R22 COURSE STRUCTURE - III & IV Year SEM I & II

III YEAR I-SEMESTER

Sl. No	Course Code	Course Title	Category	L	T	P	C
1	22CS3111	Design and Analysis of Algorithms	PC	3	-	-	3
2	22AM3112	Machine Learning	PC	3	-	-	3
3	22CS3112	Computer Networks	PC	3	-	-	3
4	22MB3113	Business Economics & Financial Analysis	HS	3	-	-	3
5	**Professional Elective – I**			3	-	-	3
	22AM3171	Graph Theory	PE				
	22AM3172	Introduction to Data Science	PE				
	22IT3172	Data Analytics	PE				
	22AM3173	Image Processing	PE				
	PRACTICAL						
6	22AM3151	Machine Learning Lab	PC	-	-	3	1.5
7	22AM3152	Computer Networks Lab	PC	-	-	3	1.5
8	22HS3151	Advanced English Communication Skills lab	BS	-	-	2	1
9	22AM3153	Skill Development Course (UI design - Flutter)	PC	-	-	2	1
10	22MC0005	Intellectual Property Rights	MC	3	-	-	0
	Total			**18**	**0**	**10**	**20**

III YEAR II- SEMESTER

Sl.No	Course Code	Course Title	Category	L	T	P	C
1	22AM3211	Cryptography and Network Security	PC	3	-	-	3
2	22AM3212	Web Technologies	PC	3	-	-	3
3	22AM3213	Neural Networks and Deep Learning	PC	3	-	-	3
4	**Professional Elective – II**			3	-	-	3
	22AM3271	Cloud Computing	PE				
	22AM3272	Pattern Recognition	PE				
	22AM3273	Computer Vision and Robotics	PE				
	22AM3274	Data Warehousing and Business Intelligence	PE				
5		**Open Elective – I**	OE	3	-	-	3
	PRACTICAL						
6	22AM3251	Deep Learning Lab	PC	-	-	3	1.5
7	22AM3252	Web Technologies Lab	PC	-	-	3	1.5
8	22AM3281	Industry Oriented Mini Project	PW	-	-	4	2
9	22MC0002	Environmental Science	MC	3	-	-	0
	Total			**18**	**0**	**10**	**20**

 * **Environmental Science in III Yr II Sem Should be Registered by Lateral Entry Students Only.**

 *MC-Satisfactory/Unsatisfactory

III YEAR – SEM-I

22CS3111-DESIGN AND ANALYSIS OF ALGORITHMS

B.Tech III year I Sem   **L T P C**
                                                                          3 0 0 3

Prerequisites:

- A course on "C Programming"
- A course on "Data Structures"

Course Objectives:

- To analyse performance of algorithms
- To understand and choose the appropriate algorithm design technique for a specified application
- To solve problems using algorithm design techniques such as the greedy method, divide and conquer, dynamic programming, backtracking and branch and bound.
- To analyse the impact of algorithm design techniques on each application solved
- To introduce and understand P and NP classes

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

- Analyse the different algorithm design techniques for a given problem.
- Design algorithms for various computing problems.
- Argue the correctness of algorithms using inductive proofs and invariants.
- Analyze the limitations of algorithms.
- Explain about coping with the limitations of algorithms.

UNIT - I
Notation of an Algorithm: Fundamentals of Algorithmic Problem Solving, Fundamentals of the Analysis of Algorithm Efficiency–Order Notations and its properties, Mathematical analysis for Recursive -Towers of Hanoi and Non-recursive algorithms
Divide and conquer- General method-Control abstraction, Solving Recurrence Relation using Substitution method and Master's Theorem, applications - Binary search, Merge sort, Quick sort, Strassen's Matrix Multiplication, Finding Maximum and Minimum element.

UNIT - II

Greedy Method- General method-Control abstraction, applications- Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest path problem.

UNIT - III
Dynamic Programming: General Method, applications-Multi Stage Graphs, Chained matrix multiplication, All pairs shortest path problem, Optimal binary search trees, 0/1 knapsack problem, Reliability design, Traveling sales person problem.

UNIT - IV
Backtracking: General method-Control abstraction, applications-The 8-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

UNIT-V
Branch and Bound: General Method-Control abstraction, applications-15-Puzzle Problem - LC search,0/1 Knapsack problem-LC Branch and Bound solution, FIFO Branch and Bound solution, Travelling sales person problem.
NP-Hard and NP-Complete problems: Basic concepts, Non-deterministic algorithms, NP – Hard and NP- Complete classes, Cook's theorem- proof of reduction.

TEXT BOOKS:
1. Ellis Horowitz, SatrajSahni and S Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publishers
2. M.T. Goodrich, Robert Tamassia, Algorithm design: Foundations, Analysis and Internet examples,Wiley student Edn, John Wiley &sons.
3. Parag Himanshu Dave,Himanshu Bhalchandra Dave, Design and Analysis algorithms PearsonPublication.

REFERENCES:
1. Allen Weiss, Data structures and Algorithm Analysis in C++, 2nd Edn, Pearson Education
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education.

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22AM3112: MACHINE LEARNING

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B. Tech III Year I Sem.   **L T P C**
                                                                                                          3 - - 3

   Prerequisites:

- Statistics
- Linear Algebra
- Calculus
- Probability
- Programming Languages and data structures.

Course Objectives: The course will explain
- The basic theory underlying machine learning.
- Machine learning problems corresponding to different applications.
- A range of machine learning algorithms along with their strengths and weaknesses.
- Machine learning algorithms to solve problems of moderate complexity.
- The algorithms to a real-world problem, optimize the models learned and report on theexpected accuracy that can be achieved by applying the models.

Course Outcomes: At the end of the course, the student will be able to
- Appreciate the importance of visualization in the data analytics solution.
- Apply structured thinking to unstructured problems.
- Understand a very broad collection of machine learning algorithms and problems.
- Learn algorithmic topics of machine learning and mathematically deep enough to introducethe required theory.
- Develop an appreciation for what is involved in learning from data**.**

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, Gradient Descent Algorithm and its variants,bias and variance.

UNIT–II
Supervised Learning- Regression: Linear-Simple, Multiple, Logistic Regression.
Classification- Naive Bayes Classifier, k-NN classifier, Support Vector Machines - Linear, NonLinear
Decision Trees-ID3 (Iterative Dichotomiser3), CART (Classification andRegression Tree)

UNIT–III
Decision Trees- C4.5, CHAID (Chi-Square Automatic Interaction Detection), Random Forest Algorithm, Ensemble Learning-Bagging, Boosting, Cross validation Techniques.

Unsupervised Learning-Clustering: Measures of distance, k-means, Gaussian Mixture Model ,Clustering, Hierarchical Learning- Divisive, Agglomerative Clustering

UNIT-IV

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

Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization

UNIT-V

Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms

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

TEXT BOOKS:

1. Machine Learning –Tom M. Mitchell,-MGH.
2. Introduction to Machine Learning with Python, **Author –** Andreas C. Müller, Sarah Guido, **Edition –** First Edition, **Publisher –** O'Reilly Media, Inc.
3. Stephen Marsland, ―Machine Learning ― An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

REFERENCE BOOKS:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.
2. Mathematics for Machine learning, **Author –** Marc Peter Deisenroth, **Edition –** First Edition, **Publisher –** Cambridge University Press.

22CS3112-COMPUTER NETWORKS

B.Tech III year I Sem   L   T   P   C
                                             3   0   0   3

Prerequisites:
- A course on "C Programming"
- A course on "Data Structures"

Course Objectives:
- To introduce various types of networks
- To Study data link layer concepts, design issues, and protocols.
- Familiarize the working mechanism of network layer
- Understanding of transport layer concepts and protocol design
- To explore the concepts of DNS, Email, WWW and various network protocols

Course Outcomes: After the completion of the course student will be able to
- Understand the fundamentals of computer networks, their types, transmission modes, and different reference models.
- Apply error-free transmission of data and analyze data collision with various protocols
- Able to apply various routing and congestion control algorithms over a network.
- Understand the concepts of TCP and UDP, congestion control, QOS.
- Apply the different types of protocols in application layer.

UNIT - I
Introduction: Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.
Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.

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-free channel, 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 protocol using Selective Repeat.
Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols

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 (IPv4 and IPv6).

UNIT – IV
Transport Layer: Transport Services, Elements of Transport protocols, Congestion Control, Connection management, TCP and UDP protocols.

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

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

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

22MB3113: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

B. Tech III Year I Semester

	L	T	P	C
	3	-	-	3

Course Objectives:

- To understand the concepts of business economics, objectives, scope, role & responsibilities of a manager of a business undertaking
- To analyze the market dynamics namely demand, elasticity of demand, demand forecasting and supply
- To gain the knowledge on the production theories and cost analysis while dealing with the production
- To explain the process & principles of accounting and to maintain Journal, Ledger, Trial Balance.
- To acquire the basics of how to analyze and interpret the financial statements through ratio analysis.

Course Outcomes: At the end of this course, students will demonstrates the ability to

- Determine the objectives, role & responsibilities of a manager of a business undertaking.
- Understand the demand for a product of a company, to analyze various factors influencing
  demand elasticity and forecast & compute the future sales level of a product.
- Examine optimum production & cost functions with the help of mathematical equations, Assess the cost behaviour, costs useful for managerial decision making.
- Apply the principle of double entry to the maintenance of books of records and explain the significance and objectives of trial balance and final accounts.
- Analyze, interpret & comment on the financial statements of a business enterprise by using ratios analysis

UNIT – I
Introduction to Business and Economics:
Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Sources of Capital for a Company, Non-Conventional Sources of Finance.
Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT – II
Demand and Supply Analysis:

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT- III

Production, Cost, Market Structures & Pricing:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, and Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, and Cost Volume Profit Analysis.

UNIT - IV

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts (Simple Problems).

UNIT – V

Financial Ratios Analysis : Concept of Ratio Analysis, Importance and Types of Ratios, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems).

TEXT BOOKS:

1. D. D. Chaturvedi, S. L. Gupta, "Business Economics - Theory and Applications", International Book House Pvt. Ltd. 2013.

2. Dhanesh K Khatri, "Financial Accounting", Tata McGraw Hill, 2011.

3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, "Managerial Economics", 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

REFERENCES:

1. Paresh Shah, "Financial Accounting for Management" 2e, Oxford Press, 2015.

2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, "Financial Accounting", 5e, Vikas Publications, 2013.

22AM3171: GRAPH THEORY
(Professional Elective – I)

B. Tech III Year I Sem.   **L T P C**
                                                                     3 - - 3

Pre-requisites: An understanding of Mathematics in general is sufficient.

Course Objectives: The objective of this course is to

- Understand and apply the fundamental concepts in graph theory
- Apply graph theory based tools in solving practical problems
- Have an idea of matching in graphs and study some applications of matching in day to day life problems.
- Understand the concept of digraphs, Euler digraphs and Hamiltonian digraphs
- Develop the under-standing of Geometric duals in Planar Graphs.

Course Outcomes: **At the end of course, students will be able to**
- Know some important classes of graph theoretic problems;
- Formulate and prove central theorems about trees, matching, connectivity, coloring and planar graphs;
- Describe and apply some basic algorithms for graphs;
- Use graph theory as a modeling tool.
- Define basic concepts of graphs, directed graphs and weighted graphs

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, Kircho-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, Konig'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.

22AM3172: INTRODUCTION TO DATA SCIENCE
(Professional Elective – I)

B. Tech III Year I Sem.   **L T P C**
                                                                         3 - - 3

Prerequisites:
- Knowledge on Probability and Statistics.
- Knowledge on Programming languages such as C, Python.

Course Objectives: The objective of this course is to:
- Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration.
- Apply various data science techniques relating to pre-processing, exploring and visualizing data.
- Understand the basic types of data and basics of R programming.
- Identify the importance of data reduction and data visualization techniques.
- Apply statistical and predictive analytical methods to deal with the real time data.

Course Outcomes: After completion of the course, the student should be able to:
- Understand basic terms what Statistical Inference means.
- Identify probability distributions commonly used as foundations for statistical modelling. Fit a model to data
- Describe the data using various statistical measures.
- Utilize R elements for data handling
- Perform data reduction and apply visualization techniques.

UNIT - I
Introduction: Definition of Data Science- Big Data and Data Science hype – and getting past the hype- Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting. **Basics of R:** Introduction, R-Environment Setup, Programming with R, Basic Data Types.

UNIT - II
Data Types & Statistical Description
Types of Data: Attributes and Measurement, What is an Attribute? The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes. Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Inter- quartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

UNIT - III
Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting, **Matrices:** Creating and Naming Matrices, Matrix Sub setting, Arrays, Class. **Factors and Data Frames:** Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.
Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating ListElements, Merging Lists, Converting Lists to Vectors

UNIT - IV

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements. **Iterative Programming in R:** Introduction, While Loop, For Loop, Looping Over List. **Functions in R:** Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functionsin R.

UNIT - V

Data Reduction: Overview of Data Reduction Strategies, Wavelet Transforms, Principal ComponentsAnalysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation.

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. Doing Data Science, Straight Talk from the Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly,2014
2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd edition.The Morgan Kaufmann Series in Data Management Systems.
3. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

REFERENCE BOOKS:
1. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, PearsonEducation.
2. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
3. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
4. Paul Teetor, "R Cookbook", O'Reilly, 20

22IT3172: DATA ANALYTICS
(Professional Elective-I)

B.Tech. III Year I Sem. **L T P C**
3 0 0 3

Prerequisites

- Data Base Management Systems, Computer Oriented Statistical Methods

Course Objectives

1. To explore the fundamental concepts of data analytics and understand various Data Sources
2. Understand several key big data technologies used for storage, analysis and manipulation ofdata.
3. To learn the principles and methods of statistical analysis.
4. Understand Regression, supervised algorithms to perform data analytics.
5. Understand various visualization techniques.

Course Outcomes

1. Identify the various sources of Big Data.
2. Understand big data technologies and the impact of data analytics for business decisions and strategy.
3. Apply and analyze various regression techniques.
4. Outline various Time series methods to discover interesting patterns
5. To carry out standard data visualization and formal inference procedures

UNIT - 1

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Exploratory data analysis, Data pre-processing, Missing Values - Outlier Detection and Treatment.

UNIT- 2

Introduction to Tools and Environment:, Application of Modeling in Business, Databases & Types of data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling. Introduction to HADOOP: Big Data, HDFS, Apache Hadoop, MapReduce.

UNIT - 3

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, Modeling Process – Training model – Validating model – Predicting new observations. Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIT - 4

Object Segmentation: Regression Vs Segmentation-Supervised and Unsupervised Learning, Tree Building – Regression, Classification, over fitting, Pruning and Complexity.

Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Data Serialization, Data Extraction and Analyze for prediction

UNIT - 5

Data Visualization: Introduction to Data Visualization, Data visualization options, Data visualization Techniques, Visualizing Complex Data and Relations, Filters – Dashboard development tools.

TEXT BOOKS:

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

REFERENCES:

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 Labs Jeffrey D Ullman Stanford Univ.
4. Michael Minelli, Michele Chambers, AmbigaDhiraj ,―Big Data, Big Analytics: EmergingBusiness Intelligence and Analytic Trends‖, John Wiley & Sons, 2013.
5. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and itsApplications", John Wiley & Sons, 2014

22AM3173: IMAGE PROCESSING

(Professional Elective – I)

B. Tech III Year I Sem.   **L T P C**

                                                                                                   3 - - 3

Prerequisites

- A course on "Linear algebra".
- A course on "Probability theory".
- A course on "Computational Mathematics".
- A course on "Computer Oriented Statistical Methods".

COURSE OBJECTIVES: The objective of this course is to:

- Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts
- Provides the knowledge of image acquisition, sampling and quantization.
- Preprocessing and enhancement.
- Image restoration, and segmentation.
- Knowledge of different image compression techniques.

COURSE OUTCOMES: At the end of the course, student will be able to:

- Understand the theoretical and mathematical foundations of Digital Image Processing.
- Explain different image acquisition, sampling and quantization methods.
- Perform Preprocessing and image enhancement operations on given images.
- Apply different Image restoration, and segmentation techniques
- Perform different image 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, LeastMean 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 CompressionModels, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

TEXT BOOKS:

1. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/ Pearson nd Education, 2 Ed, 2004.
2. Fundamentals of Digital Image Processing: A. K. Jain, PHI.

REFERENCE BOOKS:

1. Digital Image Processing using MAT LAB: Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins: Pearson Education India, 2004.
2. Digital Image Processing: William K. Pratt, John Wilely, 3rd Edition, 2004.
3. Image Processing, Analysis and Machine Vision, Second Edition, Milan Sonka, aclav Hlavac and Roger Boyle, Cengage learning.

22AM3151: MACHINE LEARNING LAB

B. Tech III Year I Semester

L	T	P	C
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Course Objective: The objective of this lab is to get an overview of the various machine learning techniques and can able to demonstrate those 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;
- Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;
- Be capable of performing experiments in Machine Learning using real-world data.

List of Experiments

1. Implement linear regression using python.
2. Implement logistic regression using python.
3. Implement Decision Trees using python
4. Implement Naïve Bayes Classifier using python
5. Implement k-nearest neighbors classifier using python
6. Implement Support Vector Machine classifier using python
7. Implement K Means clustering using python
8. Implement the finite words classification system using Back-propagation algorithm

Note: Implement the above experiments using suitable datasets from kaggle

TEXT BOOKS:
1. Machine Learning –Tom M. Mitchell,-MGH, 2020.
2. Introduction to Machine Learning with Python, **Author –** Andreas C. Müller, Sarah Guido,
   Edition – First Edition, **Publisher –** O'Reilly Media, Inc, 2016.

REFERENCE BOOKS:
1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor &Francis.
2. Mathematics for Machine learning, **Author –** Marc Peter Deisenroth, **Edition –** FirstEdition, **Publisher –** Cambridge University Press.

22AM3152: COMPUTER NETWORKS LAB

B.Tech III year I SEM

L T P C
0 0 3 1.5

Prerequisites: A course on "Programming for problem solving"
A course on "Data Structures"

Course Objectives
- To understand the working principle of various communication protocols.
- To analyze the traffic flow and the contents of protocol frames
- To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development

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
- Ability to translate end-user requirements into system and software requirements specification document.
- Ability to create dataflow diagrams.
- Ability to create software application design using UML Diagrams

List of Experiments:
1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
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 window protocol, 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. Write a program for congestion control using Leaky bucket algorithm.
8. Write a program for frame sorting technique used in buffers.
9. Programs for IP address conversion function
10. Write a client-server application for chat using UDP
    i. Wire shark
   ii. Packet Capture Using Wire shark
  iii. Starting Wire shark
   iv. Viewing Captured Traffic
    v. Analysis and Statistics & Filters

22HS3151: ADVANCED ENGLISH COMMUNICATION SKILLS LAB

L T P C

B.Tech III year I SEM **- - 2 1**

Course Objectives
This lab focuses on using Multi-media instruction as well as stimulating peer group activities for language development to meet the following targets:
1. To improve students fluency in spoken English.
2. To enable them to listen to English spoken at normal conversational speed.
3. To help students develop their vocabulary.
4. To read and comprehend texts in different contexts.
5. To communicate their ideas relevantly and coherently in writing.

Course Outcomes: Students will be able to
1. Acquire vocabulary and Grammar and use them contextually.
2. Listen and speak effectively, and present themselves effectively.
3. Develop proficiency in academic reading and writing.
4. Communicate confidently in formal and informal contexts.
5. Increase their job opportunities.

Syllabus
The following course activities will be conducted as part of the *Advanced English Communication Skills (AECS) Lab:*

Unit I
Vocabulary and Grammar: Vocabulary Building – Word Formation: Prefixes and Suffixes - Synonyms, and Antonyms, One-word Substitutes, Idioms, Phrases, Collocations, and Compound Words.
Grammar – Articles, Prepositions, Tenses, Subject-Verb Agreement, Voice and Speech-Spotting Errors - Correction of Sentences,

Unit II
Advanced Reading Comprehension: Argumentative Analysis of (with reference to) GRE, TOEFL, IELTS – Jumbled Sentences and Sentence Completion.

Unit III
Writing Skills– Structure and Different Types of Writings – Argumentative Writing – Letter Writing - Resume Writing - Technical Report Writing
Creating and Using LinkedIn Profile - Netiquette **-** Statement of Purpose (SOP) - Letter of Recommendation

Unit IV
Presentation Skills -_Oral Presentations (Group/Individual) and Written Presentations – PPTs/ Posters (Virtual/Offline) – Projects, Reports and Assignments - Introducing Oneself Virtually (Making a Video on Oneself and Analyzing it critically).

Unit V

Group Dynamics & Interviews: Group Discussion - Dos and Don'ts - Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas – Debate: Concept and Process - Difference between Group Discussions and Debates-Rubrics of Evaluation - Interviews and Types of Interviews - Pre-interview Planning, Opening Strategies, Answering Strategies - Introducing Self - Oral Interviews (face-to-face) –Virtual Interviews - Mock Interviews - Handling Technical Glitches.

References

- Kumar, Sanjay and Pushp Lata. *English for Effective Communication*, Oxford University Press, 2015.
- Konal, Nira. *English Language Laboratories- A Comprehensive Manual*, PHI Learning Pvt. Ltd. 2011.
- *The Official Guide to the GRE General Test*. Tamil Nadu: McGra Hills Education (India) 3rd Edition, 2017.

22AM3153: Skill Development Course (UI design- Flutter)

B. Tech III Year I Sem.   **L T P C**

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Prerequisites:
- Basic programming experience (e.g., Java, Python).
- Familiarity with object-oriented programming concepts.

Course Objectives:
- Learns to Implement Flutter Widgets and Layouts
- Understands Responsive UI Design and with Navigation in Flutter
- Knowledge on Widgets and customize widgets for specific UI elements, Themes
- Understand to include animation apart from fetching data

Course Outcomes:
- Implements Flutter Widgets and Layouts
- Responsive UI Design and with Navigation in Flutter
- Create custom widgets for specific UI elements and also apply styling using themes and custom styles.
- Design a form with various input fields, along with validation and error handling
- Fetches data and write code for unit Test for UI components and also animation

List of Experiments: Students need to implement the following experiments

1. a) Install Flutter and Dart SDK.
   b) Write a simple Dart program to understand the language basics.

2. a) Explore various Flutter widgets (Text, Image, Container, etc.).
   b) Implement different layout structures using Row, Column, and Stack widgets.

3. a) Design a responsive UI that adapts to different screen sizes.
   b) Implement media queries and breakpoints for responsiveness.

4. a) Set up navigation between different screens using Navigator.
   b) Implement navigation with named routes.

5. a) Learn about stateful and stateless widgets.
   b) Implement state management using set State and Provider.

6. a) Create custom widgets for specific UI elements.
   b) Apply styling using themes and custom styles.

7. a) Design a form with various input fields.
    b) Implement form validation and error handling.

8. a) Add animations to UI elements using Flutter's animation framework.
    b) Experiment with different types of animations (fade, slide, etc.).

9. a) Fetch data from a REST API.
    b) Display the fetched data in a meaningful way in the UI.

10. a) Write unit tests for UI components.
    b) Use Flutter's debugging tools to identify and fix issues.

TEXT BOOK:

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App
    Development, 1st edition, Wrox publisher.

REFERENCE BOOKS:

1. Flutter for Beginners: An introductory guide to building cross-platform
    mobile applications with Flutter and Dart 2, Packt Publishing Limited.
2. Rap Payne, Beginning App Development with Flutter: Create Cross-Platform
    Mobile Apps, 1st edition, Apress.
3. Frank Zammetti, Practical Flutter: Improve your Mobile Development
    with Google's Latest Open-Source SDK, 1st edition, Apress.

22MC0005: INTELLECTUAL PROPERTY RIGHTS

B. Tech III Year I Sem   **L T P C**

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Course Objectives:

1 Significance of intellectual property and its protection

2 Introduce various forms of intellectual property

Course Outcomes:
1. Distinguish and explain various forms of IPRs.
2. Identify criteria to fit one's own intellectual work in particular form of IPRs.
3. Apply statutory provisions to protect particular form of IPRs.
4. Appraise new developments in IPR laws at national and international level

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 copyrights: Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, International copyright law.

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

UNIT – IV

Trade Secrets: Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V

New development of intellectual property: new developments in trade mark law; copyright law, patent law, intellectual property audits.
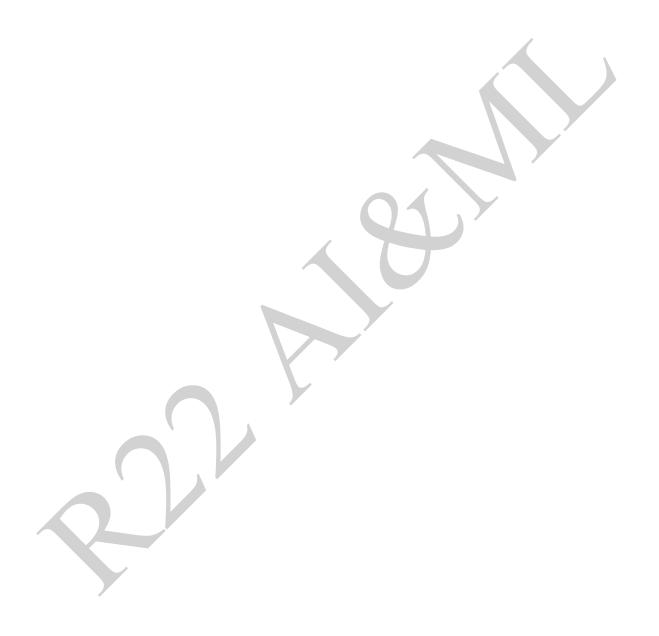
International overview on intellectual property, international – trade mark law, copyright law, international patent law, and international development in trade secrets law.

TEXT BOOK:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

REFERENCE BOOK:

1. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

III YEAR – SEM-II

22AM3211: CRYPTOGRAPHY AND NETWORK SECURITY

B. Tech III Year II Sem.   **L T P C**
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Course Objectives:

- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection

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.
- Discuss the fundamental ideas of public-key cryptography
- Discuss Web security and Firewalls

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, WileyIndia, 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.

22AM3212: WEB TECHNOLOGIES

B. Tech III Year II Sem. L T P C

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Course Objectives
- To introduce Client-side scripting with Java script and AJAX.
- To introduce PHP language for server-side scripting
- To introduce XML and processing of XML Data with Java
- To introduce Server-side programming with Java Servlets
- To introduce Server-side Programming with JSP

Course Outcomes
- Understand basics of HTML and CSS and Design and Development of Dynamic Web Pages(using Validations) with Java Script and AJAX programming
- Understand Server-side Scripting with PHP language.
- Analyze what is XML and how to parse and use XML data with JAVA
- Develop Server side Application with Servlets (Sessions and Cookies).
- Create JSP pages with Database Server**.**

UNIT-I: HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets;
Client-side Scripting: Introduction to JavaScript, JavaScript language – declaring variables, scope ofvariables, functions, event handlers (onclick, on submit etc.), Document Object Model, Form validation.

UNIT-II: XML: XML: Introduction to XML, XML document structure, DTD, Namespaces andXML Schemas.
Web Application Frameworks: Introduction to AngularJS, ReactJS, NodeJS, JQuery.
Web Robot*:* Eg: WayBack Machine, PGF (http://sites.google.com/view/pgovernanceforum)
Cyber policing Case Study of CFGoT- FGoI

UNIT - III: Introduction to Servlets: Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Session tracking, Cookies and Sessions, connecting to a database using JDBC.

UNIT-IV: Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.

UNIT-V: Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, and lists etc., Handling File Uploads. Connecting to database (MySQL as reference),

executing simple queries, handling results, Handling sessions and cookies
File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc.on text and binary files, listing directories.

TEXT BOOKS:
1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill

REFERENCES:
1. Web Programming, building internet applications, Chris Bates 2″ edition, Wiley Dreamtech
2. Java Server Pages —Hans Bergsten, SPD O'Reilly,
3. Java Script, D. Flanagan
4. Beginning Web Programming-Jon Duckett WROX.
5. Programming World Wide Web, R.W. Sebesta, Fourth Edition, Pearson.
6. Internet and World Wide Web — How to program. Dietel and Nieto, Pearson.
7. B. Malathi, K. Pavan Johar, N. Santhoshi, N. Srihari Rao, K. Chandra Sekharaiah, "The Nuts and Bolts of the India-Abusive Fake Government of Telangana: Cyber policing Against Online Sedition", ICSCIS2020 Springer Procds. Pp.553-563.

22AM3213: NEURAL NETWORKS AND DEEP LEARNING

B. Tech III Year II Sem.   L T P C

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Prerequisites:
1. Discrete Mathematical Structures
2. Mathematical and Statistical Foundations
3. Python Programming
4. Machine Learning

Course Objectives: The main objective of this course is to make students comfortable with:

1. Tools and techniques required in handling large amounts of datasets
2. Various deep learning methods in Neural Networks.
3. Several libraries and datasets publicly available will be used to illustrate the application of these algorithms.
4. Developing skills required to gain experience of doing independent research and study.
5. Gaining the knowledge to apply Regularization and optimization strategies

Course Outcomes: At the end of the course student will be able to:
1. Understand, Apply, Analyze and Evaluate Supervised Learning Neural Networks on different datasets
2. Understand, Apply, Analyze and Evaluate UnSupevised Learning Neural Networks on different datasets
3. Understand, Apply, Analyze and Evaluate Deep Neural Networks on image
4. Understand, Apply, Analyze and Evaluate Regularization techniques on deep learning networks
5. Understand, Apply, Analyze and Evaluate Optimization techniques on deep learning networks

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
Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

Convolutional Networks: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features

UNIT-IV

Regularization for Deep Learning: Parameter norm 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 Prop and 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

TEXT BOOKS:

1. Deep Learning: An MIT Press Book By Ian Good fellow and Yoshua Bengio and Aaron Courville
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.

REFERENCE BOOKS:

1. Neural Networks and Deep Learning by Charu C. Aggarwal, 2018
2. Deep Learning- Ian Good Fellow, Yoshua Bengio. Aaron Courville

22AM3271: CLOUD COMPUTING
(Professional Elective- II)

B. Tech III Year II SEM

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Pre-requisites:
- A course on "Computer Networks"
- A course on "Operating Systems"

Course Objectives:
- To explain the evolving computer model called cloud computing.
- To understand the current trend and basics of cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.
- To learn cloud enabling technologies and its applications.

Course Outcomes: After the completion of the course student should be able to
- Understand various service delivery models of a cloud computing architecture.
- Understand the virtualization and cloud computing concepts.
- Understand cloud computing architecture and managing cloud infrastructure and its applications.
- Acquire knowledge on cloud service models.
- Acquire knowledge on 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, and 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, EMCIT, 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, Salesforce, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjrasoft, Aneka Platform.

TEXT BOOKS:

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

REFERENCES:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Brobergand 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 Kumara swamy, Shahed Latif, O'Reilly, SPD, rp201

22AM3272: PATTERN RECOGNITION

B.Tech. III Year II Sem.   **L T P C**

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Course Objectives:
1. To implement pattern recognition and machine learning theories
2. To design and implement certain important pattern recognition techniques
3. To apply the pattern recognition theories to applications of interest
4. To implement the entropy minimization, clustering transformation and feature ordering
5. To apply pattern recognition techniques in real time

Course Outcome:
1. Design systems and algorithms for pattern recognition (signal classification), with focus on sequences of patterns that are analyzed using, e.g., hidden Markov models (HMM).
2. Analyze classification problems probabilistically and estimate classifier performance.
3. Understand and analyze methods for automatic training of classification systems.
4. Apply Maximum-likelihood parameter estimation in relatively complex probabilistic models, such as mixture density models and hidden Markov models.
5. Understand the principles of Bayesian parameter estimation and apply them in relatively simple probabilistic models

UNIT-I
Introduction - Basic concepts, Applications, Fundamental problems in pattern Recognition system design, Design concepts and methodologies, Examples of Automatic Pattern recognition systems, Simple pattern recognition model, Decision and Distance Functions - Linear and generalized decision functions, Pattern space and weight space, Geometrical properties, implementations of decision functions, Minimum-distance pattern classifications.

UNIT-II
Probability-Probability of events, Random variables, Joint distributions and densities, Movements of random variables, Estimation of parameter from samples, Statistical Decision Making - Introduction, Baye's theorem, Multiple features, Conditionally independent features, Decision boundaries, Unequal cost of error, estimation of error rates, the leaving-one-out-techniques, characteristic curves, estimating the composition of populations. Baye's classifier for normal patterns.

UNIT-III
Non Parametric Decision Making - Introduction, histogram, kernel and window estimation, nearest neighbor classification techniques. Adaptive decision boundaries, adaptive discriminate functions, Minimum squared error discriminate functions, choosing a decision making techniques. Clustering and Partitioning - Hierarchical Clustering: Introduction, agglomerative clustering algorithm, the single-linkage, complete-linkage and Average-linkage algorithm. Ward's method Partition clustering-Forg's algorithm, K- means's algorithm, Isodata algorithm.

UNIT-IV
Pattern Preprocessing and Feature Selection: Introduction, distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection.

UNIT-V
Syntactic Pattern Recognition & Application Of Pattern Recognition: Introduction, concepts from formal language theory, formulation of syntactic pattern recognition problem, syntactic pattern description, recognition grammars, automata as pattern recognizers, Application of pattern recognition techniques in bio-metric, facial recognition, IRIS scan, Finger prints, etc.

Text Books:
1. Gose. Johnsonbaugh. Jost. "Pattern recognition and Image Analysis", PHI. Tou. Rafael. Gonzalez. "Pattern Recognition Principle", Pearson Education

Reference Books:
1. Richard duda, Hart., David Strok, "Pattern Classification", John Wiley

22AM3273: COMPUTER VISION AND ROBOTICS

(Professional Elective – II)

B.Tech. III Year II Sem.   **L T P C**

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Pre-Requisites:

1. Mathematics and Statistics
2. Data structures
3. Programming knowledge.
4. Image Processing.

Course Objective:

1. To introduce students the fundamentals of image formation;
2. To introduce students the major ideas, methods, and techniques of computer vision and patternrecognition;
3. To develop an appreciation for various issues in the design of computer vision and object recognitionsystems
4. To provide the student with programming experience from implementing computer vision and objectrecognition applications.
5. To Develop and Use software tools for visualizing robots

Course Outcomes:

1. Implement fundamental image processing techniques required for computer vision.
2. Implement boundary tracking techniques.
3. Apply chain codes and other region descriptors, Hough Transform for line, circle, and ellipsedetections.
4. Apply 3D vision techniques and Implement motion related techniques.
5. Develop applications using computer vision techniques.

UNIT - I
CAMERAS: Pinhole Cameras.
Radiometry – Measuring Light: Light in Space, Light Surfaces, Important Special Cases.
Sources, Shadows, and Shading: Qualitative Radiometry, Sources and Their Effects, Local ShadingModels, Application: Photometric Stereo, Interreflections: Global Shading Models.
Color: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color,Surface Color from Image Color.

UNIT - II
Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency andFourier Transforms, Sampling and Aliasing, Filters as Templates.
Edge Detection: Noise, Estimating Derivatives, **Detecting Edges Texture**: Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids,
Application: Synthesis by Sampling Local Models, Shape from Texture.

UNIT - III
The Geometry of Multiple Views: Two Views
Stereopsis: Reconstruction, Human Stereopsis, Binocular Fusion, Using More Cameras
Segmentation by Clustering: What Is Segmentation? Human Vision: Grouping and Getstalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation byClustering Pixels, Segmentation by Graph-Theoretic Clustering,

UNIT - IV
Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as aProbabilistic Inference Problem, Robustness
Segmentation and Fitting Using Probabilistic Methods: Missing Data Problems, Fitting, and Segmentation, the EM Algorithm in Practice.
Tracking with Linear Dynamic Models: Tracking as an Abstract Inference Problem, Linear DynamicModels, Kalman Filtering, Data Association, Applications and Examples

UNIT - V
Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and thePerspective Projection, Affine Cameras and Affine Projection Equations.
Geometric Camera Calibration: Least-Squares Parameter Estimation, A Linear Approach to CameraCalibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization.
Model-Based Vision: Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Application: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.

TEXTBOOKS:
1. David A. Forsyth and Jean Ponce: Computer Vision–A Modern Approach, PHI Learning (IndianEdition), 2009.
2. Computer Vision: Models, Learning, and Inference, **by Simon J. D. Prince**

REFERENCE BOOKS:
1. E.R.Davies: Computer and Machine Vision–Theory, Algorithms and Practicalities,Elsevier (Academic Press), 4th edition, 2013.
2. R.C. Gonzalez and R.E. Woods "Digital Image Processing" Addison Wesley 2008.
3. Richard Szeliski "Computer Vision: Algorithms and Applications" Springer-Verlag LondonLimited 2011.

22AM3274: DATA WAREHOUSING AND BUSINESS INTELLIGENCE
(Professional Elective – II)

B.Tech. III Year II Sem.   **L T P C**
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Course Objectives: The objective of this course is to:

- Introduce the concepts and components of Business Intelligence (BI)
- To introduce data warehousing, which consist on OLAP design concepts and multidimensional modeling.
- Extract, cleanse, consolidated, and transform heterogeneous data into a single enterprise data warehouse.
- Analyze data to generate information and knowledge that lead to informed decisions for businesses.
- Use Hadoop and related big data technologies such as Map Reduce, Pig, Hive, and Impala in the context of big data management and problem solving.

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

- Students will learn how the steps of the process of data warehousing to automate analytical processes that companies need for their business strategies
- The learner will be able to design and create a data warehouse from OLAP requirements.
- Use OLAP tools to import data into multi-dimensional data cubes.
- Discuss the impact of Business Intelligence (BI) theories, architectures, and methodologies on the organizational decision making process.
- Comprehension of business analytics and it facilitates in solving business problems in real world environment.

UNIT - I
DATA WAREHOUSE: Data Warehouse-Data Warehouse Architecture- Multidimensional Data Model- Data cube and OLAP Technology-Data Warehouse Implementation -DBMS schemas for Decision support - Efficient methods for Data cube computation.

UNIT - II
Business Intelligence: Introduction – Definition, Leveraging Data and Knowledge for BI, BI Components, BI Dimensions, Information Hierarchy, Business Intelligence and Business Analytics. BI Life Cycle. Data for BI - Data Issues and Data Quality for BI.

UNIT – III
BI Implementation - Key Drivers, Key Performance Indicators and Performance Metrics, BI Architecture/Framework, Best Practices, Business Decision Making, Styles of BI-vent-Driven alerts-A cyclic process of Intelligence Creation. The value of Business intelligence -Value driven and information use.

UNIT - IV
Advanced BI – Big Data and BI, Social Networks, Mobile BI, emerging trends, Description of different BI-Tools (Pentaho, KNIME)

UNIT - V
Business intelligence implementation-Business Intelligence and integration implementation-connecting in BI systems- Issues of legality- Privacy and ethics- Social networking and BI.

TEXT BOOKS:
1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER, Elsevier.
2. Rajiv Sabherwal "Business Intelligence" Wiley Publications, 2012.

REFERENCE BOOKS:
1. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and Business Intelligence Systems, 9th Edition, Pearson Education, 2009.

2. David Loshin, Business Intelligence - The Savy Manager's Guide Getting Onboard with Emerging IT, Morgan Kaufmann Publishers, 2009.

3. Philo Janus, Stacia Misner, Building Integrated Business Intelligence Solutions with SQLServer, 2008 R2 & Office 2010, TMH, 2011.

4. Business Intelligence Data Mining and Optimization for decision making [Author: Carlo-Verellis][Publication: (Wiley)]

5. Data Warehousing, Data Mining & OLAP- Alex Berson and Stephen J. Smith- Tata McGraw-Hill Edition, Tenth reprint 2007

6. Building the Data Warehouse- W. H. Inmon, Wiley Dreamtech India Pvt. Ltd.

7. Data Mining Introductory and Advanced topics –MARGARET H DUNHAM, PEA.

22AM3251: DEEP LEARNING LAB

B. Tech III Year II Sem.   **L T P C**

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Prerequisites:
1. Machine Learning
2. Programming in Python

Course Objectives: The course will explain in depth:
1. The Foundation of Deep Learning.
2. How to Build the Neural Network.
3. How to develop successful machine learning concepts.
4. How to use Open CV and python libraries
5. How to apply different algorithms on datasets

Course Outcomes: At the end of the course student will be able to:
1. Learn the Fundamental Principles of Deep Learning.
2. Learn the Artificial and Convolution Neural Networks
3. Identify the Deep Learning Algorithms for Various Types of Learning Tasks in various domains.
4. Implement Deep Learning Algorithms and Solve Real-world problems.
5. Understand various python libraries

LIST OF EXPERIMENTS:
1. Setting up the Spyder IDE Environment and Executing a Python Program
2. Installing Keras, Tensorflow and Pytorch libraries and making use of them
3. Applying the Convolution Neural Network on computer vision problems
4. Image classification on MNIST dataset (CNN model with Fully connected layer)
5. Applying the Deep Learning Models in the field of Natural Language Processing
6. Train a sentiment analysis model on IMDB dataset, use RNN layers with LSTM/GRU notes
7. Applying the Autoencoder algorithms for encoding the real-world data
8. Applying Generative Adversarial Networks (GANs) for image generation and unsupervised tasks.

TEXT BOOKS:
1. Deep Learning by Ian Good fellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.

REFERENCES:
1. Bishop, C.M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.H., and Van Loan, C.F., Matrix Computations, JHU Press, 2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw Hill Education, 2004.

EXTENSIVE READING:
1. http://www.deeplearning.net
2. https://www.deeplearningbook.org/
3. https://developers.google.com/machine-learning/crash-course/ml-intro
4. www.cs.toronto.edu/~fritz/absps/imagenet.pdf

22AM3252: WEB TECHNOLOGIES LAB

B.Tech. III Year II Sem.   **L T P C**
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Course Objectives

- To enable the student to program web applications using the following technologies HTML, Java script, AJAX, PHP, Tomcat Server, Servlets, .

Course Outcomes

- USE LAMP / XAMP for Web Applications
- Simple Applications with Technologies like HTML, JavaScript and AJAX
- Design web application using PHP
- Parse XML Files using JAVA(DOM AND SAX Parsers)
- Use Tomcat Server for Servlets and connect to Database
- Develop JSP Applications using Tomcat Server and Java Bean development

List of Experiments

1. Write an HTML code to demonstrate
   a) Lists b) Tables (rowspan and colspan) c) Cascading Style Sheets
2. Design a web page to demonstrate
   a) Divisions b) Frames c) Embedding Images
3. Develop static pages (use Only HTML) of an online book store. The pages should resemble: www.amazon.com. The website should consist the following pages.
   a) Home page
   b) Registration and user Login
   c) User Profile Page
   d) Books catalog
   e) Shopping Cart
   f) Payment By credit card
   g) Order Conformation
4. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
5. a) Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
   b) Web Robot: Eg: WayBack Machine, PGF Cyber policing Case Study
6. Build an application on a) React JS b) Angular JS c) Node.js and JSON.
7. Write the following XML Programs
   a) Create a DTD document to validate the XML document.
   b) Create a XML Schema document to validate the XML document
8. Install the following on the local machine
   a) Apache Tomcat Web Server
   b) Install MySQL/Oracle (if not installed)
   c) Install PHP and configure it to work with Apache web server and MySQL

9. a) Write a Servlet program to read the parameters from user interface and displayWelcome message.
   b) Write a Servlet program to read initialization parameters using Servlet Config andServlet Context object.
10. Write Servlet programs to work with the following session tracking techniques.
    a) Http Session b) Cookies c) Hidden form controls
11. Develop a dynamic web page which contains Registration and Login Forms using servlet with Oracledatabase .Validate the login page.

12. a) Write a JSP Program to handle the exceptions. b) Write a JSP Program to access bean information using use Bean tag.
13. Develop a dynamic web page which contains Registration and Login Forms using JSP with Oracledatabase .Validate the login page.
14. Write a PHP script that reads data from one file and write into another file.
15. Develop a dynamic web page which contains Registration and Login Forms in PHP with MySQL database
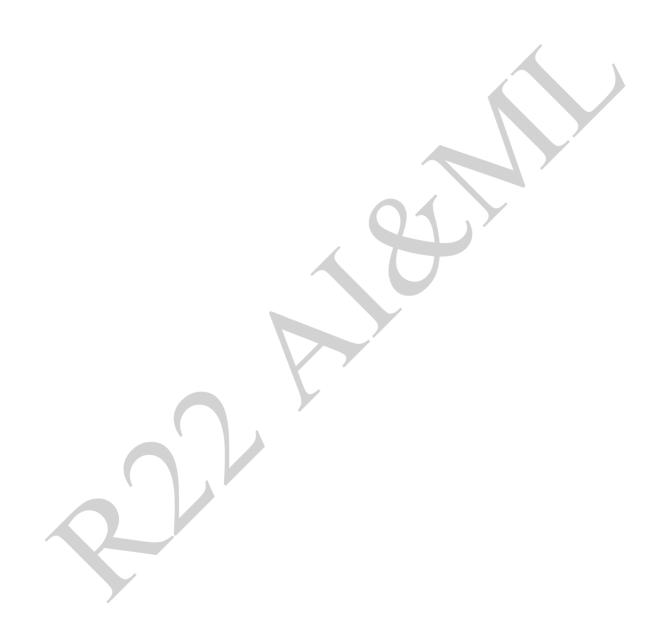   .Validate the login page.

TEXT BOOK:
1. WEB TECHNOLOGIES: A Computer Science Perspective, Jeffrey C. Jackson, Pearson Education

REFERENCE BOOKS:
1. Deitel H.M. and Deitel P.J., "Internet and World Wide Web How to program", Pearson International,2012, 4th Edition.

2. J2EE: The complete Reference By James Keogh, McGraw-Hill

3. Bai and Ekedhi, The Web Warrior Guide to Web Programming, Thomson

4. Paul Dietel and Harvey Deitel," Java How to Program", Prentice Hall of India, 8th

EditionWeb technologies, Black Book, Dreamtech press.

22AM3281: INDUSTRY ORIENTED MINI PROJECT

B.Tech. III Year II Sem. **L T P C**

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22MC0002: ENVIRONMENTAL SCIENCE
(Only for Lateral Entry students)

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III B.Tech II Semester

Course Objectives:
- To study and Understand the importance of ecosystems.
- To impart knowledge on various natural resources.
- To know about biodiversity and biotic resources
- To impart knowledge on environmental pollution and control technologies
- To study and understand the environmental policies and regulations.

Course Outcomes: At the end of this course students will demonstrate the ability to
- Explain the importance of ecosystems.
- Discuss about various natural resources.
- Describe the importance biodiversity and biotic resources
- Discuss about environmental pollution and control technologies
- Explain the environmental policies and regulations.

UNIT - I
ECOSYSTEMS: Definition, Scope and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT - II
NATURAL RESOURCES: Classification of Resources: Living and Non-Living resources,
Water Resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems.
Mineral Resources: use and exploitation, environmental effects of extracting and using mineral resources, **Land Resources:** Forest resources
Energy Resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

UNIT - III
BIODIVERSITY AND BIOTIC RESOURCES: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity:habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV
ENVIRONMENTAL POLLUTION AND CONTROL TECHNOLOGIES:
Environmental Pollution: Classification of pollution
Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient
air quality standards.
Water Pollution: Sources and types of pollution, drinking water quality standards.

Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil.
Noise Pollution: Sources and Health hazards, standards
Solid Waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management.
Pollution Control Technologies: Wastewater Treatment methods: Primary, secondary and Tertiary.
Overview of air pollution control technologies, Concepts of bioremediation.
Global Environmental Problems and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

UNIT - V
ENVIRONMENTAL POLICY, LEGISLATION & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. **EIA:** EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socioeconomical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).
Towards Sustainable Future: Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:
1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:
1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning
Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI
Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.