R22

M.Tech. (COMPUTER SCIECNE AND ENGINEERING)

M.Tech. R22 CBCS Curriculum

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

An Autonomous, ISO 9001:2015 & QS I-Gauge Diamond Rated Institute, Accredited by NAAC with 'A++' Grade
NBA Accreditation for B.Tech. CE, EEE, ME, ECE, CSE, EIE, IT Programmes
Approved by AICTE, New Delhi, Affiliated to JNTUH, NIRF 113 Rank in Engineering Category
Recognized as "College with Potential for Excellence" by UGC
Vignana Jyothi Nagar, Pragathi Nagar, Nizampet (S.O), Hyderabad – 500 090, TS, India.
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DEPARTMENT OF

COMPUTER SCIENCE AND ENGINEERING

VISION OF THE DEPARTMENT

To achieve academic and research excellence in essential technologies of Computer Science and Engineering by promoting a creative environment for learning and innovation.

MISSION OF THE DEPARTMENT

- To provide dynamic, innovative and flexible curriculum which equip the students with the necessary problem driven skills to strengthen their career prospects and potential to pursue higher studies.
- To foster inquisitive-driven research among students and staff so as to reinforce the domain knowledge and address contemporary societal issues.
- To inculcate ethical values, leadership qualities and professional behaviour skills for improving the living standards of people

M.TECH.
(COMPUTER SCIENCE AND ENGINEERING)

M.TECH. (CSE)

PROGRAM EDUCATIONAL OBJECTIVES

PEO-I: To provide students with sound foundations in Basic Sciences and fundamentals in Engineering Sciences.

PEO-II: To instill strong problem-solving skills through the courses of CSE.

PEO-III: To prepare students with hands on experience in implementing various software development concepts.

PEO-IV: To afford graduates with both fundamental and advanced knowledge of computer science and engineering that prepares them for excellence, leadership roles along diverse career paths, and integrate ethical behavior.

PEO-V: To deliver graduates to design and implement solutions for rapidly changing computing problems and information system environments and lifelong learning to adapt innovation.

M.TECH. (CSE)

PROGRAM OUTCOMES

PO-1: An ability to independently carry out research / investigation and development work to solve practical problems.

PO-2: An ability to write and present a substantial technical report / document.

PO-3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program.

PO-4: Apply the knowledge of engineering principles to develop software systems, products and processes thus to solve real world multifaceted problems.

PO-5: Ability to design and conduct experiments, procedures and technical skills necessary for engineering Exploration to solve societal problems and environmental contexts for sustainable development.

PO-6: Recognize the need to engage in self-governing and life-long learning by making use of professional and ethical principles.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD
M.TECH. I YEAR COURSE STRUCTURE AND SYLLABUS

(COMPUTER SCIENCE ENGINEERING)

I SEMESTER **R22**

Course Type	Course Code	Name of the Course	L	T	P	Credits
Professional Core-I	22PC1CP01	Distributed Computing	3	0	0	3
Professional Core-II	22PC1CP02	Advanced Problem Solving	3	0	0	3
Professional Core-III	22PC1CP03	Machine Learning	3	0	0	3
Professional Elective-I	22PE1CP01	Advanced Network Programing	3	0	0	3
	22PE1CN06	Data Science				
	22PE1CP02	Advanced Databases				
	22PE1CP03	Digital Imaging Techniques and Analysis				
	22PE1SE05	Digital Forensics				
Professional Elective-II	22PE1CP04	Information Retrieval Systems	3	0	0	3
	22PE1CP05	Knowledge Discovery				
	22PE1CP06	Scripting Languages				
	22PE1CP07	Introduction to Intelligent Systems				
	22PE1CP08	Semantic Web and Social Networks				
Professional Core Lab-I	22PC2CP01	Advanced Problem Solving Laboratory	0	0	2	1
Professional Core Lab-II	22PC2CP02	Machine Learning Laboratory	0	0	2	1
Communication Skills	22SD5HS01	Communication Skills for Academic and Research Writing	0	0	2	1
Project	22PW4CP01	Technical Seminar	0	0	4	2
Mandatory	22MN6HS01	Research Methodology and IPR	2	0	0	0
Total			**17**	**0**	**10**	**20**

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD
M.TECH. I YEAR COURSE STRUCTURE AND SYLLABUS

(COMPUTER SCIENCE ENGINEERING)

II SEMESTER **R22**

Course Type	Course Code	Name of the Course	L	T	P	Credits
Professional Core-IV	22PC1CP04	Cryptography and Network Security	3	0	0	3
Professional Core-V	22PC1CP05	Internet of Things	3	0	0	3
Professional Core-VI	22PC1CP06	Big Data Analytics	3	0	0	3
Professional Elective-III	22PE1CP09	Cloud Computing	3	0	0	3
	22PE1CP10	Soft Computing				
	22PE1CP11	Advanced Operating Systems				
	22PE1CP12	Computer Vision				
	22PE1CP13	High Performance Computing				
Professional Elective-IV	22PE1CP14	Deep Learning and Its Applications	3	0	0	3
	22PE1CP15	Natural Language Processing				
	22PE1CP16	Cognitive Science				
	22PE1CP17	Web Analytics and Development				
	22PE1CP18	Recommender Systems				
Professional Core Lab-III	22PC2CP03	Bigdata Analytics Laboratory	0	0	2	1
Professional Core Lab-IV	22PC2CP04	Cryptography and Network Security Laboratory	0	0	2	1
Industry Engagement	22SD5CP01	Industry Engagement	0	0	2	1
Project	22PW4CP02	Mini-Project	0	0	4	2
Mandatory	22MN6HS02	Ancient Wisdom	2	0	0	0
Total			**17**	**0**	**10**	**20**

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD
M.TECH. II YEAR COURSE STRUCTURE AND SYLLABUS

(COMPUTER SCIENCE ENGINEERING)

III SEMESTER **R22**

Course Type	Course Code	Name of the Course	L	T	P	Credits
Professional Elective-V	22PE1CP19	Knowledge Representation and Reasoning	3	0	0	3
	22PE1CP20	GPU Architecture and Programming				
	22PE1CP21	Block Chain Technology				
	22PE1CN08	Artificial Intelligence				
	22PE1CP23	Quantum Computing				
Open Elective	22OE1CN01	Business Analytics	3	0	0	3
	22OE1AM01	Industrial Safety				
	22OE1AM02	Operations Research				
	22OE1AM03	Entrepreneurship and Start-ups				
	22OE1PS01	Waste to Energy				
Project	22PW4CP03	Project Part - I	0	0	16	8
Total			**6**	**0**	**16**	**14**

IV SEMESTER **R22**

Course Type	Course Code	Name of the Course	L	T	P	Credits
Project	22PW4CP04	Project Part - II	0	0	28	14
Total			**0**	**0**	**28**	**14**

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PC1CP01) DISTRIBUTED COMPUTING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge on basic Networking concepts, Advanced Programming (Good knowledge in C and C++), Data Structures and Algorithms, Basic OS concepts (e.g., processes, threads, synchronization, file systems, scheduling etc.)

COURSE OBJECTIVES:

- To provide students with contemporary knowledge in distributed systems
- To equip students with skills to analyze and design distributed applications
- To provide master skills to measure the performance of distributed synchronization algorithms

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Demonstrate knowledge of the basic elements and concepts related to distributed system technologies

CO-2: Illustrate the middleware technologies that support distributed applications such as RPC, RMI and Object based middleware

CO-3: Analyze the various techniques used for clock synchronization and mutual exclusion

CO-4: Demonstrate the concepts of Resource and Process management and synchronization algorithms

CO-5: Demonstrate the concepts of Consistency and Apply the knowledge of Distributed File System to analyze various file systems like NFS, AFS and the experience in building large-scale distributed applications

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	1	2	-	1	-
CO-2	1	2	2	-	-	1
CO-3	1	2	2	-	-	-
CO-4	1	1	3	-	-	1
CO-5	1	1	2	-	1	-

UNIT–I:

Introduction to Distributed Systems:

Characterization of Distributed Systems: Issues, Goals, and Types of distributed systems, Distributed System Models, Hardware concepts, Software Concept.

Middleware: Models of Middleware, Services offered by middleware, Client Server model.

UNIT–II:

Communication: Layered Protocols, Interprocess communication (IPC): MPI, Remote Procedure Call (RPC), Remote Object Invocation, Remote Method Invocation (RMI), Message Oriented Communication, Stream Oriented Communication, Group Communication

UNIT–III:

Synchronization: Clock Synchronization, Logical Clocks, Election Algorithms, Mutual Exclusion, Distributed Mutual Exclusion-Classification of mutual Exclusion Algorithm, Requirements of Mutual Exclusion Algorithms, Performance measure.

Non-Token Based Algorithms: Lamport Algorithm, Ricart–Agrawala's Algorithm, Maekawa's Algorithm , Token Based Algorithms: Suzuki-Kasami's Broadcast Algorithms, Singhal's Heuristic Algorithm, Raymond's Tree based Algorithm, Comparative Performance Analysis.

UNIT–IV:

Resource and Process Management: Desirable Features of global Scheduling algorithm, Task assignment approach, Load balancing approach, load sharing approach, Introduction to process management, process migration, Threads, Virtualization, Clients, Servers, Code Migration

UNIT–V:

Consistency Models and Distributed File System: Datacentric and Client, Centric Consistency Models, Replica Management

Distributed File Systems: Caching Schemes, File Introduction and features of DFS, File models, File Accessing models, File Replication, Case Study: Distributed File Systems (DFS), Network File System (NFS), Andrew File System (AFS)

TEXT BOOKS:

1. Distributed Systems: Principles and Paradigms, Andrew S. Tanenbaum and Maarten Van Steen, 2nd edition, Pearson Education
2. Distributed Systems: Concepts and Design, George Coulouris, Jean Dollimore, Tim Kindberg, 4th Edition, Pearson Education, 2005

REFERENCES:

1. Distributed Systems: Principles and Paradigms, A. S. Tanenbaum and M. V. Steen, Second Edition, Prentice Hall, 2006
2. Distributed Computing Principles and Applications, M. L. Liu, Pearson Addison Wesley, 2004

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106106107
2. https://onlinecourses.nptel.ac.in/noc21_cs87/preview

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PC1CP02) ADVANCED PROBLEM SOLVING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge on Data Structures and Algorithm Design and Analysis

COURSE OBJECTIVES:

- To introduce the advanced methods of designing and analyzing algorithms
- To choose appropriate algorithms and use it for a specific problem
- To familiarize basic paradigms and data structures used to solve advanced algorithmic problems
- To understand different classes of problems concerning their computation difficulties

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand different advanced data structures and classes of problems concerning their computation difficulties.

CO-2: Analyze the complexity/performance of different algorithms and data structures operations.

CO-3: Categorize the different problems in various classes according to their complexity

CO-4: Identify appropriate data structure and algorithms design technique and use it for a specific problem solving

CO-5: Apply advanced problem-solving skills in various domains

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	1	3	3	3	1
CO-2	3	1	3	3	3	1
CO-3	3	1	3	3	3	1
CO-4	3	2	3	3	3	1
CO-5	3	2	3	3	3	2

UNIT-I:

Abstract Data Type: Priority Queue, Min/Max Heap, Binomial Heaps, Fibonacci heaps. Hashing: Implementation of Dictionaries, Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing. counting and radix sorting techniques.

Trees: AVL Trees, Red Black Trees, B-Trees, Tries.

UNIT-II:

Text Processing: Sting Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris -Pratt Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem. Introduction to Convex Hull, finding the convex hull and Graham scan approach.

UNIT-III:

Graph: Definitions and Elementary Algorithms: Shortest Path in Graphs: BFS, Dijkasra's, Bellman-Ford, Floyd-Warshall algorithm, DFS, topological sorting amortized analysis.
Modulo Representation of Integers/Polynomials: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Polynomial addition and multiplication.

UNIT-IV:

Flow-Networks: Maxflow-min cut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm.
Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, LUP-decomposition.

UNIT-V:

Linear Programming: Geometry of the feasibility region and Simplex algorithm
NP Hard and NP-Complete problems: P, NP, NP-complete and NP-hard. Cook's theorem Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.

TEXT BOOKS:

1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 2nd Edition, Pearson, 2004
2. Introduction to Algorithms, Cormen, Leiserson, Rivest, Stein
3. Fundamentals of Computer Algorithms, E. Horrowitz, S. Sahni, S. Rajasekaran, 2nd Edition, University Press, 2007

REFERENCES:

1. Algorithm Design – Foundations, Analysis, and Internet Algorithms, M. T. Goodrich, R. Tomassia, John Wiley & Sons, 2002
2. The Design and Analysis of Computer Algorithms, Aho, Hopcroft, Ullman
3. Algorithm Design, Kleinberg and Tardos
4. Design Analysis and Algorithms, Hari Mohan Pandy, University Science Press, 2009

ONLINE RESOURCES:

1. http://cs161.stanford.edu
2. https://www.ics.uci.edu/~eppstein/161/960312.html
3. https://www.cmi.ac.in/~madhavan/teaching.html

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PC1CP03) MACHINE LEARNING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge on Linear Algebra, Probability, Statistics and Linear Algebra

COURSE OBJECTIVES:

- To learn the concept of how to learn patterns and concepts from data without being explicitly programmed
- To design and analyse various machine learning algorithms and techniques
- To explore supervised and unsupervised learning paradigms of machine learning
- To learn recommendation technique and various feature selection strategies

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the basic concepts of machine learning and their usage
CO-2: Classify and Compare pros and cons of various supervised machine learning models
CO-3: Analyse various unsupervised machine learning approaches and paradigms mathematically
CO-4: Evaluate machine learning algorithms and elaborate feature selection methods
CO-5: Explore different learning techniques and recommendation systems

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	3	3	3	3
CO-2	3	3	3	3	3	3
CO-3	3	2	3	3	3	2
CO-4	3	2	2	3	3	2
CO-5	3	3	3	2	3	2

UNIT-I:
Introduction: Basic definitions, Issues in Machine Learning, types of learning, hypothesis space and inductive bias, evaluation, cross-validation, Over fitting and Under fitting, Linear Regression: Introduction, Linear Models for Regression.

UNIT-II:
Supervised Learning (Regression/Classification): Introduction, Nearest-Neighbours, Decision Trees, Bayes Rule& Naive Bayes, Logistic Regression Support Vector

Machines, Perceptron, multilayer networks, and the back propagation algorithm, Beyond Binary Classification.

UNIT-III:

Unsupervised Learning:

Clustering: Introduction, K-mean clustering, K-medoids clustering, Hierarchical clustering, Agglomerative clustering, Divisive clustering. Dimensionality Reduction, Linear Discriminant Analysis, PCA and kernel PCA.

UNIT-IV:

Evaluating Machine Learning algorithms and Feature Selection: forward search, backward search, univariate, multivariate feature selection approach, Ensemble Methods: Boosting, Bagging, Random Forests

UNIT-V:

Other Topics in Machine Learning- Semi-supervised Learning, Active Learning, Reinforcement Learning, Collaborative filtering-based Recommendation Systems

TEXT BOOKS:

1. Machine Learning: A Probabilistic Perspective, Kevin Murphy, MIT Press, 2012
2. Machine Learning, Tom Mitchell, 1st Edition, McGraw- Hill, 1997
3. Pattern Recognition and Machine Learning, Christopher Bishop, Springer, 2007

REFERENCES:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis
2. Introduction to Machine Learning, Ethem Alpaydin, 2nd Edition, MIT Press, 2010
3. The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani, Jerome Friedman

ONLINE RESOURCES:

1. Introduction to Machine Learning - Course (nptel.ac.in)
2. Supervised Machine Learning: Regression and Classification | Coursera
3. Free Online Course: Applied Machine Learning in Python from Coursera | Class Central
4. Free Online Course: Machine Learning with Python from Coursera | Class Central

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1CP01) ADVANCED NETWORK PROGRAMMING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge on Computer Networks

COURSE OBJECTIVES:

- To introduce the student to Unix/Linux kernel programming techniques
- To teach advanced C systems programming and debugging techniques in a Unix/Linux environment
- To introduce the concepts of files and Directories to manage the Linux Environment through C Programming
- To provide knowledge in working with the core operating systems Concepts Signals in Linux Environment
- To teach how to manage the Inter process communication by using the IPC techniques and Introduce the student to socket programming to manage the connections between client and server

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the Linux Operating system by commands and develop c programs

CO-2: Analyse the files and directories in Linux environment by developing C Applications

CO-3: implement system programs to control the processes using signals

CO-4: Understand Inter process communication and client-server applications

CO-5: Develop programs on Network Programming

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	1	2	2	2	1
CO-2	2	-	1	1	-	-
CO-3	2	1	2	-	2	-
CO-4	2	-	-	2	2	1
CO-5	3	2	2	3	1	2

UNIT–I:

Linux Utilities: File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking utilities, Filters, Text processing utilities and Backup utilities.

Bourne again shell(bash) - Introduction, pipes and redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the

environment, quoting, test command, control structures, arithmetic in shell, shell script examples.
Review of C programming concepts-arrays, strings (library functions), pointers, function pointers, structures, unions, libraries in C.

UNIT–II:
Files- File Concept, File types File System Structure, Inodes, File Attributes, file I/O in C using system calls, kernel support for files, file status information-stat family, file and record locking-lockf and fcntl functions, file permissions- chmod, fchmod, file ownership-chown, lchown , fchown, links-soft links and hard links – symlink, link, unlink. File and Directory management – Directory contents, Scanning Directories- Directory file APIs. Process- Process concept, Kernel support for process, process attributes, process control – process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process.

UNIT–III:
Signals- Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions. Interprocess Communication - Introduction to IPC mechanisms, Pipes- creation, IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions, Introduction to message queues, semaphores and shared memory.
Message Queues- Kernel support for messages, UNIX system V APIs for messages, client/server example.
Semaphores-Kernel support for semaphores, UNIX system V APIs for semaphores.

UNIT–IV:
Shared Memory- Kernel support for shared memory, UNIX system V APIs for shared memory, client/server example.
Network IPC - Introduction to Unix Sockets, IPC over a network, Client-Server model, Address formats(Unix domain and Internet domain), Socket system calls for Connection Oriented - Communication, Socket system calls for Connectionless-Communication, Example-Client/Server Programs- Single Server-Client connection, Multiple simultaneous clients, Socket options – setsockopt, getsockopt, fcntl.

UNIT–V:
Network Programming in Java-Network basics, TCP sockets, UDP sockets (datagram sockets), Server programs that can handle one connection at a time and multiple connections (using multithreaded server), Remote Method Invocation (Java RMI)-Basic RMI Process, Implementation details-Client-Server Application.

TEXT BOOKS:

1. Unix System Programming using C++, T. Chan, PHI
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH
3. An Introduction to Network Programming with Java, Jan Graba, Springer, 2010

REFERENCES:

1. Unix Network Programming, W. R. Stevens, PHI
2. Java Network Programming, E. R. Harold, 3rd Edition, SPD, O'Reilly
3. Linux System Programming, Robert Love, O'Reilly, SPD

4. Advanced Programming in the UNIX environment, W. R. Stevens, 2nd Edition, Pearson Education
5. UNIX for Programmers and Users, Graham Glass, King Ables, 3rd Edition, Pearson Education

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc23_cs35/preview
2. http://vlabs.iitkgp.ernet.in/ant/

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1CN06) DATA SCIENCE

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To build the fundamentals of data science
- To learn techniques and tools for transformation of data
- To gain knowledge of statistical data analysis techniques utilized in business decision making
- To develop design skills and understanding purpose and working of machine learning algorithms
- To impart design thinking capability to handle big data problems

COURSE OBJECTIVES: After completion of the course, the student should be able to
CO-1: Demonstrate proficiency with statistical analysis of data
CO-2: Demonstrate skill in data management
CO-3: Develop the ability to build and assess data-based models
CO-4: Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively
CO-5: Develop relevant programming abilities

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	3	1	2	2
CO-2	3	2	2	2	2	2
CO-3	2	3	2	2	2	2
CO-4	3	3	2	2	2	2
CO-5	2	2	2	2	2	2

UNIT-I:

Introduction: Understanding relation between Artificial Intelligence, Machine learning, and Data Science; What is Data Science? - Extracting Meaningful Patterns, Building Representative Models, Combination of Statistics, Machine Learning, and Computing, Learning Algorithms, Associated Fields; Case for Data Science – Volume, Dimensions, Complex Questions; Data Science Classification; Data Science Algorithms; Data Science Tasks and Examples; Overview of Core algorithms

Data Science Process: Crisp data mining framework vs Data science process; Prior Knowledge – Objective, Subject Area, Data, Causation vs Correlation; Data Preparation, Modeling - Training and Testing Datasets, Learning Algorithms, Evaluation of the Model; Ensemble Modeling; Application

UNIT-II:

Data Exploration: Objectives of data exploration; Datasets – Types of data; Descriptive statistics – Univariate Exploration, Multivariate Exploration; Data Visualization - Univariate Visualization (Histogram, Quartile, Distribution chart), Multivariate Visualization (Scatter plot, Scatter multiple, Scatter matrix, Bubble chart, Density chart); Visualizing High dimensional data (Parallel chart, deviation chart, and Andrews curves)

Exploratory Data Analytics: Descriptive Statistics – Mean Standard Deviation, dispersion, Skewness and Kurtosis, statistical-interference-Correlation Statistics – ANOVA.

UNIT-III:

Regression Methods: Linear Regression; Multiple Linear Regression; Logistic Regression.

Classification: Decision trees; Rule Induction; k-NEAREST NEIGHBORS; Naïve Bayesian; ANN; SVM; Ensemble learners.

Clustering: Prototype-based clustering, Density clustering, Hierarchical clustering, Model-based clustering; K-MEANS CLUSTERING, Density-Based Spatial Clustering of Applications with Noise (DB SCAN)

Model Evaluation: Confusion matrix, ROC and AUC, Lift curves.

UNIT-IV:

Anomaly Detection: Concepts - Causes of outliers, Anomaly detection techniques; Distance-Based outlier detection; Density-based outlier detection; Local outlier factor.

Time Series Forecasting: Taxonomy of time Series forecasting; Time series decomposition – Classical decomposition, Implementation, Smoothing based methods, Regression based methods, Machine learning methods – Windowing, Neural network autoregressive, Performance evaluation – Validation dataset (MAE, RMSE, MAPE, MASE), Siding window validation.

UNIT-V:

Deep learning: The AI Winter - Conceptual architecture of a perceptron, how it works - Regression Models as Neural Networks, Gradient Descent, Need for Backpropagation, Classifying More Than 2 Classes: Softmax, Convolutional Neural Networks, Dense Layer, Dropout Layer, Recurrent Neural Networks, Autoencoders, Related AI Models - Reinforcement Learning (RL) and Generative adversarial network (GAN).

TEXT BOOK:

1. Data Science - Concepts and Practice, Vijay Kotu, Bala Deshpande, 2nd Edition, Morgan Kaufmann, 2019

REFERENCES:

1. Structural Analysis, Devdas Menon, Narosa Publishers, 2018
2. Data Science from Scratch - First Principles with Python, Joel Grus, O'Reilly Media, 2015
3. Foundations of Data Science, Avrim Blum, John Hopcroft, Ravindran Kannan, Cambridge University Press, 2020
4. Big Data and Analytics, Seema Acharya, Subhashini Chellappan, Wiley Publications, 2019

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1CP02) ADVANCED DATA BASES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge on Database Management Systems

COURSE OBJECTIVES:
- To learn the modelling and design of databases
- To acquire knowledge on parallel and distributed databases and its applications.
- To study the usage and applications of Object-Oriented database
- To understand the principles of intelligent databases

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Demonstrate the emerging databases such as parallel and distributed databases
CO-2: Analyze and Implement the concept of object- relational databases
CO-3: Understand intelligent databases in development of various real time software
CO-4: Examine the issues related to multimedia and mobile database performance
CO-5: Demonstrate the emerging databases such as XML, Cloud and Big Data

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	1	2	2	1
CO-2	3	1	-	2	-	-
CO-3	2	-	1	2	1	1
CO-4	2	1	1	2	2	1
CO-5	3	3	2	3	2	1

UNIT–I:
Parallel and Distributed Databases:
Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems- Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Case Studies.

UNIT–II:
Object and Object Relational Databases:
Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies –

Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL/Oracle – Case Studies.

UNIT–III:

Intelligent Databases:

Active Databases: Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy-Applications Design Principles for Active Rules- Temporal Databases: Overview of Temporal DatabasesTSQL2- Deductive Databases: Logic of Query Languages – Datalog- Recursive Rules Syntax and Semantics of Datalog Languages-Implementation of Rules and Recursion. Recursive Queries in SQL- Spatial Databases-Spatial Data Types- Spatial Relationships Spatial Data Structures- Spatial Access Methods- Spatial DB Implementation.

UNIT–IV:

Advanced Data Models:

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management -Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols- Multimedia Databases-Information Retrieval- Data Warehousing Data Mining- Text Mining.

UNIT–V:

Emerging Technologies:

XML Databases: XML-Related Technologies-XML Schema- XML Query Languages-Storing XML in Databases-XML and SQL- Native XML Databases- Web Databases-Geographic Information Systems- Biological Data Management- Cloud Based **Databases:** Data Storage Systems on the Cloud- Cloud Storage Architectures-Cloud Data Models- Query Languages, Introduction to Big Data-Storage-Analysis.

TEXT BOOKS:

1. Fundamentals of Database Systems, R. Elmasri, S. B. Navathe, 5th Edition, Pearson Education/Addison Wesley, 2007
2. Database Systems, A Practical Approach to Design, Implementation and Management, Thomas Cannolly and Carolyn Begg, 3rd Edition, Pearson Education, 2007

REFERENCES:

1. Database System Concepts, Henry F. Korth, Abraham Silberschatz, S. Sudharshan, 5th Edition, McGraw Hill, 2006
2. An Introduction to Database Systems, C. J. Date, A. Kannan and S. Swamynathan, 8th Edition, Pearson Education, 2006
3. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, 3rd Edition, McGraw Hill, 2004

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_cs51/preview
2. http://www.cse.iitb.ac.in/infolab/Data/Courses/CS632/

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1CP03) DIGITAL IMAGING TECHNIQUES AND ANALYSIS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Linear Algebra, Probability, Differential Equations, Calculus

COURSE OBJECTIVES:

- To provide knowledge on image processing concepts
- To develop the ability to understand and implement various image processing algorithms
- To facilitate the students to recognize the appropriate need to various image processing applications with computer vision and deep learning

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Ascertain and describe the essentials of image processing concepts through mathematical interpretation

CO-2: Understand the knowledge of image transforms and image enhancement techniques involved.

CO-3: Experiment the various image segmentation and morphological operations for a meaningful partition of objects.

CO-4: Design the various basic feature extraction and selection procedures for various image applications.

CO-5: Implement image processing algorithms for real-time applications using artificial intelligence and deep learning

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	1	3	1	2	1
CO-2	2	2	3	1	3	1
CO-3	3	2	3	2	3	1
CO-4	3	2	3	2	3	2
CO-5	3	2	3	3	3	2

UNIT–I:

Introduction to Image Processing: Introduction, Digital Image Fundamentals, image acquisition and display using digital devices - Human visual perception, properties – Image Formation - Image sampling and quantization-Basic relationship between pixels.

UNIT–II:
Image Enhancement:
Image enhancement in the Spatial Domain: basic grey level transformation, Histogram Processing Enhancement using arithmetic/Logic operations-Spatial filtering: smoothing and sharpening. Image enhancement in the frequency domain: Introduction to two-dimensional transforms Discrete Fourier Transform, Discrete Cosine Transform, Haar Transform, and Discrete Wavelet Transform - smoothing frequency domain filtering-sharpening frequency domain filtering.

UNIT–III:
Processing
Morphological Image Processing: Dilation and Erosion – Opening and Closing – Hit or Miss Transformation – Thinning – Thickening – Skeleton.

UNIT–IV:
Image Segmentation: Detection of discontinuities- Object Detection Methods, Edge Liking and Boundary Detection, Thresholding Methods, Region Oriented Methods

UNIT–V:
Feature Extraction: Region of interest (ROI) selection - Feature extraction: Histogram based features – Intensity features-Color, Shape features-Local Binary Patterns (LBP), Texture descriptors- Grey Level Occurrence Matrix (GLCM).

TEXT BOOKS:

1. Digital Image Processing, Rafael C. Gonzalez, Richard E. Woods, 4th Edition, Pearson Education, 2018
2. Digital Image Processing, S. Sridhar, 2nd Edition, Oxford University, 2016

REFERENCES:

1. Fundamentals of Digital Image Processing, Anil K. Jain, PHI, 2011
2. Image Processing Analysis and Vision, Milan Sonka, Vaciav H. Lavac, Roger Boyle, 4th Edition, Cengage India, 2017

ONLINE RESOURCES:
1. https://www.cs.nmt.edu/~ip/lectures.html
2. https://web.stanford.edu/class/ee368/handouts.html
3. https://web.eecs.umich.edu/~fessler/course/556/18w/w18-eecs556-notes-final.pdf
4. https://www.math.pku.edu.cn/teachers/jiangm/courses/DIP/dip-handouts.pdf

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1SE05) DIGITAL FORENSICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES:

- Minimal concept knowledge of Computer Networks, Cybercrime and Information Warfare, Computer Networks, concept of different types of algorithms used Network Security & Cryptography , concept of Cyber Security and knowledge of Information Security Management

COURSE OBJECTIVES:

- To provide an in-depth study of the rapidly changing and fascinating field of computer forensics
- To combine both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
- To introduce the Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools
- To identify the E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics
- To learn the legal Issues of Digital Forensics

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand relevant legislation and codes of ethics

CO-2: Analyze Computer forensics and digital detective and various processes, policies and procedures

CO-3: Demonstrate the knowledge of E-discovery, E-evidence, tools and environment for Cyber Crime Analysis

CO-4: Employ the appropriate Computer, Network, Mobile & Digital forensics tools and techniques

CO-5: Understand the legal Issues of Digital Forensics

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	2	1	2	2
CO-2	3	3	2	2	2	2
CO-3	3	3	2	2	2	3
CO-4	3	3	2	1	2	2
CO-5	3	2	1	2	1	2

UNIT–I:
Digital Forensics Science: Forensics science, computer forensics, and digital forensics. Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber criminalistics area, holistic approach to cyber-forensics

UNIT–II:
Cyber Crime Scene Analysis: Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.

UNIT–III:
Evidence Management & Presentation: Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.

UNIT–IV:
Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case, Network Forensics: open-source security tools for network forensic analysis, requirements for preservation of network data.

UNIT–V:
Mobile Forensics: mobile forensics techniques, mobile forensics tools. Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008. Recent trends in mobile forensic technique and methods to search and seizure electronic evidence

TEXT BOOKS:

1. The Basics of Digital Forensics, John Sammons, Elsevier
2. Computer Forensics: Computer Crime Scene Investigation, John Vacca, Laxmi Publications

REFERENCES:

1. Learn Computer Forensics: A Beginner's Guide to Searching, Analyzing, And Securing Digital Evidence, William Oettinger, 1st Edition, Packt Publishing, 2020
2. Cybercrime and Digital Forensics: An Introduction, Thomas J. Holt, Adam M. Bossler, Kathryn C. Seigfried-Spellar, Routledge

ONLINE RESOURCES:
1. https://onlinecourses.swayam2.ac.in/cec20_lb06/preview
2. https://www.edx.org/learn/computer-forensics
3. Learn Digital Forensics Course Online or In-Person: Identify, Track and Prosecute the Cyber Criminal (hackerschool.in)
4. https://www.udemy.com/topic/digital-forensics/

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1CP04) INFORMATION RETRIEVAL SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To familiarize with Boolean and vector space retrieval models, evaluation and interface issues, text index construction and scoring
- To develop intelligent systems by applying the methods such as Prediction, Forecasting, Classification, Clustering and Optimization
- To build working systems that assist users in finding useful information on the Web

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the relationships between the Repository Systems

CO-2: Apply knowledge of data structures and indexing methods in information retrieval Systems

CO-3: Implement supervised and unsupervised algorithms on the Information systems

CO-4: Enhance the Search results applying Search techniques for better visualization to reducing the overhead of the user

CO-5: Explore the multimedia Information Retrieval to acquire the knowledge on audio, video and image data

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	3	2	2	2
CO-2	3	2	3	3	1	1
CO-3	2	3	3	3	2	3
CO-4	3	3	3	2	1	1
CO-5	2	2	2	1	1	1

UNIT–I:

Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses, Information Retrieval System Capabilities – Search, Browse, Miscellaneous.

UNIT–II:

Cataloging and Indexing: Objectives, Indexing Process, Automatic Indexing, Information Extraction Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N – gram data structure, PAT data structure, Signature file structure, Hypertext data structure.

UNIT–III:

Automatic Indexing: Classes of automatic indexing, Statistical Indexing, Natural language, Concept indexing, Hypertext linkages. Document and Term Clustering: Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters

Support vector machines and machine learning on documents. Flat clustering. Hierarchical clustering. Matrix decompositions and latent semantic indexing.

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

Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems.

UNIT–V:

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

Machine learning in IR, Introduction to Web search basics, Web crawling and indexes, Link analysis

TEXT BOOKS:

1. Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark T. Maybury, Springer
2. Modern Information Retrieval, Ricardo Baeza – Yates, Pearson Education, 2007
3. An Introduction to Information Retrieval, Cambridge University Press, Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, Cambridge, 2009

REFERENCES:

1. Information Retrieval: Algorithms and Heuristics, David A. Grossman and Ophir Frieder, 2nd Edition, Springer
2. Information Retrieval Data Structures and Algorithms, Frakes W. B., Ricardo Baeza Yates, Prentice Hall, 1992
3. Modern Information Retrieval, Baeza-Yates & Ribeiro-Neto, Pearson Education, 2010

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1CP05) KNOWLEDGE DISCOVERY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Knowledge on Data Structures, Database Management Systems and Data Mining

COURSE OBJECTIVES:

- To learn concepts from KDD to knowledge representations
- To explore knowledge representation and evaluation techniques
- To illustrate classification rules and predictions from knowledge representations
- To conduct case studies on real data mining examples

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the relationships between Data Mining, Machine Learning and Statistics

CO-2: Describe the techniques used in representing the data and Knowledge

CO-3: Apply the algorithms to evaluate the performance of a model

CO-4: Construct the classification rules and use the probability measure for Rule evaluation

CO-5: Illustrate the linear models for classification and evaluating numeric predictions

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	2	1	2	2
CO-2	3	2	3	3	2	2
CO-3	2	2	3	2	3	1
CO-4	3	2	2	1	2	1
CO-5	3	2	2	1	1	2

UNIT–I:

Introduction KDD and Data Mining - Data Mining and Machine Learning, Machine Learning and Statistics, Generalization as Search, Data Mining and Ethics

UNIT–II:

Knowledge Representation - Decision Tables, Decision Trees, Classification Rules, Association Rules, Rules involving Relations, Trees for Numeric Predictions, Neural Networks, Clusters

UNIT–III:
Decision Trees - Divide and Conquer, Calculating Information, Entropy, Pruning, Estimating Error Rates, The C4.5 Algorithm
Evaluation of Learned Results- Training and Testing, Predicting Performance, Cross-Validation

UNIT–IV:
Classification Rules - Inferring Rudimentary Rules, Covering Algorithms for Rule Construction, Probability Measure for Rule Evaluation, Association Rules, Item Sets, Rule Efficiency

UNIT–V:
Numeric Predictions - Linear Models for Classification and Numeric Predictions, Numeric Predictions with Regression Trees, Evaluating Numeric Predictions

TEXT BOOKS:
1. Data Mining and Knowledge Discovery Handbook, Maimon, Oded et al.
2. Data Cleansing: A Prelude to Knowledge Discovery

REFERENCES:
1. Handbook of Knowledge Representation. Frank van Harmelen, Vladimir Lifschitz and Bruce Porter (Eds), Foundations of Artificial Intelligence, 2008
2. Foundations of Semantic Web Technologies, Pascal Hitzler, Markus Kroetsch, and Sebastian Rudolph, Chapman & Hall/ CRC Textbooks in Computing, 2009
3. Logic for Computer Scientists, Uwe Schoning, Modern Birkäuser Classics, 1989

ONLINE RESOURCES:
1. https://www.youtube.com/watch?v=ykZ-UGcYWg&list=PLLspfyoOYoQcI6Nno3gPkq0h5YSe81hsc
2. https://www.tutorialspoint.com/data_mining/dm_knowledge_discovery.htm

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1CP06) SCRIPTING LANGUAGES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Knowledge of HTML5, CSS3, PHP, SQL, Bootstrap5, and MySQL, XAMP server installed on your PC

COURSE OBJECTIVES:

- To appreciate the nature of scripting and the role of scripting languages
- To design and implement Perl and Python software solutions that accommodate specified requirements and constraints
- To evaluate modern, representative programming languages critically
- To design and implement PHP and MySQL software solutions that accommodate specified requirements and constraints, based on analysis or modelling or requirements specification

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the differences between typical scripting languages and traditional programming languages

CO-2: Illustrate the concept of Data Structure Arrays used in PHP for effective programming

CO-3: Apply the syntax and semantics of languages using PHP and MySQL for effective scripting

CO-4: Develop Web applications for businesses platforms

CO-5: Propose the appropriate software solutions using Scripting Languages, PHP and MySQL

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	3	2	2	3
CO-2	3	3	3	2	2	2
CO-3	3	3	3	3	3	3
CO-4	3	2	3	3	3	3
CO-5	3	3	3	3	3	3

UNIT-I:

Scripts & Programs: Origin of Scripting, Characteristics of scripting languages. PHP Basics- Features, Embedding PHP Code in Web pages, Outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures, Function, Creating a Function, Function Libraries.

UNIT-II:
PHP Arrays: Creating an Array, Adding and Removing Array Elements, Locating Array Elements, Traversing Arrays, Determining Array Size and Uniqueness, Sorting Arrays. Strings and Regular Expressions.

UNIT-III:
PHP and Web Forms: Files, PHP authentication methodologies- Hard-coded, File-Based, Database based and IP based. Uploading Files with PHP, Sending Email using PHP, PHP's Encryption Functions, the MCrypt package.

UNIT-IV:
Introducing MySQL: What Makes MySQL so popular, The Evaluation of MySQL, Installing and Configuring MySQL, MySQL Storage Engines and Data types: Storage Engines, Data types and Attributes, Working with Databases and Tables, Securing MySQL.

UNIT-V:
PHP with MySQL: Handling Installation Prerequisites, Using the mysqli Extension, Interacting with the Database, Executing Database Transactions. MySQL Triggers, MySQL Views, Indexes and Searching: Database Indexing, Form – Based Searches.

TEXT BOOKS:

1. Beginning PHP and MySQL, Jason Gilmore, 3rd Edition, Dreamtech
2. The World of Scripting Languages, David Barren, Wiley Publications

REFERENCES:

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J. Lee and B. Ware, Pearson Education/Addison Wesley
2. Programming Python, M. Lutz, SPD
3. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning
4. Core Python Programming, Chun, Pearson Education

ONLINE RESOURCES:
1. XAMPP in Windows - English – YouTube
2. https://www.w3schools.com/php/php_mysql_intro.asp
3. https://www.tutorialspoint.com/php/php_and_mysql.htm

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1CP07) INTRODUCTION TO INTELLIGENT SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Knowledge on Linear Algebra, Probability and Programming Fundamentals

COURSE OBJECTIVES:

- To describe the framework for Artificial networks and its relationship to human brains
- To understand the concept of Genetic algorithms, fuzzy logic and knowledge Representation
- To understand and apply various searching techniques (Heuristic search) for problem solving
- To understand the concept of reasoning under uncertainty and to explore types of learning

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Familiarize with Artificial Neural Networks and its relationship to human brains
CO-2: Demonstrate the concepts of Genetic algorithms and fuzzy logic
CO-3: Describe knowledge representations for AI systems
CO-4: Demonstrate various heuristic search algorithms and its significance
CO-5: Understand various types of learning and reasoning under uncertainty

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	1	3	3	3	1
CO-2	2	1	3	3	3	1
CO-3	2	2	3	3	3	1
CO-4	2	1	3	3	3	1
CO-5	2	2	3	3	3	1

UNIT-I:
Biological Foundations to Intelligent Systems-I: Artificial neural networks, Backpropagation networks, Radial basis function networks, and recurrent networks.

UNIT-II:
Biological Foundations to Intelligent Systems-II: Fuzzy logic, knowledge Representation and inference mechanism, genetic algorithm, and fuzzy neural networks.

UNIT-III:

Search Methods: Basic concepts of graph and tree search. Three simple search methods: breadth-first search, depth-first search, iterative deepening search. Heuristic search methods: best-first search, admissible evaluation functions, hill climbing search. Optimisation and search such as stochastic annealing and genetic algorithm.

UNIT-IV:

Knowledge representation and logical inference Issues in knowledge representation. Structured representation, such as frames, and scripts, semantic networks, and conceptual graphs. Formal logic and logical inference. Knowledge-based systems structures, its basic components. Ideas of Blackboard architectures.

UNIT-V:

Reasoning under uncertainty and Learning Techniques on uncertainty reasoning such as Bayesian reasoning, Certainty factors and Dempster-Shafer Theory of Evidential reasoning, A study of different learning and evolutionary algorithms, such as statistical learning and induction learning.

TEXT BOOKS:

1. Handbook of Nature-Inspired and Innovative Computing, Albert Y. Zomaya - Springer, 2006
2. Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies, Floreano, D. and C. Mattiussi, IT Press, 2008

REFERENCES:

1. Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications, Leandro Nunes de Castro, Chapman & Hall/ CRC, Taylor and Francis, 2007
2. Ant Colony Optimization Marco Dorrigo, Thomas Stutzle, Prentice Hall of India, 2005
3. Machine Learning: A Practitioner's Approach, Vinod Chandra S. S., Anand H. S., Prentice Hall of India, 2020

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/108104049
2. https://www.academia.edu/37768072/Introduction_to_Intelligent_Systems

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1CP08) SEMANTIC WEB AND SOCIAL NETWORKS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Knowledge on Information Retrieval, Natural Language Processing concepts, Markup languages, Analytics

COURSE OBJECTIVES:

- To explore the ontology concepts in Computer Science in Knowledge representation
- To discuss Ontology description languages based on RDF, RDF Schema and Rule languages
- To illustrate semantic web services, methods, and tools to develop ontology
- To outline electronic sources for network analysis such as social web and related e-communities

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Identify description languages used in semantic web

CO-2: Analyze vocabulary, properties, and characteristics to annotate the requirements of semantic web languages

CO-3: Apply ontology methods and rule languages to represent knowledge by ontology development

CO-4: Illustrate the limitations, key concepts and measures used in Network Analysis

CO-5: Predict human behaviour in social web and related e-communities by visualizing social networks

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	2	3	2	1	1
CO-2	1	3	2	2	3	3
CO-3	3	3	3	3	2	3
CO-4	3	3	3	2	2	1
CO-5	3	3	3	3	3	2

UNIT–I:

The Future of the Internet: Introduction, The Syntactic web, The Semantic Web, **Ontology in Computer Science:** Defining the term Ontology, Taxonomies versus Ontologies, Thesauri versus Ontologies, Classifying Ontologies, Web Ontology Description Languages, Ontologies, Categories and Intelligence, Knowledge Representation in Description Language: Introduction, The family of Attributive languages, Inference Problems.

UNIT–II:

RDF and RDF Schema: Introduction, XML Essentials, RDF, RDF Schema, Summary of the RDF/RDF Schema Vocabulary, OWL: Introduction, Requirements for Web Ontology Description Languages, Header Information, Versioning and Annotation Properties, Datatype and Object Properties, Property Characteristics, Classes, Individuals, Summary of the OWL Vocabulary.

UNIT-III:

Rule Languages: Introduction, Usage Scenarios for Rule Languages, Semantic Web Services: Web Service Essentials, OWL-S Service Ontology, Methods for Ontology Development, Ontology Sources: Metadata, Upper Ontologies, Semantic Web and Software Tools: Metadata and Ontology Editors.

UNIT–IV:

Introduction to the Semantic Web and Social Networks: Limitations of the Semantic Web, Development of the Semantic Web, The Emergence of the Social Web, Social Network Analysis: What is social network Analysis, Development of Social Network Analysis, Key Concepts and Measures in Network Analysis.

UNIT–V:

Electronic Sources for Network Analysis: Electronic Discussion Networks, Blogs and online Communities, Web based Networks, Building Semantic Web Applications with Social Network Features.

TEXT BOOKS:

1. Semantic Web: Concepts, Techniques and Applications, Karin K. Breitman, Marco Antonio Casanova, Walter Truszkowski, Springer, 2007
2. Social Networks and the Semantic Web, Peter Mika, Springer, 2007

REFERENCES:

1. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J. Davies, Rudi Studer, Paul Warren, John Wiley & Sons
2. Semantic Web and Semantic Web Services, Liyang Lu, Chapman and Hall/CRC Publishers, Taylor & Francis

ONLINE RESOURCES:

1. https://www.youtube.com/watch?v=e5RPhWIBcY4&list=PLea0WJq13cnDDe8V7eVLRelaOnFztOEAq
2. https://www.youtube.com/watch?v=v9GQyenwwzw&list=PLyqSpQzTE6M8CLBcLnq-f3vHRH-klC39L

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PC2CP01) ADVANCED PROBLEM SOLVING LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE PRE-REQUISITES: Basic knowledge on Algorithm Design and Analysis

COURSE OBJECTIVES:

- To familiarize with advanced methods of designing and analysing algorithms
- To choose appropriate algorithms and use it for a specific problem
- To train basic paradigms and data structures used to solve advanced algorithmic problems
- To understand different classes of problems concerning their computation difficulties

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Analyze the complexity/performance of different classes of problems
CO-2: Identify appropriate data structure and algorithms design technique and use it for a specific problem solving
CO-3: Design efficient algorithms for solving the problems
CO-4: Implement the different advanced problem solving algorithms
CO-5: Apply advanced problem-solving skills in various domains

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	3	2	2	1
CO-2	3	2	3	3	2	1
CO-3	3	2	3	3	3	2
CO-4	3	2	3	3	3	2
CO-5	3	2	3	3	3	2

LIST OF PROGRAMS:

1. Write a program to implement Linear Probing and Separate Chaining.
2. Write a program to implement Min/Max Heap.
3. Write a program to implement Fibonacci Heap.
4. Write a program to implement AVL tree, Red-Blac tree operations.
5. Write a program to implement Boyer-Moore and KMP pattern matching algorithm.
6. Write a program to implement LCS algorithm.
7. Write a program to implement Topological sorting.
8. Write a program to compute shortest path by BFS.
9. Write a program to implement Dijkasra's Algorithm.

10. Write a program to implement Bellman-Ford Algorithm
11. Write a program to implements Ford-Fulkerson algorithm to compute maximum flow.
12. Write a program to implement strassen's algorithm.
13. Write a program to implement LUP-decomposition of a matrix.
14. Write a program to implement Floyd-Warshall Algorithm.
15. Write a program to implement Polynomial addition and multiplication.
16. Write a program to implement Simplex algorithm.

TEXT BOOKS:

1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 2nd Edition, Pearson, 2004
2. Introduction to Algorithms, Cormen, Leiserson, Rivest, Stein

REFERENCES:

1. Fundamentals of Computer Algorithms, E. Horrowitz, S. Salmi, S. Rajasekaran, 2nd Edition, University Press, 2007
2. Algorithm Design – Foundations, Analysis, and Internet Algorithms, M. T. Goodrich, R. Tomassia, John Wiley & Sons, 2002

ONLINE RESOURCES:

1. http://cs161.stanford.edu
2. https://www.ics.uci.edu/~eppstein/161/960312.html
3. https://www.cmi.ac.in/~madhavan/teaching.html

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PC2CP02) MACHINE LEARNING LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE PRE-REQUISITES: Basic knowledge on Linear Algebra, Probability

COURSE OBJECTIVES:

- To introduce to the basic concepts and techniques of Machine Learning
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability-based and Generalized learning techniques
- To understand ensemble models of machine learning algorithm

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explore various python programming data types, control structures and packages
CO-2: Understand various techniques of data pre-processing and implement them
CO-3: Analyse the purpose of various machine learning approaches
CO-4: Apply appropriate machine learning algorithm to solve recommendation problems

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	3	3	3	3
CO-2	3	3	3	3	3	3
CO-3	3	2	3	3	3	2
CO-4	3	3	3	2	3	2

LIST OF PROGRAMS:

WEEK 1: Installation of Python Software. Installing various packages related to Machine Learning Aspects in Python Language
WEEK 2: Basic Commands in Python Language, operations, and control structures
WEEK 3: Data types, Data Structures in Python
WEEK 4: Import or Export data, Data Visualization and Data shaping in Python
WEEK 5: Outlier Detection, Data Cleaning in Python
WEEK 6: Classification of Data using Decision Trees using Python
WEEK 7: Implementing Naive Bayes Algorithm
WEEK 8: Implementation of K Nearest Neighbourhood Algorithm
WEEK 9: Implementation of K Means Algorithm
WEEK 10: Implementation of Support Vector Machine (SVM) Algorithm

WEEK 11: Implementation of Ensemble Learning
WEEK 12: Implementation of collaborative filtering algorithm for recommender system

TEXT BOOKS:

1. Machine Learning, Tom M. Mitchell, McGraw Hill
2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007

REFERENCES:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis
2. Machine Learning: The Art And Science of Algorithms That Make Sense of Data, Peter, Flash, Cambridge University Press
3. The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer, 2009

ONLINE RESOURCES:

1. Introduction to Machine Learning - Course (nptel.ac.in)
2. Supervised Machine Learning: Regression and Classification | Coursera
3. Free Online Course: Applied Machine Learning in Python from Coursera | Class Central
4. Free Online Course: Machine Learning with Python from Coursera | Class Central

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22SD5HS01) COMMUNICATION SKILLS FOR ACADEMIC AND RESEARCH WRITING

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE OBJECTIVES:

- To equip the students with an understanding of the mechanics and conventions of academic and research writing including cohesion and coherence to produce texts that demonstrate precision and clarity
- To enable students to present focused, logical arguments that support a thesis
- To empower the students to find, analyze, evaluate, summarize and synthesize appropriate source material for literature review
- To enable students to use appropriate language to analyze and interpret the data, and prepare an outline
- To enable students to become adept in the requirements and specifications of standard writing to produce academic and research papers

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply knowledge of academic language features, and text structure and ensure cohesion and coherence as connected to various text types

CO-2: Demonstrate the use of writing process strategies through outlining, reviewing, composing, and revising

CO-3: Evaluate sources and use summary, analysis, synthesis, and integration to construct a literature review on a topic chosen by the student

CO-4: Prepare an outline for Research Articles and Thesis

CO-5: Apply standard documentation style to produce academic and research papers that meet the demands of specific genres, purposes, and audiences

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	1	3	1	1	2	3
CO-2	3	3	3	3	3	3
CO-3	1	3	2	2	3	1
CO-4	3	3	2	1	2	1
CO-5	3	3	3	3	3	3

UNIT-I:

a) Factors Influencing Effective Writing: Mechanics of Writing, Purpose of Writing, Audience/reader, Organisation- Cohesion, and Coherence

b) Features of Academic Writing: Introduction, Complexity, Formality, Precision, Objectivity, Explicitness, Accuracy and Appropriacy, Relevance, Hedging

UNIT-II:

1. Academic Writing Forms:

a) Analysing arguments; Building an argument
b) Making a Counter Argument- Managing tone, and tenor

2. Types of Research: Primary and Secondary Research;
3. Research Design: Statement of the Problem, Survey of relevant literature, Writing Hypotheses, Developing Objectives; Research Tools

UNIT-III:

a) Criteria of Good Research- Avoiding Plagiarism
b) Data Interpretation
c) Preparing an outline for Research Articles & Research Reports

UNIT-IV:

a) Reference Skills -Paraphrasing (Change of parts of speech, word order, synonyms, using the passive form), -Summarizing (Steps in summarising)
b) Documentation Format: APA style
c) Documentation Format: MLA style

UNIT-V:

a) Writing Article Reviews
b) Report Writing: a) Writing Technical Reports b) Writing Proposals

TEXT BOOKS:

1. A Course in Academic Writing, Gupta R., Orient Black Swan, 2010
2. Academic Writing: Exploring Processes and Strategies, Leki I., CUP, 1998
3. Writing-up Research: Experimental Research Report Writing for Students of English, Weissberg R., & Buker S., Englewood Cliffs, Prentice Hall, 1990

REFERENCES:

1. English Academic Writing for Students and Researchers. Yakhontova T., 2003
2. Inside Track: Successful Academic Writing, Gillett A., Hammond A., Martala M., Pearson Education, 2009
3. English for Academic Research: Writing Exercises, Wallwork, Springer, 2013
4. The MLA Handbook for Writers of Research Papers, 7th Edition, Modern Language Association
5. Academic Writing for Graduate Students: A Course for Non-native Speakers of English, Swales J. M., & Feak C. B., University of Michigan Press, 1994

ONLINE RESOURCES:

1. https://www.coventry.ac.uk/study-at-coventry/student-support/academic-support/centre-for-academic-writing/support-for-students/academic-writing-resources/
2. https://www.biz-e-training.com/resources-for-learners/academic-writing-online-resources/

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22MN6HS01) REASEARCH METHODOLOGY AND IPR

TEACHING SCHEME		
L	T/P	C
2	0	0

EVALUATION SCHEME			
SE-I	SE-II	SEE	TOTAL
50	50	-	100

COURSE OBJECTIVES:

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand research problem formulation

CO-2: Analyze research related information & follow research ethics

CO-3: Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity

CO-4: Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular

CO-5: Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	2	1	2	1
CO-2	3	3	2	2	2	2
CO-3	3	3	2	1	2	2
CO-4	3	3	2	1	2	2
CO-5	3	3	2	1	2	1

UNIT–I:

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT–II:

Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT–III:
Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT–IV:
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT–V:
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System.
New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs

TEXT BOOKS:

1. Research Methodology: An Introduction for Science & Engineering Students, Stuart Melville and Wayne Goddard
2. Research Methodology: An Introduction, Wayne Goddard and Stuart Melville
3. Research Methodology: A Step by Step Guide for beginners, Ranjit Kumar, 2nd Edition

REFERENCES:

1. Resisting Intellectual Property, Halbert, Taylor & Francis Ltd., 2007
2. Industrial Design, Mayall, McGraw Hill, 1992
3. Product Design, Niebel, McGraw Hill, 1974
4. Intellectual Property in New Technological Age, Robert P. Merges, Peter S. Menell, Mark A. Lemley, 2016
5. Intellectual Property Rights Under WTO, T. Ramappa, S. Chand, 2008

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PC1CP04) CRYPTOGRAPHY AND NETWORK SECURITY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COUSE PRE-REQUISITES: Basic knowledge on Computer Networks and Mathematics

COURSE OBJECTIVES:

- To understand the fundamentals of cryptography
- To understand various key distribution and management schemes
- To understand how to deploy encryption techniques to secure data in transit across data networks
- To apply algorithms used for secure transactions in real world applications

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the basic concepts of cryptography, network security
CO-2: Apply the concepts of public key cryptography and key management
CO-3: Familiarize with the concepts of authentication and email security
CO-4: Understand IP and web security concepts and mechanisms
CO-5: Identify and investigate vulnerabilities, viruses and security threats and mechanisms to counter them

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	1	3	3	3	3
CO-2	3	1	3	3	2	2
CO-3	3	2	2	3	3	3
CO-4	2	1	3	2	3	2
CO-5	3	2	3	2	3	3

UNIT–I:
Security Attacks, Security Services and Mechanisms, A model for Internetwork security. Classical Encryption Techniques, DES, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operation, RC4, Blowfish, Placement of Encryption Function, Traffic Confidentiality.

UNIT–II:
Public key Cryptography Principles, RSA algorithm, Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography. Message authentication and Hash Functions, Authentication Requirements and Functions, Message Authentication, Hash Functions and MACs Hash and MAC Algorithms SHA-512, HMAC.

UNIT–III:
Digital Signatures, Authentication Protocols, Digital signature Standard, Authentication Applications, Kerberos, X.509 Directory Authentication Service. Email Security: Pretty Good Privacy (PGP) and S/MIME.

UNIT–IV:
IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.
Web Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

UNIT–V:
Intruders, Viruses and Worms Intruders, Viruses and related threats Firewalls: Firewall Design Principles, Trusted Systems, Intrusion Detection Systems.

TEXT BOOK:
1. Cryptography and Network Security (Principles and Approaches), William Stallings, 4th Edition, Pearson Education

REFERENCES:
1. Network Security Essentials (Applications and Standards), William Stallings Pearson Education
2. Principles of Information Security, Whitman, Thomson

ONLINE RESOURCES:
1. https://www.mooclab.club/tags/network-security/
2. https://in.coursera.org/lecture/managing-network-cybersecurity/cryptography-and-network-security-w9SuJ

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PC1CP05) INTERNET OF THINGS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To introduce the terminology, technology, concept of M2M (machine to machine) and its applications
- To introduce the Python scripting language which issued in many IoT devices
- To introduce the IOT in different domains, system management with NETCONF-YANG
- To introduce the hardware and working principles of various sensors used for IoT
- To introduce the Raspberry PI platform, design and implementation of web application framework used in IoT applications

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understanding the physical and logical design of the Internet of Things, IoT & M2M

CO-2: Analyzing various applications of Internet of Things in various domain, NETCONF-YANG

CO-3: Creating logical design of IoT Systems using Python

CO4: Understanding the hardware and working principles of various sensors used for IoT,

CO5: Creating web application framework design using Raspberry PI plat form and RESTful web API

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	2	1	2	2	3
CO-2	3	1	2	2	3	3
CO-3	1	1	2	2	2	3
CO-4	2	2	2	2	2	2
CO-5	1	2	3	3	2	2

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 enabled Technologies –Wireless Sensor Networks, Cloud Computing, Bigdata analytics, Communication protocols, Embedded Systems, IoT Levels and Templates.

IOT and M2M: Introduction, M2M, Difference between IOT and M2M, SDN and NFV for IOT

UNIT–II:

Domain Specific IoTs: Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

System Management with NETCONF-YANG: Software defined Networking, Network Function Virtualization, Need for IOT Systems Management, Simple Network Management Protocol, Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systems management with NETCONF-YANG

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 Python packages -JSON,XML, HTTPLib, URLLib, SMTPLib

UNIT-IV:

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

UNIT-V:

Controlling Hardware: Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, Using unipolar and bipolar Stepper motors

Digital input- Sensing push switch, pull-up and pull-down resistors, Rotary encoder, Using keypad, Using RTC Sensors: Light sensor, temperature sensor with thermistor, voltage sensor, ADC and ADC, Temperature and Humidity Sensor DHT11, Read Switch, Distance Measurement with ultrasound sensor

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014
3. Raspberry Pi Cookbook, Software and Hardware Problems and Solutions, Simon Monk, O'Reilly (SPD), 2016

REFERENCES:

1. Designing the Internet of Things, Adrian McEwen, Hakim Cassimally, Wiley, 2014
2. The Internet of Things, Samuel Greengard, MIT Press, Cambridge, 2015
3. Internet of Things: Principles and Paradigms, Rajkumar Buyya, Amir Vahid Dastjerdi, Morgan Kaufman, 2016

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PC1CP06) BIG DATA ANALYTICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge on Data Analytics, Statistical Analysis

COURSE OBJECTIVES:

- To explore the fundamental concepts of big data analytics
- To learn to analyze the data analysis techniques
- To explore the techniques related to mining streams
- To understand, explore Big Data technology and its associated database techniques

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Work with big data platform and analyze the big data analytic techniques for useful business applications
CO-2: Design efficient algorithms for mining the data from large volumes
CO-3: Learn to use various techniques for mining data stream
CO-4: Analyze the Hadoop and Map Reduce technologies and related database techniques associated with big data analytics
CO-5: Explore Hadoop framework & visualization techniques

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	3	2	3	2
CO-2	3	2	3	2	3	2
CO-3	3	2	3	2	3	2
CO-4	2	2	3	2	3	2
CO-5	2	2	3	2	3	2

UNIT-I:

Big Data and Data Analysis: Introduction to Big Data Platform, Challenges of Conventional Systems, Web Data, Evolution of Analytic Scalability, Analytic Processes and Tools, Analysis vs Reporting, Modern Data Analytic Tools. Statistical Concepts: Sampling Distributions, Re- Sampling, Statistical Inference - Prediction Error, Regression Modelling, Multivariate Analysis.

UNIT-II:

Classification and Clustering:

Classification: Rule Based Classifier, Nearest neighbour classifiers, Artificial Neural Network, Support Vector Machine.

Cluster Analysis: Overview, K-Means, Agglomerative, Hierarchical Clustering, Prototype based clustering.

UNIT-III:

Mining Data Streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams.

Mining Frequent Item Sets: Mining Frequent Item-sets, Market Based Model, A-Priori Algorithm, Handling Large Data Sets in Main Memory, Limited Pass Algorithms, Counting Frequent Item- sets in a Stream.

UNIT-IV:

Hadoop: Meet Hadoop, Comparison with other systems, A brief history of Hadoop and the Hadoop ecosystem, Hadoop Distributed File System, Components of Hadoop, Analyzing the Data with Hadoop, Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features

UNIT-V:

Frameworks and Visualization: Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services –HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper.

TEXT BOOKS:

1. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Stream with Advanced Analytics, Bill Franks, John Wiley & Sons, 2012
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar Michael Steinbach, Pearson
3. Mining of Massive Datasets, Anand Rajaraman and Jeffrey David Ullman, Cambridge University Press, 2012

REFERENCES:

1. Making Sense of Data, Glenn J. Myatt, John Wiley & Sons, 2007
2. Big Data Glossary, Pete Warden, O"Reilly, 2011
3. Data Mining Concepts and Techniques, Jiawei Han, Micheline Kamber, 2nd Edition, Elsevier, 2008
4. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O'Reilly Media, 2012

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106104189
2. Data Engineering Certification Courses Online - Purdue University Program (simplilearn.com)
3. Learn Big Data with Online Courses, Classes, & Lessons | edX

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CP09) CLOUD COMPUTING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge on Computer Systems, Programming

COURSE OBJECTIVES:

- To understand cloud computing paradigm, recognize its various forms
- To get a clear understanding of Cloud Computing fundamentals and its importance to various organizations
- To master the concepts of IaaS, PaaS, SaaS, Public and Private clouds
- To understand the security issues and storage mechanism for the cloud

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Articulate the main concepts of Distributed system models, key technologies, need of virtualization of clusters, data centres

CO-2: Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, different types of cloud

CO-3: Explain the core issues of cloud computing such as security, privacy, and interoperability, Understanding the cloud services and the workflow of the cloud

CO-4: Articulate the Scientific applications and SLA management in cloud computing

CO-5: Identifying the Legal issues of Cloud computing and Organizational Readiness in the cloud

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	3	1	2	1	3
CO-2	3	3	2	3	2	2
CO-3	3	3	2	3	2	3
CO-4	3	3	3	3	3	3
CO-5	3	3	1	2	3	3

UNIT-I:

Systems Modelling, Clustering and Virtualization: Distributed System Models and Enabling Technologies, Computer Clusters for Scalable Parallel Computing, Virtual Machines and Virtualization of Clusters and Data centres.

UNIT-II:

Foundations: Introduction to Cloud Computing, migrating into a Cloud, Enriching the 'Integration as a Service' Paradigm for the Cloud Era. Infrastructure as a Service (IAAS) & Platform and Software as a Service (PAAS / SAAS)

UNIT-III:

Virtual machines provisioning and Migration services, 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

UNIT-IV:

Understanding Scientific Applications for Cloud Environments. An Architecture for Federated Cloud Computing. SLA Management in Cloud Computing, Performance Prediction for HPC on Clouds.

UNIT-V:

Legal Issues in Cloud computing, Achieving Production Readiness for Cloud Services. Building Content Delivery networks using Clouds, Organizational Readiness and Change management in the Cloud age.

TEXT BOOKS:

1. Cloud Computing: Principles and Paradigms, 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 Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Tata McGraw Hill, 2011

REFERENCES:

1. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsen peter, Tata McGraw Hill, 2011
2. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010
3. Cloud Computing: Implementation, Management and Security, John W. Rittinghouse, James F. Ransome, CRC Press, 2012
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O'Reilly, SPD, 2011
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, 2011

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_cs14/preview

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CP10) SOFT COMPUTING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge on Mathematics, Machine Learning, Deep Learning

COURSE OBJECTIVES:

- To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario
- To implement soft computing based solutions for real-world problems
- To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms
- To provide student a hands-on experience on MATLAB to implement various strategies
- To understand recent trends in various soft computing constituents

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Explain various soft computing techniques and their roles in building intelligent machines

CO-2: Analyze the problems which can be solved using fuzzy logic, genetic algorithms and neural networks

CO-3: Apply soft computing techniques to solve engineering problems

CO-4: Implement various soft computing approaches for a given problem using MAT Lab or Python

CO-5: Understand recent case studies or trends in various constituents of soft computing

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	-	3	3	2	-
CO-2	2	-	3	3	3	1
CO-3	3	1	3	3	3	-
CO-4	1	2	3	3	3	-
CO-5	3	3	3	2	2	2

UNIT-I:

Introduction to Soft Computing: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics.

UNIT-II:

Fuzzy Logic: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT-III:

Neural Networks: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks,

Radial Basis Function Networks: Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks.

UNIT-IV:

Genetic Algorithms: Introduction to Genetic Algorithms (GA)- GA Operators, Applications of GA in Machine Learning: Machine Learning Approach to Knowledge Acquisition.

UNIT-V:

Matlab/Python Lib: Introduction to MATLAB /Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic.

Recent Trends in Fuzzy logic, neural networks and genetic algorithm, Implementation of recently proposed soft computing techniques.

TEXT BOOKS:

1. Neuro-Fuzzy and Soft Computing, J. S. R. Jang, C. T. Sun and E. Mizutani, PHI / Pearson Education, 2004
2. Principles of Soft Computing, S. N. Sivanandam and S. N. Deepa, Wiley India, 2011

REFERENCES:

1. Fuzzy Sets and Fuzzy Logic: Theory and Applications, George J. Klir and Bo Yuan, Prentice Hall, 1995
2. An Introduction to Genetic Algorithm, Melanic Mitchell, MIT Press, 1996
3. Fuzzy Logic with Engineering Applications, Timothy J. Ross, Wiley, 2010
4. Neural Networks, Fuzzy Logic and Genetic Algorithms, S. Rajasekaran and G. A. V. Pai, 1st Edition, PHI, 2003

ONLINE RESOURCES:

1. https://youtu.be/K9gjuXjJeEM
2. https://youtu.be/5lM6uYXqFEU

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CP11) ADVANCED OPERATING SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge of Operating System, Functions, Scheduling, Memory Management

COURSE OBJECTIVES:

- To understand main components of Real time Operating system and their working
- To know about distributed system and its functioning
- To learn about centralized system and its working
- To explore on network operating system
- To know about Kernel, concept of threading, multi-tasking Vs multi-programming

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Describe and demonstrate about real-time operating system (RTOS), its functioning, usage , and its applications

CO-2: Compare and contrast distributed Vs centralized design principles and features

CO-3: Describes network operating system features and design principles

CO-4: Exemplify and hypothesize kernel Issues and development principles

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	3	3	2	2
CO-2	3	3	2	3	2	3
CO-3	2	3	3	2	3	2
CO-4	3	2	2	3	2	3
CO-5	3	3	2	3	2	3

UNIT-I:

Real-time Operating Systems: Introduction to Real-Time Operating Systems, Definitions, Important Terminology and Concepts with examples, Role of an OS in Real Time Systems,

UNIT-II:

Real-Time Applications: How Real-Time OSs Differ from General-Purpose OSs, Design issues, principles, and case study.

UNIT-III:

Distributed Operating System: Introduction to Distributed Systems, Definitions, Goals, Advantages of Distributed Systems over Centralized Systems, Advantages of

Distributed Systems over Independent PCs, Disadvantages of Distributed Systems Design issues, features and principles of working, case study.

UNIT-IV:

Network Operating System: Introduction to Network operating system, Definitions, Different types of network operating systems, Function of Network operating systems, Design issues, working principles and characteristic features, case study.

UNIT-V:

Kernel Development and Secure concerns: Introduction, Overview, Issues and development principles, case study. Protection, privacy, access control and security issues, solutions.

TEXT BOOKS:

1. Distributed Operating Systems, Andrew S. Tanenbaum, PHI
2. Modern Operating Systems, Andrew S. Tanenbaum, 3rd Edition, Pearson Education
3. Operating System Principles, Lubemir F. Bic and Alan C. Shaw, Pearson Education, 2003

REFERENCES:

1. Operating Systems: Internal and Design Principles, Stallings, 6th Edition, Pearson Education
2. UNIX Network Programming, W. Richard Stevens, 1998, PHI
3. UNIX User Guide, Ritchie & Yates
4. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, 7th Edition, John Wiley & Sons

ONLINE RESOURCES:

1. https://youtube.com/playlist?list=PLBlnK6fEyqRiVhbXDGLXDk_OQAeuVcp2O

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CP12) COMPUTER VISION

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge on Image Processing

COURSE OBJECTIVES:

- To be familiar with both the theoretical and practical aspects of computing with images
- To have described the foundation of image formation, measurement, and analysis
- To understand the geometric relationships between 2D images and the 3D world
- To grasp the principles of state-of-the-art deep neural networks to built Computer Vision Applications
- To have gained exposure to object and scene recognition and categorization from images

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Learn basic concepts of computer imaging systems
CO-2: Understand edge detection techniques and performance
CO-3: Develop morphological filtering and transformations
CO-4: Implement feature extraction using similarity measures
CO-5: Apply Patter analysis techniques based on supervised and unsupervised learning approaches

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	3	3	3	2
CO-2	3	2	3	3	3	1
CO-3	3	2	3	3	3	1
CO-4	3	2	3	3	3	2
CO-5	3	3	3	3	3	2

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, colour, spectral, texture, using CVIP tools, Feature analysis, feature vectors, distance /similarity measures, data pre-processing

UNIT–V:
Pattern Analysis: Clustering: K-Means, K-Medio's, Mixture of Gaussians. Classification: Discriminant Function, Supervised, Un-supervised, Semi supervised. Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods.

TEXT BOOKS:
1. Computer Vision: Algorithms and Applications, Richard Szeliski
2. Deep Learning, Goodfellow, Bengio, and Courville
3. Dictionary of Computer Vision and Image Processing, Fisher et al.

REFERENCES:
1. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003
2. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, 2nd Edition, Cambridge University Press, 2004
3. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006

ONLINE RESOURCES:
1. https://faculty.ucmerced.edu/mcarreira-perpinan/teaching/ee589/lecture-notes.pdf
2. https://cs.nyu.edu/~fergus/teaching/vision_2012/
3. http://www.cs.cmu.edu/afs/cs/academic/class/15385-s06/lectures/ppts/
4. http://vision.stanford.edu/teaching/cs131_fall1718/files/cs131-class-notes.pdf

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CP13) HIGH PERFORMANCE COMPUTING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Knowledge on using the UNIX command line to operate a computer, connect to a cluster, and write simple shell scripts; and submit and manage jobs on a cluster using a scheduler, transfer files, and use software through environment modules

COURSE OBJECTIVES:
- To improve the system performance
- To learn various distributed and parallel computing architecture
- To learn different computing technologies

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the concepts of modern processors
CO-2: Understand and analyze optimization techniques for serial code
CO-3: Understand the taxonomy of parallel computing paradigms
CO-4: Understand distributed memory parallel programming with MPI
CO-5: Analyze MPI performance tools

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	1	1	1	1	1
CO-2	3	1	3	2	2	2
CO-3	3	1	1	2	2	2
CO-4	3	1	1	1	1	2
CO-5	3	1	2	1	1	2

UNIT–I:
Modern Processors: Stored Program Computer Architecture- General purpose cache-based microprocessor-Performance based metrics and benchmarks- Moore's Law-Pipelining- Superscalarity-SIMD- Memory Hierarchies Cache- mapping- prefetch-Multicore processors- Multithreaded processors- Vector Processors- Design Principles-Maximum performance estimates- Programming for vector architecture.

UNIT–II:
Basic Optimization Techniques for Serial Code: scalar profiling- function and line based runtime profiling- hardware performance counters- common sense optimizations- simple measures, large impact- elimination of common subexpressions-avoiding branches- using SIMD instruction sets- the role of compilers - general

optimization options- inlining - aliasing- computational accuracy- register optimizations- using compiler logs- C++ optimizations - temporaries- dynamic memory management- loop kernels and iterators data access optimization: balance analysis and light speed estimates- storage order- case study: Jacobi algorithm and dense matrix transpose.

UNIT–III:

Parallel Computers: Taxonomy of parallel computing paradigms- Shared memory computers- Cache coherence- UMA - ccNUMA- Distributed-memory computers- Hierarchical systems- Networks- Basic performance characteristics- Buses- Switched and fat- tree networks- Mesh networks- Hybrids - Basics of parallelization - Why parallelize - Data Parallelism - Function Parallelism- Parallel Scalability- Factors that limit parallel execution- Scalability metrics- Simple scalability laws- parallel efficiency - serial performance Vs Strong scalability- Refined performance models- Choosing the right scaling baseline- Case Study: Can slow processors compute faster- Load balance.

UNIT–IV:

Distributed Memory Parallel Programming with MPI: message passing - Introduction to MPI – example - messages and point-to-point communication - collective communication – nonblocking point-to-point communication- virtual topologies - MPI parallelization of Jacobi solver- MPI implementation - performance properties

UNIT–V:

Efficient MPI Programming: MPI performance tools- communication parameters- Synchronization, serialization, contention- Reducing communication overhead- optimal domain decomposition- Aggregating messages – Nonblocking Vs Asynchronous communication- Collective communication- Understanding intra-node point-to-point communication

TEXT BOOKS:

1. Georg Hager, Gerhard Wellein, Introduction to High Performance Computing for Scientists and Engineers, Chapman & Hall / CRC Computational Science Series, 2011

REFERENCES:

1. High Performance Computing, Charles Severance, Kevin Dowd, 2nd Edition, O'Reilly Media, 1998
2. Computer Architecture and Parallel Processing, Kai Hwang, Faye Alaye Briggs, McGraw Hill, 1984

ONLINE RESOURCES:

- https://nptel.ac.in/courses/112105293

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CP14) DEEP LEARNING AND ITS APPLICATIONS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Able to write programs in python and have knowledge on Algorithms and Basic Mathematics

COURSE OBJECTIVES:
- To understand characteristics of neural networks
- To identify methods to train and minimization of errors of neural networks
- To analyze different architectures of deep learning
- To build CNN and RNN models and evaluate the performance
- To study importance of deep learning models in various applications

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand basic characteristics of neural networks
CO-2: identify methods to minimize the error of neural networks
CO-3: Analyze different architectures of deep learning
CO-4: Build CNN and RNN models
CO-5: Apply deep learning models on various applications

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	3	3	2	2
CO-2	3	2	3	3	3	2
CO-3	3	3	3	3	3	3
CO-4	3	3	2	2	3	2
CO-5	3	3	3	3	3	3

UNIT-I:
Introduction to Neural Networks: Characteristics of neural networks, Historical development of neural networks principles, Artificial neural networks: Terminology, Models of neuron, Topology, Basic learning laws.

UNIT-II:
Training Neural Networks: Risk minimization, loss functions, back propagation, regularization, model selection, optimization.

UNIT-III:
Deep Learning Architectures: Introduction to deep learning, Machine Learning and Deep Learning, Representation Learning, Activation Functions: RELU, LRELU, ERELU,

Unsupervised Training of Neural Networks, Restricted Boltzmann Machines, Auto Encoders, Deep Learning Applications.

UNIT-IV:

Convolutional Neural Networks: Architectural Overview, Motivation, Layers, Filters, Parameter sharing, Regularization, Popular CNN Architectures: ResNet, AlexNet– Applications.

UNIT-V:

Sequence Modelling – Recurrent and Recursive Nets: Recurrent Neural Networks, Bidirectional RNNs, Encoder-decoder sequence to sequence architectures, LSTM, CNN training on computer vision data, Sentiment analysis using RNN, Time series data analysis using RNN, Feature extraction in NLP.

TEXT BOOKS:

1. Deep Learning, Ian Good fellow, Yoshua Bengio and Aaron Courville, MIT Press
2. The Elements of Statistical Learning, T. Hastie, R. Tibshirani, and J. Friedman, Springer
3. Machine Learning in Data Science using Python, Dr. R. Nageswara Rao, Dreamtech, 2022

REFERENCES:

1. Probabilistic Graphical Models, Koller and N. Friedman, MIT Press
2. Pattern Recognition and Machine Learning, Bishop C. M., Springer, 2006
3. Artificial Neural Networks, Yegnanarayana B., PHI Learning, 2009
4. Deep learning: A Practitioners Approach, Josh Patterson, Adam Gibson
5. Neural Networks and Deep Learning, Michael Nielsen, Determination Press, 2015

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106106184
2. Why deep learning is becoming so popular? | Deep Learning Tutorial 2 (Tensorflow2.0, Keras & Python) – YouTube

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CP15) NATURAL LANGUAGE PROCESSING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Knowledge on Data Structures, Finite Automata and Probability Theory

COURSE OBJECTIVES:

- To understand the algorithms available for the processing of linguistic information of natural languages
- To conceive basic knowledge on various syntactic and semantics of NLP tasks
- To familiarize various NLP software libraries and data sets publicly available
- To apply the NLP techniques for language modelling

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand Morphological Models and familiarize with issues and challenges
CO-2: Describe the concepts of syntax and evaluate parsing algorithms
CO-3: Analyze the semantics and pragmatics of a statement written in a natural language
CO-4: Extract information using predicate argument structure in a corpus
CO-5: Design and implement different language modeling Techniques

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	3	3	3	3
CO-2	3	3	3	3	3	3
CO-3	3	3	3	3	3	2
CO-4	3	2	2	2	3	2
CO-5	3	3	2	2	3	2

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: Cohesion, Reference Resolution, Discourse Cohesion 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
3. Foundations of Statistical Natural Language Processing, Christopher D. Manning and Hinrich Schutze, MIT Press, 1999

REFERENCES:
1. Speech and Natural Language Processing, Daniel Jurafsky & James H. Martin, Pearson Publication
2. Practical Text Analytics: Interpreting Text and Unstructured Data for Business Intelligence, Steven Struhl, Kogan Page, 2015
3. Handbook of Natural Language Processing, Nitin Indurkhya and Fred J. Damerau, Second Edition, Chapman and Hall/CRC Press, 2010

ONLINE RESOURCES:
1. Applied Natural Language Processing - Course (nptel.ac.in)
2. Natural Language Processing - Course (nptel.ac.in)
3. Natural Language Processing | Coursera
4. Top Nlp Courses - Learn Nlp Online | Coursera

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CP16) COGNITIVE SCIENCE

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Preliminary understanding of various concepts such as, learning, memory, thinking, problem solving, reasoning, decision making, sensation, perception, attention and intelligence

COURSE OBJECTIVES:

- To identify the basics of artificial intelligence and cognitive science engineering with focus on knowledge representation, and its use by individual minds, brains, and machines
- To analyse the mind and intelligence, embracing psychology, artificial intelligence, neuroscience and linguistics
- To analyse the basics of language acquisition skills and language processing techniques
- To relate the role of neuro science in cognitive field and robotics applications
- To analyse the role of cognitive science for vision/image processing

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Describe the concepts and role of computers in Cognitive Science, Nature of Artificial Intelligence, Psychology, Neuroscience, Language Acquisition, Neuropsychology

CO-2: Explain the philosophical and theoretical perspectives, Cognitive Architecture, Cognitive Processes, mind organization, cognitive organization, Computation of Cognitive Functioning at machines level

CO-3: Analyse the Information Processing Models of the Mind, Strategies for Brain mapping, and function of Nervous System

CO-4: Demonstrate the use of neuroscience in cognitive domain in present industry and familiarize with Cognitive function measurement tools, Robotics and Challenges of neuroscience in cognitive domain in present industry

CO-5: Discuss the applications of Cognitive Science for Vision/Image Processing

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	1	2	2	2	2
CO-2	3	1	2	2	2	2
CO-3	3	1	2	3	2	2
CO-4	3	1	2	2	2	2
CO-5	3	1	2	1	1	2

UNIT-I:

Introduction to Cognitive Science and Cognitive Psychology: The Cognitive view – Some Fundamental Concepts – Computers in Cognitive Science – Applied Cognitive Science – The Interdisciplinary Nature of Cognitive Science -Artificial Intelligence: Knowledge representation -The Nature of Artificial Intelligence - Knowledge Representation – Artificial Intelligence: Search, Control, and Learning
Cognitive Psychology – The Architecture of the Mind - The Nature of Cognitive Psychology- A Global View of The Cognitive Architecture

UNIT-II:

Cognitive Neuroscience: Cognitive Processes, Working Memory, and Attention- The Acquisition of Skill- Brain and Cognition Introduction to the Study of the Nervous System – Neural Representation – Neuropsychology- Computational Neuroscience - The Organization of the mind. Organization of Cognitive systems - Strategies for Brain mapping – A Case study: Exploring mindreading

UNIT-III:

Language Acquisition, Semantics and Processing Models: Milestones in Acquisition – Theoretical Perspectives- Semantics and Cognitive Science – Meaning and Entailment, Computational Models of Semantic Processing.

UNIT-IV:

Natural Language Processing and Cognitive Process: Preliminaries, Role of Grammar in Language Processing. Connectionist Models, Information Processing Models of the Mind- Physical symbol systems and language of thought- Applying the Symbolic Paradigm Neural networks and distributed information processing- Neural network models of Cognitive Processes

UNIT-V:

Higher-Level Cognition and Challenges: Dynamical systems and situated cognition Challenges – Emotions and Consciousness – Computation of Cognitive Functioning in machines: Robotics, Human-Robotics Interaction. Perception and sensing: visual cognition, cognitive mechanisms of vision, Feature Extraction from Images, Information Processing in Perception and Visual Behaviour

TEXT BOOKS:

1. Cognitive Science: An Introduction, Neil Stillings, Steven E. Weisler, Christopher H. Chase and Mark H. Feinstein, 2nd Edition, 1995
2. Cognitive Science: An Introduction to the Science of the Mind José Luis Bermúdez, Cambridge University Press, 2010
3. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivashankar B. Nair, 3rd Edition, Tata McGraw Hill Education, 2012

REFERENCES:

1. Computational Vision: Information Processing in Perception and Visual Behavior Hanspeter A. Mallot, Translated John S. Allen
2. How the Mind Works, Steven Pinker, 2009
3. Cognitive Science: An Interdisciplinary Approach, Carolyn Panzer Sobel and Paul Li, 2013
4. Cognitive Science: An Introduction to the Study of Mind, J. Friedenberg and G. Silverman, 2006

5. Artificial Intelligence - A Modern Approach, Stuart J. Russell, Peter Norvig, 3rd Edition, Pearson Publishers, 2015

ONLINE RESOURCES:

1. Trends in Cognitive Sciences (JOURNAL)
2. onlinecourses.nptel.ac.in
3. www.coursera.org

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CP17) WEB ANALYTICS AND DEVELOPMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Knowledge on Web Technologies, Software Engineering and Unified Modeling Language

COURSE OBJECTIVES:
- To explore the use of social network analysis
- To understand the web search and retrieval techniques
- To understand growing connectivity and complexity in the world ranging from small groups to www

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand social network and web data and methods
CO-2: Analyze web analytics tools
CO-3: Demonstrate web search and retrieval
CO-4: Analyze links, random graphs and network evolution
CO-5: Understand connection search, collapse and diffusion of innovation

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	2	2	2	1	1
CO-2	1	2	2	1	-	1
CO-3	1	2	2	1	-	1
CO-4	1	2	2	2	1	1
CO-5	2	2	2	1	1	1

UNIT–I:
Introduction – Social network and Web data and methods, Graph and Matrices, Basic measures for individuals and networks, Information Visualization

UNIT–II:
Web Analytics tools: Click Stream Analysis, A/B testing, Online Surveys

UNIT–III:
Web Search and Retrieval: Search Engine Optimization, Web Crawling and indexing, Ranking Algorithms, Web traffic model

UNIT–IV:

Making Connection: Link Analysis, Random Graphs and Network evolution, Social Connects: Affiliation and identity

UNIT–V:

Connection: Connection Search, Collapse, Robustness Social involvements, and diffusion of Innovation

TEXT BOOKS:

1. Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Hansen Derek, Ben Schneiderman, Marc Smith, Morgan Kaufmann, 304, 2011
2. Web Analytics 2.0: The Art of Online Accountability, Avinash Kaushik, 2009

REFERENCES:

1. Networks, Crowds, and Markets: Reasoning About a Highly Connected World, Easley D. & Kleinberg J, Cambridge University Press, 2010
2. Social network analysis: Methods and Applications, Wasserman S. & Faust K., Cambridge University Press, 1994
3. Theories of Communication Networks, Monge P. R. & Contractor N. S, Oxford University Press, 2003

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106106156
2. http://www.cs.cornell.edu/home/kleinber/networks-book/

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CP18) RECOMMENDER SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic concepts on: Getting the Data, Explore, Clean, and Augment the Data and basic knowledge on Predict the Ranking, Visualize the Data, Iterate and Deploy Models

COURSE OBJECTIVES:
- To know the issues, applications, and techniques for making recommendations,
- To understand-personalized, content-based, and collaborative filtering approaches
- To explore a variety of choice-making strategies with the goal of providing affordable, personal, and high-quality recommendations
- To identify the metrics to evaluate the recommender systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the concepts of Information Retrieval models for making recommendation systems
CO-2: Generate the features of document used in classification algorithms
CO-3: Analyze the types of recommendation systems
CO-4: Discuss the opportunities to design the hybridization strategies
CO-5: Apply the evaluation techniques used to evaluate the recommender systems

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	3	2	2	3
CO-2	2	2	2	1	2	1
CO-3	3	3	3	1	2	1
CO-4	3	3	3	2	2	2
CO-5	3	3	2	2	1	1

UNIT–I:
Introduction: Overview of Information Retrieval, Retrieval Models, Search and Filtering Techniques: Relevance Feedback, User Profiles, Recommender system functions, Matrix operations, covariance matrices, Understanding ratings, Applications of recommendation systems, Issues with recommender system

UNIT–II:
Content-Based Filtering: High level architecture of content-based systems, Advantages and drawbacks of content-based filtering, Item profiles, discovering

features of documents, pre-processing, and feature extraction, obtaining item features from tags, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.

UNIT–III:
Collaborative Filtering: User-based recommendation, Item-based recommendation, Model based approaches, Matrix factorization, Attacks on collaborative recommender systems.

UNIT–IV:
Hybrid Approaches: Opportunities for hybridization, Monolithic hybridization design: Feature combination, Feature augmentation, Parallelized hybridization design: Weighted, Switching, Mixed, Pipelined hybridization design: Cascade Meta-level, Limitations of hybridization strategies

UNIT–V:
Evaluating Recommender System: Introduction, General properties of evaluation research, Evaluation designs: Accuracy, Coverage, confidence, novelty, Diversity, scalability, serendipity, Evaluation on historical datasets, Offline evaluations

TEXT BOOKS:

1. Recommender Systems: An Introduction, Jannach D., Zanker M. and FelFering A., 1st Edition, Cambridge University Press, 2011
2. Recommender Systems: The Textbook, Charu C. Aggarwal, 1st Edition, Springer 2016

REFERENCES:

1. Recommender Systems Handbook, Ricci F., Rokach L., Shapira D., Kantor B. P., 1st Edition, Springer, 2011
2. Recommender Systems For Learning, Manouselis N., Drachsler H., Verbert K., Duval E., 1st Edition, Springer, 2013

ONLINE RESOURCES:
1. http://www.iem.iitkgp.ac.in/eco/Recommender_Systems/
2. https://in.coursera.org/specializations/recommender-systems
3. https://tryolabs.com/blog/introduction-to-recommender-systems

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PC2CP03) BIG DATA ANALYTICS LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE PRE-REQUISITES: Basic knowledge in LINUX, SQL, JAVA

COURSE OBJECTIVES:

- To discuss the overview of data analytics and interpret the data analytics life cycle
- To illustrate the various data analytic methods using R
- To design programs using data analytics techniques
- To identify the usage of Hadoop Ecosystem

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the importance of data analytics in real life through life cycle and explore the features of R and R Studio environment

CO-2: Explore the data types and programming constructs of R with examples

CO-3: Develop analysis model using various datasets

CO-4: Analyze the data for cluster analysis, time series analysis and other mining techniques

CO-5: Learn the different tools in Hadoop framework

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	3	2	3	3
CO-2	3	2	3	2	3	2
CO-3	3	2	3	2	3	2
CO-4	2	2	3	2	3	3
CO-5	2	2	3	2	3	2

LIST OF EXPERIMENTS:

1. Data Analytics Life Cycle
2. Basic Data Analytic methods using R and R Studio environment. Explore the features
3. Explore the data types of R and demonstrate the basic operations of data types
4. Explore the control structures of R and demonstrate with one example under each case
5. Importing & exporting the data from I) CSV file ii) Excel File
6. Data Visualization through I) Histogram ii) Pie Chart iii) Box Plot iv) Density Plots
7. Conduct Hypothesis Test on „mtcars" dataset
8. Demonstrate regression analysis

9. Demonstrate „Association Rule Mining" using „groceries" dataset
10. Demonstrate clustering technique using „iris" dataset
11. Demonstrate the time series analysis and develop the prediction model using "airpassengers" dataset
12. Hadoop Storage File system
    i. Write a command to create the directory structure in HDFS.
    ii. Write a Command to move file from local unix/linux machine to HDFS cluster.
13. Viewing Data Contents, Files and Directory
    i. Write HDFS command Look at the HDFS files and directory of under your Hadoop cluster.
    ii. Write HDFS command to see contents of files which are present in Hadoop cluster.
14. Getting Files data from the Hadoop Cluster to Local Disk.:
    i. Find out HDFS command to take file from HDFS to local file system.
    ii. If we want process any data first should move into Hadoop cluster using HDFS commands. All files storage in Haddoop cluster will be using HDFS
15. Map Reduce Programming (Processing data) – Word Count
    i. Develop the word count map-reduce program to count the words with given input file. Before you start, execute the prepare step, to load the data into HDFS.
    ii. Most Frequent Words Count
    iii. Use the output from the previous program to list the most frequent words with their counts.

TEXT BOOKS:

1. R-The statistical Programming Language, Mark Gardener, Wiley India Pvt. Ltd
2. Hadoop: The Definitive Guide, Tom White, Third Edition, O'Reilly Media, 2012

REFERENCES:

1. R Programming, A. K. Verma, Cengage
2. Big Data Glossary, Pete Warden, O'Reilly, 2011

ONLINE RESOURCES:

1. Big Data Course - Online Hadoop Certification Training (intellipaat.com)
2. Hadoop Developer In Real World: Learn Hadoop for Big Data | Udemy

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PC2CP04) CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE PRE-REQUISITES: Knowledge on Computer Networks, Mathematics and any programming language

COURSE OBJECTIVES:
- To implement the cryptographic algorithms
- To implement the security algorithms
- To implement cryptographic, digital signatures algorithms

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: To implement the Block and Stream Encryption algorithms
CO-2: To implement the Secret key and Public key security algorithms
CO-3: To implement Authentication, digital signatures algorithms
CO-4: To implement Key Management Algorithms
CO-5: To implement Firewalls and Secure Web transactions

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	1	3	3	3	3
CO-2	2	1	3	3	2	3
CO-3	3	2	2	3	3	3
CO-4	3	1	3	2	3	2
CO-5	3	2	3	3	3	3

LIST OF EXPERIMENTS:

1. Implementation of symmetric cipher algorithm (AES and RC4)
2. Random number generation using a subset of digits and alphabets.
3. Implementation of RSA based signature system
4. Implementation of Subset sum
5. Authenticating the given signature using MD5 hash algorithm.
6. Implementation of Diffie-Hellman algorithm
7. Implementation ElGAMAL cryptosystem.
8. Implementation of Rabin Cryptosystem. (Optional).
9. Implementation of Kerberos cryptosystem
10. Firewall implementation and testing.
11. Implementation of a trusted secure web transaction.
12. Digital Certificates and Hybrid (ASSY/SY) encryption, PKI.

13. Message Authentication Codes.
14. Elliptic Curve cryptosystems (Optional)

ONLINE RESOURCES:

1. https://www.mooclab.club/tags/network-security/
2. https://crypto.stanford.edu/~dabo/courses/OnlineCrypto/

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PW4CP02) MINI-PROJECT

TEACHING SCHEME

L	T/P	C
0	4	2

CIE	SEE	TOTAL
40	60	100

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the formulated industry / technical / societal problems
CO-2: Analyze and / or develop models for providing solution to industry / technical / societal problems
CO-3: Interpret and arrive at conclusions from the project carried out
CO-4: Demonstrate effective communication skills through oral presentation
CO-5: Engage in effective written communication through project report

COURSE OUTLINE:

- A student shall undergo a mini-project during II semester of the M.Tech. programme.
- A student, under the supervision of a faculty member, shall collect literature on an allotted project topic of his / her choice, critically review the literature, carry out the project work, submit it to the department in a prescribed report form and shall make an oral presentation before the departmental Project Review Committee.
- Evaluation of the mini-project shall consist of CIE and SEE and shall be done by a Project Review Committee (PRC) consisting of the Head of the Department, faculty supervisor and a senior faculty member of the specialization / department.
- CIE shall be carried out for 40 marks on the basis of review presentation as per the calendar dates and evaluation format.
- SEE shall be carried out at the end of semester fpr 60 marks on the basis of oral presentation and submission of mini-project report.
- Prior to the submission of mini-project report to the PRC, its soft copy shall be submitted to the PG Coordinator for PLAGIARISM check.
- The mini-project report shall be accepted for submission to the PRC only upon meeting the prescribed similarity index of less than 25%.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22MN6HS02) ANCIENT WISDOM

TEACHING SCHEME		
L	T/P	C
2	0	0

EVALUATION SCHEME			
SE-I	SE-II	SEE	TOTAL
50	50	-	100

COURSE OBJECTIVES:

- To introduce the contribution from Ancient Indian system & tradition to modern science & Technology
- To trace, identify and develop the ancient knowledge systems
- To introduce the sense of responsibility, duties and participation of individual for establishment of fearless society

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Familiarize learners with major sequential development in Indian science, engineering and technology

CO-2: Understand eco-friendly, robust and scientific planning and architecture system of ancient India

CO-3: Trace, identify, practice and develop the significant Indian mathematic and astronomical knowledge

CO-4: Understand the importance of Indian aesthetics in individual realization of the truth arises by realizing the harmony within

UNIT-I:

Indian Science & Technology: Indian S & T Heritage, sixty-four art forms and occupational skills (64 Kalas)

Ancient Architecture:

Scientific Achievements though Ancient Architect: Musical Pillars of Vitthal temple, Sundial of konark temple, construction of eight shiva temple in straight line from Kedarnath to rameshwaram at longitude 79oE 41'54, Veerbhadra temple with 70 hanging pillars

UNIT-II:

Foundation Concept for Science and Technology: The Introduction to Ancient Mathematics & Astronomy Introduction to Brief introduction of inception of Mathematics & Astronomy from vedic periods. Details of different authors who has given mathematical & astronomical sutra (e.g. arytabhatta, bhaskara, brahmagupta, varamahira, budhyana, yajanvlkya, panini, pingala, 22 bharat muni, sripati, mahaviracharya, madhava, Nilakantha somyaji, jyeshthadeva, bhaskara-II, shridhara Number System and Units of Measurement, concept of zero and its importance, Large numbers & their representation, Place Value of Numerals, Decimal System, Measurements for time, distance and weight, Unique approaches to represent numbers (Bhūta Saṃkhya System, Kaṭapayādi System), Pingala and the Binary system, Knowledge Pyramid

Indian Mathematics, Great Mathematicians and their contributions, Arithmetic Operations, Geometry (Sulba Sutras, Aryabhatiya-bhasya), value of π, Trigonometry, Algebra, Chandah Sastra of Pingala, Indian Astronomy, celestial coordinate system,

Elements of the Indian Calendar Aryabhatiya and the Siddhantic Tradition Pancanga – The Indian Calendar System

UNIT-III:

Humanities & Social Sciences: Health, Wellness & Psychology, Ayurveda Sleep and Food, Role of water in wellbeing Yoga way of life Indian approach to Psychology, the Triguṇa System Body-Mind-IntellectConsciousness Complex. Governance, Public Administration & Management reference to ramayana, Artha Sastra, Kauṭilyan State

UNIT-IV:

Aspiration and Purpose of Individual and Human Society: Aims of Human life; at individual level and societal level. At societal level; Four purusarthas Dharma, Artha, Kama, Moksha.

Individual Level:

Program for Ensuring Human Purpose:

Fundamental Concept of Nitishastra: Satyanishtha Aur Abhiruchi (Ethics, Integrity & aptitude). The true nature of self; Shiksha Valli, Bhrigu Valli (concept of Atman-Brahman (self, soul).

The True Constitution of Human: Ananda Valli (Annamaya Kosha, Pranamaya Kosha, Manomaya Kosha, Vijnanamaya Kosha, Anandamaya Kosha). The four states of consciousness (Waking state, Dreaming state, Deep Sleep State, Turiya the fourth state), Consciousness (seven limbs and nineteen mouths), Prajna, Awarness. The Life Force Prana (Praana-Apaana-Vyaana-Udaana- Samaana

Ancient Indian Science (Ayurveda & Yoga)

Ayurveda for Life, Health and Well-being: Introduction to Ayurveda: understanding Human body and Pancha maha bhuta, the communication between body & mind, health

Introduction to Yoga: Definition, Meaning and objectives of Yoga, Relevance of yoga in modern age. the six cleansing procedures of Yoga, understanding of Indian psychological concept, consciousness, tridosha & triguna.

UNIT-V:

Five Important Slokas for Enlightenment

Gayatri Mantram, Santi Mantram: Asatoma Sadgamaya, Geeta (Yada Yadahi Dharmasya, Glanirbhavati Bharata), Amanitwam Adambitwam.., Karmanyevadikarastu… Maa phaleshukadachana

TEXT BOOKS:

1. Textbook on Indian Knowledge Systems, Prof. B Mahadevan, IIM Bengaluru
2. Indian Knowledge Systems, Kapur K. and Singh A. K., 2005

REFERENCES:

1. Tatvabodh of Sankaracharya, Central Chinmay Mission Trust, Bombay, 1995
2. Value and Distribution System in India, B. L. Gupta, Gyan Publication House
3. Ancient Indian Culture and Civilization, Reshmi Ramdhoni, Star Publication, 2018
4. Ancient Indian Society, Maharaj Swami Chidatmanjee, Anmol Publication
5. Ancient Indian Classical Music, Lalita Ramkrishna, Shubhi Publications

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22PE1CP19) KNOWLEDGE REPRESENTATION AND REASONING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge on Formal Languages, Logic and Programming and Discrete Mathematics (data structures and algorithms)

COURSE OBJECTIVES:
- To be an intelligent agent needs to be able to solve problems in its world
- To explore a variety of representation formalisms
- To learn associated algorithms for reasoning

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand an intelligent agent needs to be able to solve problems in its world
CO-2: Learn a simple language of propositions, and move on to first order logic, and then to representations for reasoning about action, change, situations, and about other agents in incomplete information situations.
CO-3: Illustrate a variety of representation formalisms and associated algorithms for reasoning
CO-4: Implement the Description Logic, the ALC Language and Inheritance in Taxonomies
CO-5: Apply the Default Reasoning, logics and Multi Agent Scenarios

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	3	2	2	3
CO-2	2	3	3	2	2	1
CO-3	3	3	2	3	3	2
CO-4	3	3	3	3	2	1
CO-5	2	2	2	3	2	1

UNIT-I:
Introduction, Propositional Logic, Syntax and Semantics, Proof Systems, Natural Deduction, Tableau Method, Resolution Method

UNIT–II:
First Order Logic (FOL), Syntax and Semantics, Unification, Forward Chaining, the Rete Algorithm, Rete example, Programming Rule Based Systems, Representation in FOL, Categories and Properties, Reification, Event Calculus

UNIT–III:
Deductive Retrieval, Backward Chaining, Logic Programming with Prolog, Resolution Refutation in FOL, FOL with Equality, Complexity of Theorem Proving

UNIT–IV:
Description Logic (DL), Structure Matching, Classification, Extensions of DL, The ALC Language, Inheritance in Taxonomies

UNIT–V:
Default Reasoning, Circumscription, The Event Calculus Revisited, Default Logic, Autoepistemic Logic, Epistemic Logic, Multi Agent Scenarios

TEXT BOOKS:
1. Handbook of Knowledge Representation, Frank van Harmelen, Vladimir Lifschitz and Bruce Porter, 1st Edition, Elsevier, 2008
2. Artificial Intelligence: Knowledge Representation and Learning, Prof. Deepak Khemani, Indian Institute of Technology, Madras (https://drive.google.com/file/d/1rguiyKFAD89erKqcP6ZQQgzEjCPYJBbf/view)

REFERENCES:
1. Knowledge Representation & Reasoning, Brachman & Levesque
2. Foundations of Artificial Intelligence, J. Hendler H. Kitano B. Nebel, (https://dai.fmph.uniba.sk/~sefranek/kri/handbook/handbook_of_kr.pdf)
3. Natural Language Processing and Knowledge Representation, Lucia Jwanska and Stuart C. Shapiro

ONLINE RESOURCES:
1. https://nptel.ac.in/courses/106106140

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22PE1CP20) GPU ARCHITECTURE AND PROGRAMMING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge on Programming and Data Structure, Digital Logic, Computer architecture

COURSE OBJECTIVES:

- To learn basics of conventional CPU architectures, their extensions for single instruction multiple data processing (SIMD) and finally the generalization of this concept in the form of single instruction multiple thread processing (SIMT) as is done in modern GPUs
- To explore GPU architecture basics in terms of functional units and then dive into the popular CUDA programming model commonly used for GPU programming
- To extend the architecture specific details like memory access coalescing, shared memory usage, GPU thread scheduling etc. which primarily effect program performance are also covered in detail
- To drives to a different SIMD programming language called OpenCL which can be used for programming both CPUs and GPUs in a generic manner

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the basics of conventional CPU architectures
CO-2: Illustrate the GPU architecture basics in terms of functional units
CO-3: Examine memory access coalescing, shared memory usage, GPU thread scheduling
CO-4: Apply optimization techniques in implementing GPU programming
CO-5: Design and implement an application through GPU programming

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	2	3	2	2	2
CO-2	3	2	3	3	2	2
CO-3	3	3	3	2	3	1
CO-4	3	3	3	3	3	2
CO-5	2	3	3	3	3	3

UNIT–I:
Review of Traditional Computer Architecture – Basic five stage RISC Pipeline, Cache Memory, Register File, SIMD instructions

UNIT–II:
GPU architectures - Streaming Multi Processors, Cache Hierarchy, The Graphics Pipeline, Introduction to CUDA programming

UNIT–III:
Multi-dimensional mapping of dataspace, Synchronization, Warp Scheduling, Divergence, Memory Access Coalescing

UNIT–IV:
Optimization Examples: optimizing Reduction Kernels, Kernel Fusion, Thread and Block Coarsening

UNIT–V:
OpenCL basics, CPU GPU Program Partitioning, Application Design: Efficient Neural Network Training/Inferencing.

TEXT BOOKS:
1. GPU Architecture and Programming, Prof. Sowmyajit Dev, IIT Kharagpur (https://drive.google.com/file/d/11_cmuSzpdXhdx1mvtHBGQvOwyaZ_Px0H/view

REFERENCES:
1. Hands on – GPU Programming with Python and CUDA, Dr. Brain Tuomanen, Packt Publishing, 2018
2. Programming Massively Parallel Processors: A Hands-on Approach, David Kirk, Wen-mei Hwu, Morgan Kaufman, 2010
3. CUDA Programming: A Developer's Guide to Parallel Computing with GPUs, Shane Cook; Morgan Kaufman, 2012
4. Introduction to GPU architecture, Ofer Rosenberg, PMTS SW, OpenCL Dev Team
5. CUDA by Example: An Introduction to General Purpose GPU Programming, Jason Sanders and Edward Kandrot, Addison Wesley

ONLINE RESOURCES:
1. https://nptel.ac.in/courses/106105220

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22PE1CP21) BLOCK CHAIN TECHNOLOGY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To familiarize with the functional/operational aspects of cryptocurrency ecosystem
- To understand blockchain technology architecture and components
- To smart contracts and bitcoins
- To understand blockchain and other technologies

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand blockchain technology
CO-2: Understanding the concept of distributed transactions and Bitcoin
CO-3: Remembering the concept of Fault Tolerant mechanisms
CO-4: Applying various security algorithms
CO-5: Understanding blockchain and machine learning

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	2	2	1	1
CO-2	3	3	2	2	2	2
CO-3	3	2	2	3	2	2
CO-4	3	2	3	1	1	2
CO-5	2	2	1	1	2	1

UNIT-I:
Basics of Blockchain: Introduction, Concept of Blockchain, History, Definition of Blockchain, Fundamentals of Blockchain, P2P Network, Characteristics of Blockchain, Consensus in Trust-Building Exercise, Public, Private, and Hybrid Blockchains, Distributed Ledger Technologies, DLT Decentralized Applications and Databases, Architecture of Blockchain, Transactions, Chaining Blocks, Value Proposition of Blockchain Technology

UNIT-II:
Architecture of Blockchain: Architecture of Blockchain, Transactions, Chaining Blocks, Value Proposition of Blockchain Technology, Consensus: Introduction, Consensus Approach, Consensus Algorithms, Byzantine Agreement Methods

UNIT-III:

Bitcoins: Introduction, Working of Bitcoin, Merkle Trees, Bitcoin Block Structure, Bitcoin Address, Bitcoin Transactions, Bitcoin Network, Bitcoin Wallets, Bitcoin Payments, Bitcoin Clients, Bitcoin supply.

UNIT-IV:

Blockchain Components: Introduction, Ethereum, History, Ethereum Virtual Machine, Working of Ethereum, Ethereum Clients, Ethereum Key Pairs, Ethereum Addresses, Ethereum Wallets, Ethereum Transactions, Ethereum Languages, Ethereum Development Tools

Smart Contracts: Introduction, Smart Contracts, Absolute and Immutable, Contractual Confidentiality, Law Implementation and Settlement, Characteristics, Internet of Things

UNIT-V:

Blockchain and Allied Technologies: Blockchain and Cloud Computing, Characteristics of Blockchain Cloud, Blockchain and Artificial Intelligence, Blockchain and IoT, Blockchain and Machine Learning, Blockchain and Robotic Process Automation.

TEXT BOOKS:

1. Blockchain Technology: Concepts and Applications, Kumar Saurabh, Ashutosh Saxena, Wiley
2. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Andreas Antonopoulos, O'Reilly, 2014

REFERENCES:

1. Blockchain Technology, Chandramouli Subramanian, Asha A. George, Abhilash K. A. and Meena Karthikeyan, Universities Press, 2020
2. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Daniel Drescher, Apress, 2017
3. The Basics of Bitcoins and Blockchains, Antony Lewis, Coral Gables, 2018

ONLINE RESOURCES:

1. J. A. Garay et al, The bitcoin backbone protocol - analysis and applications EUROCRYPT2015LNCSVOl9057, (VOLII), pp281310 (Also available at eprint.iacr.org/2016/1048), (Serious beginning of discussions related to formal models for bitcoin protocols)

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22PE1CN08) ARTIFICIAL INTELLIGENCE

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OUTCOMES:

- To learn the different nature of environments and problem solving agents
- To understand the knowledge and reasoning techniques
- To learn different learning techniques and natural language processing applications
- To understand the natural language processing and its applications
- To learn functions of robotics and AI based programming Tools

COURSE OBJECTIVES: After completion of the course, the student should be able to
CO-1: To familiarize to the concepts of Artificial Intelligence
CO-2: To learn about knowledge representation AI and reasoning
CO-3: To understand various types of learning
CO-4: To understand the importance of natural language processing in the real world
CO-5: To learn about AI based programming tools

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	1	1	1	1
CO-2	2	1	2	1	2	2
CO-3	3	1	2	2	-	-
CO-4	3	-	2	1	2	2
CO-5	2	-	2	2	3	3

UNIT–I:

Introduction: AI definition, Foundations of AI, History of AI, Agents and environments, The nature of the Environment, Problem solving Agents, Problem Formulation, Search Strategies

UNIT–II:

Knowledge and Reasoning: Knowledge-based Agents, Representation, Reasoning and Logic, Prepositional logic, First-order logic, Using First-order logic, Inference in First-order logic, forward and Backward Chaining

UNIT–III:

Learning: Learning from observations, Forms of Learning, Inductive Learning, Learning decision trees, why learning works, Learning in Neural and Belief networks

UNIT–IV:

Practical Natural Language Processing: Practical applications, Efficient parsing, Scaling up the lexicon, Scaling up the Grammar, Ambiguity, Perception. Image formation, Image processing operations for Early vision, Speech recognition and Speech Synthesis

UNIT–V:

Robotics: Introduction, Tasks, parts, effectors, Sensors, Architectures, Configuration spaces, Navigation and motion planning, Introduction to AI based programming Tools

TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach, Stuart Russell, Peter Norvig, 2nd Edition, Pearson Education, 2007
2. Artificial Neural Networks, B. Yagna Narayana, PHI

REFERENCES:

1. Artificial Intelligence, E. Rich and K. Knight, 2nd Edition, TMH
2. Artificial Intelligence and Expert Systems, Patterson, PHI
3. Expert Systems: Principles and Programming, Giarrantana, Riley, 4th Edition, Thomson
4. PROLOG Programming for Artificial Intelligence, Ivan Bratka, 3rd Edition, Pearson Education
5. Neural Networks, Simon Haykin, PHI

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22PE1CP23) QUANTUM COMPUTING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge on Linear Algebra, Theory of Computation

COURSE OBJECTIVES:

- To provide an insight of basics of quantum physics from a computer scientist's perspective
- To describes reality and understand the philosophical implications of quantum computing

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Demonstrate vector spaces, matrices, quantum state
CO-2: Illustrate density operator and quantum measurement theory
CO-3: Understand commutator algebra
CO-4: Analyze tensor products
CO-5: Understand quantum measurement theory

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	-	-	-	1
CO-2	3	2	-	2	2	1
CO-3	3	-	2	-	2	1
CO-4	3	2	-	-	2	1
CO-5	3	-	2	-	-	1

UNIT-I:
Qubit & Quantum States: The Qubit, Vector Spaces. Linear Combination Of Vectors, Uniqueness of a spanning set, basis & dimensions, inner Products, orthonormality, gram-schmidt orthogonalization, bra-ket formalism, the Cauchyschwarez and triangle Inequalities

UNIT-II:
Matrices & Operators: Observables, The Pauli Operators, Outer Products, The Closure Relation, Representation of operators using matrices, outer products &matrix representation, matrix representation of operators in two dimensional spaces, Pauli Matrix, Hermitian unitary and normal operator, Eigen values &Eigen Vectors, Spectral Decomposition, Trace of an operator, important properties of Trace, Expectation Value of Operator, Projection Operator,
Positive Operators.

UNIT-III:
Commutator Algebra, Heisenberg uncertainty principle, polar decomposition &singular values, Postulates of Quantum Mechanics.

UNIT-IV:
Tensor Products: Representing Composite States in Quantum Mechanics, Computing inner products, Tensor products of column vectors, operators and tensor products of Matrices.
Density Operator: Density Operator of Pure & Mix state, Key Properties, Characterizing Mixed State, Practical Trace & Reduce Density Operator, Density Operator & Bloch Vector.

UNIT-V:
Quantum Measurement Theory: Distinguishing Quantum states & Measures, Projective Measurements, Measurement on Composite systems, Generalized, Measurements, Positive Operator- Valued Measures.

TEXT BOOKS:
1. Quantum Computing without Magic, Zdzislaw Meglicki
2. Quantum Computing Explained, David McMahon

REFERENCES:
1. Quantum Computer Science, Marco Lanzagorta, Jeffrey Uhlmann
2. An Introduction to Quantum Computing, Phillip Kaye, Raymond Laflamme, Michele Mosca

ONLINE RESOURCES:
1. https://nptel.ac.in/courses/106106232

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22OE1CN01) BUSINESS ANALYTICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the role of business analytics within an organization and to analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization
- To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making and to become familiar with processes needed to develop, report, and analyze business data
- To use decision-making tools/Operations research techniques and to manage business process using analytical and management tools
- To analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply knowledge of data analytics

CO-2: Think critically in making decisions based on data and deep analytics

CO-3: Use technical skills in predicative and prescriptive modeling to support business decision-making

CO-4: Translate data into clear, actionable insights

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	-	1	-	1	1
CO-2	3	-	2	-	1	2
CO-3	2	1	1	-	1	1
CO-4	1	2	1	-	1	1

UNIT-I:

Business Analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics.

Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

UNIT-II:

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data Business Analytics Technology.

UNIT-III:

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.

Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

UNIT-IV:

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.

Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

UNIT-V:

Decision Analysis: Formulating Decision Problems, Decision Strategies without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Recent trends in Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

TEXT BOOKS:

1. Business Analytics-Principles, Concepts, and Applications, Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson
2. Business Analytics, James Evans, Pearson Education
3. Business Analytics, Purba Halady Rao, PHI, 2013

REFERENCES:

1. Business Analytics for Managers: Taking Business Intelligence Beyond Reporting, Gert H. N. Laursen, Jesper Thorlund, 2nd Edition, Wiley Publications
2. Business Analytics: Data Analysis & Decision Making, S. Christian Albright, Wayne L. Winston, 5th Edition, 2015
3. Business Intelligence Guidebook: From Data Integration to Analytics, Rick Sherman Elsevier, 2014

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22OE1AM01) INDUSTRIAL SAFETY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Elements of Mechanical, Civil, Electrical and Industrial Engineering

COURSE OBJECTIVES:

- To achieve an understanding of principles, various functions and activities of safety management
- To communicate effectively information on Health safety and environment facilitating collaboration with experts across various disciplines so as to create and execute safe methodology in complex engineering activities
- To anticipate, recognize, and evaluate hazardous conditions and practices affecting people, property and the environment, develop and evaluate appropriate strategies designed to mitigate risk
- To develop professional and ethical attitude with awareness of current legal issues by rendering expertise to wide range of industries

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply risk management principles to anticipate, identify, evaluate and control physical, chemical, biological and psychosocial hazards

CO-2: Communicate effectively on health and safety matters among the employees and with society at large

CO-3: Demonstrate the use of state of the art occupational health and safety practices in controlling risks of complex engineering activities and understand their limitations

CO-4: Interpret and apply legislative / legal requirements, industry standards, and best practices in accident prevention programmes in a variety of workplaces

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	2	2	3	1
CO-2	-	-	-	-	2	3
CO-3	3	1	2	1	-	-
CO-4	-	2	-	1	-	2

UNIT-I:

Safety Management: Evaluation of modern safety concepts – Safety management functions – safety organization, safety department – safety committee, safety audit -

performance measurements and motivation – employee participation in safety and productivity.

UNIT-II:

Operational Safety: Hot metal Operation – Boiler, pressure vessels – heat treatment shop - gas furnace operation-electroplating-hot bending pipes – Safety in welding and cutting. Cold-metal Operation- Safety in Machine shop- metal cutting – shot blasting, grinding, painting – power press and other machines.

Safe Handling and Storage: Material Handling, Compressed Gas Cylinders, Corrosive Substances, Hydrocarbons, Waste Drums and Containers

UNIT-III:

Safety Measures: Layout design and material handling - Use of electricity – Management of toxic gases and chemicals – Industrial fires and prevention – Road safety– Safety of sewage disposal and cleaning – Control of environmental pollution – Managing emergencies in industrial hazards.

UNIT-IV:

Accident Prevention: Human side of safety – personal protective equipment – Causes and cost of accidents. Accident prevention programmes - Specific hazard control strategies - HAZOP – Training and development of employees – First Aid – Fire fighting devices – Accident reporting investigation.

UNIT-V:

Safety, Health, Welfare & Laws: Safety and health standards – Industrial hygiene – occupational diseases prevention - Welfare facilities – History of legislations related to safety–pressure vessel act- Indian boiler act- The environmental protection act – Electricity act - Explosive act.

TEXT BOOKS:

1. Safety Management, John V. Grimaldi and Rollin H. Simonds, All India Travellers Bookseller, 1989
2. Safety Management in Industry, Krishnan N. V., Jaico Publishing House, 1996

REFERENCES:

1. Occupational Safety Manual, BHEL
2. Industrial Safety and The Law, P. M. C. Nair Publishers
3. Managing Emergencies in Industries, Loss Prevention of India Ltd., Proceedings, 1999
4. Safety Security and Risk Management, U. K. Singh & J. M. Dewan, A. P. H. Publishing Company, 1996
5. Industrial Safety Management: Hazard Identification and Risk Control, L. M. Deshmukh, McGraw Hill, 2005

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22OE1AM02) OPERATIONS RESEARCH

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To analyze linear programming models in practical and their practical use
- To apply the transportation, assignment and sequencing models and their solution methodology for solving problems
- To apply inventory and queuing, inventory models and their solution methodology for solving problems
- To evaluate the simulation models

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Evaluate the problems using linear programming

CO-2: Analyze assignment, transportation problems

CO-3: Apply inventory and queuing problems for real time problems

CO-4: Model the real-world problem and simulate it

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	1	3	3	2	-	-
CO-2	1	3	3	3	-	-
CO-3	1	3	3	3	-	-
CO-4	1	3	3	3	-	-

UNIT-I:

Introduction to Operations Research: Definitions of OR, Characteristics of OR, Scope of OR, Classification of Optimization Techniques, models in OR, General L.P Formulation, Graphical solution, Simplex Techniques.

Allocation: Linear Programming Problem Formulation- Graphical solution-Simplex method-Artificial variables technique-Two phase method, Big-M Method-Duality Principle.

UNIT-II:

Transportation Problem: Formulation-Optimal solution-unbalanced transportation problem-Degeneracy. Assignment problem-Formulation-Optimal solution-Variations of Assignment Problem-Travelling Salesman Problem.

Sequencing: Introduction-Flow Shop sequencing-n jobs through two machines-n jobs through three machines-Job shop sequencing-two jobs through m machines.

UNIT-III:

Waiting Lines: Introduction-Single channel-Poisson arrivals-exponential service times-with infinite population and finite population models-Multichannel-Poisson arrivals-exponential service times with infinite population single channel Poisson arrivals.

UNIT-IV:

Inventory Models: Deterministic inventory, models - Probabilistic inventory control models

UNIT-V:

Simulation: Definition-Types of simulation models-phases of simulation-applications of simulation Inventory and Queuing problems-Advantages and Disadvantages-Brief Introduction of Simulation Languages.

TEXT BOOKS:

1. Operations Research, S. D. Sharma, Kedarnath Ramnath, Meerut
2. Engineering Optimization, S. S. Rao, New Age International, 2014
3. Introduction to Genetic Algorithms, S. N. Sivanandam, Springer

REFERENCES:

1. Operations Research-An Introduction, H. A. Taha, PHI, 2008
2. Principles of Operations Research, H. M. Wagner, PHI, 1982
3. Introduction to Optimization: Operations Research, J. C. Pant, Jain Brothers, 2008

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22OE1AM03) ENTREPRENEURSHIP AND START-UPS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To motivate the engineers to inculcate the skills thereof in any professional role and to consider intrapreneurship or entrepreneurship as career choices for personal and societal growth
- To understand different Theories of Entrepreneurship and their Classification
- To create Feasibility Reports, Business, Project Plans and resolve Operational problems
- To understand the roles of Family, non-family entrepreneurs and learning about Startups' Opportunities, Corporate Legal and Intellectual Property related issues

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the role of an entrepreneur in the economic development and discover societal problems as entrepreneurial opportunities and ideate to develop solutions through systematic and creative approaches to innovation and business strategy

CO-2: Learn different Theories of entrepreneurship, the role of Family and Non-Family entrepreneurs and problem-solving skills

CO-3: Create Marketing, Financial Plans and evaluate Structural, Financial and Managerial Problems

CO-4: Apply lean methodology to startup ideas using Business Model Canvas and be able to create Business Plans through establishing business incubators. Understand Corporate Legal and Intellectual Property related matters

COURSE ARTICULATION MATRIX:

*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	1	3	2	-	3
CO-2	1	-	-	-	-	2
CO-3	1	-	-	-	-	2
CO-4	-	-	-	1	-	-

UNIT-I:

Entrepreneurship: Definition of Entrepreneur, Entrepreneurial motivation and barriers; Internal and external factors; Types of entrepreneurs, Personality and Skill Set of an Entrepreneur, Entrepreneurship as a career for engineers, scientists, and technologists.

UNIT-II:

Theories of Entrepreneurship: Classification of entrepreneurship. Creativity and Innovation: Creative Problems Solving, Creative Thinking, Lateral Thinking, Views of De Bono, Khandwala and others, Creative Performance in terms of motivation and skills.

Family and Non-Family Entrepreneurs: Role of Professionals, Professionalism vs. family entrepreneurs, Role of Woman entrepreneur, Sick industries, Reasons for Sickness, Remedies for Sickness, Role of BIFR in revival, Bank Syndications.

UNIT-III:

Creativity and Entrepreneurial Plan: Idea Generation, Screening and Project Identification, Creative Performance, Feasibility Analysis: Economic, Marketing, Financial and Technical; Project Planning, Evaluation, Monitoring and Control, segmentation, Targeting and positioning of Product, Role of SIDBI in Project Management.

UNIT-IV:

Operation Problems: Incubation and Take-off, Problems encountered Structural, Financial and Managerial Problems, Types of Uncertainty. Institutional support for new ventures: Supporting organizations; Incentives and facilities; Financial Institutions and Small-scale Industries, Govt. Policies for SSIs.

UNIT-V:

Startups' Opportunity Assessment, Business Models, Entrepreneur talk, Clinical/ Regulatory, Sector Specific Group Briefing by Advisory Committee, Corporate Legal and Intellectual Property, Pitching, Payers and Reimbursement, Pitch practice, Investors, Mistakes I Won't Repeat, Business Development and Exits, Finance, Budgeting, Team Building, Opportunities in Telangana State and India – incubators, schemes, accelerators.

TEXT BOOKS:

1. Understanding Enterprise: Entrepreneurship and Small Business, Bridge S. et al., Palgrave, 2003
2. Holt- Entrepreneurship: New Venture Creation, Prentice Hall, 1998
3. Entrepreneurship Development, Robert D. Hisrich, Michael P. Peters, Tata McGraw Hill

REFERENCES:

1. New Venture Creation: An Innovator's Guide to Entrepreneurship, Marc H. Meyer and Frederick G. Crane, 2nd Edition, Sage Publications
2. Technology Ventures: From Idea to Enterprise, Byers, Dorf, Nelson
3. Venture Deals: Be Smarter Than Your Lawyer and Venture Capitalist - Feld, Mendelson, Costolo
4. Breakthrough Entrepreneurship, Burgstone and Murphy
5. Business Model Generation, Alexander Osterwalder

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22OE1PL01) WASTE TO ENERGY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To create awareness in students of energy conservation
- To identify the use of different types of Bio waste energy resources
- To understand different types of bio waste energy conservations
- To detect different waste conversion into different forms of energy

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Find different types of energy from waste to produce electrical power
CO-2: Estimate the use of bio waste to produce electrical energy
CO-3: Understanding different types of bio waste and its energy conversions
CO-4: Analyze the bio waste utilization and to avoid the environmental pollution

COURSE ARTICULATION MATRIX:
*(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	3	1	2	1
CO-2	3	3	3	3	2	3
CO-3	3	2	3	2	2	3
CO-4	3	3	3	3	2	3

UNIT-I:
Introduction to Energy From Waste: Classification of waste as fuel, Agro based, Forest residue, Industrial waste, MSW (Municipal solid waste) – Conversion devices – Incinerators, Gasifiers, Digestors. Urban waste to energy conversion, Biomass energy Programme in India.

UNIT-II:
Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT-III:
Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power.

UNIT-IV:

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT-V:

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion.

Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

TEXT BOOKS:

1. Biogas Technology-Transfer and Diffusion, M. M. EL-Halwagi, Elsevier Applied Science Publisher, 1984
2. Introduction to Biomass Energy Conversions, Sergio Capareda

REFERENCES:

1. Non-Conventional Energy, Desai Ashok V., Wiley Eastern Ltd., 1990
2. Biogas Technology - A Practical Hand Book, Khandelwal K. C. and Mahdi S. S., Vol. I & II, Tata McGraw Hill, 1983
3. Food, Feed and Fuel from Biomass, Challal D. S., IBH Publishing, 1991
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996