

VIGNANA BHARATHI Institute of Technology

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

IV YEAR I- SEMESTER

S.No	Course	Course Title	category	L	Т	Р	С
	Code	D	DC				
1	21AM4111	DevOps	PC	3	1	-	4
2	21AM4112	Cryptography and Network	PC	3	-	-	3
		Security					
3		Open Elective – III		3	-	-	3
4		Professional Elective – III		3	-	-	3
	21AM4171	Internet of Things	PE				
	21AM4172	Predictive Analytics	PE				
	21AM4173	Big Data Management	PE				
	21AM4174	Computer vision & Robotics	PE				
5		Professional Elective – IV		3	-	-	3
	21AM4175	Software Process & Project	PE				
		Management					
	21AM4176	Reinforcement Learning	PE				
	21CS4176	Ad Hoc and Sensor Networks	PE				
	21AM4177	High Performance	PE				
		Computing					
PRACTICAL							
6	21AM4151	DevOps Lab	PC	-	-	3	1.5
7	21AM4152	Cryptography and Network	PC	-	-	3	1.5
		Security Lab					
8	21AM4181	Mini Project	PW	-	-	4	2
	To	otal Credits		15	1	10	21



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IV YEAR II-SEMESTER

S.No	Course Code	Course Title	Category	L	Т	Р	С		
1	21MB4212	Fundamentals of Management and Organizational Behavior	HS	3	-	-	3		
		Professional Elective – V	·						
	21AM4271	Data Analytics	PE						
2	21DS4271	Human Computer Interaction	PE	3	-	-	3		
	21AM4272	Quantum Computing	PE						
	21AM4273	Soft Computing	PE						
]	Professional Elective – VI							
	21AM4275	Expert Systems	PE						
3	21AM4276	Business Intelligence	PE	3	-	-	3		
	21IT4276	Information Retrieval Systems	PE						
	21AM4277	Robotic Process Automation	PE						
Practical									
4	21AM4281	Major Project	PW	-	-	20	10		
	Tota	al Credits		9		20	19		



Open Electives offered by the Department of Computer Science and Engineering (AI/ML) to other Departments

S.No.	Open Elective	Subject	Subject Name	Credits	
		Code			
1.	Open Elective - I	21AM3161	Machine Learning	3	
		21AM3162	Artificial Intelligence	C	
2.	Open Elective – II	21AM3261	Neural Networks & Deep	2	
			Learning	3	
		21AM3262	Reinforcement Learning		
3.	Open Elective - III	21AM4161	Soft Computing	3	
		21AM4162	Natural Language Processing		
				9	



21AM4111: DEVOPS

B.Tech. IV Year I Sem.

L T P C

31-4

Course Objectives: The objective of this course is to:

- 1. Describe the agile relationship between development and IT operations.
- 2. Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
- 3. Implement automated system update and DevOps lifecycle.
- 4. Illustrate the types of version control systems, continuous integration tools, and continuous monitoring tools.
- 5. Analyze the concepts of test automation and deployment automation.

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

- 1. Identify components of Devops environment.
- 2. Describe Software development models and architectures of DevOps.
- 3. Apply different project management, integration and testing tools.
- 4. Apply different code deployment tools.
- 5. Assemble and adopt Devops in real-time projects.

UNIT - I

Introduction: Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT-II

Software development models and DevOps: DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing. **DevOps influence on Architecture:** Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

UNIT-III

Introduction to project management: The needfor source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT-IV

Integrating the system: Build systems, Jenkins buildserver, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.



UNIT-V

Testing Tools and automation: Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development

Deployment of the system: Deployment systems, Virtualization stacks, code execution at theclient, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker

TEXT BOOKS:

- JoakimVerona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN- 10: 1788392574
- 2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

REFERENCE BOOKS:

 LenBass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10

2. The Devops Handbook: How to Create World-Class Agility, Reliability, & Security in Technology Organizations; by GeneKim (Author), Patrick Debois (Author), Professor JohnWillis (Author), Jez Humble (Author), John Allspaw

21AM4112: CRYPTOGRAPHY AND NETWORK SECURITY

B.Tech. IV Year I Sem.

L	Т	Р	С
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Course Objectives:

- To understand basics of Cryptography and Network Security.
- To be able to secure a message over insecure channel by various means.
- To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
- To understand various protocols for network security to protect against the threats in the networks.
- To Generate and distribute a PGP key pair and use the PGP package to send an encrypted email message.

Course Outcomes:

- •Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.
- •Ability to identify information system requirements for both of them such as client and server.
- •Ability to understand the current legal issues towards information security.
- •Discuss the fundamental ideas of public-key cryptography
- •Discuss Web security and Firewalls

UNIT - I

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

UNIT - II

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

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

UNIT - III

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

Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

UNIT - IV

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

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



UNIT –V

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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



21AM4171: INTERNET OF THINGS (Professional Elective-III)

L T P C 3 - - 3

IV B. Tech I Sem.

Course Objectives

- Understand the concepts of Internet of Things and able to build IoT applications
- Learn the programming and use of Arduino and Raspberry Pi boards.
- Known about data handling and analytics in SDN.
- Learn about the sensors and actuators.
- Able to realize the revolution of Internet in Mobile Devices, Sensor Networks

Course Outcomes

- To know basic protocols in sensor networks.
- To write Program and configure Arduino boards for various designs.
- To write Python programming and interfacing for Raspberry Pi.
- To Design IoT applications in different domains.
- To Understand SDN for IOT

UNIT I

Introduction to Internet of Things: Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.

UNIT II

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

UNIT III

Introduction to Python programming: - Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT IV

Introduction to Raspberry Pi:- Interfacing Raspberry Pi with basic peripherals Implementation of IoT with Raspberry Pi.

UNIT V

Introduction to Software defined Network (SDN):-SDN for IoT, Industrial IoT, and Case Study: Agriculture, Healthcare, and Activity Monitoring.

TEXT BOOKS:

1. "The Internet 'of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)

2. "Make sensors": Terokarvinen, kemo, karvinen and villeyvaltokari, 1st edition, maker media, 2014.

3. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti



REFERENCES:

- 1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
- 2. WaltenegusDargie,ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"
- 3. Beginning Sensor networks with Arduino and Raspberry Pi Charles Bell, Apress, 2013.
- 4. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, 2013, ISBN: 978-1-118-43062-0
- 4. Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 2013, ISBN 0989973700



21AM4172: PREDICTIVE ANALYTICS

B.Tech IV Year I Sem.

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Course Objectives:

- 1 Exposure to various linear methods for Regression and Classification
- 2 Mostly used for classification and regression analysis.
- 3 Analyze historical data with the goal of identifying trends or patterns
- **4** The course serves to advance and refine expertise on theories, approaches andtechniques related to prediction and forecasting.
- **5** To advice on when and how to use each model. Also learn how to combine two ormore models to improve prediction

Course Outcomes

- 1. Understand the process of formulating business objectives, data selection/collection, preparation and process to successfully design, build, evaluate and implement predictivemodels for a various business application.
- 2. Compare the underlying predictive modeling techniques.
- 3. Select appropriate predictive modeling approaches to identify cases to progress with.
- 4. Learn model assessment and validation.
- 5. Understand the basics of statistical approaches for predictive analytics.

UNIT - I

Linear Methods for Regression and Classification: Overview of supervised learning, Linear regression models and least squares, Multiple regression, Multiple outputs, Subset selection, Ridge regression, Lasso regression, Linear Discriminant Analysis, Logistic regression, Perceptron learning algorithm.

UNIT - II

Model Assessment and Selection: Bias, Variance, and model complexity, Bias-variance trade off, Optimism of the training error rate, Estimate of In-sample prediction error, Effective number of parameters, Bayesian approach and BIC, Cross- validation, Boot strap methods, conditional or expected test error.

UNIT - III

Additive Models, Trees, and Boosting: Generalized additive models, Regression and classification trees, Boosting methods-exponential loss and AdaBoost, Numerical Optimization via gradient boosting, Examples (Spam data, California housing, New Zealand fish, Demographic data).



UNIT - IV

Neural Networks (NN), Support Vector Machines (SVM), and K-nearest Neighbor: Fitting neural networks, Back propagation, Issues in training NN, SVM for classification, Reproducing Kernels, SVM for regression, K-nearest – Neighbour classifiers (Image Scene Classification).

UNIT - V

Unsupervised Learning and Random forests: Association rules, Cluster analysis, Principal Components, Random forests and analysis.

TEXT BOOKS:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning DataMining, Inference, and Prediction, Second Edition, Springer Verlag, 2009.

REFERENCE BOOKS:

- 1. C.M.Bishop –Pattern Recognition and Machine Learning, Springer, 2006.
- 2. L. Wasserman-All of statistics.
- 3. Gareth James. Daniela Witten. Trevor Hastie Robert Tibshirani. An Introduction to Statistical Learning with Applications in R.



21AM4173: BIG DATA MANAGEMENT (Professional Elective-III)

IV B.Tech I Sem.

L T P C 3 -- 3

Prerequisites:

• A knowledge on Database Management Systems.

Course Objectives:

- To optimize business decisions and create competitive advantage with Big Data analytics
- To learn to analyse the big data using intelligent techniques
- To introduce programming tools PIG & HIVE in Hadoop echo system
- To manage job execution in Hadoop environment
- To develop Big Data Solutions using Hadoop Eco Sytem.

Course Outcomes:

- Illustrate big data challenges in different domains including social media, transportation, finance and medicine
- Use various techniques for mining data stream
- Design and develop Hadoop
- Identify the characteristics of datasets and compare the trivial data and big data for various applications
- Explore the various search methods and visualization techniques

UNIT I

Introduction to big data: Introduction to Big Data Platform, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting.

UNIT II

Stream Processing: Mining data streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) Applications, Case Studies – Real Time Sentiment Analysis – Stock Market Predictions.

UNIT III

Introduction to Hadoop: Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment.

UNIT IV

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



UNIT V

Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, multiple linear regression, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'reilly Media, Fourth Edition, 2015.

 Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.
 Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP, 2012

References:

1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley& sons, 2012.

2. Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, "Harness the Power of Big Data: The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.

3. Arshdeep Bahga and Vijay Madisetti, "Big Data Science & Analytics: A Hands On Approach ", VPT, 2016.



B.Tech. IV Year I Sem.

Pre-Requisites:

- 1. Linear algebra, vector calculus, and probability
- 2. Data structures
- 3. Coding that represents images as feature and geometric constructions.
- 4. Programming knowledge.
- 5. Image Processing.

Course Objective:

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

Course Outcomes:

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

UNIT – I

CAMERAS: Pinhole Cameras.

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

UNIT - II

Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates.

Edge Detection: Noise, Estimating Derivatives, Detecting Edges.

Texture: Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids,

Application: Synthesis by Sampling Local Models, Shape from Texture.





UNIT - III

The Geometry of Multiple Views: Two Views

Stereopsis: Reconstruction, Human Stereposis, Binocular Fusion, Using More Cameras **Segmentation by Clustering:** What Is Segmentation? Human Vision: Grouping and Getstalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,

UNIT - IV

Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as aProbabilistic Inference Problem, Robustness

Segmentation and Fitting Using Probabilistic Methods: Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice.

Tracking With Linear Dynamic Models: Tracking as an Abstract Inference Problem, Linear DynamicModels, Kalman Filtering, Data Association, Applications and Examples

UNIT - V

Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and thePerspective Projection, Affine Cameras and Affine Projection Equations.

Geometric Camera Calibration: Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization.

Model-Based Vision: Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Application: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.

TEXTBOOKS:

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

REFERENCE BOOKS:

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



21AM4175: SOFTWARE PROCESS AND PROJECT MANAGEMENT (Professional Elective - IV)

B.Tech IV Year I Semester

Course Objectives

L	Т	Р	С
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- A basic knowledge of software project management principles.
- The ability to come up with a project schedule and assign resources.
- Choose an appropriate project development methodology (e.g. waterfall, spiral...)
- Identify project risks, monitor and track project deadlines.
- The capability to work in a team environment and be aware of different modes of communications.

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

- Identify and describe how different project contexts will impact upon all aspects of a software development project.
- Identify and describe the key phases of project management and the key skills associated with each.
- Determine an appropriate project management approach through an evaluation of the business ontextandprojectscopeandknowledgeofagileandtraditionalprojectmanagement approaches.
- Demonstrate through application, knowledge of the key project management skills, such as product and work break-down structure, schedule; governance including progress reporting, risk and quality management.
- As part of a small team research and produce a concise piece of writing suitable for presentation to senior management.

UNIT-I

Conventional Software Management: The waterfall model, conventional software Management performance. Overview of Project Planning – Stepwise Project Planning.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT –II

The old way and the new way: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life cycle phases: Engineering and production stages, Inception, Elaboration, Construction,

Transition phases.

Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.



UNIT –III

Work Flows of the process: Software process workflows, Iteration workflows.

Checkpoints of the process: Major milestones, Minor Milestones, Periodic status

Assessments.

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

UNIT-IV

Process Automation: Automation Building blocks.

Project Control and Process instrumentation: These Vencor Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation. **Tailoring the process:** Process discriminates

UNIT-V

Project Organizations and Responsibilities:

Line-of-Business Organizations, Understanding Behavior – Organizational Behavior **Future Software Project Management:** Modern Project Profiles, Next generation Software economics, modern process transitions.

Case Study: The command Center Processing and Display system-Replacement (CCPDS-R).

TEXT BOOKS:

1. Software Project Management, Walker Royce: Pearson Education, 2005.

REFERENCES:

- 1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.
- 2. Software Project Management, Joel Henry, Pearson Education.
- 3. Software Project Management in practice, Pankaj Jalote, Pearson Education.2

21AM4176: REINFORCEMENT LEARNING (Professional Elective - IV)

B.Tech. IV Year I Sem.

L T PC

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 Monte Carlo.
- 4. Understand Bootstrapping and Temporal-Difference learning methods (TD(0), SARSA, Q-Learning)
- 5. Understand $TD(\lambda)$ 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; $TD(\lambda)$ algorithm; Need for generalization in practice; Linear function approximation and geometric view; Linear $TD(\lambda)$. 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 Brand on Brown "Deep Reinforcement Learning in Action," First Edition, Manning Publications 2020.

21CS4176: AD-HOC AND SENSOR NETWORKS (Professional Elective - IV)

B.Tech. IV Year I Sem.

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Course Objectives

- Understanding of the fundamental concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers
- Devise appropriate data dissemination protocols and model links cost
- Architect sensor networks for various application setups.
- Analyze the performance of sensor networks and best Routing Methods.
- Evaluate the Wireless Sensor Network Simulation Models.

Course Outcomes

- Understand the issues and challenges in security provisioning and also familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs.
- Illustrate the various sensor network Platforms, tools and applications.
- Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc sensor networks.
- Analyzing the routing algorithms and its characteristics of wireless sensor networks.
- Evaluate the principles and characteristics of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks.

UNIT 1

Introduction to Ad-hoc Wireless Networks-Cellular and Ad-hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet, MAC protocols for Ad-hoc Wireless Networks-Issues, Design Goals and Classifications of the MAC Protocols.

UNIT 2

Routing Protocols for Ad-hoc Wireless Networks-Issues in Designing a Routing Protocol, Classifications of Routing Protocols, Topology-based versus Position-based Approaches, Issues and design goals of a Transport layer protocol, Classification of Transport layer solutions, TCP over Ad-hoc Wireless Networks, Solutions for TCP over Ad-hoc Wireless Networks.

UNIT 3

Security protocols for Ad-hoc Wireless Networks-Security in Ad-hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad-hoc Wireless Networks.

UNIT 4

Wireless Sensors and Applications-The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

UNIT 5

Security in WSNs-Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote, Sensor Network Operating Systems–TinyOS, LA-TinyOS, SOS, RETOS, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.

Text Books

1) Ad Hoc Wireless Networks –Architectures and Protocols, C. Siva Ram Murthy, B. S. Murthy, Pearson Education, 2004.

2) Ad Hoc and Sensor Networks –Theory and Applications, Carlos Corderio Dharma P.Aggarwal, World Scientific Publications / Cambridge University Press, March 2006.

3) Wireless Sensor Networks –Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010.

Reference Books

1) Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp2009.

2) Wireless Ad hocMobile Wireless Networks –Principles, Protocols and Applications, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008.

3) Ad hoc Networking, Charles E.Perkins, Pearson Education, 2001

4) Wireless Ad hoc Networking, Shih-Lin Wu, Yu-Chee Tseng, Auerbach Publications, Taylor & Francis Group, 2007.

21AM4177: High Performance Computing (Professional Elective- V)

B.Tech IV Year I Semester

Prerequisites:

• Computer networks

Course Objectives

- Knowledge on parallel programming paradigms, HPC platforms with particular reference to Cluster system.
- To learn about Modern Processors and concepts.
- To learn about Parallel Computers and Programming.
- To Study about Memory Parallel Programming using OpenMP and MPI.
- Understand the means by which to measure, assess and analyse the performance of HPC applications.

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

- Understand the role of HPC in science and engineering.
- Use HPC platforms and parallel programming models.
- Measure, analyze and assess the performance of HPC applications and their supporting hardware.
- Administration, scheduling, code portability and data management in an HPC environment, with particular reference to Grid Computing.
- Analyze the suitability of different HPC solutions to common problems found in Computational Science.

UNIT I

Introduction: Characteristics and requirements, Review of Computational Complexity, Performance: metrics and measurements, Granularity and Partitioning, Locality: temporal/spatial/stream/kernel, Basic methods for parallel programming, Real-world case studies (drawn from multi scale, multi-discipline applications).

UNIT -II

High-End Computer Systems: Memory Hierarchies, Multi-core Processors: Homogeneous and Heterogeneous, Shared-memory Symmetric Multiprocessors, Vector Computers, Distributed Memory Computers, Supercomputers and Peta scale Systems, Application Accelerators / Reconfigurable Computing, Novel computers: Stream, multithreaded, and purpose-built.

UNIT -III

Parallel Algorithms: Parallel models: ideal and real frameworks, Basic Techniques: Balanced Trees, Pointer Jumping, Divide and Conquer, Partitioning, Regular Algorithms: Matrix operations and Linear Algebra, Irregular Algorithms: Lists, Trees, Graphs, Randomi.

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UNIT -IV

Parallel Programming: Revealing concurrency in applications, Task and Functional Parallelism, Task Scheduling, Synchronization Methods, Parallel Primitives (collective operations), SPMD Programming (threads, OpenMP, MPI), I/O and File Systems, Parallel Matlabs (Parallel Matlab, Star-P, Matlab MPI), Partitioning Global Address Space (PGAS) languages (UPC, Titanium, and Global Arrays

UNIT -V

Performance: Measuring performance, Identifying performance bottlenecks, restructuring applications for deep memory hierarchies, Partitioning applications for heterogeneous resources, using existing libraries, tools, and frameworks.

TEXT BOOKS:

1. Contemporary High Performance Computing by Jeffrey S. Vetter, Released November 2017, Publisher(s): Chapman and Hall/CRC, ISBN: 9781466568358.

REFERENCES:

1. High Performance Computing by Charles Severance & Kevin Dowd, Copyright Year: 2010, Last Update: 2021, Publisher: Opens tax CNX

21AM4151: DEVOPS LAB

B.Tech. IV Year I Sem.

Course Objectives:

- 1. Describe the agile relationship between development and IT operations.
- 2. Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability
- 3. Implement automated system update and DevOps lifecycle
- 4. To understand virtualization and performance
- 5. To implement test cases using Selenium

Course Outcomes:

- 1. Identify components of Devops environment
- 2. Apply different project management, integration, testing and coded eployment tool
- 3. Investigate different DevOps Software development, models
- 4. Demonstrate continuous integration and development using Jenkins.
- 5. Analyze data to detect anomalies

List of Experiments:

- 1. Write code for a simple user registration form for an event.
- 2. Explore Git and GitHub commands.
- 3. Practice Source code management on GitHub. Experiment with the source code written in exercise 1.
- 4. Jenkins installation and setup, explore the environment.
- 5. Demonstrate continuous integration and development using Jenkins.
- 6. Explore Docker commands for content management.
- 7. Develop a simple containerized application using Docker.
- 8. Integrate Kubernetes and Docker
- 9. Automate the process of running containerized application developed in exercise 7 using Kubernetes.
- 10. Install and Explore Selenium for automated testing.
- 11. Write a simple program in JavaScript and perform testing using Selenium.
- 12. Develop test cases for the above containerized application using selenium.

TEXT BOOKS:

- Joakim Verona. Practical Devops, Second Edition. Ingram shor ttitle;2nd edition (2018). ISBN-10: 1788392574
- 2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

REFERENCE BOOKS:

- 1. LenBass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley
- 2. Edureka DevOps Full Course-https://youtu.be/S_0q75eD8Yc

21AM4152: CRYPTOGRAPHY AND NETWORK SECURITY LAB

B.Tech. IV Year I Sem.

Course Objectives

- 1. To understand basics operations involved in encryption and decryption algorithms.
- 2. To be able to implement Conventional Encryption Algorithms.
- 3. To be able to implement Public Key Cryptography Algorithms.
- 4. To be able to implement Message Authentication Algorithms.
- 5. To be able to implement cryptographic Hash Functions algorithms.

Course Outcomes

- 1. Student will be able to understand basic mathematical operations involved in cryptography.
- 2. Student will be able to implement Conventional Encryption Algorithms .i.e DES,AES, Blowfish,RC4 algorithms..
- 3. Student will be able to implement Public Key Cryptography Algorithms i.e RSA, Diffie-Hellman algorithms
- 4. Student will be able to implement Message Authentication Algorithms.
- 5. Student will be able implement cryptographic Hash Functions algorithms.

EXPERIMENTS:

- 1. Write a C program that contains a string (char pointer) with a value _Hello world'. The program should XOR each character in this string with 0 and displays the result.
- 2. Write a C program that contains a string (char pointer) with a value _Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
- 3. Write a Java program to perform encryption and decryption using the following algorithms a Ceaser cipher b. Substitution cipher c. Hill Cipher
- 4. Write a C/JAVA program to implement the DES algorithm logic.
- 5. Write a C/JAVA program to implement the Blowfish algorithm logic.
- 6. Write a C/JAVA program to implement the Rijndael algorithm logic.
- 7. Write the RC4 logic in Java Using Java cryptography ,encrypt the text—Hello world using Blowfish. Create your own key using Java key tool.
- 8. Write a Java program to implement RSA algorithm.
- 9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
- 10. Calculate the message digest of a text using the SHA-1algorithm in JAVA.
- 11. Calculate the message digest of at extusing the MD5algorithm in JAVA.

TEXT BOOKS:

- 1. CryptographyandNetworkSecurity-PrinciplesandPractice:WilliamStallings,Pearson Education, 6th Edition
- 2. Cryptography and Network Security : Atul Kahate, McGraw Hill, 3rdEdition

REFERENCES

- 1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
- 2. Cryptography and Network Security: Forouzan Mukhopadhyay, McGraw Hill,3rd Edition.

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21AM4181: Mini Project

B.Tech IV Year I Semester	L	Т	Р	С
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* Industry Oriented Mini Project

IV YEAR II SEMESTER

21MB4212: FUNDAMENTALS OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR

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IV B.Tech II Sem.

Course Objective:

• To understand the fundamentals of management, history and evolution of management theories

- To analyze various dimensions of organizational planning and organizing.
- To understand the functions of staffing, Directing and controlling.
- To understand the fundamental concepts of Organizational Behaviour.
- To analyze and evaluate the various dimensions of Cognitive process and Stress related issues in Organizational Behaviour.

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

- Understand the fundamentals of management and contribution of management thinkers.
- Analyze the relevance and importance of planning and organizing.
- Understand the importance of organizing, types of organizational structures and various function of human resource management
- Understand fundamental concepts of organizational behaviour
- Analyze and evaluate the various dimensions of cognitive process and stress related issues in organizational behaviour.

UNIT- I

Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management.

Approaches- Classical Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT – II

Planning and Organizing: General Framework for Planning - Planning Process, Types of Plans, Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization.

UNIT- III

Staffing: Functions of HRM.

Leadership: Leadership Styles; Leadership theories.

Motivation - Types of Motivation; Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X, Theory Y and Theory Z.

Communication: Types of communication, Importance, Communication Process and communication Barriers.

Controlling: Process of controlling, Types of Control

UNIT- IV

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.

UNIT- V

Cognitive Processes-II: Personality and Attitudes - Personality as a continuum – Meaning of personality - Johari Window and Transactional Analysis - Nature and Dimension of Attitudes- 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.

TEXT BOOKS:

- 1. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.
- 2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009
- 3. Principles and Practice of Management, L. M. Prasad, S. Chand, 2019, New Delhi.
- 4. Robbins, P. Stephen, Timothy A. Judge: Organisational Behaviour, 12/e, PHI/Pearson, NewDelhi, 2009.

REFERENCES:

- 1. Newstrom W. John & Davis Keith, Organisational Behaviour-- Human Behaviour at Work, 12/e,TMH, New Delhi, 2009.
- 2. Luthans, Fred: Organizational Behaviour 10/e, McGraw-Hill, 2009.

21AM4271: DATA ANALYTICS

B.Tech. IV Year II Sem.

L T P C 3 - - 3

Prerequisites

• Data Base Management Systems, Computer Oriented Statistical Methods

Course Objectives

- 1. To explore the fundamental concepts of data analytics.
- 2. To learn the principles and methods of statistical analysis
- 3. To develop problem solving abilities using Mathematics
- 4. To apply algorithmic strategies while solving problems
- 5. To understand regression and segmentation

Course Outcomes

- 1. Identify the various sources of Big Data.
- 2. Apply several key big data technologies used for storage, analysis and manipulation of data.
- 3. Design methodologies to extract data from structured and un-structured data for analytics
- 4. Apply Regression algorithms to perform data analytics.
- 5. Apply advanced regression and Time series modeling to Discover interesting patterns

UNIT-1

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

UNIT-2

Introduction to Tools and Environment, Application of Modelling in Business, Databases & Types of data and variables, Data Modelling Techniques, Missing imputations etc. Need for Business Modeling.

UNIT-3

Regression - Concepts, Blue property assumptions, Least Square Estimation, Variable

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

UNIT-4

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

UNIT-5

Working with Documents:

Standard Operating Procedures for documentation and knowledge sharing. Definingpurpose and scope documents, Understanding structure of documents — case studies, articles, white papers, technical reports etc., Intellectual Property and Copyright, Document preparation tools.

TEXT BOOKS:

1. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

2. Associate Analytics Handbook.

REFERENCES:

- 1. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway Labs Jeffrey D Ullman Stanford Univ.
- 2. Michael Minelli, Michele Chambers, Ambiga Dhiraj,—BigData, BigAnalytics: Emerging Business Intelligence and Analytic Trends^{||}, John Wiley & Sons, 2013.
- BartBaesens, "AnalyticsinaBigDataWorld: TheEssentialGuidetoDataScienceandits Applications", John Wiley & Sons, 2014

21DS4271: HUMAN COMPUTER INTERACTION

(Professional Elective –V)

B.Tech. IV Year II Sem.

COURSE OBJECTIVES:

L T P C 3 - - 3

- 1. To understand the design principles of developing a Human Computer Interface.
- 2. To learn tools and devices required for designing a good interface
- 3. To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Value based living in a natural way.
- 4. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.
- 5. To help the students appreciate the essential complementarity between VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

COURSE OUTCOMES:

1. Acquire knowledge on principles and components of HCI.

- 2: Analyze product usability evaluations and testing methods
- 3: Design an effective user interface for software application using the building tools and techniques
- 4: Ability to develop appropriate technologies and management patterns to create harmony in professional and personal life.

5: It ensures students sustained happiness through identifying the essentials of human values and skills. Develop ability to

- 1. Demonstrate an understanding of guidelines, principles, and theories influencing human computer interaction.
- 2. Recognize how a computer system may be modified to include human diversity
- 3. Be aware of mobile HCI.
- 4. Learn the guidelines for user interface

UNIT - I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

UNIT - II

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions. Screen

Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

UNIT- III

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

UNIT- IV

HCI in the software process, The software life cycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction.

UNIT- V

Cognitive models Goal and task hierarchies Design Focus: GOMS saves money Linguistic models The challenge of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities Ubiquitous computing applications research Design Focus: Ambient

Wood - augmenting the physical Virtual and augmented reality Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization Design Focus: Getting the size right.

TEXT BOOKS:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech. Units 1, 2, 3

2. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education Units 4, 5

REFERENCE BOOKS:

1. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia.

- 2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.
- User Interface Design, Soren Lauesen, Pearson Education.
 Human –Computer Interaction, D. R. Olsen, Cengage Learning.
- 5. Human Computer Interaction, Smith Atakan, Cengage Learning.

21AM4272: QUANTUM COMPUTING

(Professional Elective – V)

B.Tech. IV Year II 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
- 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.

21AM4273: SOFTCOMPUTING (Professional Elective – V)

B.Tech IV Year II Sem.	L	Т	Р	С
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Course objectives:

- 1. To make the student to understand the role of imprecision and uncertainty in real world scenarios.
- 2. To explain the role of Soft Computing in addressing the imprecision and uncertainty.
- 3. To explain the principal components of soft computing that include Fuzzy Sets and Fuzzy Logic, Artificial Neural Networks, Genetic Algorithms and Rough Sets.
- 4. To learn the Design and Implementation of Soft Computing methodologies.
- 5. To explain the design of hybrid systems which is combination of one or more soft computing methodologies mentioned.

Course outcomes:

- 1. Demonstrate Fuzzy set theory
- 2. Interpret fuzzy systems
- 3. Apply ANN Back propagation algorithm for classification
- 4. Apply ANN training algorithms for solving real world problems.
- 5. Apply fundamentals and operators of Genetic Algorithm

UNIT I

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta-Perceptron Network-Adaline Network-Madaline Network.

UNIT II

Back propagation Neural Networks - Kohonen Neural Network -Learning VectorQuantization-HammingNeuralNetwork-HopfieldNeuralNetwork- Bidirectional Associative Memory -Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.

UNIT III

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations-Membership Functions-Defuzzification-Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning-Introduction to Fuzzy Decision Making.

UNIT IV

Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction-Inheritance Operators-CrossOver-Inversion and Deletion - MutationOperator-BitwiseOperators-ConvergenceofGeneticAlgorithm.

UNIT-V

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy ArtMap: A Brief Introduction - Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller

TEXT BOOKS:

1. S.N.Sivanandam, S.N.Deepa, "PrinciplesofSoftComputing", WileyIndia Pvt.

Ltd., 2nd Edition,2011.

2. S.Rajasekaran, G.A.VijayalakshmiPai,"Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications", PHI Learning Pvt.Ltd., 2017.

REFERENCES:

- 1. Jyh-ShingRogerJang, Chuen-TsaiSun, EijiMizutani, —Neuro-Fuzzyand Soft Computing , Prentice-Hall of India, 2002.
- 2. Kwang H.Lee, —First course on Fuzzy Theory and Applications, Springer, 2005.
- 3. George J.KlirandBoYuan,—FuzzySetsandFuzzyLogic-Theoryand B Applications, PrenticeHall, 1996.

4. James A. Freeman and David M. Skapura, —Neural Networks Algorithms, Applications, and Programming Techniques^{II}, Addison Wesley, 2003.

21AM4275: EXPERT SYSTEMS (Professional Elective–VI)

B.Tech.IV Year II Sem.

LTPC

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 too lsand building the expert system.
- 5. How to identify the pit falls 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.

TEXT BOOKS:

- 1. Elain Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill, NewDelhi.
- 2. Waterman D.A., "A Guide to Expert Systems", Addison Wesley Longman.
- 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

REFERENCE BOOKS:

- 1. Stuart Russel and other Peter Norvig, "Artificial Intelligence– A Modern Approach", Prentice-Hall.
- 2. Patrick Henry Winston, "Artificial Intelligence", Addison Wesley.
- 3. Patterson, Artificial Intelligence & Expert System, Prentice Hall India, 1999.
- 4. Hayes-Roth, Lenat, and Waterman: Building Expert Systems, Addison Wesley.
- 5. Weiss S.M.and Kulikowski C.A., "A Practical Guide to Designing Expert Systems", Rowman & Allanhe ld, New Jersey.

21AM4276: BUSINESS INTELLIGENCE (Professional Elective – VI)

B. Tech IV Year II Semester

L T P C 3 - - 3

Course objectives:

- To understand Knowledge on various concepts of business intelligence,
- To know about Business Intelligence implementation and business analytics.
- To analyze Customer Relationship Management Techniques
- To know about key elements in Corporate Performance Management
- To know about ethics in social networking.

Course Outcomes:

- Understand fundamental concepts of BI and Analytics
- Application of BI Key Performance indicators
- Design of Dashboards, Implementation of Web Analytics
- Understanding Utilization of Advanced BI Tools and their Implementation.
- Implementation of BI Techniques and BI Ethics.

UNIT - I

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

UNIT - II

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

UNIT - III

Business Analytics – Objective Curve, Web Analytics and Web Intelligence, Customer RelationshipManagement.

Business/Corporate Performance Management - Dashboards and Scorecards, Business ActivityMonitoring, Six Sigma.

UNIT-IV

Advanced BI – Re-evaluate Current BI Processes -Big Data and BI, Social Networks, Mobile BI, emerging trends, Description of different BI-Tools (Pentaho, KNIME)

UNIT-V

Business intelligence implementation-Connecting in BI systems- Issues of legality- Privacy and ethics- Social networking and BI-Future of Business Intelligence-Emerging Technologies, Machine Learning, Predicting the future with Data Analysis, BI search and Text analysis-Advanced Visualization-Rich report, future beyond technology.



TEXT BOOKS:

- Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and BusinessIntelligence Systems, 9th Edition, Pearson Education, 2009.
- David Loshin, Business Intelligence The Savy Manager's Guide Getting Onboard withEmerging IT, Morgan Kaufmann Publishers, 2009.
- 3. Rajiv Sabherwal "Business Intelligence" Wiley Publications, 2012.

REFERENCE BOOKS

- 1. Philo Janus, Stacia Misner, Building Integrated Business Intelligence. Solutions with SQLServer, 2008 R2 & Office 2010, TMH, 2011.
- 2. Business Intelligence Data Mining and Optimization for decision making, Carlo-Verellis, Wiley Publications.

21IT4276: INFORMATION RETRIEVAL SYSTEMS (Professional Elective - VI)

IV B.Tech II Sem

LTPC

3 - - 3 Course

Objectives:

- To learn the important concepts and algorithms in IRS.
- To learn genesis and diversity of information retrieval situations for text and hyper media.
- To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.
- To understand the performance of information retrieval using advanced techniques such as classification, clustering, and filtering
- To understand various Text Search Algorithms and Multimedia Information Retrieval

Course Outcomes:

- Understand IR principles to locate relevant information in large collections of data
- Understand information extraction using indexing, and various data structure algorithms.
- Design different document clustering algorithms and understand automatic indexing.
- Use various search algorithms and perform information visualization.
- Analyze the ways to design an Information Retrieval System for web search tasks.

UNIT I

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

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

UNIT II

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

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

UNIT III

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

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

UNIT IV

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

UNIT V

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

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval, Web search basics. Web crawling and indexes.

Text Books:

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

Reference Books:

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

3. Modern Information Retrieval By Yates and Neto Pearson Education.

21AM4277: ROBOTIC PROCESS AUTOMATION (Professional Elective- VI)

B.Tech IV Year II Semester

L T P C 3 - - 3

Prerequisites:

- Programming Concepts Basics ,Understanding the application,
- Basic Web Concepts, Protocols, Email Clients, Data Structures

Course Objectives

- To understand the Basics of Robotic Process Automation.
- Identify the intensity of Design Robotic Process Automation.
- To comprehend the installation process of RPA Tools.
- To understand the control structure to design RPA Application.
- To know the way of interaction of Robotic Process Automation with external Applications.
- To understand the Exception Handling Mechanism in RPA.

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

- Provide knowledge on Robotic Process Automation.
- Compare RPA with Non Automation process.
- Skills to Design RPA with Internal interactions.
- Skills to Design RPA with External Application interaction.
- Knowledge on implement RPA using Exception Handling mechanism.

UNIT - I

Processes, Software Design, SDL C: Programming Concepts Basics – 2 : Scripting, .Net Framework, .Net ,Fundamentals, Control structures and functions, XML, HTML, CSS, Variables&Arguments.

RPA Basics: History of Automation, What is RPA, RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Types of Bots, and Workloads, which can be automated.

UNIT - II

RPA Advanced Concepts: Standardization of processes, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, RPA Team. Process Design Document/Solution Design Document, Industries best suited for RPA, Risks, & Challenges with RPA, RPA and emerging ecosystem.

Installation: Installing Studio community edition, The User Interface, Keyboard Shortcuts, About Updating, About Automation Projects, Introduction to Automation Debugging, Managing Activation Packages, Reusing Automations Library, Installing the Chrome Extension, Installing the Firefox Extension, Connecting your project to a source control system, Activities Guide.

Variables : Managing Variables, Naming Best Practices, The Variables Panel, Generic Value Variables, Text Variables, True or False Variables, Number Variables, Array Variables ,Date and Time Variables, Data Table Variables, Managing Arguments, Naming Best Practices, The Arguments Panel, Using Arguments, About Imported Namespaces, Importing New Namespaces.

UNIT - III

Control Flow: Control Flow Introduction, If Else Statements, Loops, Advanced Control Flow, Sequences, Flowcharts, About Control Flow, Control Flow Activities, The Assign Activity, The Delay Activity, The Do While Activity, The If Activity, The Switch Activity, The While Activity, The For Each Activity, The Break Activity.

Data Manipulation :Data Manipulation Introduction, Scalar variables, collections and Tables, Text Manipulation, Data Manipulation, Gathering and Assembling Data.

Recording and Advanced UI Interaction: Recording Introduction, Basic and Desktop Recording, Web Recording, Input / Output Methods, Screen Scraping, Data Scraping, Scraping advanced techniques.

Selectors: Selectors, Defining and Assessing Selectors, Customization, Debugging, Dynamic Selectors, Partial Selectors, RPA Challenge.

UNIT- IV

Advanced Automation concepts and techniques: Image, Text & Advanced Citrix Automation: Introduction to Image &Text, Automation, Image based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices, Using tab for Images, Starting Apps.

Excel Data Tables &PDF: Data Tables in RPA, Excel and Data Table basics, Data Manipulationin excel, Extracting Data from PDF, Extracting a single piece of data, Anchors, Using anchors in PDF.

Email Automation: Email Automation, Incoming Email automation, Sending Email automation.

UNIT- V

Exceptional Handling & Best Practice: Debugging and Exception Handling: Debugging Tools, Strategies for solving issues, Catching errors.

Introduction to Orchestrator: Tenants, Authentication, Users, Roles, Robots, Environments, Queues & Transactions, Schedules.

Emerging and Future Trends in IT: Emerging and Future Trends in IT: Artificial Intelligence, Machine Learning, Agent awareness, Natural Language Processing, Computer Vision.

TEXT BOOKS:

- 1. Learning Robotic Process Automation by Alok Mani Tripathi, Published by PacktPublishing Ltd.
- 2. Robotic Process Automation Succinctly By Ed Freitas Foreword by Daniel Jebara

REFERENCES:

- 1. Robotic Process Automation by Nividous
 - 2. Robotic Process Automation NICE Special Edition by NICE RPA team with Steve Kaelble, Published by: John Wiley & Sons, Ltd., The Atrium, Southern Gate.

21AM4281: MAJOR PROJECT

B.Tech IV Year II Semester

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