



# VIGNAN'S INSTITUTE OF MANAGEMENT AND TECHNOLOGY FOR WOMEN

(An Autonomous Institution)

[Sponsored by Lavu Educational Society, Affiliated to JNTUH & Approved by AICTE, New Delhi]  
Kondapur (V), Ghatkesar (M), Medchal - Malkajgiri (D) - 501 301. Phone: 96529 10002/3



## COMPUTER SCIENCE &ENGINEERING (AI & ML)

### COURSE STRUCTURE-VR24

#### IV B.Tech.-I Semester

S.No.	Course Code	Course	L	T	P	Credits
1	ML701PC	Deep Learning	3	0	0	3
2	ML702PC	Nature Inspired Computing	2	0	0	2
3		Professional Elective -III	3	0	0	3
4		Professional Elective -IV	3	0	0	3
5		Open Elective - II	3	0	0	3
6	MS703BS	Professional Practice, Law & Ethics	2	0	0	2
7		Professional Elective - III Lab	0	0	2	1
8	ML704PC	Project Stage - I	0	0	6	3
		<b>Total</b>	<b>16</b>	<b>0</b>	<b>8</b>	<b>20</b>

#### IV B.Tech.-II Semester

S.No.	Course Code	Course	L	T	P	Credits
1		Professional Elective - V	3	0	0	3
2		Professional Elective – VI	3	0	0	3
3		Open Elective – III	3	0	0	3
4	ML801PC	Project Stage – II including Seminar	0	0	22	11
5		<b>Total</b>	<b>9</b>	<b>0</b>	<b>22</b>	<b>20</b>

Note: L-Theory

T-Tutorial

P-Practical

C-Credits



# VIGNAN'S INSTITUTE OF MANAGEMENT AND TECHNOLOGY FOR WOMEN

(An Autonomous Institution)

[Sponsored by Lavu Educational Society, Affiliated to JNTUH & Approved by AICTE, New Delhi]  
Kondapur (V), Ghatkesar (M), Medchal - Malkajgiri (D) - 501 301. Phone: 96529 10002/3



## Professional Elective -III

S.No.	Course Code	Course	L	T	P	Credits
1	IT731PE	Internet of Things	3	0	0	3
2	CS732PE	Data Mining	3	0	0	3
3	CS733PE	Scripting Languages	3	0	0	3
4	IT734PE	Mobile Application Development	0	0	22	11
5	CS735PE	Cloud Computing	9	0	22	20

## Professional Elective -IV

S.No.	Course Code	Course	L	T	P	Credits
1	CS741PE	Quantum Computing	3	0	0	3
2	ML742PE	Expert Systems	3	0	0	3
3	IT743PE	Semantic Web	3	0	0	3
4	IT744PE	Game Theory	0	0	22	11
5	CS745PE	Mobile Computing	9	0	22	20

## Professional Elective -V

S.No.	Course Code	Course	L	T	P	Credits
1	IT851PE	Social Network Analysis	3	0	0	3
2	ML852PE	Federated Machine Learning	3	0	0	3
3	IT853PE	Augmented Reality & Virtual Reality	3	0	0	3
4	IT854PE	Web Security	0	0	22	11
5	ML855PE	Ad-hoc & Sensor Networks	9	0	22	20

## Professional Elective -VI

S.No.	Course Code	Course	L	T	P	Credits
1	EC861PE	Speech and Video Processing-ECE	3	0	0	3
2	ML862PE	Robotic Process Automation-ECE	3	0	0	3
3	ML863PE	Randomized Algorithms	3	0	0	3
4	ML864PE	Cognitive Computing	0	0	22	11
5	ML865PE	Conversational AI	9	0	22	20



# VIGNAN'S INSTITUTE OF MANAGEMENT AND TECHNOLOGY FOR WOMEN

(An Autonomous Institution)

[Sponsored by Lavu Educational Society, Affiliated to JNTUH & Approved by AICTE, New Delhi]  
Kondapur (V), Ghatkesar (M), Medchal - Malkajgiri (D) - 501 301. Phone: 96529 10002/3



## Open Elective-II

S.No.	Course Code	Course	L	T	P	Credits
1	CS721OE	Introduction to Natural Language Processing	3	0	0	3
2	ML722OE	AI applications	3	0	0	3

## Open Elective-III

S.No.	Course Code	Course	L	T	P	Credits
1	ML831OE	Chatbots	3	0	0	3
2	ML832OE	Evolutionary Computing	3	0	0	3

<b>B.Tech. CSE (AI &amp; ML)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>IV Year - II Semester</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>SOCIAL NETWORK ANALYSIS (Professional Elective – V)</b>				

**Prerequisites:**

- Web Technologies
- Computer Networks
- Data Warehousing and Data Mining

**Course Objectives:**

- Understand the concepts of social media
- Learn the mechanisms for social network analysis
- Analysis of widely used services such as email, Wikis, Twitter, flickr, YouTube, etc.

**Course Outcomes:**

- Ability to construct social network maps easily
- Gain skills in tracking the content flow through the social media
- Understand NodeXL use to perform social network analysis

**UNIT - I**

**Introduction:** Social Media and Social Networks

**Social Media:** New Technologies of Collaboration

**Social Network Analysis:** Measuring, Mapping, and Modelling collections of Connections.

**UNIT - II**

NodeXL, Layout, Visual Design, and Labelling, Calculating and Visualising Network Metrics, Preparing Data and Filtering, Clustering and Grouping.

**UNIT - III**

**CASE STUDIES:**

**Email:** The lifeblood of Modern Communication.

**Thread Networks:** Mapping Message Boards and Email Lists

**Twitter:** Conversation, Entertainment and Information

**UNIT - IV**

**CASE STUDIES:**

Visualizing and Interpreting Facebook Networks, WWW Hyperlink Networks

**UNIT - V**

**CASE STUDIES:**

**You Tube:** Contrasting Patterns of Content Interaction, and Prominence.

## **Wiki Networks: Connections of Creativity and Collaboration**

### **TEXT BOOKS:**

1. Hansen, Derek, Ben Shneiderman, Marc Smith, *Analyzing Social Media Networks with NodeXL: Insights from a Connected World*, Morgan Kaufmann, 2011.

### **REFERENCE BOOKS:**

1. Avinash Kaushik, *Web Analytics 2.0: The Art of Online Accountability*, Sybex, 2009.
2. Marshall Sponder, *Social Media Analytics: Effective Tools for Building, Interpreting and Using Metrics*, 1st Edition, MGH, 2011.

<b>B.Tech. CSE (AI &amp; ML)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>IV Year - II Semester</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>FEDERATED MACHINE LEARNING (Professional Elective – V)</b>				

**Prerequisites:**

- The prerequisite knowledge for this course includes machine learning, basic computer systems and basic programming skills.

**Course Objectives:**

- Understand the key concepts and issues behind Federated Learning
- Get familiar with key theoretical results of Federated Learning

**Course Outcomes:**

- Understand the basics on privacy-preserving ML
- Analyze the key concepts of Distributed ML and FL
- Understand the key concepts and applications of Horizontal FL and Vertical FL
- Motivates the intensive mechanism design for FL
- Analyze the concepts of federated reinforcement learning

**UNIT - I:**

**Introduction:** Motivation, Federated Learning as a Solution, The Definition of Federated Learning, Categories of Federated Learning, Current Development in Federated Learning, Research Issues in Federated Learning, Open-Source Projects, Standardization Efforts, The Federated AI Ecosystem Background: Privacy-Preserving Machine Learning, PPML and Secure ML, Threat and Security Models, Privacy Threat Models, Adversary and Security Models, Privacy Preservation Techniques, Secure Multi-Party Computation, Homomorphic Encryption, Differential Privacy

**UNIT - II:**

**Distributed Machine Learning:** Introduction to DML, The Definition of DML, DML Platforms, Scalability-Motivated DML, Large-Scale Machine Learning, Scalability-Oriented DML Schemes, Privacy-Motivated DML, Privacy-Preserving Decision Trees, Privacy-Preserving Techniques, Privacy-Preserving DML Schemes, Privacy-Preserving Gradient Descent, Vanilla Federated Learning, Privacy-Preserving Methods

**UNIT - III:**

**Horizontal Federated Learning:** The Definition of HFL, Architecture of HFL, The Client- Server Architecture, The Peer-to-Peer Architecture, Global Model Evaluation, The Federated Averaging Algorithm, Federated Optimization, The FedAvg Algorithm, The Secured FedAvg Algorithm, Improvement of the FedAvg Algorithm, Communication Efficiency, Client Selection Vertical Federated Learning: The Definition of VFL, Architecture of VFL, Algorithms of VFL, Secure Federated Linear Regression, Secure Federated Tree-Boosting

**UNIT - IV:**

**Federated Transfer Learning:** Heterogeneous Federated Learning, Federated Transfer Learning, The FTL Framework, Additively Homomorphic Encryption, The FTL Training Process, The FTL Prediction Process, Security Analysis, Secret Sharing-Based FTL Incentive Mechanism Design for Federated Learning: Paying for Contributions, Profit- Sharing Games, Reverse Auctions, A Fairness-Aware Profit Sharing Framework, Modeling Contribution, Modeling Cost, Modeling Regret, Modeling Temporal Regret, The Policy Orchestrator, Computing Payoff Weightage

**UNIT - V:**

**Federated Learning for Vision, Language, and Recommendation:** Federated Learning for Computer Vision, Federated CV, Federated Learning for NLP, Federated NLP, Federated Learning for Recommendation Systems, Recommendation Model, Federated Recommendation System

**Federated Reinforcement Learning:** Introduction to Reinforcement Learning, Policy, Reward, Value Function, Model of the Environment, RL Background Example, Reinforcement Learning Algorithms, Distributed Reinforcement Learning, Asynchronous Distributed Reinforcement Learning, Synchronous Distributed Reinforcement Learning, Federated Reinforcement Learning, Background and Categorization

**TEXT BOOKS:**

1. Federated Learning, Qiang Yang, Yang Liu, Yong Cheng, Yan Kang, Tianjian Chen, and Han Yu Synthesis Lectures on Artificial Intelligence and Machine Learning 2019.

<b>B.Tech. CSE (AI &amp; ML)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>IV Year - II Semester</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>AUGMENTED REALITY &amp; VIRTUAL REALITY (Professional Elective –V)</b>				

**Course Objectives:**

- Provide a foundation to the fast growing field of AR and make the students aware of the various AR concepts.
- To give historical and modern overviews and perspectives on virtual reality. It describes the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.

**Course Outcomes:**

- Describe how AR systems work and list the applications of AR.
- Understand the software architectures of AR.
- Understand the Visual perception and rendering in VR
- Understand the interaction, auditory perception and rendering in VR

**UNIT - I:**

**Introduction to Augmented Reality:** Augmented Reality - Defining augmented reality, history of augmented reality, Examples, Related fields

**Displays:** Multimodal Displays, Visual Perception, Requirements and Characteristics, Spatial Display Model, Visual Displays

**Tracking:** Tracking, Calibration, and Registration, Coordinate Systems, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors

**UNIT - II:**

**Computer Vision for Augmented Reality:** Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Outdoor Tracking.

**Interaction:** Output Modalities, Input Modalities, Tangible Interfaces, Virtual User Interfaces on Real Surfaces, Augmented Paper, Multi-view Interfaces, Haptic Interaction

**Software Architectures:** AR Application Requirements, Software Engineering Requirements, Distributed Object Systems, Dataflow, Scene Graphs

**UNIT - III:**

**Introduction to Virtual Reality:** Defining Virtual Reality, History of VR, Human Physiology and Perception

**The Geometry of Virtual Worlds:** Geometric Models, Axis-Angle Representations of Rotation, Viewing Transformations

**Light and Optics:** Basic Behavior of Light, Lenses, Optical Aberrations, The Human Eye, Cameras, Displays

#### **UNIT - IV:**

**The Physiology of Human Vision:** From the Cornea to Photoreceptors, From Photoreceptors to the Visual Cortex, Eye Movements, Implications for VR

**Visual Perception:** Visual Perception - Perception of Depth, Perception of Motion, Perception of Color  
**Visual Rendering:** Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates, Immersive Photos and Videos

#### **UNIT - V:**

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

**Interaction:** Motor Programs and Remapping, Locomotion, Social Interaction

**Audio:** The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering

#### **TEXT BOOKS:**

1. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India;First edition (12 October 2016),ISBN-10: 9332578494
2. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016

#### **REFERENCE BOOKS:**

1. Allan Fowler-AR Game Developmentll, 1st Edition, A press Publications, 2018, ISBN 978-1484236178
2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002
3. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009
4. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381
5. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0
6. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.

<b>B.Tech. CSE (AI &amp; ML)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>IV Year - II Semester</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>WEB SECURITY (Professional Elective –V)</b>				

**Course Objectives:**

- Give an Overview of information security Give an overview of Access control of relational databases

**Course Outcomes:** Students should be able to

- Understand the Web architecture and applications
- Understand client side and service side programming
- Understand how common mistakes can be bypassed and exploit the application
- Identify common application vulnerabilities

**UNIT - I:**

The Web Security, The Web Security Problem, Risk Analysis and Best Practices  
Cryptography and the Web: Cryptography and Web Security, Working Cryptographic Systems and Protocols, Legal Restrictions on Cryptography, Digital Identification

**UNIT - II:**

The Web's War on Your Privacy, Privacy-Protecting Techniques, Backups and Antitheft, Web Server Security, Physical Security for Servers, Host Security for Servers, Securing Web Applications

**UNIT - III:**

Database Security: Recent Advances in Access Control, Access Control Models for XML, Database Issues in Trust Management and Trust Negotiation, Security in Data Warehouses and OLAP Systems

**UNIT - IV:**

Security Re-engineering for Databases: Concepts and Techniques, Database Watermarking for Copyright Protection, Trustworthy Records Retention, Damage Quarantine and Recovery in Data Processing Systems, Hippocratic Databases: Current Capabilities and

**UNIT - V:**

Future Trends Privacy in Database Publishing: A Bayesian Perspective, Privacy-enhanced Location Based Access Control, Efficiently Enforcing the Security and Privacy Policies in a Mobile Environment

**TEXT BOOKS:**

1. Web Security, Privacy and Commerce Simson G Arfinkel, Gene Spafford, O'Reilly.
2. Handbook on Database security applications and trends Michael Gertz, Sushil Jajodia

<b>B.Tech. CSE (AI &amp; ML)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>IV B.Tech – II Semester</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>AD-HOC &amp; SENSOR NETWORKS (Professional Elective – V)</b>				

**Prerequisites:**

1. Computer Networks
2. Distributed Systems
3. Mobile Computing

**Course Objectives:**

- To understand the challenges of routing in ad-hoc and sensor networks
- To understand various broadcast, multicast and geo casting protocols in ad hoc and sensor networks
- To understand basics of Wireless sensors, and Lower Layer Issues and Upper Layer Issues of WSN

**Course Outcomes:**

- Understand the concepts of sensor networks and applications
- Understand and compare the MAC and routing protocols for ad hoc networks
- Understand the transport protocols of sensor networks

**UNIT - I:**

**Introduction to Ad Hoc Networks**

Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

**Routing in MANETs**

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

**UNIT - II:**

**Data Transmission**

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

**UNIT - III:**

**Geo casting**

Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR.

TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

**UNIT - IV:**

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

**UNIT - V:****Upper Layer Issues of WSN**

Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

**TEXTBOOKS:**

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN – 981-256-681-3
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kaufman)

**REFERENCE BOOKS:**

1. C. Siva Ram Murthy, B.S. Manoj Ad Hoc Wireless Networks: Architectures and Protocols.
2. Taieb Znati Kazem Sohraby, Daniel Minoli, Wireless Sensor Networks: Technology, Protocols and Applications, Wiley.

<b>B.Tech. CSE (AI &amp; ML)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>IV Year – II Semester</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>SPEECH AND VIDEO PROCESSING (Professional Elective – VI)</b>				

**Course Objectives:**

- To make students understand speech and video processing techniques

**Course Outcomes:**

- Describe the mechanisms of human speech production systems and methods for speech feature extraction.
- Understand basic algorithms of speech analysis and speech recognition.
- Explain basic techniques in digital video processing, including imaging characteristics and sensors.
- Apply motion estimation and object tracking algorithms on video.

**UNIT - I:**

**Speech processing concepts**

The speech production mechanism, Discrete time speech signals, Pole-Zero modeling of speech, relevant properties of the fast Fourier transform for speech recognition, convolution, linear and non linear filter banks, spectral estimation of speech using DFT. Linear Prediction analysis of speech.

**UNIT - II:**

**Speech recognition**

Feature extraction for speech, static and dynamic feature for speech recognition, MFCC, LPCC, Distance measures, vector quantization models, Gaussian Mixture model, HMM.

**UNIT - III:**

**Multi-Dimensional Signals and Systems**

Multi-Dimensional Signals, Multi-Dimensional Transforms, Multi-Dimensional Systems, Multi-Dimensional Sampling Theory, Sampling Structure Conversion

**Digital Images and Video:** Human Visual System and Color, Digital Video

**UNIT - IV:**

**Motion Estimation**

Image Formation, Motion Models, 2D Apparent-Motion Estimation, Differential Methods, Matching Methods, Nonlinear Optimization Methods, Transform-Domain Methods, 3D Motion and Structure Estimation

**UNIT - V:**

**Video Segmentation and Tracking**

Image Segmentation, Change Detection, Motion Segmentation, Motion Tracking, Image and Video Matting, Performance Evaluation

**TEXT BOOKS:**

1. Fundamentals of Speech recognition – L. Rabiner and B. Juang, Prentice Hall signal processing series
2. Digital Video processing, A Murat Tekalp, 2nd edition, Prentice Hall.

**REFERENCE BOOKS:**

1. Discrete-time speech signal processing: principles and practice, Thomas F. Quatieri, Coth.
2. Video Processing and Communications, Yao Wang, J. Osternann and Qin Zhang, Pearson
3. Education
4. “Speech and Audio Signal Processing”, B. Gold and N. Morgan, Wiley.
5. “Digital image sequence processing, Compression, and analysis”, Todd R. Reed, CRC Press
6. “Handbook of Image and Video processing”, Al Bovik, Academic press, second Edition.

<b>B.Tech. CSE (AI &amp; ML)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>IV Year – II Semester</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>ROBOTIC PROCESS AUTOMATION (Professional Elective – VI)</b>				

**Course Objectives:**

- Introduce robotic process automation, techniques of automation using UiPath RPA tool.

**Course Outcomes:**

- Understand the concepts of Robotic Process Automation.
- Apply the flow chart mechanism in various calculations.
- Applying UiPath tool for debugging process
- Design system managing techniques.
- Create application for process automation using UiPath tool.

**UNIT - I:**

**Robotic Process Automation:** Introduction, Scope and techniques of automation, Robotic process automation, Components of RPA, RPA platforms, About UiPath  
**UiPath Stack** UiPath Studio, UiPath Robot, Types of Robots, UiPath Orchestrator  
**UiPath Studio** Projects, User interface

**The User Interface:** Task recorder, Advanced UI interactions: Input methods, Output methods

**UNIT - II:**

**Sequence, Flowchart, and Control Flow:** Sequencing the workflow, Activities, Control Flow, various types of loops and decision making

**Data Manipulation:** Variables and scope, Collections, Arguments – Purpose and use, Data table usage with examples, File operation with step-by-step example, CSV/Excel to data table and vice versa

**UNIT - III:**

**Taking Control of the Controls:** Finding and attaching windows, Finding the control, Techniques for waiting for a control, Act on controls – mouse and keyboard activities, Handling events, revisit recorder, When to use OCR, Types of OCR available, How to use OCR

**Plugins and Extensions:** Terminal Plugin, SAP Automation, Citrix automation and Credential management

**UNIT - IV:**

**Handling User Events and Assistant Bots:** Assistant bots, Monitoring system event triggers, Monitoring image and element triggers, Launching an assistant bot on a keyboard event

**Exception Handling, Debugging, and Logging:** Exception handling, Common exceptions and ways to handle them, Logging and taking screenshots, Debugging

techniques, Collecting crash dumps, Error reporting

**UNIT - V:**

**Managing and Maintaining the Code:** Project organization, nesting workflows, Reusability of workflows, Commenting techniques, State Machine, When to use Flowcharts, State Machines, or Sequences, Using config files

**Deploying and Maintaining the Bot:** Publishing using publish utility, using Orchestration Server to control bots, deploy bots, License Management, Publishing and Managing updates

**TEXT BOOKS:**

1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath: Create Software robots. with the leading RPA tool – UiPath Kindle Edition

**REFERENCE BOOKS:**

1. Robotic Process Automation A Complete Guide - 2020 Edition Kindle Edition.

<b>B.Tech. CSE (AI &amp; ML)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>IV B.Tech – II Semester</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>RANDOMIZED ALGORITHMS (Professional Elective – VI)</b>				

**Course Objectives:**

- To introduce the power of randomization in the design of algorithms.

**Course Outcomes:**

- Appreciate the fundamentals of randomized algorithm design.
- Understand the fundamentals of Markov chains and the Monte Carlo method.
- Apply high probability analysis to selected randomized algorithms.
- Understand the Fingerprint and Pattern Matching techniques

**UNIT - I:**

**Introduction**, A Min – Cut algorithm, Las Vegas and Monte Carlo, Binary Planar Partitions, A Probabilistic Recurrence  
Game-Theoretic Techniques: Game Tree Evaluation, The Minimax Principle

**UNIT - II:**

**Moments and Deviations:** Occupancy Problems, The Markov and Chebyshev Inequalities, Randomized Selection, Two Point sampling, The Coupon Collector's problem.

Markov Chains and Random Walks: A 2-SAT example, Markov Chains, Random Walks on Graphs, Graph Connectivity

**UNIT - III:**

**Algebraic Techniques:** Fingerprinting and Freivald's Technique, Verifying Polynomial Identities, Perfect Matching in Graphs, Verifying Equality of Strings, A Comparison of Fingerprinting Techniques, Pattern Matching

**UNIT - IV:**

**Data Structures:** The Fundamental of Data-structures, Random Treaps, Skip Lists, Hash Tables Graph Algorithms: All Pairs Shortest Path, The Min- Cut Problem, Minimum Spanning Trees

**UNIT - V:**

Geometric Algorithms: Randomized Incremental Construction, Convex Hulls in the Plane, Duality, Half-Space Intersections, Dalaunay Triangulations, Trapezoidal Decompositions, Parallel and Distributed Algorithms: The PRAM Model, Sorting on a PRAM, Maximal Independent Sets, Perfect Matchings

**TEXT BOOKS:**

1. Randomized Algorithms: Rajeev Motwani, Prabhakar Raghavan, Cambridge University Press

2. Probability and Computing: Randomization and Probabilistic Techniques in Algorithms and
3. Data Analysis by Eli Upfal and Michael Mitzenmacher.

<b>B.Tech. CSE (AI &amp; ML)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>IV B.Tech – II Semester</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>COGNITIVE COMPUTING (Professional Elective – VI)</b>				

**Prerequisites:**

- Probability theory

**Course Objectives:**

- To provide an understanding of the central challenges in realizing aspects of human cognition.
- To provide a basic exposition to the goals and methods of human cognition.
- To develop algorithms that use AI and machine learning along with human interaction and feedback to help humans make choices/decisions.
- To support human reasoning by evaluating data in context and presenting relevant findings along with the evidence that justifies the answers.

**Course Outcomes:**

- Understand cognitive computing
- Plan and use the primary tools associated with cognitive computing.
- Plan and execute a project that leverages cognitive computing.
- Understand and develop the business implications of cognitive computing..

**UNIT - I:**

**Introduction to Cognitive Science:** Understanding Cognition, IBM's Watson, Design for Human Cognition, Augmented Intelligence, Cognition Modeling Paradigms: Declarative/ logic-based computational cognitive modeling, connectionist models of cognition, Bayesian models of cognition, a dynamical systems approach to cognition.

**UNIT - II:**

Cognitive Models of memory and language, computational models of episodic and semantic memory, modeling psycholinguistics.

**UNIT - III:**

Cognitive Modeling: modeling the interaction of language, memory and learning, Modeling select aspects of cognition classical models of rationality, symbolic reasoning and decision making.

**UNIT - IV:**

Formal models of inductive generalization, causality, categorization and similarity, the role of analogy in problem solving, Cognitive Development Child concept acquisition. Cognition and Artificial cognitive architectures such as ACT-R, SOAR, OpenCog, CopyCat, Memory Networks.

**UNIT - V:**

DeepQA Architecture, Unstructured Information Management Architecture (UIMA), Structured Knowledge, Business Implications, Building Cognitive Applications, Application of Cognitive Computing and Systems.

**TEXTBOOKS:**

1. The Cambridge Handbook of Computational Psychology by Ron Sun (ed.), Cambridge University Press.

**REFERENCE BOOKS:**

1. Judith S. Hurwitz, Marcia Kaufman, Adrian Bowles Cognitive Computing and Big Data Analytics, Wiley
2. Vijay V Raghavan, Venkat N. Gudivada, Venu Govindaraju, Cognitive Computing: Theory and Applications: Volume 35 (Handbook of Statistics), North Hollan.

<b>B.Tech. CSE (AI &amp; ML)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>IV B.Tech – II Semester</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>CONVERSATIONAL AI (Professional Elective – VI)</b>				

**Course Objectives:**

- To be familiar with the basic knowledge about conversational systems.
- To understand the different techniques of natural language processing
- Study the fundamental role of machine learning in building conversational systems.
- To know the various applications of conversational systems and its future development

**Course Outcomes:**

- Understand the basic technologies required for building a conversational system.
- Learn the rule-based dialogue system
- Involve AI in building conversational system and build advanced systems that are cognitively inclined towards human behaviour.
- Develop a real time working conversational system for social domain that can intelligently process inputs and generate relevant replies.

**UNIT - I:**

**Introducing Dialogue Systems**

Introduction of Dialogue System, History of Dialogue Systems, Present-Day Dialogue Systems, Modeling Conversation Dialogue Systems, Designing and Developing Dialogue Systems

**UNIT - II:**

**Rule-Based Dialogue Systems: Architecture, Methods, and Tools**

Dialogue Systems Architecture, designing a Dialogue System, Tools for Developing Dialogue Systems, Rule-Based Techniques in Dialogue Systems Participating in the Alexa Prize

**UNIT - III:**

**Statistical Data-Driven Dialogue Systems**

Motivating the Statistical Data-Driven Approach, Dialogue Components in the Statistical Data-Driven Approach, Reinforcement Learning (RL), Representing Dialogue as a Markov Decision Process, From MDPs to POMDPs, Dialogue State Tracking, Dialogue Policy, Problems and Issues with Reinforcement Learning in POMDPs

**UNIT - IV:**

**Evaluating Dialogue Systems**

Process of Evaluation, Evaluating Task-Oriented Dialogue Systems, Evaluating Open-Domain Dialogue Systems, Evaluation Frameworks- PARADISE, Quality of

Experience (QoE), Interaction Quality, Best Way to Evaluate Dialogue Systems

**UNIT - V:**

**End-to-End Neural Dialogue Systems**

Neural Network Approaches to Dialogue Modeling, A Neural Conversational Model, Introduction to the Technology of Neural Dialogue, Retrieval-Based Response Generation, Task-Oriented Neural Dialogue Systems, Open-Domain Neural Dialogue Systems, Some Issues and Current Solutions, Dialogue Systems: Datasets, Competitions, Tasks, and Challenges.

**TEXT BOOKS:**

1. Michael McTear, “Conversational AI: Dialogue Systems, Conversational Agents, and Chatbots”, Second Edition, Moran and Claypool Publishers, 2020.

**REFERENCE BOOKS:**

1. Cathy Pearl, “Designing Voice User Interfaces: Principles of Conversational Experiences”, O’REILLY, 2016.

<b>B.Tech. CSE (AI &amp; ML)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>IV B.Tech – II Semester</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>CHATBOTS (Open Elective – III)</b>				

**Prerequisites:**

1. None

**Course Objectives:**

- Knowledge on concepts of chatbots and understanding the developer environment bot framework.

**Course Outcomes:**

- Understand basic concepts of chatbots
- Analyze different entities in building bots
- Understand the concepts of advanced bot building
- Discuss different types of chatbot use cases

**UNIT - I:**

**Introduction to Chatbots:** Definition of chatbots, Journey of Chatbots, Rise of Chatbots, Messaging Platforms.

**UNIT - II:**

**Setting Up the Developer Environment Botframework**

Local Installation, Installing NodeJS, Following the Development Pipeline, Storing Messages in Database

**UNIT - III:**

Basics of Bot Building- Intents, Entities

**UNIT - IV:**

**Advanced Bot Building**

Design Principles, Showing Product Results, Saving Messages, Building Your Own Intent Classifier

**UNIT - V:**

**Business and Monetization** Analytics, Chatbot Use Cases- Modes of Communication- Business-to-Business (B2B), Chap Business to-Consumer (B2C) Consumer-to-Consumer (C2C) Business-to-Employee (B2E), Employee-to-Employee (E2E), Chatbots by Industry Vertical

**TEXT BOOKS:**

1. Rashid Khan, Anik Das, Build Better Chatbots: A Complete Guide to Getting Started with Chatbots, Apress

## **REFERENCE BOOKS:**

1. Drexen Braxley, Chat GPT #1 Bible - 10 Books in 1: A Comprehensive Guide to AI: Elevate Your Daily Life, Increase Work Output, Secure Financial Gains, Foster Career Growth, and Cultivate Modern Talents Paperback
2. D. Nardo Publications, ChatGPT Made Simple How Anyone Can Harness AI To Streamline Their Work, Study & Everyday Tasks To Boost Productivity & Maintain Competitive Edge By Mastering Prompt Engineering
3. Robert E. Miller, Prompt Engineering Bible Join and Master the AI Revolutions Profit Online with GPT-4 & Plugins for Effortless Money Making!
4. Lucas Foster, Chat GPT Bible Developer and Coder Special Edition: Enhancing Coding Productivity with AI-Assisted Conversations.

<b>B.Tech. CSE (AI &amp; ML)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>IV B.Tech – II Semester</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>EVOLUTIONARY COMPUTING (Open Elective – III)</b>				

**Prerequisites:**

1. Knowledge on algorithms

**Course Objectives:**

- Introduce the concepts of evolutionary computing and various evolution algorithms

**Course Outcomes:**

- Appraise the significance of evolutionary computing
- Apply genetic operators and genetic programming for classification problems
- Hybridization of genetic algorithms with other techniques
- Understand multi objective, interactive evolutionary algorithms.

**UNIT - I:**

**Optimization, Modelling, and Simulation Problems** Search Problems, Optimization Versus Constraint Satisfaction, The Famous NP Problems

**Evolutionary Computing:** The Origins: The Main Evolutionary Computing Metaphor, Brief History, The Inspiration from Biology, Evolutionary Computing

**Evolutionary Algorithm:** Definition, Components of Evolutionary Algorithms, An Evolutionary Cycle by Hand, Example Applications, The Operation of an Evolutionary Algorithm, Natural Versus Artificial Evolution, Evolutionary Computing, Global Optimization, and Other Search Algorithms

**UNIT - II:**

**Representation, Mutation, and Recombination** Representation and the Roles of Variation Operators, Binary Representation, Integer Representation, Real-Valued or Floating-Point Representation, Permutation Representation, Tree Representation

**Fitness, Selection, and Population Management:** Population Management Models, Parent Selection, Survivor Selection, Selection Pressure, Multimodal Problems, Selection, and the Need for Diversity

**Popular Evolutionary Algorithm Variants:** Genetic Algorithms, Evolution Strategies, Evolutionary Programming, Genetic Programming, Learning Classifier Systems, Differential Evolution, Particle Swarm Optimization, Estimation of Distribution Algorithms

**UNIT - III:**

**Parameters and Parameter Tuning:** Evolutionary Algorithm Parameters, EAs and EA Instances, Designing Evolutionary Algorithms, The Tuning Problem, Algorithm Quality: Performance and Robustness, Tuning Methods.

**Parameter Control:** Introduction, Examples of Changing Parameters, Classification of Control Techniques, Examples of Varying EA Parameters

**UNIT - IV:**

**Working with Evolutionary Algorithms:** Working of EA, Performance Measures, Test Problems for Experimental Comparisons, Example Applications

**Hybridization with Other Techniques: Memetic Algorithms:** Motivation for Hybridizing EAs, A Brief Introduction to Local Search, Structure of a Memetic Algorithm, Adaptive Memetic Algorithms, Design Issues for Memetic Algorithms, Example Application: Multistage Memetic Timetabling

**UNIT - V:**

**Multi objective Evolutionary Algorithms** Multiobjective Optimization Problems, Dominance and Pareto Optimality, EA Approaches to Multiobjective Optimization, Example Application: Distributed Coevolution of Job Shop Schedules

**Constraint Handling:** Two Main Types of Constraint Handling, Approaches to Handling Constraints, Example Application: Graph Three-Colouring

**Interactive Evolutionary Algorithms:** Characteristics of Interactive Evolution, Algorithmic Approaches to the Challenges of IEAs, Interactive Evolution as Design vs. Optimization, Example Application: Automatic Elicitation of User Preferences

**TEXT BOOKS:**

1. A. E. Eiben, J. E. Smith, Introduction to Evolutionary Computing, Second Edition, Springer.

**REFERENCE BOOKS:**

1. David E. Goldberg, "Genetic Algorithms in search, Optimization & Machine Learning".
2. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.