methods- Adhoc methods, Check lists methods, Matrices methods, Networks methods, Overlays methods. EIA review-Baseline Conditions -Construction Stage Impacts, post project impacts.

UNIT-III

Environmental Management Plan: EMP preparation, Monitoring Environmental ManagementPlan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief& Rehabilitation, Stipulating

the Conditions, Monitoring Methods, Pre-Appraisal and Appraisal.

UNIT-IV

Environmental Legislation and Life cycle Assessment: Environmental laws and protectionacts,Constitutionalprovisions-powers and functions of Central and State government,The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972,Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste managementrules. Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-costcriteriacasestudies.

UNIT-V

CaseStudies: Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Airports.

TEXT BOOKS:

- Anjaneyulu. YandManickam. V.,Environmental Impact Assessment Methodologies, B.S.Publications, Hyderabad,2007
- Barthwal, R.R.,Environmental Impact Assessment, NewAge Internationa lPublishers,2002

REFERENCE BOOKS:

- Jain, R.K.,Urban, L.V.,Stracy, G.S., Environmental Impact Analysis, VanNostr and ReinholdCo., New York, 1991.
- Rau,J.G. and Wooten,D.C., Environmental Impact Assessment, McGrawHillPub.Co.,NewYork,1996.

CE4122OE: INDUSTRIAL WASTE WATER TREATMENT
(OpenElective-II)

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CE4122OE	**Open Elective- II**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: **None**								

Course Objectives:

- To present the information of waste water generation from various industries
- To inform about the conventional treatment processes for specific industrial
- Waste waters
- To explain about the new developments in industrial waste water treatment
- technologies

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

- Identify the characteristics of industrial waste waters
- Describe pollution effects of disposal of industrial effluent
- Identify and design treatment options for industrial waste water
- Formulate environmental management plan

UNIT-I

Introduction: Waste water Characteristics, Standards of Disposal, Treatment Objective and Strategies, Layouts of Primary, Secondary and Advanced Treatment Units.

UNIT-II

Design of Preliminary and Primary Treatment Operations: Screens, Grit Chambers, SkimmingTank, Primary and Secondary Sedimentation Tanks.

UNIT-III

Biological Treatment Processes: Types, Kinetics of Plug Flow and Completely Mixed Systems.Attached Growth Processes: Trickling Filters (Standard Rate, High Rate), Biofilters, Practices, Features and Design, Operational Difficulties and Remedial Measures, Rotating Biological Contactors. Suspended Growth Processes:

UNIT-IV

Activated Sludge Process, Modifications and Design Equations, Process Design Criteria, Oxygen and Nutrient Requirements –Classification and Design of Oxidation Ponds, Lagoons.

UNIT-V

Sludge Treatment and Disposal: Sludge Thickening, Aerobic and Anaerobic Sludge Digestion Processes,Design of Digester Tank,Sludge Dewatering, Ultimate Disposal, Sludge Drying Beds, Other Methods of Sludge Treatment.

TEXT BOOKS:

- Waste water Treatment– Concepts and Design Approach, by GLKaria and RA Christian, Prentice Hall of India, 2006
- 2.Environmental Engineering by GerardKiely, McGraw Hill Education(India) PvtLtd,2013
- 3.Environmental Engineering– ADesign Approach by A.P.Sincero and GASincero, Prentice Hall of India, 2014

REFERENCES:

- Waste water Engineering- Collection, Treatment, Disposal and Reuse by Metcal fandEddy,, McGraw Hill Education (India)PvtLtd,2013
- Industrial Waste Treatment by Nelson Leonard Nemerow, Butter worth-Heinemann, 2007.
- Biological Process Designs for Wastewater Treatment by Benefield L.D.andRandallC.D. PrenticeHall Pub. Co., 1980.

AM4103PC: DEEP LEARNING LAB

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
AM4103PC	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		0	**0**	**2**	**1**	**25**	**75**	**100**
Contact Classes:NIL	**Tutorial classes:NIL**	**Practical classes: 36**				**Total Classes:36**		
Prerequisites:								

Course Objectives:

1. To implement various neural networks
2. To become familiar with various tools used in deep learning.

Course Outcomes:

1. Students will be able solve problems using various types of neural networks.

Exercises

1. Implement Image classification.
2. Implement chat bot.
3. Implement neural networks to identify dog, cat.
4. Implement traffic sign recognition.
5. Implement predicts sequential data system.

*MC4001: INTELLECTUAL PROPERTY RIGHTS

IV-I:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Mandatory	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
***MC4001**		**3**	**0**	**0**	**0**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

UNIT – I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT & REFERENCE BOOKS:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, TataMcGraw Hill Publishing company ltd

SM4201MS:ORGANIZATIONAL BEHAVIOUR

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	core	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
SM4201MS		**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: None								

Course Objectives:

The objective of the course is to provide the students with the conceptual framework and the theories underlying Organizational Behaviour.

UNIT-I:

Introductionto OB- Definition, Nature and Scope– Environmental and organizational context– Impact of IT, globalization, Diversity, Ethics, culture, reward systems and organizational design on Organizational Behaviour. Cognitive Processes- I:Perception and Attribution: Nature and importance of Perception– Perceptual selectivity and organization– Social perception– Attribution Theories– Locus of control– Attribution Errors– Impression Management.

UNIT-II:

Cognitive Processes-II: Personality and Attitudes– Personality as a continuum– Meaning of personality-Johari Window and Transactional Analysis- Nature and Dimension of Attitudes– Job satisfaction and organizational commitment- Motivational needs and processes- Work-Motivation Approaches Theoriesof Motivation- Motivation across cultures - Positive organizational behaviour: Optimism – Emotional intelligence– Self-Efficacy.

UNIT-III:

Dynamics of OB-I: Communication – types – interactive communication in organizations – barriers to communication and strategies to improve the follow of communication - Decision Making: Participative decision-making techniques – creativity and group decision making. Dynamics of OB –II Stress and Conflict: Meaning and types of stress –Meaning and types of conflict - Effect of stress and intra-individual conflict-strategies to cope with stress and conflict.

UNIT-IV:

Dynamics of OB –III Power and Politics: Meaning and types of power – empowerment - Groups Vs.Teams – Nature of groups – dynamics of

informal groups – dysfunctions of groups and teams – teams in modern work place.

UNIT-V:

Leading High performance: Job design and Goal setting for High performance- Quality of Work Life-Sociotechnical Design and High-performance work practices- Behavioural performance management: reinforcement and punishment as principles of Learning– Process of Behavioural modification- Leadership theories-Styles, Activities and skills of Great leaders.

REFERENCEBOOKS:

1. Luthans,Fred:OrganizationalBehaviour10/e,McGraw-Hill,2009
2. McShane: OrganizationalBehaviour,3e,TMH,2008
3. Nelson:Organizational Behaviour,3/e,Thomson,2008.
4. NewstromW.John&DavisKeith,OrganisationalBehaviour--HumanBehaviouratWork,12/e,TMH,NewDelhi,2009.
5. PierceandGardner:ManagementandOrganisationalBehaviour:AnIntegratedperspective,Thomson,2009.
6. Robbins,P.Stephen,TimothyA.Judge:OrganisationalBehaviour,12/e, PHI/Pearson,NewDelhi,2009.
7. PareekUdai:BehaviouralProcessatWork:Oxford&IBH,NewDelhi,2009.
8. Schermerhorn:OrganizationalBehaviour9/e,Wiley,2008.
9. Hitt:OrganizationalBehaviour,Wiley,2008
10. Aswathappa: OrganisationalBehaviour,7/e,Himalaya,2009
11. Mullins:ManagementandOrganisationalBehaviour,Pearson,2008.
12. McShane,Glinow:OrganisationalBehaviour--Essentials,TMH,2009.
13. Ivancevich:OrganisationalBehaviourandManagement, 7/e,TMH,2008.

AM4203PE: COMPUTATIONAL COMPLEXITY

(Professional Elective-VI)

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Professional	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
AM4203PE	**Elective-VI**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		

1. **Prerequisites:** Acourseon"ComputerProgrammingandDataStructures"
2. A courseon "DiscreteStructuresandGraphTheory"

Prerequisites:

3. A course on"Computer Programming and DataStructures"
4. A course on "Discrete Structures and Graph Theory"

Course Objectives:

- Introduces to theory of computational complexity classes
- Discuss about algorithmic techniques and application of these techniques to problems.
- Introduce to randomized algorithms and discuss how effective they are in reducing time and space complexity.
- Discuss about Graph based algorithms and approximation algorithms
- Discuss about search trees

Course Outcomes:

- Ability to classify decision problems into appropriate complexity classes
- Ability to specify what it meansto reduce one problem to another, and construct reductions for simple examples.
- Ability to classify optimization problems into appropriate approximation complexity classes
- Ability to choose appropriate datastructure for the given problem
- Ability to choose and apply appropriate design method for the given problem

UNIT-I

Computational Complexity: Polynomial time and its justification, Nontrivial examples of polynomial- time algorithms, the concept of reduction (reducibility), Class P Class NP and NP- Completeness, The Pversus NP

problem and whyit's hard

UNIT-II

Algorithmic paradigms: Dynamic Programming– Longest common subsequence, matrix chain multiplication, knapsack problem, Greedy – 0-1 knapsack, fractional knapsack, scheduling problem,Huffman coding, MST, Branch-and-bound – travelling sales person problem, 0/1 knapsack problem, Divide and Conquer– Mergesort,binarysearch,quicksort.

UNIT-III

Randomized Algorithms: Finger Printing, Pattern Matching, Graph Problems, Algebraic Methods, Probabilistic Primality Testing,De-Randomization Advanced Algorithms.

UNIT-IV

Graph Algorithms: Shortest paths, Flow networks, Spanning Trees; Approximation algorithms, Randomized algorithms. Approximation algorithms: Polynomial Time Approximation Schemes.

UNIT-V

Advanced Data Structures and applications: Decision Trees and Circuits, B-Trees, AVLTrees, Red and Black trees, Dictionaries and tries, Maps, Binomial Heaps, Fibonacci Heaps, Disjoint sets, Union by Rank and Path Compression

TEXT BOOKS:

1. T.Cormen, C.Leiserson, R.Rivest and C.Stein,Introduction to Algorithms, ThirdEdition,McGraw-Hill,2009.
2. R.MotwaniandP.Raghavan, Randomized Algorithms, Cambridge University Press, 1995.
3. J.J.McConnell,Analysis of Algorithms: An Active Learning Approach, Jones &Bartlett Publishers,2001.
4. D.E.Knuth,ArtofComputerProgramming,Volume3,SortingandSearching,SecondEdition,Addison-WesleyProfessional,1998.
5. S.Dasgupta, C. H. PapadimitriouandU.V.Vazirani,Algorithms, McGraw-Hill, 2008.

AM4204PE:DISTRIBUTED SYSTEMS

(ProfessionalElective- VI)

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Professional	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
AM4204PE	**Elective-VI**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: Acourseon"OperatingSystems" Acourseon"ComputerOrganization&Architecture"								

Course Objectives

- This course provides an insight into Distributed systems.
- Topicsinclude-Peer to Peer Systems, Transactions and Concurrency control, Security and Distributed shared memory

Course Outcomes

- Ability to understand Transactions and Concurrency control.
- Ability to understand Security issues.
- Understanding Distributed shared memory.
- Ability to design distributed systems for basic level applications.

UNIT-I

Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resourcesharing and web, challenges, System models -Introduction, Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication, Distributed objects and Remote Invocation- Introduction, Communication between distributed objects, RPC, Events and notifications, Casestudy-Java RMI.

UNIT-II

OperatingSystemSupport-Introduction, OSlayer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Servicearchitecture.

UNIT-III

PeertoPeerSystems–Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays,Overlay case studies-Pastry, Tapestry, Application

case studies- Squirrel, Ocean Store.
Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.
Coordination and Agreement-Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT-IV

Transactions and Concurrency Control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Time stamp ordering. Distributed Transactions- Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

UNIT-V

Replication-Introduction, System model and group communication, Fault to lerant services, Transactions with replicated data. Distributed shared memory, Design and Implementation issues, Consistency models.

TEXT BOOKS:

1. Distributed Systems Concepts and Design, GCoulouris, JDollimore and TKindberg, FourthEdition,Pearson Education.
2. Distributed Systems, S.Ghosh,Chapman &Hall/CRC, Taylor& FrancisGroup, 2010.

REFERENCE BOOKS:

1. Distributed Systems–Principles and Paradigms, A.S.Tanenbaum and M.V.Steen, Pearson Education.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D.Kshemakalyaniand MukeshSinghal,Cambridge,rp 2010.

AM4205PE:NEURAL NETWORKS & DEEP LEARNING

(ProfessionalElective- VI)

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Professional	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
AM4205PE	**Elective-VI**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives:

- To introduce the foundations of Artificial Neural Networks
- To acquire the knowledge on Deep Learning Concepts
- To learn various types of Artificial Neural Networks
- To gain knowledge to apply optimization strategies

Course Outcomes:

- Ability to understand the concepts of Neural Networks
- Ability to select the Learning Networks in modeling real world systems
- Ability to use an efficient algorithm for DeepModels
- Ability to apply optimization strategies for large scale applications

UNIT-I

Artificial Neural Networks Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back- propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

UNIT-II

Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

UNIT-III

Introduction to Deep Learning, Historical Trends in Deep learning, Deep

Feed - forward networks,Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

UNIT-IV

Regularization for Deep Learning: Parameternorm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Propand Manifold,Tangent Classifier

UNIT-V

Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms,Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods,Optimization Strategies and Meta-Algorithms

Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing

TEXTBOOKS:

1. Deep Learning: An MITPress BookByIanGoodfellowandYoshua BengioandAaron Courville
2. Neural Networks and Learning Machines, SimonHaykin,3rd Edition, Pearson Prentice Hall.

AM4206PE:HUMAN COMPUTER INTERACTION

(Professional Elective- VI)

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
AM4206PE	**Professional Elective-VI**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

CourseObjectives:

To gain an overview of Human- Computer Interaction(HCI), with an understanding of user interface design in general, and alternatives to traditional "keyboard and mouse" computing; become familiar with the vocabulary associated with sensory and cognitive systems as relevant to task performance by humans; be able to apply models from cognitive psychology to predicting user performance in various human-computer interaction tasks and recognize the limits of human performance as they apply to computer operation; appreciate the importance of a design and evaluation methodology that begins with and maintains a focus on the user; be familiar with a variety of both conventional and non-traditional user interface paradigms, the latter including virtual and augmented reality,mobile and wearable computing, and ubiquitous computing; and understand the social implications of technology and their ethical responsibilities as engineers in the design of technologicalsystems. Finally, working in small groups on a product design from start to finish will provide you with in valuable team-work experience.

CourseOutcomes:

- Ability to apply HCI and principlesto interaction design.
- Ability to design certain tools for blind or PHpeople.

UNIT-I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of gooddesign.A brief history of Screend esign.

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user–Interface popularity, characteristics-Principles of user interface.

UNIT-II

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

Screen Designing: Designgoals–Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount ofinformation – focus and emphasis – presentation information simply and meaningfully – information retrieval on web– statistical graphics– Technological consideration in interface design.

UNIT-III

Windows– New and Navigation schemes selection of window, selection of devices based and screen-based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems,choosing colors.

UNIT-IV

HCI in the software process, The software lifecycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction

UNIT-V

Cognitive models Goal and task hierarchies Design Focus: GOMS saves money Linguistic models The challenge of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities Ubiquitous computing applications research Design Focus: Ambient Wood – augmenting the physical Virtual and augmented reality Design Focus: Shared experienceDesign Focus: Applications of augmented reality Information and data visualization Design Focus: Getting the size right.

TEXT BOOKS:

1. The essential guide to user interface design,Wilbert OGalitz,WileyDreamTech.Units1,2,3
2. Human–Computer Interaction. AlanDix, JanetFincay, GreGoryd,Abowd, RussellBealg, Pearson Education Units4,5

REFERENCE BOOKS:

1. Designingtheuser interface.3rdEditionBenShneidermann,PearsonEducationAsia.
2. InteractionDesignPrece,Rogers,Sharps.WileyDreamtech.
3. UserInterfaceDesign, SorenLauesen,PearsonEducation.
4. Human–ComputerInteraction,D.R.Olsen,CengageLearning.
5. Human–ComputerInteraction,Smith- Atakan,CengageLearning.

AM4207PE:CYBER FORENSICS

(Professional Elective-VI)

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Professional	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
AM4207PE	**Elective-VI**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites: NetworkSecurity								

Course Objectives:

- Abriefexplanationoftheobjectiveistoprovidedigitalevidenceswhichareobtainedfromdigitalmedia.
- Inordertounderstandtheobjectivesofcomputerforensics,firstofall,peoplehavetorecognizethedifferentrolescomputerplaysin acertain crime.
- According toasnippetfromtheUnitedStatesSecurityService,thefunctionscomputerhasindifferentkindsofcrimes.

Course Outcomes:

- Students will understand the usage of computers in forensic, and how to use various forensictoolsfora widevarietyofinvestigations.
- Itgivesan opportunitytostudentstocontinue theirzeal inresearch incomputerforensics

UNIT-I

Introduction of Cybercrime: Types, The Internet spawnscrime, Worm sversusviruses, Computers'roles in crimes, Introduction to digital forensics, Introduction to Incident - Incident Response Methodology –Steps-ActivitiesinInitial Response, Phase after detection of an incident

UNIT-II

Initial Response and forensic duplication, Initial Response & Volatile Data Collection from Windowssystem -Initial Response & Volatile Data Collection from Unix system – Forensic Duplication: Forensic duplication: Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forensic. Duplicate/ Qualified Forensic Duplicate of a Hard Drive

UNIT-III

Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

Network Forensics: Network forensics overview, performing live

acquisitions, developing standardproceduresfor network forensics,using network tools,examining the honey netproject.

UNIT-IV

Current Forensic tools: evaluating computer forensic tool needs, computer forensics software tools,computer forensics hardware tools, validating and testing forensics software E-Mail Investigations:Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail,investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mailforensictools.

Cell phone and mobile device forensics: Understanding mobile device forensics, understanding acquisition procedures for cellphones and mobile devices.

UNIT-V

Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft start up tasks,MS-DOS startup tasks, virtual machines.

TEXTBOOKS:

1. KevinMandia,ChrisProsise,"IncidentResponseandcomputerforensics" ,Tata McGrawHill,2006.

CS4231OE: MACHINE LEARNING
(Open Elective- III)

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CS4231OE	**Open Elective- III**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives:

- To be able to formulate machine learning problems corresponding to different applications.
- To understand arrange of machine learning algorithms along with their strengths and weaknesses.
- To understand the basic theory underlying machine learning.

Course Outcomes:

- Student should be able to understand the basic concepts such as decision trees and neural networks.
- Ability to formulate machine learning techniques to respective problems.
- Apply machine learning algorithms to solve problems of moderate complexity

UNIT–I

Introduction: An illustrative learning task, and a few approaches to it. What is known fromalgorithms? Theory, Experiment. Biology. Psychology. Overview of Machine learning, related areas and applications. Linear Regression, Multiple Regression, Logistic Regression, logistic functions. **ConceptLearning**: Version spaces. Inductive Bias. Active queries. Mistake bound/ PAC model. basic results. Overview of issues regarding data sources, success criteria.

UNIT– II

Decision Tree Learning: - Minimum Description Length Principle. Occam's razor. Learningwith active queries Introduction to information theory, Decision Trees, Cross Validation and Over fitting.

Neural Network Learning: Perceptions and gradient descent back propagation,multi layer networks and back propagation.

UNIT–III

Sample Complexity and Over fitting: Errors in estimating means. Cross Validation and jack knifing VC dimension. Irrelevant features: Multiplicative rules for weight tuning.

Support Vector Machines: functional and geometric margins, optimum

margin classifier, constrained optimization, Lagrange multipliers, primal/dual problems, KKT conditions, dualofthe optimum margin classifier,soft margins,and kernels.

Bayesian Approaches: The basics Expectation Maximization. Bayes theorem, Naïve Bayes Classifier, Markovmodels, Hidden Markov Models

UNIT-IV

Instance-based Techniques: Lazy vs. eager generalization. K nearest neighbor, case- based reasoning. **Clustering and Unsupervised Learning:** K-means clustering, Gaussian mixture density estimation, model selection

UNIT-V

Genetic Algorithms: Different search methods for induction - Explanation-based Learning: using prior knowledge to reduce sample complexity.

Dimensionality reduction: feature selection, principal component analysis, linear discriminant analysis, factor analysis, independent component analysis, multi dimensional scaling, manifold learning

TEXT BOOKS:

1. Tom Michel, Machine Learning, McGrawHill,1997
2. TrevorHastie,RobertTibshirani&JeromeFriedman. The Elements of Statically Learning,Springer Verlag,2001

REFERENCE BOOKS:

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh,Cambridge UnivPress.
2. Richardo.Duda,PeterE.HartandDavidG.Stork,pattern classification,JohnWiley&Sons Inc.,2001
3. ChrisBishop,Neural Networks for Pattern Recognition, Oxford UniversityPress, 1995

CS4232OE: CLOUD COMPUTING

(Open Elective- III)

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CS4232OE	**Open Elective- III**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives:

- To explain the evolving computer model called cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.

CourseOutcomes:

- Ability to understand the virtualization and cloud computing concepts.

UNIT-I

Systems Modeling, Clustering and Virtualization: Distributed System Models and Enabling Technologies, Computer Clusters for Scalable Parallel Computing, Virtual Machines and Virtualization of Clusters and Data centers.

UNIT-II

Foundations: Introduction to Cloud Computing, Migrating into a Cloud, Enriching the 'Integration as a Service' Paradigm for the Cloud Era, The Enterprise Cloud Computing Paradigm.

UNIT-III

Infrastructure as a Service (IAAS) & Platform and Software as a Service (PAAS /SAAS): Virtual machines provisioning and Migration services, On the Management of Virtual machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a cluster as a Service, Secure Distributed Data Storage in Cloud Computing. Aneka, Comet Cloud, T-Systems', Workflow Engine for Clouds, Understanding Scientific Applications for Cloud Environments.

UNIT-IV

Monitoring, Management and Applications: An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing, Performance Prediction for HPC on Clouds, Best Practices in Architecting

Cloud Applications in the AWS cloud, Building Content Delivery networks using Clouds, Resource Cloud Mashups.

UNIT-V

Governance and Case Studies: Organizational Readiness and Change management in the Cloudage, Data Security in the Cloud, Legal Issues in Cloud computing, Achieving Production Readiness for Cloud Services.

TEXT BOOKS:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James BrobergandAndrzejM.Goscinski,Wiley,2011.
2. Distributed and Cloud Computing, KaiHwang, Geoffery C.Fox, JackJ.Dongarra, Elsevier,2012.

REFERENCE BOOKS:

1. Cloud Computing: APracticalApproach, AnthonyT.Velte, TobyJ.Velte, RobertElsenpeter, TataMcGrawHill, rp2011.
2. Enterprise Cloud Computing, GautamShroff, Cambridge University Press, 2010.
3. Cloud Computing: Implementation,Management and Security, JohnW. Rittinghouse,JamesF.Ransome, CRC Press,rp2012.
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud,GeorgeReese,O'Reilly,SPD, rp2011.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, ShahedLatif, O'Reilly,SPD,rp2011.

CS4233OE: NATURAL LANGUAGE PROCESSING

(Open Elective- III)

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CS4233OE	**Open Elective- III**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives:

- Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes:

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carryout proper experimental methodology for training and evaluating empirical NLP systems
- Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms
- Able to design different language modeling Techniques.

UNIT-I

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

UNIT-II

Syntax Analysis: Parsing Natural Language, Tree banks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

UNIT-III

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT-IV

Predicate- Argument Structure, Meaning Representation Systems, Software.

UNIT-V

Discourse Processing: Cohension, Reference Resolution, Discourse Cohension and Structure **Language Modeling:** Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modeling

TEXTBOOKS:

- MultilingualnaturalLanguageProcessingApplications:FromTheorytoPractice–Daniel M.Bikeland Imed Zitouni,Pearson Publication
- NaturalLanguageProcessingandInformationRetrieval:TanvierSiddiqui,U.S. Tiwary

REFERENCE BOOK:

1.SpeechandNaturalLanguageProcessing- DanielJurafsky&JamesHMartin,PearsonPublications

EE4231OE:INSTRUMENTATION AND CONTROL

(Open Elective- III)

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EE4231OE	**Open Elective- III**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nil**				**Total Classes:60**		
Prerequisites:	**BasicElectricalEngineering,AnalogElectronics,Mathematics**							

Course objectives:

- To introduce the basic principles of all measuring instruments
- To deal with the measurement of voltage, current, Power factor, power, energy and magnetic measurements.
- TounderstandthebasicconceptsofControlEngineering

Course Outcomes:

After completion of this course, the student able to

- Understand different types of measuring instruments, their construction, operation and characteristics
- Identify the instruments suitable for typical measurements
- Apply the knowledge about transducers and instrument transformers to use them effectively.
- Apply the knowledge of basic control engineering.

UNIT–I

Characteristics of Signals: Measuring Systems, Performance Characteristics-Static characteristics, Dynamic Characteristics; Errors in Measurement- Gross Errors, Systematic Errors, Statistical Analysis of Random Errors.

UNIT–II

Oscillo scope: Cathode ray oscillo scope-Cathode ray tube-time base generator-horizontal and vertical amplifiers- CRO probes- applications of CRO-Measurement of phase and frequency-lissajous patterns-Sampling oscillo scope-analog and digital type.

UNIT–III

Transducers: Definition of transducers, Classification of transducers, Advantages of electrical transducers, Characteristics and choice of transducers; Principle of operation ofresistor, inductor, LVDT and capacitor transducers.

UNIT–IV

Measurement of Non-Electrical Quantities: Measurement ofstrain, Gauge sensitivity, Displacement, Force Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature,Pressure,Vacuum,Flow

UNIT–V

Introduction to Control System: Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of controlsystems- Classification of control systems, Feed- Back Characteristics, Effects of feedback. Mathematical models– Differential equations - Impulse Response and transfer functions –Translational and Rotational mechanical systems.

TEXT BOOKS:

- G.K.Banerjee,"Electrical and Electronic Measurements", PHI Learning Pvt.Ltd., 2nd Edition,2016
- S.C.Bhargava,"Electrical Measuring Instruments and Measurements", BSPublications, 2012.
- B.C.Kuo,"Automatic Control System",PrenticeHall,1995

REFERENCES:

- A.K.Sawhney, "Electrical&Electronic Measurement &Instruments", DhanpatRai & Co.Publications, 2005.
- R.K.Rajput,"Electrical&Electronic Measurement & Instrumentation", S.Chandand CompanyLtd., 2007.
- Bucking hamand Price,"Electrical Measurements", Prentice–Hall,1988.
- Reissland,M.U,"Electrical Measurements: Fundamentals, Concepts, Applications", NewAge International(P) Limited Publishers,1st Edition2010.
- E.W.GoldingandF.C.Widdis,"ElectricalMeasurementsandmeasuringInstruments",fifthEdition,WheelerPublishing,2011.

EE4232OE: ENERGY STORAGE SYSTEMS

(Open Elective- III)

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EE4232OE	**Open Elective- III**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:	**Electro chemistry**							

CourseObjective:

- To enable the student to understand the need for energy storage, devices and technologies available and their applications.

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

- Analyze the characteristics of energy from various sources and need for storage.
- Classify various types of energy storage and various devices used for the purpose.
- Identify various real time applications.

UNIT-I

Electrical Energy Storage Technologies: Characteristics of electricity, Electricity and theroles of EES, High generation cost during peak-demand periods, Need for continuous andflexible supply, Long distance between generation and consumption, Congestion in powergrids,Transmission bycable.

UNIT-II

Needs for Electrical Energy Storage: Emerging needs for EES, More renewable energy,less fossil fuel,Smart Griduses, The roles of electrical energy storage technologies, The roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the view point of generators of renewable energy.

UNIT-III

Features of Energy Storage Systems: Classification of EES systems , Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage (CAES), Fly wheel energy storage (FES),Electrochemical storage systems, Secondary batteries, Flow batteries, Chemical energy storage, Hydrogen(H2), Synthetic natural gas(SNG).

UNIT-IV

Types of Electrical Energy Storage systems: Electrical storage systems, Double-layer capacitors(DLC), Super conducting magnetic energy storage(SMES), Thermal storage systems, Standards for EES, Technical comparison of EES technologies.

UNIT-V

Applications: Present status of applications, Utility use (conventional power generation, grid operation& service), Consumer use(uninterruptable power supply for large consumers),New trends in applications ,Renewable energy generation, Smart Grid, Smart Micro grid,Smart House, Electric vehicles, Management and control hierarchy of storage systems,Internal configuration of battery storage systems, External connection of EES systems ,Aggregating EES systems and distributed generation (Virtual Power Plant), Battery SCADA–aggregation of many dispersed batteries.

Text Books:

- "JamesM.Eyer,JosephJ.IannucciandGarthP.Corey","EnergyStorageBenefitsandMarketAnalysis",SandiaNationalLaboratories,2004.
- TheElectricalEnergyStoragebyIECMarketStrategyBoard.

Reference Book:

1."Jim Eyer, Garth Corey", Energy Storage for the Electricity Grid: Benefits and MarketPotentialAssessmentGuide,Report,SandiaNationalLaboratories,Feb201

EC4231OE: ELECTRONIC MEASURING INSTRUMENTS

(Open Elective- III)

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EC4231OE	**Open Elective- III**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:	**Electro chemistry**							

Course Objectives:

- It provides an understanding of various measuring systems functioning and metrics for performance analysis.
- Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
- Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

Course Outcomes: On completion of this course student can be able to

- Identify the various electronic instruments based on their specific ations for carrying out a particular task of measurement.
- Measure various physical parameters by appropriately selecting the transducers.
- Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.

UNIT-I

Block Schematics of Measuring Systems and Performance Metrics: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag.

UNIT-II

Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Wave form Generator,and Specifications.

UNIT-III

Measuring Instruments: DCVoltmeters, D'Arsonval Movement, DCCurrent Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments. CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes.

UNIT-IV

Recorders: X-YPlotter, Curvetracer, Galvanometric Recorders, Servo transducers, pen driving mechanisms, Magnetic Recording, Magnetic recording techniques.

UNIT-V

Transducers: Classification, Strain Gauges, Bounded, unbounded; orceand Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermo couples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezo electric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

TEXT BOOKS:

1. Electronic Measurements and Instrumentation: B.M.Oliver, J.M.Cage TMH Reprint2009.
2. Electronic Instrumentation:H.S.Kalsi–TMH,2nd Edition2004.

REFERENCES:

1. ElectronicInstrumentationandMeasurements– DavidA.Bell,OxfordUniv.Press,1997.
2. ModernElectronicInstrumentationandMeasurementTechniques:A.D.Helbi ncs, W.D. Cooper:PHI5th Edition2003.
3. ElectronicMeasurementsandInstrumentation– K.LalKishore,PearsonEducation2010.
4. IndustrialInstrumentation:T.R.PadmanabhamSpringer2009.

ME4231OE:RELIABILITY ENGINEERING

(Open Elective- III)

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
ME4231OE	**Open Elective- III**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:	**Mathematics III**							

Course Objectives:

- To introduce the basic concepts of reliability, various models of reliability
- To analyze reliability of various systems
- To introduce techniques of frequency and duration for reliability evaluation of repairable systems.

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

- model various systems applying reliability networks
- evaluate the reliability of simple and complex systems
- estimate the limiting state probabilities of repairable systems
- apply various mathematical models for evaluating reliability of irreparable systems

UNIT-I

Basic Probability Theory: Elements of probability, probability distributions, Random variables, Density and Distribution functions-Binomial distribution-Expected value and standard deviation

- Binomial distribution, Poisson distribution, normal distribution, exponential distribution, Weibull distribution.

Definition of Reliability: Definition of terms used in reliability, Component reliability, Hazardrate, derivation of the reliability function in terms of the hazard rate. Hazard models - Bath tubcurve,

Effect of preventive maintenance. Measures of reliability: Mean Time to Failure and MeanTime betweenFailures.

UNIT–II

Network Modeling and Evaluation of Simple Systems: Basic concepts- Evaluation of network Reliability / Unreliability - Series systems, Parallel systems- Series-Parallel systems partially redundant systems-Examples.

Network Modeling and Evaluation of Complex systems: Conditional probability method tieset, Cutset approach- Event tree and reduced event tree methods- Relationships between tie andcutsets-Examples.

UNIT–III

Time Dependent Probability: Basic concepts-Reliability function f(t).F(t),R(t)andh(t)-Relationship between these functions.

Network Reliability Evaluation Using Probability Distributions: Reliability Evaluation of Series systems, Parallel systems – Partially redundant systems- determination of reliabilitymeasure-MTTF for series and parallel systems– Examples.

UNIT–IV

Discrete Mark ovChains: Basic concepts-Stochastic transitional probability matrix- time dependent probability evaluation-Limiting State Probability evaluation- Absorbing states– Examples.

Continuous Markov Processes: Modeling concepts- State space diagrams- Unreliability evaluation of single and two component repairable systems

UNIT–V

Frequency and Duration Techniques: Frequency and duration concepts, application to multistate problems, Frequency balance approach.

Approximate System Reliability Evaluation: Series systems– Parallel systems- Network reduction techniques- Cutset approach-Common mode failures modeling and evaluationtechniques-Examples.

TEXT BOOKS:

1. Roy Billinton and Ronald NAllan,Reliability Evaluation of

Engineering Systems,PlenumPress,1983.
2. E.Balagurusamy, Reliability Engineering by TataMcGraw-HillPublishing Company Limited,2002.

REFERENCE BOOK:

1.K.K.Agarwal,ReliabilityEngineering-
KluwerAcademicPublishers,1993.

ME4232OE:INDUSTRIAL MANAGEMENT

(Open Elective- III)

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
ME4232OE	**Open Elective- III**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course objectives:

- Understandthephilosophiesofmanagementgurus
- Understand the various types of organization structures and their features, and theiradvantagesanddisadvantages.
- LearningvariousIndustrialEngineeringPracticeslikeOperation sManagementtechniques, work study, statistical quality control techniques, Job evaluation techniquesandnetworkanalysistechniques.

Course outcomes:

- Abletoapplyprinciplesofmanagement
- Abletodesigntheorganizationstructure
- Abletoapplytechniquesforplantlocation,designplantlayoutand valueanalysis
- Abletocarryoutworkstudytofindthebestmethodfordoingthewor kandestablishstandardtimeforagivenmethod
- Abletoapplyvariousqualitycontroltechniquesandsamplingplans
- Abletodojobevaluationandnetworkanalysis.

UNIT.I Introduction to Management: Entrepreneurship and organization- Nature and Importance of Management, Functions of Management, Taylor's Scientific Management Theory, Fayol'sPrinciples of Management, Maslow's Theory of Human Needs, Douglas McGregor's Theory X andTheoryY,Herzberg'sTwo-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management

UNIT.II

Designing Organizational Structures: Departmentalization and Decentralization, Types of Organization structures- Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundaryless organization, inverted pyramid structure, lean and flat organization structure and their merits, demerits and suitability.

UNIT.III

Operations Management:Objectives- product design process-Processs election-Types of production system (Job, batch and Mass Production), Plant location- factors- Urban- Ruralsites comparison- Types of Plant Layouts- Design of product layout-Line balancing (RPW method)Value analysis- Definition-types of values- Objectives-Phases of value analysis-Fast diagram

UNIT.IV:

Work Study: Introduction- definition- objectives- steps in work study- Method study- definition, objectives-steps of method study. Work Measurement- purpose-types of study- Stop watch methods-steps- key rating- allowances- standard time calculations-work sampling.

Statistical Quality Control: variables-attributes, Shewart control charts for variables- chart, Rchart, - Attributes- Defective-Defect-Charts for attributes- p-chart -c chart (simple Problems),Acceptance Sampling- Single sampling-Double sampling plans- OCcurves.

UNIT.V

Job Evaluation: Methods of job evaluation - simple routing objective systems - classificationmethod factor comparison method, point method, benefits of job evaluation and limitations. Project Management(PERT/CPM): Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project with in given time, Project Cost Analysis, Project Crashing .(Simple problems)

TEXT BOOKS:

1. Industrial Engineering and Management/ O.P.Khanna/ Khanna Publishers.
2. Industrial Engineering and Management Science/T.R. Banga and S.C.Sarma/KhannaPublishers.

REFERENCE BOOKS:

1. MotionandTimeStudybyRalphMBarnes!JohnWilley&SonsWorkStudybylLO.
2. HumanfactorsinEngineering&Design/ErnestJMcCormick/TMH.
3. Production&OperationManagement/PaneerSelvam/PHI.
4. IndustrialEngineeringManagement/NVSRaju/CengageLearning.
5. IndustrialEngineeringHandBook/Maynard.
6. IndustrialEngineering ManagementI Ravi Shankar/Galgotia.

ME4233OE:RENEWABLE ENERGY SOURCES

(Open Elective- III)

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
ME4233OE	**Open Elective- III**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:								

Course Objectives:

- To explain the concepts of Non-renewable and renewable energy systems
- To outline utilization of renewable energy sources for both domestic and industrial applications
- To analyse the environmental and cost economics of renewable energy sources in comparison with fossil fuels.

Course Outcomes:

- Understanding of renewable energy sources
- Knowledge of working principle of various energy systems
- Capability to carryout basic design of renewable energy systems

UNIT.I

Global and National Energy Scenario: Over view of conventional & renewable energy sources,need & development of renewable energy sources, types of renewable energy systems, Future ofEnergyUse, Global and IndianEnergy scenario,Renewable and Non-renewableEnergy sources,Energy for sustainable development, Potential of renewable energy sources, renewable electricityand key elements, Global climate change, CO2 reduction potential of renewable energy- conceptof Hybrid systems.

UNIT.II

Solar Energy: Solar energy system, Solar Radiation, Availability, Measurement and Estimation,Solar Thermal Conversion Devices

and Storage, Applications Solar Photovoltaic Conversion solar photo voltaic,solar thermal,applications of solar energy systems.

UNIT.III

WindEnergy: Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of the wind, power in the wind, factors influencing wind, wind data and energy estimation, wind speed monitoring, classification of wind, characteristics, applications of wind turbines, offshore wind energy- Hybrid systems, wind resource assessment, Betz limit, site selection, wind energy conversion devices. Safety and environmental aspects, wind energy potential and installation in India.

UNIT.IV

Biogas:Properties of biogas (Calorific valueand composition), biogas plant technology and status, Bioenergy 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.

UNIT.V

Ocean Energy: Ocean wave energy conversion, principle of Ocean Thermal Energy Conversion(OTEC), ocean thermal power plants, tidal energy conversion, Tidal and wave energy its scope and development, Scheme of development of tidal energy.

Small hydro Power Plant: Importance of small hydro power plants and their Elements, types of turbines for small hydro, estimation fprimary and secondary power.

Geothermal Energy:Geothermal power plants, types of Geothermal resources, hot springs and steamejection.

TEXT BOOKS:

1. Renewable Energy Sources /Twidell, J.W.andWeir, A./EFNSponLtd., 1986.
2. Non-Conventional Energy Sources /G.DRai /Khanna Publishers

REFERENCE BOOKS:

1. Kishore VVN, Renewable Energy Engineering and Technology, TeriPress,NewDelhi,2012
2. GodfreyBoyle,Renewable Energy, Power for a SustainableFuture, Oxford University Press,U.K,1996.
3. Non-ConventionalEnergyResourcesbyEHKhan

CE4231OE:REMOTE SENSING AND GIS

(OpenElective-III)

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
	Open	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CE4231OE	**Elective- III**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:	**Surveying**							

Course Objectives: This course will make the student to understand about the principles of GIS,Remote Sensing, SpatialSystems,and its applicationsto EngineeringProblems.

CourseOutcomes: At the end of the course, the student will be able to:

- Retrieve the information content of remotely sensed data
- Analyze the energy interactions in the atmosphere and earth surface features
- Interpret the images for preparation of thematicmaps
- Apply problem specific remote sensing data for engineering applications
- Analyze spatial and attribute data for solving spatial problems
- Create GIS and cartographic outputs for presentation

UNIT– I

Introduction to Photo grammetry: Principles& types of aerial photograph, geometry of verticalaerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamental sofstereoscopy, fiducial points, parallax measurement usingfiducial line.

UNIT– II

Remote Sensing: Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process. Electro-magnetic Spectrum, Energy interactions with atmosphere and with earth surfacefeatures (soil,water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques.

UNIT– III

Geographic Information Systems: Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial DataInput-Attribute data Management–Data display-Data Exploration-Data Analysis. COORDINATE SYSTEMS: Geographic Coordinate System: Approximation of the Earth, Datum; Map Projections: Types of Map Projections-Map projection parameters- Commonly used Map Projections -Projected coordinate Systems.

UNIT– IV

Vector Data Model: Representation of simple features- Topology and its importance; coverageand its data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geobase data model; Geometric representation of Spatial Feature and data structure, Topology rules

UNIT– V

Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure,Data Conversion, Integration of Raster and Vector data.

Data Input: Metadata, Conversion of Existing data, creating new data; Remote Sensing data,Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing

TEXTBOOKS:

1. Remote Sensing and GISLilles and andKiefer, JohnWilley2008.
2. Remote SensingandGISB.BhattabyOxfordPublishers2015.
3. IntroductiontoGeographicInformationSystem–Kang-TsungChang,McGraw-Hill2015

REFERENCES:

1. Concepts&TechniquesofGISbyC.P.LoAlbert,K.W.Yonng,PrenticeHall(India)Publications.
2. PrincipalsofGeophysicalInformationSystems–PeterABurraghandRachaelA.McDonnell,Oxford Publishers 2004.
3. BasicsofRemotesensing&GISbyS.Kumar,LaxmiPublications.

CE4232OE:DISASTER MANAGEMENT

(OpenElective-III)

IV-II:CSE(AI&ML)								
Course Code	**Category**	**Hours/Weak**			**Credits**	**Max Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CE4232OE	**Open Elective- III**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Contact Classes:45	**Tutorial classes:15**	**Practical classes: Nill**				**Total Classes:60**		
Prerequisites:	**Surveying**							

Course Objectives: The subject provides different disasters, tools and methods for disaster management.

CourseOutcomes: At the end of the course, the student will be able to:

- Understanding Disasters, man-made Hazardsand Vulnerabilities
- Understanding disaster management mechanism
- Understanding capacity building concepts and planning of disaster managements

UNIT-I

Understanding Disaster: Concept of Disaster - Different approaches- Concept of Risk - LevelsofDisasters –Disaster Phenomenaand Events (Global,national and regional)

Hazards and Vulnerabilities: Natural and man-made hazards; response time, frequency and forewarning levels of different hazards - Characteristics and damage potential or natural hazards;hazard assessment - Dimensions of vulnerability factors; vulnerability assessment – Vulnerability and disaster risk - Vulnerabilities to flood and earth quakehazards

UNIT-II

Disaster Management Mechanism: Concepts of risk management and crisis managements -Disaster Management Cycle- Response and Recovery - Development, Prevention, Mitigation and Preparedness- Planning for Relief

UNIT-III

Capacity Building: Capacity Building: Concept-Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management- Legislative Support atthe state and national levels

UNIT-IV

Coping with Disaster:Coping Strategies; alternative adjustment processes– Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits – Mass media and disaster management.

UNIT-V

Planning for disaster management: Strategies for disaster management planning - Steps forformulating a disaster risk reduction plan - Disaster management Act and Policy in India -Organizational structure for disaster management in India- Preparation of state and district disaster management plans

TEXTBOOKS:

1. Manualon Disaster Management, National Disaster Management, Agency Govtof India.
2. Disaster Management by MrinaliniPandeyWiley2014.
3. Disaster Science and Management by T.Bhattacharya, McGrawHill Education (India)PvtLtd Wiley2015

REFERENCES:

1. EarthandAtmosphericDisastersManagement,N.Pandharinath,CKRajan,BSPublications2009.
2. NationalDisasterManagementPlan,MinistryofHomeaffairs,GovernmentofIndia(http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)