COMPUTER SCIENCE AND ENGINEERING

(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

R19-COURSE STRUCTURE & SYLLABUS

IV YEAR I- SEMESTER

Sl.No	Course Code	Course Title	category	L	T	P	C
1	19AM4111	Neural Networks & Deep Learning	PC	3	1	-	4
2	19AM4112	Reinforcement Learning	PC	3	-	-	3
3	**Professional Elective – IV**			3	-	-	3
	19AM4171	Quantum Computing	PE				
	19AM4172	Expert Systems	PE				
	19AM4173	Cloud Computing	PE				
	19AM4174	Game Theory	PE				
	19AM4175	Mobile Computing	PE				
4	**Professional Elective – V**			3	-	-	3
	19AM4176	Social Network Analysis	PE				
	19AM4177	Federated Machine Learning	PE				
	19AM4178	Augmented Reality & Virtual Reality	PE				
	19AM4179	Web Security	PE				
	19CS417A	Ad-hoc & Sensor Networks	PE				
5		**Open Elective – II**	OE	3	-	-	3
PRACTICAL							
6	19AM4151	Deep Learning Lab	PC	-	-	2	1
7	19AM4181	Major Project Phase I	PW	-	-	6	3
8	19AM4182	Mini Project*	PW	-	-	-	2
Total Credits				**15**	**1**	**8**	**22**

***Note:** Mini Project should be carried out during summer break after III yr II semester

IV YEAR II-SEMESTER

Sl.No	Course Code	Course Title	Category	L	T	P	C
1	19MB4211	Organizational Behaviour	HS	3	-	-	3
2	**Professional Elective - VI**			3	-	-	3
	19AM4271	Speech and Video Processing	PE				
	19AM4272	Robotics Process Automation	PE				
	19AM4273	Randomized Algorithms	PE				
	19AM4274	Cognitive Computing	PE				
	19AM4275	Semantic Web	PE				
3		**Open Elective – III**	OE	3	-	-	3
Practical							
4	19AM4281	Major Project Phase II	PW	-	-	14	7
Total Credits				**9**	**0**	**14**	**16**

19AM4111: NEURAL NETWORKS AND DEEP LEARNING

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

3 1 - 4

Prerequisites:

1. Linear algebra
2. Probability and statistics
3. Partial derivatives
4. Machine Learning

Course Objectives: The course will explain in depth:

- The foundations of Artificial Neural Networks
- The knowledge on Deep Learning Concepts
- Various types of Artificial Neural Networks
- The knowledge of Augmentation, Regularization for Deep learning
- The knowledge to apply optimization strategies

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

1. Understand the concepts of Neural Networks
2. Apply the Learning Networks in modelling real world systems
3. Understand the basic concepts of Deep Learning
4. Apply an efficient algorithm for Deep Models
5. Apply optimization strategies for large scale applications

UNIT-I

Artificial Neural Networks Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

UNIT-II

Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

UNIT - III

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

UNIT - IV

Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier

UNIT - V

Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-

Order Methods, Optimization Strategies and Meta-Algorithms

Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing

TEXT BOOKS:

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

REFERENCE BOOKS:

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

19AM4112: REINFORCEMENT LEARNING

B.Tech. IV Year I Sem.

L	T	P	C
3	-	-	3

Prerequisites:

1. Linear algebra
2. Real analysis and calculus
3. Probability
4. Machine Learning
5. Artificial Intelligence

Course Objectives: The course will explain in depth:

1. Knowledge on fundamentals of reinforcement learning and the methods used to create agents that can solve a variety of complex tasks.
2. Formalize problems as Markov Decision Processes and bellman equations
3. Knowledge on value functions, as a general-purpose tool for optimal decision-making
4. How to implement dynamic programming as an efficient solution approach to an industrial control problem
5. Characterize and differentiate between different fundamental approaches to Reinforcement Learning.

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

1. Understand basics of RL tasks and the core principles behind the RL, including policies, value functions.
2. Understand RL Framework and Markov Decision-Process, deriving Bellman equations.
3. Analyze the use of Dynamic Programming and MonteCarlo.
4. Understand Bootstrapping and Temporal-Difference learning methods (TD(0), SARSA, Q-Learning)
5. Understand TD(λ)algorithm, policy-based methods and implement Case Studies.

UNIT - I

Basics of probability and linear algebra, Definition of a stochastic multi-armed bandit, Definition of regret, Achieving sublinear regret, UCB algorithm, KL-UCB, Thompson Sampling.

UNIT - II

Markov Decision Problem, policy, and value function, Reward models (infinite discounted, total, finite horizon, and average), Episodic & continuing tasks, Bellman's optimality operator, and Value iteration & policy iteration

UNIT - III

The Reinforcement Learning problem, prediction and control problems, Model-based algorithm, Monte Carlo methods for prediction, and Online implementation of Monte Carlo policy evaluation

UNIT - IV

Bootstrapping; TD(0) algorithm; Convergence of Monte Carlo and batch TD(0) algorithms; Model-free control: Q-learning, Sarsa, Expected Sarsa.

UNIT - V

n-step returns; TD(λ) algorithm; Need for generalization in practice; Linear function approximation and geometric view; Linear TD(λ). Tile coding; Control with function approximation; Policy search; Policy gradient methods; Experience replay; Fitted Q Iteration; Case studies.

TEXT BOOKS:

1. "Reinforcement learning: An introduction," First Edition, Sutton, Richard S., and Andrew G. Barto, MIT press 2020.
2. "Statistical reinforcement learning: modern machine learning approaches," First Edition, Sugiyama, Masashi. CRC Press 2015.

REFERENCE BOOKS:

1. "Bandit algorithms," First Edition, Lattimore, T. and C. Szepesvári. Cambridge University Press. 2020.
2. "Reinforcement Learning Algorithms: Analysis and Applications," Boris Belousov, Hany Abdulsamad, Pascal Klink, Simone Parisi, and Jan Peters First Edition, Springer 2021.
3. Alexander Zai and Brandon Brown "Deep Reinforcement Learning in Action," First Edition, Manning Publications 2020.

19AM4171: QUANTUM COMPUTING (Professional Elective – IV)

B.Tech. IV Year I Sem.

L	T	P	C
3	-	-	3

Course Objectives: The objective of this course is to:

1. To introduce the fundamentals of quantum computing
2. To introduce problem-solving approach using finite dimensional mathematics
3. To learn the basic quantum logical operations and algorithms for processing quantum information.
4. To learn the basic knowledge about the practical use of quantum algorithms and quantum programming skills.
5. To learn the basic quantum logical operations and algorithms for processing quantum information.

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

1. To Understand basics of quantum computing
2. To Understand physical implementation of Qubit
3. To Understand Quantum algorithms and their implementation
4. To Understand the Impact of Quantum Computing on Cryptography
5. To Understand simple quantum algorithms and information channels in the quantum circuit model

UNIT - I

Introduction to Essential Linear Algebra: Some Basic Algebra, Matrix Math, Vectors and Vector Spaces, Set Theory. **Complex Numbers:** Definition of Complex Numbers, Algebra of Complex Numbers, Complex Numbers Graphically, Vector Representations of Complex Numbers, Pauli Matrice, Transcendental Numbers.

UNIT - II

Basic Physics for Quantum Computing: The Journey to Quantum, Quantum Physics Essentials, Basic Atomic Structure, Hilbert Spaces, Uncertainty, Quantum States, Entanglement.

Basic Quantum Theory: Further with Quantum Mechanics, Quantum Decoherence, Quantum Electrodynamics, Quantum Chromodynamics, Feynman Diagram Quantum Entanglement and QKD, Quantum Entanglement, Interpretation, QKE.

UNIT - III

Quantum Architecture: Further with Qubits, Quantum Gates, More with Gates, Quantum Circuits, The D-Wave Quantum Architecture. **Quantum Hardware:** Qubits, How Many Qubits Are Needed? Addressing Decoherence, Topological Quantum Computing, Quantum Essentials.

UNIT - IV

Quantum Algorithms: What Is an Algorithm? Deutsch's Algorithm, Deutsch-Jozsa Algorithm, Bernstein-Vazirani Algorithm, Simon's Algorithm, Shor's Algorithm, Grover's Algorithm.

UNIT - V

Current Asymmetric Algorithms: RSA, Diffie-Hellman, Elliptic Curve. **The Impact of Quantum Computing on Cryptography:** Asymmetric Cryptography, Specific Algorithms, Specific Applications.

TEXT BOOKS:

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press
2. Dr. Chuck Easttom, Quantum Computing Fundamentals, Pearson

REFERENCE BOOKS:

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. Basic Concepts. Vol. Basic Tools and Special Topics, World Scientific.
3. Pittenger A. O., An Introduction to Quantum Computing Algorithms.

19AM4172: **EXPERT SYSTEMS (Professional Elective – IV)**

B.Tech. IV Year I Sem.

L	T	P	C
3	-	-	3

Prerequisites:

1. Linear algebra
2. Real analysis and calculus
3. Probability
4. Machine Learning
5. Artificial Intelligence

Course Objectives: The course will explain in depth:

1. The basic techniques of artificial intelligence.
2. The different knowledge representation techniques.
3. The architecture of Expert systems
4. The expert system tools and building the expert system.
5. How to identify the pitfalls in developed expert systems

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

1. Apply the basic techniques of artificial intelligence.
2. Develop knowledge-based systems with proper representation schemes.
3. Understand the architecture of an expert system and its tools.
4. Understand the importance of building expert systems.
5. Understand various problems with an expert systems.

UNIT - I

Introduction to AI programming languages, Blind search strategies, Breadth-first – Depth-first – Heuristic search techniques Hill Climbing – Best first – A Algorithms AO* algorithm – game tress, Min-max algorithms, game playing – Alpha-beta pruning.

UNIT - II

Knowledge representation issues predicate logic – logic programming Semantic nets- frames and inheritance, constraint propagation; Representing Knowledge using rules, Rules-based deduction systems.

UNIT - III

Introduction to Expert Systems, Architecture of expert systems, Representation and organization of knowledge, Basics characteristics, and types of problems handled by expert systems.

UNIT - IV

Expert System Tools: Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems.

UNIT - V

Building an Expert System: Expert system development, Selection of the tool, Acquiring Knowledge, Building process.

Problems with Expert Systems: Difficulties, common pitfalls in planning, dealing with domain experts, difficulties during development.

TEXTBOOKS:

1. ElainRichandKevinKnight,"ArtificialIntelligence",TataMcGraw-Hill,NewDelhi.
2. WatermanD.A.,"AGuidetoExpertSystems",AddisonWesleyLongman.
3. J. Giarratano and G. Riley, "Expert Systems -- Principles and Programming",4th Edition, PWS Publishing Company
4. Peter Jackson," Introduction to Expert Systems", Addison Wesley Longman

REFERENCEBOOKS:

1. StuartRusselandotherPeterNorvig,"ArtificialIntelligence-AModernApproach",Prentice-Hall.
2. PatrickHenryWinston,"ArtificialIntelligence",AddisonWesley.
3. Patterson, ArtificialIntelligence&ExpertSystem,PrenticeHallIndia,1999.
4. Hayes-Roth,Lenat,andWaterman:BuildingExpertSystems,AddisonWesley.
5. WeissS.M.andKulikowskiC.A.,"APracticalGuidetoDesigningExpertSystems",Rowman&Allanheld,NewJersey.

19AM4173: CLOUD COMPUTING (PROFESSIONAL ELECTIVE – IV)

B.Tech. IV Year I Sem.

L	T	P	C
3	-	-	3

Pre-requisites:

1. A course on "Computer Networks"
2. A course on "Operating Systems"
3. A course on "Distributed Systems"

Course Objectives: The objective of this course is to

- This course provides an insight into cloud computing
- Topics covered include- distributed system models, different cloud service models, service-oriented architectures, cloud programming and software environments, resource management.
- The fundamental ideas behind Cloud Computing, the evolution of the paradigm, its applicability; benefits, as well as current and future challenges
- Cloud storage technologies and relevant distributed file systems
- The basic ideas and principles in data center design; cloud management techniques and cloud software deployment considerations

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

- Ability to understand various service delivery models of a cloud computing architecture.
- Ability to understand the ways in which the cloud can be programmed and deployed.
- Understanding cloud service providers.
- Ability to understand network and storage virtualization and outline their role in enabling the cloud computing system model.
- Analyze various cloud programming models and apply them to solve problems on the cloud.

UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

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

UNIT V:

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

TEXT BOOK:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014
2. Cloud Computing: Concepts, Technology, and Architecture – By Zaigham Mahmood, Ricardo Puttini, and Thomas Erl.

REFERENCE BOOKS:

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

19AM4174: GAME THEORY (Professional Elective – IV)

B.Tech. IV Year I Sem.

L	T	P	C
3	-	-	3

Prerequisites:

1. Linear algebra
2. Real analysis and calculus
3. Probability
4. Machine Learning and Artificial Intelligence

Course Objectives: The course will explain in depth

1. The strategic games with imperfect information
2. ThestandardequilibriumconceptssuchasNashequilibrium,Subgame-PerfectNash Equilibrium, and others.
3. Equilibrium Concepts for Games with Imperfect Information
4. The Solution Concepts for Extensive-form Game
5. The solution for Repeated Games and Infinitely Repeated Games

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

1. Understand the basic concepts of game theory and solutions
2. Understand different types of equilibrium interpretations
3. Understand and analyze knowledge and solution concepts
4. Analyze extensive games with perfect information
5. Understand and analyze repeated and infinitely repeated games

UNIT - I

Introduction- Game Theory, Games and Solutions Game Theory and the Theory of Competitive Equilibrium, Rational Behavior, The Steady State and Deductive Interpretations, Bounded Rationality Terminology and Notation. Nash Equilibrium- Strategic Games, Nash Equilibrium Examples Existence of a Nash Equilibrium, Strictly Competitive Games, Bayesian Games: Strategic Games with Imperfect Information.

UNIT - II

Mixed, Correlated, and Evolutionary Equilibrium - Mixed Strategy Nash Equilibrium, Interpretations of Mixed Strategy Nash Equilibrium, Correlated Equilibrium, Evolutionary Equilibrium, Rationalizability and Iterated Elimination of Dominated Actions -Rationalizability Iterated Elimination of Strictly Dominated Actions, Iterated Elimination of Weakly Dominated Actions.

UNIT - III

Knowledge and Equilibrium -A Model of Knowledge Common Knowledge, Can People Agree to Disagree? Knowledge and Solution Concepts, The Electronic Mail Game

UNIT - IV

Extensive Games with Perfect Information -Extensive Games with Perfect Information Subgame Perfect Equilibrium Two Extensions of the Definition of a Game The Interpretation of a Strategy, Two Notable Finite Horizon Games, Iterated Elimination of Weakly Dominated, Strategies Bargaining Games - Bargaining and Game Theory, A Bargaining Game of Alternating Offers Subgame Perfect Equilibrium Variations and Extensions.

UNIT - V

Repeated Games - The Basic Idea Infinitely Repeated Games vs.\ Finitely Repeated Games, Infinitely Repeated Games: Definitions Strategies as Machines Trigger Strategies: Nash Folk, Theorems Punishing for a Limited Length of Time: A Perfect Folk Theorem for the Limit of Means Criterion Punishing the Punisher: A Perfect Folk Theorem for the Overtaking Criterion, Rewarding Players Who Punish: A Perfect Folk Theorem for the Discounting Criterion The Structure of Subgame Perfect

Equilibria Under the Discounting Criterion Finitely Repeated Game.

TEXT BOOKS:

1. A course in Game Theory, M. J. Osborne and A. Rubinstein, MIT Press
2. Game Theory, Roger Myerson, Harvard University Press
3. Game Theory, D. Fudenberg and J. Tirole, MIT Press

REFERENCE BOOKS:

1. Theory of Games and Economic Behavior, J. von Neumann and O. Morgenstern, New York: John Wiley and Sons.
2. Games and Decisions, R.D. Luce and H. Raiffa, New York: John Wiley and Sons.
3. Game Theory, G. Owen, 2nd Edition, New York: Academic Press.

19AM4175: MOBILE COMPUTING (Professional Elective – IV)

B.Tech. IV Year I Sem.

L	T	P	C
3	-	-	3

Prerequisites: Computer Networks, Distributed Systems/Distributed Operating Systems

Course Objectives: The Objective of this Course is to

- Make the student understand the concept of mobile computing paradigm, its novel applications and limitations.
- Understand the typical mobile networking infrastructure through a popular GSM protocol
- Understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer
- Understand the database issues in mobile environments & data delivery models.
- Understand the ad hoc networks and related concepts.

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

1. Understand the concept of mobile computing paradigm, its novel applications and limitations.
2. Analyze and develop new mobile applications
3. Understand the protocols and platforms related to mobile environment
4. Classify data delivery mechanisms
5. Understand IP and TCP layers of Mobile Communication.

UNIT - I

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

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

UNIT –II

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

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

UNIT - III

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

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

UNIT - IV

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

UNIT - V

Mobile Ad hoc Networks (MANETs): Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, Mobile Agents, Service Discovery. **Protocols and Platforms for Mobile Computing:** WAP, Bluetooth, XML, J2ME, JavaCard, PalmOS, Windows CE, SymbianOS, Linux for Mobile Devices, Android.

TEXT BOOKS:

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

REFERENCE BOOK:

1. Asoke K Talukder, Hasan Ahmed, Roopa Yavagal Mobile Computing: Technology, Applications and Service Creation, Mc GrawHill Education.
2. Mobile Computing: Technology, Applications and Service Creation Paperback by Asoke K Talukder (Author), Hasan Ahmed (Author), Roopa Yavagal (Author)

19AM4176: SOCIAL NETWORK ANALYSIS (Professional Elective – V)

B.Tech. IV Year I Sem.

L	T	P	C
3	-	-	3

Prerequisites

1. A course on "Web Technologies".
2. A course on "Computer Networks".
3. A course on "Data Warehousing and Data Mining".

Course Objectives: The objective of this course is to

1. It introduces the concepts of social media
2. It provides the mechanisms for social network analysis
3. Includes the concepts that allow for better visualization and analysis of widely used services such as email, Wikis, Twitter, flickr, YouTube, etc.
4. Conveying the basic ideas and advanced technologies in social network analysis
5. To understand human behaviour in social web and related communities.

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

1. Ability to construct social network maps easily
2. Gain skills in tracking the content flow through the social media
3. Use NodeXL to perform social network analysis
4. Understand the basic concepts and principles of different theoretical models of the social networks analysis.
5. Compare how different network structures affect social dynamics

UNIT - I:

Introduction: Social Media and Social Networks**. Social Media:** New Technologies of Collaboration.

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

UNIT - II:

NodeXL, Layout, Visual Design, and Labeling, Calculating and Visualizing Network Metrics, Preparing Data and Filtering, Clustering and Grouping.

UNIT - III:

CASE STUDIES - I:

Email: The lifeblood of Modern Communication**. Thread Networks:** Mapping Message Boards and Email Lists. **Twitter:** Conversation, Entertainment and Information.

UNIT - IV:

CASE STUDIES - II: Visualizing and Interpreting Facebook Networks, WWW Hyperlink Networks

UNIT-V:

CASE STUDIES - III:

You Tube: Contrasting Patterns of Content Interaction, and Prominence**. Wiki Networks:** Connections of Creativity and Collaboration.

TEXT BOOKS:

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

REFERENCE BOOK:

1. Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting and Using Metrics, 1st Edition, MGH, 2011.

19AM4177: FEDERATED MACHINE LEARNING (Professional Elective – V)

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

3 - - 3

Prerequisites:

- Machine Learning
- Computer Vision
- Natural Language Processing
- Reinforcement Learning

Course Objectives: The objective of the course is to:

1. Explain key concepts and issues behind Federated Learning and get familiar with key theoretical results of Federated Learning
2. Learn Scalability and privacy motivated Distributed Machine Learning
3. Learn Privacy concerns and privacy-preserving methods of Federated Learning.
4. Learn Statistical heterogeneity of data in federated networks
5. Learn Federated Learning for Vision,Natural Language Processing and Reinforcement Learning.

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

1. Acquire Knowledge on the basic concepts, architecture, and applications of FL.
2. Understand Privacy-Preserving and Scalability oriented Distributed Machine Learning.
3. Analyze horizontal federated learning
4. Understand and Analyze Federated Transfer Learning and prediction process.
5. UnderstandthesignificanceofFederatedLearningforVision,Language,andRecommendation

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.

TEXTBOOK:

1. FederatedLearning,QiangYang,YangLiu,YongCheng,YanKang,TianjianChen,andHanYu-Synthesis“Lectureson Artificial Intelligence andMachineLearning “2019.
2. Muhammad Habib ur Rehman, Mohamed Medhat Gaber ” Federated Learning Systems: Towards Next-Generation AI” 2021.

REFERENCE BOOKS:

1. Mitchell Tom, “Machine Learning”, Latest Edition, Mc-Graw Hill
2. Szeliski,R.,” Computer Vision: Algorithms and Applications,”Springer,2011.
3. Multi-lingual natural Language Processing Applications: From Theory to Practice-Daniel M.Bikeland Imed Zitouni ,Pearson Publication

19AM4178: AUGMENTED REALITY AND VIRTUAL REALITY

(Professional Elective – V)

B.Tech. IV Year I Sem.

L	T	P	C
3	-	-	3

Prerequisites:

- Artificial Neural Networks
- Reinforcement Learning

Course Objectives: The course will explain in-depth

1. The basic concepts of Augmented Reality and how it works
2. The AR Devices and Components
3. The basic concepts and applications of Virtual Reality
4. Representation of VR with case studies
5. Rending images that depict a virtual world

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

1. Describe how AR and VR systems work and list the applications of AR and VR.
2. Understand and analyze the hardware requirement of AR.
3. UnderstandthedesignandimplementationofthehardwarethatenablesVRsystemstobebuilt.
4. Understand the system of human vision and its implication on perception and rendering.
5. Describe the importance of interaction and audio in VR systems.

UNIT - I:

Introduction to Augmented Reality: What Is Augmented Reality - Defining augmented reality, history of augmented reality, The Relationship Between Augmented Reality and Other Technologies-Media, Technologies, Other Ideas Related to the Spectrum Between Real and Virtual Worlds, applications of augmented reality Augmented Reality Concepts- How Does Augmented Reality Work? Concepts Related to Augmented Reality, Ingredients of an Augmented Reality Experience**.**

UNIT - II:

AR Devices & Components: AR Components – Scene Generator, Tracking system, monitoring system, display, Game scene. AR Devices – Optical See- Through HMD, Virtual retinal systems, Monitor bases systems, Projection displays, Video see-through systems.

UNIT - III:

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

UNIT - IV:

Representing the Virtual World: Representation of the Virtual World, Visual Representation in VR, Aural Representation in VR and Haptic Representation in VR, Case Study: GHOST (General Haptics Open Software Toolkit) software development toolkit.

UNIT - V:

Visual Perception & Rendering: Visual Perception - Perception of Depth, Perception of Motion, Perception of Color, Combining Sources of Information, Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates.

TEXTBOOK:

1. Allan Fowler-AR Game Development‖, 1st Edition, A press Publications, 2018, ISBN 978-1484236178
2. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12October 2016),ISBN-10:9332578494
3. Virtual Reality, Steven M.LaValle,CambridgeUniversityPress,2016.
4. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)".

REFERENCEBOOKS:

1. Morgan Kaufmann Publishers, San Francisco,CA,2002.
2. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann,2009.
3. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN:9781491962381.
4. Sanni Siltanen-Theory and applications of marker-based augmented reality. Julkaisija – UtgivarePublisher.2012.ISBN978-951-38-7449-0.

19AM4179: WEB SECURITY (Professional Elective – V)

B.Tech. IV Year I Sem.

L	T	P	C
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Prerequisites:

1. Computer Networks
2. Cryptography and Network Security
3. Database Management Systems
4. Data Warehousing and Mining

Course Objectives: The objective of the course is to:

1. The basic Knowledge on Web Security
2. Security and Privacy Protecting Techniques in web applications
3. Security in Database, Data ware House and OLAP systems
4. Security Reengineering techniques for databases
5. Enforcing the security and privacy policies in database.

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

1. Understand the Web architecture and applications
2. Understand client side and service side programming
3. Understand how common mistakes can be bypassed and exploit the application
4. Identify common application vulnerabilities and use exploited vulnerabilities to penetrate a network's defences.
5. Understand privacy in Database

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 Future Trends.

UNIT - V

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

TEXTBOOKS:

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

REFERENCEBOOKS:

1. Web Security for Developers, Real Threats Practical Defense by Malcoim McDonald.
2. Security for Web Developer by John Paul Mueller

19CS417A: AD-HOC & SENSOR NETWORKS (Professional Elective - V)

B.Tech. IV Year I Sem.

L	T	P	C
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Prerequisites

1. A course on “Computer Networks”
2. A course on “Mobile Computing”.
3. IEEE standards and protocols.
4. Knowledge of Wireless networks.
5. Topology.

Course Objectives:

1. To understand the concepts of sensor networks
2. To remember the MAC and transport protocols for ad hoc networks
3. To Analyze the security of sensor networks
4. To Design the applications of ad hoc and sensor networks.
5. To Apply most appropriate algorithms.

Course Outcomes:

1. Ability to understand the state-of-the-art research in the emerging subject of Ad Hoc and Wireless Sensor Networks
2. Ability to solve the issues in real-time application development based on ASN.
3. Ability to conduct further research in the domain of ASN.
4. Ability to understand the routing and implementation of different suitable algorithms,
5. Ability to discover new applications in 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; **Reactive**: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-**Location Services**-DREAM, Quorum-based; **Forwarding Strategies:** Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

UNIT - II

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

UNIT - III

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, Sensor Networks and mobile robots.

TEXT BOOKS:

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

Reference Books:

1. Wireless sensor networks A network perspective, by Jun Zheng, Abbas Jamalipour, A John Wiley & Sons INC Publications.
2. Wireless Ad hoc and Sensor Networks Protocols, Performance, and Control *By Jagannathan Sarangapani,* Edition1st Edition, First Published2007, eBook Published31 January 2017, Pub. Location Boca Raton.

OPEN ELECTIVE II

B.Tech. IV Year I Sem.

L	T	P	C
3	-	-	3

19AM4151: DEEP LEARNING LAB

B.Tech. IV Year I Sem.

L	T	P	C
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Prerequisites:

1. Machine Learning
2. Programming in Python

Course Objectives: The course will explain in depth:

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

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

1. Learn the Fundamental Principles of Deep Learning.
2. Learn the Artificial and Convolution Neural Networks
3. Identify the Deep Learning Algorithms for Various Types of Learning Tasks in various domains.
4. Implement Deep Learning Algorithms and Solve Real-world problems.
5. Understand various python libraries

LIST OF EXPERIMENTS:

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

TEXT BOOKS:

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

REFERENCES:

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

EXTENSIVE READING:

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

Counselling Code : VBIT

VIGNANA BHARATHI Institute of Technology

(A UGC Autonomous Institution, Approved by AICTE, Accredited by NBA & NAAC-A Grade, Affiliated to JNTUH)

19AM4182: MINI PROJECT*

B.Tech. IV Year I Sem.

L	T	P	C
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Counselling Code : VBIT

VIGNANA BHARATHI Institute of Technology

(A UGC Autonomous Institution, Approved by AICTE, Accredited by NBA & NAAC-A Grade, Affiliated to JNTUH)

19AM4181: MAJOR PROJECT PHASE – I

B.Tech. IV Year I Sem.

L	T	P	C
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19MB4211: ORGANIZATIONAL BEHAVIOUR

B.Tech. IV Year II Sem.

L	T	P	C
3	-	-	3

Course Objectives: The objective of the course is to provide the students with the conceptual framework and the theories underlying Organizational Behaviour.

UNIT - I:

Introduction to OB - Definition, Nature and Scope – Environmental and organizational context – Impact of IT, globalization, Diversity, Ethics, culture, reward systems and organizational design on Organizational Behaviour. Cognitive Processes-I: Perception and Attribution: Nature and importance of Perception – Perceptual selectivity and organization – Social perception – Attribution Theories – Locus of control –Attribution Errors –Impression Management.

UNIT- II:

Cognitive Processes-II: Personality and Attitudes – Personality as a continuum – Meaning of personality - Johari Window and Transactional Analysis - Nature and Dimension of Attitudes – Job satisfaction and organizational commitment-Motivational needs and processes- Work-Motivation Approaches Theories of Motivation- Motivation across cultures - Positive organizational behaviour: Optimism – Emotional intelligence – Self-Efficacy.

UNIT - III:

Dynamics of OB-I: Communication – types – interactive communication in organizations – barriers to communication and strategies to improve the follow of communication - Decision Making: Participative decision-making techniques – creativity and group decision making. Dynamics of OB –II Stress and Conflict: Meaning and types of stress –Meaning and types of conflict - Effect of stress and intra-individual conflict - strategies to cope with stress and conflict.

UNIT - IV:

Dynamics of OB –III Power and Politics: Meaning and types of power – empowerment - Groups Vs. Teams – Nature of groups – dynamics of informal groups – dysfunctions of groups and teams – teams in modern work place.

UNIT - V:

Leading High performance: Job design and Goal setting for High performance- Quality of Work Life-Socio technical Design and High-performance work practices - Behavioural performance management: reinforcement and punishment as principles of Learning –Process of Behavioural modification - Leadership theories - Styles, Activities and skills of Great leaders.

REFERENCE BOOKS:

1. Luthans, Fred: Organizational Behaviour 10/e, McGraw-Hill, 2009
2. McShane: Organizational Behaviour, 3e, TMH, 2008
3. Nelson: Organizational Behaviour, 3/e, Thomson, 2008.
4. Newstrom W. John & Davis Keith, Organisational Behaviour-- Human Behaviour at Work, 12/e, TMH, New Delhi, 2009.
5. Pierce and Gardner: Management and Organisational Behaviour: An Integrated perspective, Thomson, 2009.
6. Robbins, P. Stephen, Timothy A. Judge: Organisational Behaviour, 12/e, PHI/Pearson, New Delhi, 2009.
7. Pareek Udai: Behavioural Process at Work: Oxford & IBH, New Delhi, 2009.
8. Schermerhorn: Organizational Behaviour 9/e, Wiley, 2008.
9. Hitt: Organizational Behaviour, Wiley, 2008.

19AM4271: SPEECH AND VIDEO PROCESSING (Professional Elective – VI)

B.Tech. IV Year II Sem. **L T P C**
3 - - 3

Prerequisites:

1. Course on " Fundamentals of Digital Image and Video Processing".
2. Course on "Digital Speech Processing"

COURSE OBJECTIVES

1. To understand speech Process basics.
2. To learn Features for Speech recognition.
3. To understand Different model in video processing.
4. To understand video motion estimations.
5. To learn video tracking techniques. .

COURSE OUTCOMES:

1. Describe the mechanisms of human speech production system and methods for speech enhancement.
2. Understand basic algorithms of speech analysis and speech recognition.
3. Explain basic techniques in digital video processing, including imaging characteristics.
4. Apply motion estimation video sequence.
5. Apply object tracking algorithms on video sequence.

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 nonlinear filter banks, spectral estimation of speech using DFT. Linear Prediction analysis of speech.

UNIT - II:
Speech recognition: Real and Complex Cepstrum, application of cepstral analysis to speech signal, feature extraction for speech, static and dynamic feature for speech recognition, robustness issues, discrimination in the feature space, feature selection, MFCC, LPCC, Distance measures, vector quantization models. Gaussian Mixture model, HMM.

UNIT - III:
Basics of Video Processing: Video formation, perception and representation: Principle of color video, video cameras, video display, pinhole model, CAHV model, Camera motion, Shape model, motion model, Scene model, two-dimensional motion models. Three-Dimensional Rigid Motion, Approximation of projective mapping.

UNIT - IV:
Motion estimation Techniques: Optical flow, motion representation, motion estimation criteria, optimization methods, pixel-based motion estimation, Block matching algorithm, gradient Based, Intensity matching, feature matching, frequency domain motion estimation, Depth from motion. Motion analysis applications: Video Summarization, video surveillance.

UNIT - V:
object tracking and segmentation: 2D and 3D video tracking, blob tracking, kernel based counter tracking, feature matching, filtering Mosaicing, video segmentation, mean shift based, active shape

model, video shot boundary detection. Interframe compression, Motion compensation

TEXT BOOKS:

1. Fundamentals of Speech recognition – L. Rabiner and B. Juang, Prentice Hall signal processing series.
2. Digital Video processing, A Murat Tekalp, Prentice Hall.
3. Discrete-time speech signal processing: principles and practice, Thomas F. Quatieri, Coth.
4. Video Processing and Communications, Yao Wang, J. Osternann and Qin Zhang, Pearson Education.

REFERENCE BOOKS:

1. “Speech and Audio Signal Processing”, B.Gold and N. Morgan, Wiley.
2. “Digital image sequence processing, Compression, and analysis”, Todd R. Reed, CRC Press
3. “Handbook of Image and Video processing”, Al Bovik, Academic press, second Edition

19AM4272: ROBOTIC PROCESS AUTOMATION (Professional Elective – VI)

B.Tech. IV Year II Sem.

L	T	P	C
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COURSE OBJECTIVES: The objective of the course is to:

1. Understand basics Robotic Process Automation.
2. Learn Features Panel-Dashboard and Features Panel-activity.
3. Understand Devices, workload, Audit Log and Administration.
4. Understand Bot Creator, database and XML commands.
5. Learn Commands used in robotic process automation .

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

1. Provide Robotic Process Automation.
2. Implement various features.
3. Implement various API's.
4. Use of various commands.
5. Implement process automation.

UNIT - I

Introduction to Robotic Process Automation & Bot Creation Introduction to RPA and Use cases – Automation Anywhere Enterprise Platform – Advanced features and capabilities – Ways to create Bots.

UNIT - II

Web Control Room and Client Introduction - Features Panel - Dashboard (Home, Bots, Devices, Audit, Workload, Insights) - Features Panel – Activity (View Tasks in Progress and Scheduled Tasks) - Bots (View Bots Uploaded and Credentials).

UNIT - III

Devices (View Development and Runtime Clients and Device Pools) - Workload (Queues and SLA Calculator) - Audit Log (View Activities Logged which are associated with Web CR) - Administration (Configure Settings, Users, Roles, License and Migration) - Demo of Exposed API's – Conclusion – Client introduction and Conclusion.

UNIT - IV

Bot Creator Introduction – Recorders – Smart Recorders – Web Recorders – Screen Recorders - Task Editor – Variables - Command Library – Loop Command – Excel Command – Database Command - String Operation Command - XML Command.

UNIT - V

Terminal Emulator Command - PDF Integration Command - FTP Command - PGP Command - Object Cloning Command - Error Handling Command - Manage Windows Control Command - Workflow Designer - Report Designer.

TEXTBOOKS:

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.
2. The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems- Tom Taulli

REFERENCE BOOKS:

1. Robotic Process Automation A Complete Guide-2020EditionKindleEdition.
2. Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant- Richard Murdoch.

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19AM4273: RANDOMIZED ALGORITHMS (Professional Elective – VI)

B.Tech. IV Year II Sem.

L	T	P	C
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COURSE OBJECTIVES

1. Introduce to randomized algorithms.
2. To analyze Moments and Deviations.
3. To understand Different Algebraic Techniques.
4. To understand how the choice of data structures and algorithm design methods impacts the performance of programs.
5. To analyze performance of algorithms.

Course Outcomes:

1. Appreciate the fundamentals of randomized algorithm design.
2. Understand the fundamentals of Markov chains and the Monte Carlo method.
3. Apply high probability analysis to selected randomized algorithms.
4. Understand the Comparison of Fingerprinting Techniques and Pattern Matching
5. Understand Geometric Algorithms.

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. 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 Data-structuring Problem, Random Treaps, Skip Lists, Hashtables, Hashing with O(1) Search Time. Graph Algorithms: All Pairs Shortest Paths, 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.
2. Probability and Computing: Randomization and Probabilistic Techniques in Algorithms and Data Analysis by Eli Upfal and Michael Mitzenmacher.

REFERENCE BOOK:

1. Rajeev Motwani, Prabhakar Raghavan, Randomized Algorithms, Cambridge University Press
2. Probability and Computing: Randomized Algorithms and Probabilistic Analysis

19AM4274: COGNITIVE COMPUTING (Professional Elective – VI)

B.Tech. IV Year II Sem.

L	T	P	C
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Prerequisites: Probability theory

Course Objectives:

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

Course Outcomes:

1. Understand what cognitive computing is, and how it differs from traditional approaches.
2. Plan and use the primary tools associated with cognitive computing.
3. Plan and execute a project that leverages cognitive computing.
4. Understand and develop the business implications of cognitive computing.
5. 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.

TEXT BOOKS:

1. The Cambridge Handbook of Computational Psychology by Ron Sun (ed.), Cambridge University Press.
2. Formal Approaches in Categorization by Emmanuel M. Pothos, Andy J. Wills, 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 Holland.

19AM4275: SEMANTIC WEB (Professional Elective – VI)

B.Tech. IV Year II Sem.

L	T	P	C
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Prerequisites:

1. **Web Technology**

Course Objectives:

1. To learn Web Intelligence.
2. To understand the basics of semantic web.
3. To learn Knowledge Representation for the Semantic Web.
4. To learn Ontology Engineering.
5. To learn Semantic Web Applications, Services and Technology.

Course Outcomes:

1. Understand the characteristics of Semantic Web.
2. Apply SOAP and UDDI to web services.
3. Handle multiple web services using Orchestration.
4. Create documents using XML.
5. Construct and use Ontologies.

UNIT - I

Introduction: Introduction to Semantic Web, the Business Case for the Semantic Web, XML and Its Impact on the Enterprise.

UNIT - II

Web Services: Uses, Basics of Web Services, SOAP, UDDI, Orchestrating Web Services, Securing Web Services, Grid Enabled and Semantic Web of Web Services.

UNIT - III

Resource Description Framework: Features, Capturing Knowledge with RDF.

XML Technologies: XPath, The Style Sheet Family: XSL, XSLT, and XSL FO, XQuery, XLink, XPointer, XInclude, XMLBase, XHTML, XForms, SVG.

UNIT - IV

Taxonomies and Ontologies: Overview of Taxonomies, Defining the Ontology Spectrum, Topic Maps, Overview of Ontologies, Syntax, Structure, Semantics, and Pragmatics, Expressing Ontologies Logically, Knowledge Representation.

UNIT - V

Semantic Web Application: Semantic Web Services, e-Learning, Semantic Bioinformatics, Enterprise Application Integration, Knowledge Base. **Semantic Search Technology:** Search Engines, Semantic Search, Semantic Search Technology, Web Search Agents, Semantic Methods, Latent Semantic Index Search, TAP, Swoogle.

TEXT BOOKS:

1. Thinking on the Web - Berners Lee, Godel and Turing, Wiley Interscience.
2. Foundations of Semantic Web Technologies- Pascal Hitzler,Markus Krotzsch Sebastian Rudolph

REFERENCE BOOKS:

1. The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management by Michael C. Daconta, Leo J. Obrst, Kevin T. Smith, Wiley Publishing, Inc.
2. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J.Davies, R.Studer, P.Warren, John Wiley & Sons.
3. Semantic Web and Semantic Web Services - Liyang Lu Chapman and Hall/CRC Publishers, (Taylor & Francis Group)
4. Information Sharing on the semantic Web - Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
5. Programming the Semantic Web, T.Segaran, C.Evans,J.Taylor, O'Reilly,SPD.

OPEN ELECTIVE III

B.Tech. IV Year II Sem.

L	T	P	C
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19AM4281: MAJOR PROJECT PHASE II

B.Tech. IV Year II Sem.

L	T	P	C
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