



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

COURSE STRUCTURE
and
DETAILED SYLLABI
for
Two Year PG Programme

M.Tech
Computer Science and Engineering
(Applicable for batches admitted from 2025-26)



Department of Computer Science & Engineering
University College of Engineering Kakinada(A)
JNTU Kakinada



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

M. Tech(CSE) I–Semester

S.No	CourseTitle	L	T	P	C	Assessment	
						Int	Ext
1	ProgramCore–1 Data Structures and Algorithm Analysis	3	1	0	4	40	60
2	ProgramCore–2 Advanced Data Warehousing and Data Mining	3	1	0	4	40	60
3	ProgramCore–3 Mathematical and Statistical Foundations of Computer Science	3	1	0	4	40	60
4	ProgramElective –I	3	0	0	3	40	60
5	ProgramElective –II	3	0	0	3	40	60
6	Laboratory–1 Data Structures and Algorithm Analysis Lab	0	0	4	2	40	60
7	Laboratory–2 Advanced Data Warehousing and Data MiningLab	0	0	4	2	40	60
8	Seminar-I	0	0	2	1	100	-
TOTAL		15	3	08	23		

List of Program Elective Courses in I Semester (Electives –I & II)

S.No.	CourseTitle
1	1. Image Processing 2. Soft Computing 3. Advanced Computer Networks 4. Advanced Operating Systems 5. Advanced Software Engineering 6. Time Series Analysis 7. High Performance Computing 8. Agile Methodologies 9. Advanced Compiler Design 10. Any minimum 12 weeks MOOCS/NPTEL courses with prior approval of BoS



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

M. Tech(CSE) II–Semester

Sl. No.	CourseTitle	L	T	P	C	Assessment	
						Int	Ext
1	ProgramCore–4 Machine Learning	3	1	0	4	40	60
2	ProgramCore–5 Cryptography & Network Security	3	1	0	4	40	60
3	ProgramCore–6 Introduction to Quantum computing	3	1	0	4	40	60
4	ProgramElective –III	3	0	0	3	40	60
5	ProgramElective –IV	3	0	0	3	40	60
6	Laboratory–3 Machine Learning Lab	0	0	4	2	40	60
7	Laboratory–4 Cryptography & Network SecurityLab	0	0	4	2	40	60
8	Seminar–II	0	0	2	1	100	-
	TOTAL	15	3	08	23		

ListofProgramElectiveCoursesinIISemester(ElectivesIII&IV)

S. No.	CourseTitle
1	1. Feature Engineering 2. Generative AI 3. Adhoc Sensor Networks 4. Natural Language Processing 5. Secure Coding 6. Block Chain Technologies 7. DevOps 8. Social Media Analytics 9. Any minimum12 weeks MOOCS/NPTEL courses with prior approval of BoS

Note:Summer Internship/ Industrial Training will be done during *Year break (II sem to III Sem)* and evaluated in IIISem.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

M. Tech (CSE) - III Semester

S. No	Course Title	L	T	P	C	Assessment	
						Int	Ext
1	Research Methodology and IPR / Swayam 12 week MOOC course – RM&IPR	3	0	0	3	40	60
2	Summer Internship/ Industrial Training (8-10 weeks)*	-	-	-	3	100	-
3	Comprehensive Viva [#]	-	-	-	2	100	-
4	Dissertation Part – A ^{\$}	-	-	20	10	100	-
	TOTAL	3	-	20	18		

* Student attended during summer / year break and assessment will be done in 3rd Sem.

Comprehensive viva can be conducted courses completed upto second sem.

\$ Dissertation – Part A, internal assessment

M Tech. (CSE) – IV Semester

S. No.	Course Title	L	T	P	C	Assessment	
						Int	Ext
1	Dissertation Part – B [%]	-	-	32	16	-	100
	TOTAL	-	-	32	16		

% External Assessment



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

I Semester	DATA STRUCTURES AND ALGORITHM ANALYSIS	L	T	P	C
		3	1	0	4

Course Objectives:

The main objectives of the course are to make student

- Implement and manipulate fundamental data structures
- Understand and apply various searching and sorting algorithms
- Analyze and implement tree-based data structures
- Develop a solid understanding of hash tables and their operations
- Implement and evaluate advanced data structures

UNIT	CONTENTS
UNIT – 1	Introduction to Algorithms and Data Structures -Algorithms, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, probabilistic analysis, Amortized analysis, Singly Linked Lists, Doubly Linked Lists, Circular Lists, Stacks and Queues- Algorithm Implementation using Linked Lists, Applications of Lists, Stacks and Queues.
UNIT – 2	Searching- Linear and Binary search methods, Sorting-Topological sorting, Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Trees- Binary trees, Operations- Insertion, Deletion, Properties, Representation and Traversals (DFT, BFT), Expression Trees (Infix, Prefix, Postfix), Graphs- Basic Concepts, Storage Structures and Traversals, Applications.
UNIT – 3	Dictionaries, ADT, The List ADT, Stack ADT, Queue ADT, Hash Table Representation, Hash Functions, Collision Resolution-Separate Chaining, Open Addressing- Linear Probing, Double Hashing
UNIT – 4	Priority Queues - Definition, ADT, Realising a Priority Queue Using Heaps, Definition, Insertion, Deletion, Search Trees- Binary Search Trees, Definition, ADT, Implementation, Operations- Searching, Insertion, Deletion
UNIT – 5	Search Trees - AVL Trees, Definition, Height of AVL Tree, Operations- Insertion, Deletion and Searching. Introduction to Red-Black and Splay Trees, B-Trees, Height of B-Tree, Insertion, Deletion and Searching, Comparison of Search Trees

Text Books:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, Richard F. Gilberg, Behrouz A. Forouzon, Cengage Learning
2. Data Structures, Algorithms and Applications in Java, 2nd Edition, Sartaj Sahni, University Press/Orient Black Swan



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering

M.Tech CSE R25

Reference Books:

1. Introduction to Algorithms, Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, 4th Edition, MIT Press, Cambridge
2. Data Structures and Algorithm Analysis, 2nd Edition, Mark Allen Weiss, Pearson.
3. Data Structures and Algorithms in C++, 3rd Edition, Adam Drozdek, Cengage Learning.
4. C and Data Structures: A Snap Shot Oriented Treatise Using Live Engineering Examples, 1st Edition, N.B.Venkateswarulu, E.V. Prasad, S Chand & Co.
5. Classic Data Structures, 2nd Edition, Debasis Samanta, PHI Learning.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

I Semester	ADVANCED DATA WAREHOUSING AND DATA MINING	L	T	P	C
		3	1	0	4

Course Objectives: The main objectives of the course are to

- Understand Data Warehousing and OLAP
- Master Data Preprocessing and Statistical Techniques
- Apply Classification Techniques and Model Evaluation
- Perform Association and Sequential Pattern Mining
- Explore Clustering and Advanced Data Mining

UNIT	CONTENTS
UNIT – 1	Data Warehousing and Online Analytical Processing: Basic concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Cloud Data Warehouse, Data Mining Methodologies: CRISP-DM and SEMMA, Comparison of Data Mining Methodologies. Statistical Limits on Data Mining, Introduction to Predictive Analytics, Technologies, Applications, Major issues (Text Book- 1)
UNIT – 2	Data Objects & Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity. Data Preprocessing: An Overview, Data Cleaning, Data Integration, Dimensionality Reduction, PCA, Data Transformation and Data Discretization. (Text Book- 1)
UNIT – 3	Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Attribute Selection Measures, Tree Pruning, Scalability and Decision Tree Induction, Visual Mining for Decision Tree Induction, Bayesian Classification Methods: Bayes Theorem, Naïve Bayes Classification, Bayesian Belief Networks, Rule-Based Classification, Model Evaluation and Selection. (Text Book- 2)
UNIT – 4	Association Rule Mining: Problem Definition, Frequent Itemset Generation, Rule Generation: Confident Based Pruning, Rule Generation in Apriori Algorithm, Frequent Item Sets, FP-Growth Algorithm, <i>Sequential Patterns</i> : Preliminaries, Sequential Pattern Discovery, GSP Algorithm, Prefix-SPAN algorithm.(Text Book- 2)
UNIT – 5	Cluster Analysis: Clustering techniques, Different Types of Clusters; K-means, K-means Additional Issues, Bi-secting K-Means, Agglomerative Hierarchical Clustering: BIRCH, DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. Mining rich data types: Mining text data, Spatio-temporal data, Graph and networks. (Text Book- 2)



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

Text Books:

1. Data Mining Concepts and Techniques, 3rd Edition, Jiawei Han, Michel Kamber, Elsevier.
2. Introduction to Data Mining: Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Pearson.

Reference Books:

1. Data Mining: Vikram Pudi, P. Radha Krishna, Oxford Publisher.
2. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.

Online Resources: (NPTEL course by Prof. Pabitra Mitra)

1. http://onlinecourses.nptel.ac.in/noc17_mg24/preview
2. http://www.saedsayad.com/data_mining_map.htm



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

I Semester	MATHEMATICAL AND STATISTICAL FOUNDATIONS OF COMPUTER SCIENCE	L	T	P	C
		3	1	0	4

Course Objectives:

The main objectives of the course are to make student

- Understand and apply the fundamental concepts of probability
- Master statistical inference techniques
- Develop skills in hypothesis testing
- Explore algebraic structures and number theory
- Learn the principles of graph theory

UNIT	CONTENTS
UNIT – 1	Basic Probability and Random Variables: Random Experiments, Sample Spaces Events, the Concept of Probability, the Axioms of Probability, Some Important Theorems on Probability, Assignment of Probabilities, Conditional Probability, Theorems on Conditional Probability, Independent Events, Bayes Theorem or Rule. Random Variables, Discrete Probability Distributions, Distribution Functions for Random Variables, Distribution Functions for Discrete Random Variables, Continuous Random Variables
UNIT – 2	Sampling and Estimation Theory: Population and Sample, Statistical Inference, Sampling With and Without Replacement, Random Samples, Random Numbers Population Parameters, Sample Statistics, Sampling Distributions, Frequency Distributions, Relative Frequency Distributions, Computation of Mean, Variance, and Moments for Grouped Data. Unbiased Estimates and Efficient Estimates, Point Estimates and Interval Estimates. Reliability, Confidence Interval, Estimates of Population Parameters, Maximum Likelihood Estimates
UNIT – 3	Tests of Hypothesis and Significance: Statistical Decisions, Statistical Hypotheses. Null Hypotheses, Tests of Hypotheses and Significance, Type I and Type II Errors, Level of Significance, Tests Involving the Normal Distribution, One-Tailed and Two- Tailed Tests, P Value, Special Tests of Significance for Large Samples, Special Tests of Significance for Small Samples, Relationship between Estimation Theory and Hypothesis Testing, Operating Characteristic Curves. Power of a Test, Quality Control Charts, Fitting Theoretical Distributions to Sample Frequency Distributions, The Chi-Square Test for Goodness of Fit, Contingency Tables, Yates' Correction for Continuity, Coefficient of Contingency.
UNIT – 4	Algebraic Structures and Number Theory: Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

	Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem)
UNIT – 5	Graph Theory: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

Text Books:

1. Foundation Mathematics for Computer Science, 1st Edition, John Vince, Springer, 2015
2. Probability & Statistics, 3rd Edition, Murray R. Spiegel, John J. Schiller and R. Alu Srinivasan, Schaum's Outline Series, Tata McGraw-Hill Publishers, 2018
3. Probability and Statistics with Reliability, 2nd Edition, K. Trivedi, Wiley.
4. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, H. Rosen, Tata McGraw Hill.

Reference Books:

1. Probability and Computing: Randomized Algorithms and Probabilistic Analysis, 1st Edition, M. Mitzenmacher and E. Upfa.
2. Applied Combinatorics, 6th Edition, Alan Tucker, Wiley.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

I Semester	IMAGE PROCESSING	L	T	P	C
		3	0	0	3

Course Objectives:

The main objectives of the course are to make student

- Understand the fundamental concepts of image processing
- Apply image enhancement techniques
- Explore image restoration and reconstruction methods
- Understand and apply color fundamentals and models,
- Develop expertise in image segmentation and feature extraction techniques

UNIT	CONTENTS
UNIT – 1	Introduction: Fundamental steps in Image Processing System, Components of Image Processing System, Elements of Visual Perception, Image Sensing and acquisition, Image sampling & Quantization, Basic Relationship between pixels. Image Enhancement Techniques: Spatial Domain Methods: Basic grey level transformation, Histogram equalization, Image subtraction, image averaging
UNIT – 2	Spatial filtering: Smoothing, sharpening filters, Laplacian filters, Frequency domain filters, Smoothing and sharpening filters, Homomorphism is filtering. Image Restoration & Reconstruction: Model of Image Degradation/restoration process, Noise models, Spatial filtering, Inverse filtering, Minimum mean square Error filtering, constrained least square filtering, Geometric mean filter, Image reconstruction from projections. Color Fundamentals, Color Models, Color Transformations.
UNIT – 3	Image Compression: Redundancies, Coding, Interpixel, Psycho visual, Fidelity, Source and Channel Encoding, Elements of Information Theory, Loss Less and Lossy Compression, Run length coding, Differential encoding, DCT, Vector quantization, Entropy coding, LZW coding; Image Compression Standards-JPEG, JPEG 2000, MPEG; Video compression.
UNIT – 4	Wavelet Based Image Compression: Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT), Continuous, Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding
UNIT – 5	Image Segmentation: Discontinuities, Edge Linking and boundary detection, Thresholding, Region Based Segmentation, Watersheds, Introduction to morphological operations, binary morphology- erosion, dilation, opening and closing operations, applications, basic gray-scale morphology operations, Feature extraction, Classification, Object recognition. Digital Image Watermarking: Introduction, need of Digital Image Watermarking, applications of watermarking in copyright protection



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

and Image quality analysis. Deep Learning techniques for Image Processing

Text Books:

1. Digital Image Processing. 2nd ed. Gonzalez, R.C. and Woods, R.E. India: Person Education.

Reference Books:

1. Digital Image Processing. John Wiley, Pratt, W. K, Fourth Edition.
2. Digital Image Processing, Jayaraman S., Veerakumar T. and Esakkiranjana S., Tata McGraw-Hill, Edition-3.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

I Semester	SOFT COMPUTING	L	T	P	C
		3	0	0	3

Course Objectives:

The main objectives of the course are to introduce the concepts in Soft Computing such as Artificial Neural Networks, Fuzzy logic-based systems, genetic algorithm-based systems and their hybrids.

UNIT	CONTENTS
UNIT – 1	Introduction: soft computing vs. hard computing, various types of softcomputing techniques, applications of soft computing. Basic toolsof soft computing – Fuzzy logic, evolutionarycomputing. Neural networks, application scope ofneural networks, fuzzy logic, genetic algorithm, and hybrid systems.
UNIT – 2	Fuzzy Sets : Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion. Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications and Defuzzifications. Fuzzy Controller, Fuzzy rule base and approximate reasoning: truth values and tables in fuzzy logic, fuzzy propositions formation of rules, decomposition of compound rules, aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference system, fuzzy expert systems.
UNIT – 3	Evolutionary Computing: Basic Evolutionary Processes, EV: A Simple Evolutionary System, Evolutionary Systems as Problem Solvers, A Historical Perspective, Canonical Evolutionary Algorithms - Evolutionary Programming, Evolution Strategies, A Unified View of Simple Evolutionary Algorithms- A Common Framework, Population Size.
UNIT – 4	Genetic Algorithm(GA): Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection,Genetic operators, Mutation, Generational Cycle, Traditional algorithm vs genetic algorithm, simple GA, general genetic algorithm, schema theorem, Classification of genetic algorithm, Holland classifier systems, genetic programming, applications of genetic algorithm, Convergence of GA. Applications and advances in GA, Differences and similarities between GA and other traditional method, applications.
UNIT – 5	Swarm Intelligence: Introduction, Particle Swarm Optimization (PSO) Algorithm- Formulations, Pseudo-code, parameters, premature convergence, topology, biases, Real valued and binary PSO, Ant Colony Optimization(ACO)- Formulations, Pseudo-code. Applications of PSO and ACO

Text Books:

1. S. N. Sivanandam and S. N. Deepa, Principles of soft computing–John Wiley & Sons, ISBN- 9788126527410.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering

M.Tech CSE R25

2. Timothy J. Ross, Fuzzy Logic with engineering applications, John Wiley & Sons, 2016.

Reference Books:

1. N.K. Sinha, M.M. Gupta, Soft Computing & Intelligent Systems: Theory & Applications, Academic Press /Elsevier.
2. Simon Haykin, Neural Network- A Comprehensive Foundation, Prentice Hall International.
3. R. Eberhart, Y.Shi, Computational Intelligence: Concepts to Implementation, Morgan Kaufman/Elsevier.
4. Driankov D., Hellendoorn H, Reinfrank M., An Introduction to Fuzzy Control, Narosa Pub..
5. Goldberg D.E, Genetic Algorithms in Search, Optimization and Machine Learning Addison Wesley.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

I Semester	ADVANCED COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

Course Objectives:

This course is aimed at enabling the students to provide basic understanding of Computer networks starting with OSI Reference Model, Protocols at different layers with special emphasis on IP, TCP & UDP and Routing algorithms.

UNIT	CONTENTS
UNIT – 1	Network layer: Network Layer design issues, store-and forward packet switching, services provided transport layers, implementation of connection less services, implementation of connection oriented services, comparison of virtual circuit and datagram subnets, Routing Algorithms-shortest path routing, flooding, distance vector routing, link state routing, Hierarchical routing, congestion control algorithms: Approaches to congestion control, Traffic aware routing, Admission control, Traffic throttling, choke Packets, Load shedding, Quality of Service, Application requirements, Traffic shaping, Leaky and Token buckets.
UNIT – 2	Internetworking and IP protocols: difference in networks, internetworking, tunneling, The network layer in the internet, IPV4 Protocol, IP addresses, Subnets, CIDR, classful and Special addressing, Network Address Translation (NAT), IPV6 Address structure, address space, IPV6 Advantages, packet format, extension Headers, Transition from IPV4 to IPV6 , Internet Control Protocols- ICMP, ARP, DHCP.
UNIT – 3	Transport Layer Protocols: Introduction, Services, Port numbers, User Datagram Protocol: User datagram, UDP services, UDP Applications, Transmission control Protocol: TCP services, TCP features, Segment, A TCP connection, State transition diagram, Windows in TCP, Flow control and error control, TCP Congestion control, TCP Timers, SCTP: SCTP services SCTP features, packet format, An SCTP association, flow control, error control
UNIT – 4	Wireless LANS: Introduction, Architectural comparison, Access control, The IEEE 802.11 Project: Architecture, MAC sub layer, Addressing Mechanism, Physical Layer, Bluetooth: Architecture, Bluetooth Layers, Other Wireless Networks: WIMAX: Services, IEEE project 802.16, Layers in project 802.16, Cellular Telephony: Operations, First Generation (1G), Second Generation (2G), Third Generation (3G), Fourth Generation (4G), Satellite Networks: Operation, GEO Satellites, MEO satellites, LEO satellites



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

UNIT – 5	Emerging trends in Computer networks: Mobile computing: Motivation for mobile computing, Protocol stack issues in mobile computing environment, mobility issues in mobile computing, security issues in mobile networks, MOBILE Ad Hoc Networks: Applications of Ad Hoc Networks, Challenges and Issues in MANETS, MAC Layer Issues Routing Protocols in MANET, Transport Layer Issues, Ad hoc Network Security
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Text Books:

1. Data Communications and Networking, 4th Edition, Behrouz A Fourzan, TMH.
2. Computer Networks, 4th edition, Andrew S Tanenbaum, Pearson.
3. Computer Networks, Mayank Dave, CENGAGE, First edition.

Reference Books:

1. Computer Networks, A System Approach, 5th ed, Larry L Peterson and Bruce S Davie, Elsevier.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

I Semester	ADVANCED OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

Course Objectives: This course is aimed at enabling the students to provide comprehensive and up-to-date coverage of the major developments in distributed Operating System, Multi-processor Operating System and to cover important theoretical foundations including Process Synchronization, Concurrency, Event ordering, Mutual Exclusion, Deadlock.

UNIT	CONTENTS
UNIT – 1	Overview of Operating systems: Introduction, Operating system services, System calls, Types of operating systems. Process Management: Process Concepts, Process states, process control block, process scheduling, Operations on processes, Scheduling Algorithms.
UNIT – 2	Memory management concepts: Swapping, Contiguous memory allocation, Paging, Segmentation, Virtual memory, Demand Paging, Page-replacement Algorithms, Thrashing.
UNIT – 3	Process Synchronization: Critical section problem, Semaphores, Readers-Writers problem. Deadlocks: System model, Deadlocks Characterization, Methods for handling deadlocks, Deadlock prevention, Avoidance, Detection and Recovery from Deadlocks.
UNIT – 4	Operating System Support in Distributed Systems : Introduction , Operating System layer, Role of protection processes and address space. Distributed Systems and Synchronization: Clock Synchronization, logical clocks, mutual exclusion, Data-Centric Consistency Models, Client-Centric Consistency Models, Consistency Protocols, Ricart-Agarwala Algorithm, Maekawa Algorithm.
UNIT – 5	File systems and protection: The concept of file, Access methods, Directory structure, File system structure, File system implementation, File sharing, Protection, Directory implementation, Allocation methods, Free space management. Case studies of Android, and iOS.

Text Books:

1. Operating System Concepts, 8th Edition, Silberschatz and Galvin, John Wiley.
2. Distributed Systems, 2nd Edition, Andrew S. Tanenbaum, Maarten Vanteen.

Reference Books:

1. Advanced Concepts in Operating Systems, Indian edition, Singhal, M and Shivaratri, N.. Tata McGraw Hill, 2001.
2. Distributed computing: Principles, Algorithms, and systems, 1st Edition, Kskhemkalyani, A, Singhal M, Cambridge university press, 2008.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

I Semester	ADVANCED SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives:

This course is designed to provide an in depth understanding of phases of Software Development, common process models including Waterfall, the Unified Process, hands-on experience with elements of the agile process, a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, and Software Design techniques.

UNIT	CONTENTS
UNIT – 1	Software and Software Engineering: Nature of software, Software Process, Software Engineering Practice. Process Models: Generic process model, defining a framework activity, identifying task set, process assessment and improvement, perspective process models, Agility and process: Agility, Agile process, Scrum, other Agile frameworks, recommended process model
UNIT – 2	Human aspects of Software Engineering: characteristics and psychology of Software Engineer, software team, team structure. Principles that guide practice: core principles, principles that guide each framework activity. Understanding Requirements: Requirements engineering, establishing groundwork, requirements gathering, developing use cases, building analysis model, negotiating requirements, requirements monitoring, validating Requirements Requirements modeling: requirements analysis, class-based modeling, functional modeling, behavioral modeling.
UNIT – 3	Design: Design process, design concepts, design model, Architectural design: software architecture, architectural styles, architectural design, assessing alternative architectural designs. User experience design: elements, golden rules, User interface analysis and design, user experience analysis, user interface design, design evaluation, usability and accessibility Design for mobility: mobile development life cycle, mobile architecture, web design pyramid, mobility and design quality, best practices.
UNIT – 4	Quality: software quality, quality dilemma, achieving software quality Reviews: review metrics, Informal reviews, and Formal technical reviews. Software Quality Assurance: elements, SQA process, Product characteristics, SQA tasks, goals and metrics, statistical software quality assurance, software reliability, ISO 9000 quality standards, SQA plan.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

	Software testing: strategic approach to software testing, planning and recordkeeping, test case design, white box testing, black box testing, object oriented testing.
UNIT – 5	Software testing- integration level: Software testing fundamentals, integration testing, regression testing, integration test in OO context, validation testing. Software testing- testing for mobility: mobile testing guidelines, testing strategies, User experience testing issues, web application testing, Web testing strategies, security testing, performance testing. Software metrics and analytics: software measurement, software analytics, product metrics, metrics for testing, metrics for maintenance, process and project metrics, software measurement, metrics for software quality

Text Books:

1. “Software Engineering, A practitioner’s Approach”, Roger S. Pressman, Bruce R. Maxim, 9th Edition, Tata McGraw-Hill.
2. “Software Engineering”, Ian Sommerville, 9th edition, Pearson education

Reference Books:

1. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill.
2. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

I Semester	TIME SERIES ANALYSIS	L	T	P	C
		3	0	0	3

Course Objectives:

This course is aimed at enabling the students to introduce a variety of statistical models for time series and cover the main methods for analyzing these models

UNIT	CONTENTS
UNIT – 1	Introduction of Timeseries Analysis: Introduction to Time Series and Forecasting, Different types of data, Internal structures of time series. Models for time series analysis, Autocorrelation and Partial autocorrelation. Examples of Time series, Nature and uses of forecasting, Forecasting Process, Data for forecasting, Resources for forecasting
UNIT – 2	Statistics Background for Forecasting: Graphical Displays, Time Series Plots, Plotting Smoothed Data, Numerical Description of Time Series Data, Use of Data Transformations and Adjustments, General Approach to Time Series Modeling and Forecasting, Evaluating and Monitoring Forecasting Model Performance
UNIT – 3	Time Series Regression Model: Introduction Least Squares Estimation in Linear Regression Models, Statistical Inference in Linear Regression, Prediction of New Observations, Model Adequacy Checking, Variable Selection Methods in Regression, Generalized and Weighted Least Squares, Regression Models for General Time Series Data, Exponential Smoothing, First order and Second order
UNIT – 4	Autoregressive Integrated Moving Average (ARIMA) Models: Autoregressive Moving Average Models, Stationarity and Invertibility of ARMA Models, Checking for Stationarity using Variogram, Detecting Nonstationarity, Autoregressive Integrated Moving Average (ARIMA) Models, Forecasting using ARIMA, Seasonal Data, Seasonal ARIMA Models, Forecasting using Seasonal ARIMA Models- Introduction, Finding the “BEST” Model.
UNIT – 5	Multivariate Time Series Models and Forecasting: Multivariate Time Series Models and Forecasting, Multivariate Stationary Process, Vector ARIMA Models, Vector AR (VAR) Models, Neural Networks and Forecasting Spectral Analysis, Bayesian Methods in Forecasting.

Text Books:

1. Introduction To Time Series Analysis and Forecasting, 2nd Edition, Wiley Series, Douglas C. Montgomery, Cheryl L. Jen, 2015
2. Master Time Series Data Processing, Visualization, and Modeling Using Python, Dr. Avishek Pal, Dr.PKS Prakash, 2017.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

I Semester	HIGH PERFORMANCE COMPUTING	L	T	P	C
		3	0	0	3

Course Objectives:

This course is aimed at enabling the students to

- Understand the fundamentals of parallel computing
- Explore the principles of parallel algorithm design
- Master basic parallel communication operations
- Learn to program shared-memory parallel systems
- Implement parallel algorithms for matrix operations and graph processing

UNIT	CONTENTS
UNIT – 1	Introduction: Motivating Parallelism, Scope of Parallel Computing, Parallel Programming Platforms: Implicit Parallelism, Trends in Microprocessor and Architectures, Limitations of Memory, System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines, Scalable design principles, Architectures: N-wide superscalar architectures, Multi-core architecture.
UNIT – 2	Parallel Programming: Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for Containing Interaction Overheads, Parallel Algorithm Models, The Age of Parallel Processing, the Rise of GPU Computing, A Brief History of GPUs, Early GPU.
UNIT – 3	Basic Communication: Operations- One-to-All Broadcast and All-to-One Reduction, All-to-All Broadcast and Reduction, All-Reduce and Prefix-Sum Operations, Scatter and Gather, All-to-All Personalized Communication, Circular Shift, Improving the Speed of Some Communication Operations. Programming shared address space platforms: threads- basics, synchronization, OpenMP programming
UNIT – 4	Analytical Models: Sources of overhead in Parallel Programs, Performance Metrics for Parallel Systems, and The effect of Granularity on Performance, Scalability of Parallel Systems, Minimum execution time and minimum cost, optimal execution time. Dense Matrix Algorithms: Matrix Vector Multiplication, Matrix-Matrix Multiplication.
UNIT – 5	Parallel Algorithms- Sorting and Graph: Issues in Sorting on Parallel Computers, Bubble Sort and its Variants, Parallelizing Quick sort, All-Pairs Shortest Paths, Algorithm for sparse graph, Parallel Depth-First Search, Parallel Best First Search. CUDA Architecture: CUDA Architecture, Using the CUDA



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

	Architecture, Applications of CUDA, Introduction to CUDA C-Write and launch CUDA C kernels, Manage GPU memory, Manage communication and synchronization, Parallel programming in CUDA- C.
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Text Books:

1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, "Introduction to Parallel Computing", 2nd edition, Addison-Wesley, ISBN: 0-201-64865-2
2. Jason sanders, Edward Kandrot, "CUDA by Example", Addison-Wesley, ISBN-13: 978-0-13-138768-3

Reference Books

1. Kai Hwang, "Scalable Parallel Computing", McGraw Hill, ISBN:0070317984
2. Shane Cook, "CUDA Programming: A Developer's Guide to Parallel Computingwith GPUs", Morgan Kaufmann Publishers Inc. San Francisco, CA, USA, ISBN: 780124159884
3. David Culler, Jaswinder Pal Singh, "Parallel Computer Architecture: A Hardware/Software Approach", Morgan Kaufmann, ISBN 978-1-55860-343-1
4. Rod Stephens, "Essential Algorithms", Wiley, ISBN: 978-1-118-61210-1



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

I Semester	AGILE METHODOLOGIES	L	T	P	C
		3	0	0	3

Course Objectives:

This course is aimed at enabling the students to introduce the important concepts of Agile software development Process, emphasize the role of stand-up meetings in software collaboration, impart the knowledge on values and principles in understanding agility

UNIT	CONTENTS
UNIT – 1	Learning Agile: Agile, Getting Agile into your brain, Understanding Agile values, No Silver Bullet, Agile to the Rescue. A fractured perspective, The Agile Manifesto, Understanding the Elephant, Where to Start with a New Methodology.
UNIT – 2	The Agile Principles: The 12 Principles of Agile Software, The Customer Is Always Right, Delivering the Project, Better Project Delivery for the Ebook Reader Project. Communicating and Working Together, Project Execution—Moving the Project Along, Constantly Improving the Project and the Team. The Agile Project: Bringing All the Principles Together
UNIT – 3	SCRUM and Self-Organizing Teams: The Rules of Scrum, Act I: I Can Haz Scrum, Everyone on a Scrum Team owns the Project, Status Updates Are for Social Networks, The Whole Team Uses the Daily Scrum, Feedback and the Visibility-Inspection-Adaptation Cycle, The Last Responsible Moment, Sprinting into a Wall, Sprints, Planning, and Retrospectives. Scrum Planning and Collective Commitment: Not Quite Expecting the Unexpected, User Stories, Velocity, and Generally Accepted Scrum Practices, Victory Lap, Scrum Values Revisited.
UNIT – 4	XP And Embracing Change: Going into Overtime, The Primary Practices of XP, The Game Plan Changed, but We're Still Losing, The XP Values, Help the Team Change Their Mindset, An Effective Mindset Starts with the XP Values, The Momentum Shifts, Understanding the XP Principles Helps You Embrace Change. XP, Simplicity, and Incremental Design: Code and Design, Make Code and Design Decisions at the Last Responsible Moment, Final Score. .
UNIT – 5	Lean, Eliminating Waste, and Seeing the whole: Lean Thinking, Creating Heroes and Magical Thinking. Eliminate Waste, Gain a Deeper Understanding of the Product, Deliver As Fast As Possible. Kanban, Flow, and Constantly Improving: The Principles of Kanban, Improving Your Process with Kanban, Measure and Manage Flow, Emergent Behavior with Kanban. The Agile Coach: Coaches Understand Why People Don't Always Want to



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

	Change. The Principles of Coaching.
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Text Books:

1. Andrew Stellman, Jill Alison Hart, Learning Agile, O'Reilly, 2015.

Reference Books:

1. Andrew Stellman, Jennifer Green, Head first Agile, O'Reilly, 2017.
2. Rubin K , Essential Scrum : A practical guide to the most popular Agile process, Addison-Wesley.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

I Semester	ADVANCED COMPILER DESIGN	L	T	P	C
		3	0	0	3

Course Objectives:

This course is aimed at enabling the students to

- Understand the structure and components of a compiler
- Master the concepts of syntax analysis
- Learn syntax-directed translation (SDT)
- Explore intermediate code generation techniques
- Gain a comprehensive understanding of runtime environments

UNIT	CONTENTS
UNIT – 1	Lexical Analysis: Language Processors, Structure of a Compiler, Lexical Analysis, The Role of the Lexical Analyzer, Bootstrapping, Input Buffering, Specification of Tokens, Recognition of Tokens, Lexical Analyzer Generator-LEX, Finite Automata, Regular Expressions and Finite Automata, Design of a Lexical Analyzer Generator.
UNIT – 2	Syntax Analysis: The Role of the Parser, Context-Free Grammars, Derivations, Parse Trees, Ambiguity, Left Recursion, Left Factoring, Top Down Parsing: Pre Processing Steps of Top Down Parsing, Backtracking, Recursive Descent Parsing, LL (1) Grammars, Non-recursive Predictive Parsing, Error Recovery in Predictive Parsing
UNIT – 3	Bottom Up Parsing: Introduction, Difference between LR and LL Parsers, Types of LR Parsers, Shift Reduce Parsing, SLR Parsers, Construction of SLR Parsing Tables, More Powerful LR Parses, Construction of CLR (1) and LALR Parsing Tables, Dangling Else Ambiguity, Error Recovery in LR Parsing, Handling Ambiguity Grammar with LR Parsers
UNIT – 4	Syntax Directed Translation: Syntax-Directed Definitions (SDD), Evaluation Orders for SDD's, Applications of Syntax Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's. Intermediate Code Generation: Variants of Syntax Trees, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking, Control Flow, Backpatching, Intermediate Code for Procedures.
UNIT – 5	Run Time Environments: Storage Organization, Run Time Storage Allocation, Activation Records, Procedure Calls, Displays, Code Optimization: The Principle Sources of Optimization, Basic Blocks, Optimization of Basic Blocks, Structure Preserving Transformations, Flow Graphs, Loop Optimization, Data-Flow Analysis, Peephole Optimization, Code Generation: Issues in the Design of a Code



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

	Generator, Object Code Forms, Code Generation Algorithm, Register Allocation and Assignment.
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Text Books:

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson Publishers.

Reference Books:

1. Compiler Construction, Principles and Practice, Kenneth C Loudon, Cengage Learning.
2. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
3. Optimizing Compilers for Modern Architectures, Randy Allen, Ken Kennedy, Morgan Kauffmann.
4. Levine, J.R., T. Mason, D. Brown, Lex and Yacc, edition, O'Reilly & Associates.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

I Semester	DATA STRUCTURES AND ALGORITHM ANALYSIS LAB	L	T	P	C
		0	0	4	2

Course Objectives:

This course is aimed at enabling the students to

- Implement and manipulate fundamental data structures
- Apply advanced techniques in linked list manipulation
- Implement and analyze sorting algorithms

UNIT	CONTENTS
Experiment– 1	Write a Java program to perform various operations on single linked list
Experiment– 2	Write a Java program for the following a) Reverse a linked list b) Sort the data in a linked list c) Remove duplicates d) Merge two linked lists
Experiment– 3	Write a Java program to perform various operations on doubly linked list
Experiment– 4	Write a Java program to perform various operations on circular linked list
Experiment– 5	Write a Java program for performing various operations on stack using linked list
Experiment– 6	Write a Java program for performing various operations on queue using linked list
Experiment– 7	Write a Java program for the following using stack a) Infix to postfix conversion. b) Expression evaluation. c) Obtain the binary number for a given decimal number.
Experiment– 8	Write a Java program to implement various operations on Binary Search Tree Using Recursive and Non-Recursive methods.
Experiment– 9	Write a Java program to implement the following for a graph. a) BFS b) DFS
Experiment– 10	Write a Java program to implement Merge & Heap Sort of given elements
Experiment– 11	Write a Java program to implement Quick Sort of given elements
Experiment– 12	Write a Java program to implement various operations on AVL trees
Experiment– 13	Write a Java program to perform the following operations: a) Insertion into a B-tree b) Searching in a B-tree



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

Experiment– 14	Write a Java program to implementation of recursive and non-recursive functions to Binary tree Traversals
Experiment– 15	Write a Java program to implement all the functions of Dictionary ADT using Hashing



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

I Semester	ADVANCED DATA WAREHOUSING AND DATA MINING LAB	L	T	P	C
		0	0	4	2

Course Objectives:

The main objective of the course is to

- Inculcate Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment
- Design a data warehouse or data mart to present information needed by management in a form that is usable
- Emphasize hands-on experience working with all real data sets.
- Test real data sets using popular data mining tools such as WEKA, Python Libraries
- Develop ability to design various algorithms based on data mining tools.

Software Requirements: WEKA Tool/Python/R-Tool/Rapid Tool/Oracle Data mining

UNIT	CONTENTS
Experiment– 1	<p>Creation of a Data Warehouse.</p> <ul style="list-style-type: none"> ➤ Build Data Warehouse/Data Mart (using open source tools like Pentaho Data Integration Tool, Pentaho Business Analytics; or other data warehouse tools like Microsoft-SSIS, Informatica, Business Objects,etc.,) ➤ Design multi-dimensional data models namely Star, Snowflake and Fact Constellation schemas for any one enterprise (ex. Banking, Insurance, Finance, Healthcare, manufacturing, Automobiles, sales etc). ➤ Write ETL scripts and implement using data warehouse tools. ➤ Perform Various OLAP operations such slice, dice, roll up, drill up and pivot
Experiment– 2	<p>Explore machine learning tool “WEKA”</p> <ul style="list-style-type: none"> ➤ Explore WEKA Data Mining/Machine Learning Toolkit. ➤ Downloading and/or installation of WEKA data mining toolkit. ➤ Understand the features of WEKA toolkit such as Explorer, Knowledge Flow interface, Experimenter, command-line interface. ➤ Navigate the options available in the WEKA (ex. Select attributes panel, Preprocess panel, Classify panel, Cluster panel, Associate panel and Visualize panel) ➤ Study the arff file format Explore the available data sets in WEKA. Load a data set (ex. Weather dataset, Iris dataset, etc.) ➤ Load each dataset and observe the following: <ol style="list-style-type: none"> 1. List the attribute names and they types



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

	<ol style="list-style-type: none"> 2. Number of records in each dataset 3. Identify the class attribute (if any) 4. Plot Histogram 5. Determine the number of records for each class. 6. Visualize the data in various dimensions
Experiment– 3	<p>Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets</p> <ul style="list-style-type: none"> ➤ Explore various options available in Weka for preprocessing data and apply <p>Unsupervised filters like Discretization, Resample filter, etc. on each dataset</p> <ul style="list-style-type: none"> ➤ Load weather. nominal, Iris, Glass datasets into Weka and run Apriori Algorithm with different support and confidence values. ➤ Study the rules generated. Apply different discretization filters on numerical attributes and run the Apriori association rule algorithm. Study the rules generated. ➤ Derive interesting insights and observe the effect of discretization in the rule generation process.
Experiment– 4	<p>Demonstrate performing classification on data sets Weka/R</p> <ul style="list-style-type: none"> ➤ Load each dataset and run ID3, J48 classification algorithm. Study the classifier output. Compute entropy values, Kappa statistic. ➤ Extract if-then rules from the decision tree generated by the classifier, Observe the confusion matrix. ➤ Load each dataset into Weka/R and perform Naïve-bayes classification and k-Nearest Neighbour classification. Interpret the results obtained. ➤ Plot RoC Curves ➤ Compare classification results of ID3, J48, Naïve-Bayes and k-NN classifiers for each dataset, and deduce which classifier is performing best and poor for each dataset and justify.
Experiment– 5	<p>Demonstrate performing clustering of data sets</p> <ul style="list-style-type: none"> ➤ Load each dataset into Weka/R and run simple k-means clustering algorithm with different values of k (number of desired clusters). ➤ Study the clusters formed. Observe the sum of squared errors and centroids, and derive insights. ➤ Explore other clustering techniques available in Weka/R. ➤ Explore visualization features of Weka/R to visualize the clusters. Derive interesting insights and explain
Experiment– 6	<p>Demonstrate knowledge flow application on data sets into Weka/R</p> <ul style="list-style-type: none"> ➤ Develop a knowledge flow layout for finding strong association rules by using Apriori, FP Growth algorithms



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

	<ul style="list-style-type: none"> ➤ Set up the knowledge flow to load an ARFF (batch mode) and perform a cross validation using J48 algorithm ➤ Demonstrate plotting multiple ROC curves in the same plot window by using J48 and Random forest tree
Experiment– 7	Demonstrate ZeroR technique on Iris dataset (by using necessary preprocessing technique(s)) and share your observations
Experiment– 8	Write a Java program to prepare a simulated data set with unique instances
Experiment– 9	Write a Python program to generate frequent item sets / association rules using Apriori algorithm
Experiment– 10	Write a program to calculate chi-square value using Python/R. Report your observation.
Experiment– 11	Implement a Java/R program to perform Apriori algorithm
Experiment– 12	Write a R program to cluster your choice of data using simple k-means algorithm using JDK
Experiment– 13	Write a program of cluster analysis using simple k-means algorithm Python/R programming language
Experiment– 14	Write a program to compute/display dissimilarity matrix (for your own dataset containing at least four instances with two attributes) using Python
Experiment– 15	Visualize the datasets using matplotlib in Python/R.(Histogram, Box plot, Bar chart, Pie chart etc.,)



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

II Semester	MACHINE LEARNING	L	T	P	C
		3	1	0	4

Course Objectives:

The objectives of the course are to

- Define machine learning and its different types (supervised and unsupervised) and understand their applications.
- Apply supervised learning algorithms including decision trees and k-nearest neighbours (k-NN).
- Implement unsupervised learning techniques, such as K-means clustering.
- Understand the basic of deep learning and Convolutional Neural Networks

UNIT	CONTENTS
UNIT – 1	Introduction to Machine Learning (ML): Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets
UNIT – 2	Nearest Neighbor-Based Models: Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures ,K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms
UNIT – 3	Linear Discriminants for Machine Learning: Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptron's (MLPs), Backpropagation for Training an MLP
UNIT – 4	Introducing Deep Learning: Biological and Machine Vision, Human and Machine Language, Artificial Neural Networks, Training Deep Networks, Improving Deep Networks.
UNIT – 5	Convolutional Neural Networks(CNN): Nerual Network and Representation Learning, Convolutional Layers, Multichannel Convolution Operation, Recurrent Neural Networks: Introduction to RNN, RNN Code, PyTorch Tensors: Deep Learning with PyTorch, CNN in PyTorch.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

Text Books:

1. Machine Learning Theory and Practice, M N Murthy, V S Ananthanarayana, Universities Press (India), 2024
2. Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence, Jon Krohn, Grant Beyleveld, AglaéBassens, September 2019, Addison-Wesley Professional, ISBN: 9780135116821

Reference Books:

1. Machine Learning, Tom M. Mitchell, McGraw-Hill Publication, 2017
2. Machine Learning in Action, Peter Harrington, Dream Tech
3. Introduction to Data Mining, Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

II Semester	CRYPTOGRAPHY & NETWORK SECURITY	L	T	P	C
		3	1	0	4

Course Objectives:

The main objectives of the course are to

- Understand the basic categories of threats to computers and networks
- Discuss the Mathematics of Cryptography, fundamental ideas of Symmetric and Asymmetric Cryptographic Algorithms, Network layer, Transport Layer and Application Layer Protocols Enhanced security mechanisms

UNIT	CONTENTS
UNIT – 1	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. Classical Encryption Techniques-symmetric cipher model, Substitution techniques, Transposition techniques, Rotor Machines, Steganography.
UNIT – 2	Introduction to Symmetric Cryptography: Algebraic Structures -Groups, Rings, Fields, $GF(2^n)$ fields, Polynomials. Mathematics of Asymmetric cryptography: Primes, Checking For Primness, Eulers phi-functions, Fermat's Little Theorem, Euler's Theorem, Generating Primes, Primality Testing, Factorization, Chinese Remainder Theorem, Quadratic Congruence, Exponentiation And Logarithm.
UNIT – 3	Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, IDEA, Block cipher operation, Stream ciphers: RC4, RC5 Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Diffie-Hellman Key Exchange, Elgamal Cryptographic system, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.
UNIT – 4	Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Requirements and Security, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithms (SHA) Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MAC'S, MAC'S Based On Hash Functions: HMAC, MAC'S Based On Block Ciphers: DAA And CMAC Digital Signatures: Digital Signatures, Elgamal Digital Signature Scheme, Elliptic Curve Digital Signature Algorithm, RSA-PSS Digital Signature Algorithm.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

UNIT – 5	Network and Internet Security: Transport-Level Security: Web Security Considerations, Transport Level Security, HTTPS, SSH. IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload, Authentication Header Protocol. Electronic-Mail Security: Internet-mail Security, Email Format, Email Threats and Comprehensive Email Security, S/MIME, PGP.
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Text Books:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 7th Edition, 2017
2. Cryptography and Network Security: Behrouz A. Forouzan Debdeep, McGraw Hill, 3rd Edition, 2015

Reference Books:

1. Cryptography and Network Security: Atul Kahate, McGraw Hill, 3rd Edition.
2. Introduction to Cryptography with Coding Theory: Wade Trappe, Lawrence C. Washington, Pearson.
3. Modern Cryptography: Theory and Practice, Wenbo Mao. Pearson



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

II Semester	INTRODUCTION TO QUANTUM COMPUTING	L	T	P	C
		3	1	0	4

Course Objectives:

The main objectives of the course are to

- Introduce fundamental concepts of quantum mechanics and its mathematical formalism.
- Explore quantum computing and communication principles and technologies.
- Understand the physical implementation and limitations of quantum systems.
- Enable students to relate quantum theory to practical applications in computing, cryptography, and sensing.
- Familiarize students with the emerging trends in quantum technologies

UNIT	CONTENTS
UNIT – 1	History of Quantum Computing: Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations
UNIT – 2	Background Mathematics: Basics of Linear Algebra, Hilbert space, Probabilities and measurements. Background Physics: Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. Background Biology: Basic concepts of Genomics and Proteomics (Central Dogma)
UNIT – 3	Qubit: Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.
UNIT – 4	Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm
UNIT – 5	Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation

Text Books:

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

Reference Books:

1. Quantum Computing for Computer Scientists, Noson S. Yanofsky, Mirco A. Mannucci
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol.I.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

II Semester	FEATURE ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives:

The main objectives of the course are to make student

- Understand the machine learning pipeline
- Master techniques for preprocessing and transforming data
- Learn how to encode categorical variable
- Explore dimensionality reduction techniques
- Apply clustering and model stacking technique

UNIT	CONTENTS
UNIT – 1	The Machine Learning Pipeline: Data, Tasks, Models, Features, Model Evaluation, Fancy Tricks with Simple Numbers: Scalars, Vectors, and Spaces, Dealing with Counts, Binarization, Quantization or Binning, Log Transformation, Log Transform in Action, Power Transforms: Generalization of the Log Transform, Feature Scaling or Normalization, Min-Max Scaling, Standardization (Variance Scaling), ℓ_2 Normalization, Interaction Features, Feature Selection
UNIT – 2	Text Data: Flattening, Filtering, and Chunking: Bag-of-X: Turning NaturalText into Flat Vectors, Bag- of-Words, Bag-of-n-Grams, Filtering for Cleaner Features: Stopwords, Frequency-Based Filtering, Stemming; Atoms of Meaning: From Words to n-Grams to Phrases: Parsing and Tokenization, Collocation Extraction for Phrase Detection The Effects of Feature Scaling: From Bag-of-Words to Tf-Idf :Tf-Idf : A Simple Twist on Bag-of- Words, Putting It to the Test : Creating a Classification Dataset, Scaling Bag-of-Words with Tf-Idf Transformation, Classification with Logistic Regression, Tuning Logistic Regression with Regularization
UNIT – 3	Categorical Variables: Counting Eggs in the Age of Robotic Chickens: Encoding Categorical Variables: One-Hot Encoding, Dummy Coding, Effect Coding, Pros and Cons of Categorical Variable Encodings; Dealing with Large Categorical Variables: Feature Hashing, Bin Counting. Dimensionality Reduction: Squashing the Data Pancake with PCA: Intuition, Derivation: Linear Projection, Variance and Empirical Variance, Principal Components: First Formulation, Matrix-Vector Formulation, General Solution of the Principal Components; Transforming Features, Implementing PCA: PCA in Action, Whitening and ZCA, Considerations and Limitations of PCA
UNIT – 4	Nonlinear Featurization via K-Means Model Stacking: k-Means Clustering, Clustering as Surface Tiling, k-Means Featurization for Classification: Alternative Dense Featurization, Pros, Cons, and Gotchas



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

UNIT – 5	Item-Based Collaborative Filtering, First Pass: Data Import, Cleaning, and Feature Parsing, Academic Paper Recommender: Naïve Approach, Second Pass: More Engineering and a Smarter Model, Academic Paper Recommender: Take 2, Third Pass: More Features is More Information, Academic Paper Recommender: Take 3
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Text Books:

1. “Feature Engineering for Machine Learning Principles and Techniques for Data Scientists”, Alice Zheng & Amanda Casari, O’REILLY, 2018
2. “Feature Engineering and Selection: A Practical Approach for Predictive Models”, Max Kuhn, Kjell Johnson, CRC Press, 2019



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

II Semester	GENERATIVE AI	L	T	P	C
		3	0	0	3

Course Objectives:

The main objectives of the course are to

- Learn Python and TensorFlow skills for Generative AI.
- Study techniques for cleaning and preparing data for Generative AI tasks.
- Implement generative AI models
- Develop innovative applications using generative AI tools and techniques.

UNIT	CONTENTS
UNIT – 1	Introduction To GenAI: Historical Overview of Generative modelling, Difference between GenAI and Discriminative Modeling, Importance of generative models in AI and Machine Learning, Types of Generative models, GANs, VAEs, autoregressive models and Vector quantized Diffusion models, Understanding of probabilistic modeling and generative process, Challenges of Generative Modeling, Future of GenAI, Ethical Aspects of AI, Responsible AI, Use Cases
UNIT – 2	Generative Models For Text: Language Models Basics, Building blocks of Language models, Transformer Architecture, Encoder and Decoder, Attention mechanisms, Generation of Text, Models like BERT and GPT models, Generation of Text, Autoencoding, Regression Models, Exploring ChatGPT, Prompt Engineering: Designing Prompts, Revising Prompts using Reinforcement Learning from Human Feedback (RLHF), Retrieval Augmented Generation, Multimodal LLM, Issues of LLM like hallucination
UNIT – 3	Generation of Images: Introduction to Generative Adversarial Networks, Adversarial Training Process, Nash Equilibrium, Variational Autoencoders, Encoder-Decoder Architectures, Stable Diffusion Models, Introduction to Transformer-based Image Generation, CLIP, Visual Transformers ViT- DALL-E2 and DALL-E3, GPT-4V, Issues of Image Generation models like Mode Collapse and Stability.
UNIT – 4	Generation of Painting, Music, and Play: Variants of GAN, Types of GAN, Cyclic GAN, Using Cyclic GAN to Generate Paintings, Neural Style Transfer, Style Transfer, Music Generating RNN, MuseGAN, Autonomous agents, Deep Q Algorithm, Actor-critic Network.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

UNIT – 5	Open Source Models And Programming Frameworks: Training and Fine tuning of Generative models, GPT 4 All, Transfer learning and Pretrained models, Training vision models, Google Copilot, Programming LLM, LangChain, Open Source Models, Llama, Programming for TimeSformer, Deployment, Hugging Face.
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Text Books:

1. Denis Rothman, “Transformers for Natural Language Processing and Computer Vision”, Third Edition , Packt Books, 2024

Reference Books:

1. David Foster, ”Generative Deep Learning”, O’Reily Books, 2024.
2. Altaf Rehmani, “Generative AI for Everyone”, BlueRose One, 2024.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

II Semester	ADHOC SENSOR NETWORKS	L	T	P	C
		3	0	0	3

Course Objectives:

The main objectives of the course are to make students

- Understand the fundamental concepts of wireless sensor networks and have a basic knowledge of the various protocols at various layers.
- Architect sensor networks for various application setups.
- Devise appropriate data dissemination protocols and model links cost.
- Evaluate the performance of sensor networks and identify bottlenecks

UNIT	CONTENTS
UNIT – 1	Introduction: Fundamentals of Wireless Communication Technology, The Electromagnetic Spectrum, Radio propagation Mechanisms, Characteristics of the Wireless channel, mobile adhoc networks (MANETs), Wireless Sensor Networks (WSNs): concepts and architectures, Applications of adhoc and Sensor Networks, Design Challenges in adhoc and Sensor Networks
UNIT – 2	MAC Protocols for adhoc Wireless Networks: Issues in designing a MAC Protocol, Issues in Designing a MAC Protocol for adhoc Wireless Networks, Design Goals of a MAC Protocol for adhoc Wireless Networks, Classification of MAC Protocols, Contention based protocols, Contention based protocols with Reservation Mechanisms, Contention based protocols with Scheduling Mechanisms, Multi-channel MAC – IEEE 802.11.
UNIT – 3	Routing Protocols and Transport Layer in adhoc Wireless Networks: Routing Protocol: Issues in designing a routing protocol for adhoc networks, Classification, proactive routing, reactive routing (on-demand), hybrid routing, Transport Layer protocol for adhoc networks, Design Goals of a Transport Layer Protocol for adhoc Wireless Networks, Classification of Transport Layer solutions-TCP over adhoc wireless, Network Security, Security in adhoc Wireless Networks, Network Security Requirements.
UNIT – 4	Wireless Sensor Networks (WSNS) and Mac Protocols: Single node architecture, hardware and software components of a sensor node, WSN Network architecture: typical network architectures, data relaying and aggregation strategies, MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC -IEEE 802.15.4.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

UNIT – 5	WSN Routing, Localization & QoS: Issues in WSN routing, OLSR, Localization, Indoor and Sensor Network Localization, absolute and relative localization, triangulation, QoS in WSN, Energy Efficient Design, Synchronization.
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Text Books:

1. AdHoc Wireless Networks: Architectures and Protocols, C. Siva Ram Murthy, B. S. Manoj, Pearson Education.
2. Wireless Adhoc and Sensor Networks, Labiod. H, Wiley, 1st edition.
3. Wireless adhoc and sensor Networks: theory and applications, Li, X, Cambridge University Press, fifth edition.

Reference Books:

1. Adhoc& Sensor Networks: Theory and Applications, 2nd edition, Carlos De Moraes Cordeiro, Dharma Prakash Agrawal, World Scientific Publishing Company.
2. Wireless Sensor Networks, Feng Zhao, Leonides Guibas, Elsevier Publication, 2nd edition.
3. Protocols and Architectures for Wireless Sensor Networks, Holger Karl, Andreas Willig, Wiley.
4. Wireless Sensor Networks Technology, Protocols, and Applications, Kazem Sohraby, Daniel Minoli, & Taieb Znati, John Wiley.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

II Semester	NATURAL LANGUAGE PROCESSING	L	T	P	C
		3	0	0	3

Course Objectives:

The objectives of the course are to introduce the fundamental concepts and techniques of natural language processing (NLP).

UNIT	CONTENTS
UNIT – 1	Introduction: Origins and challenges of Natural Language Processing(NLP), Language Modeling: Grammar-based LM, Statistical LM, Regular Expressions, Finite-State Automata, English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance
UNIT – 2	Word Level Analysis: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part- of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging, Hidden Markov and Maximum Entropy models
UNIT – 3	Syntactic Analysis: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar, Dependency Grammar, Syntactic Parsing, Ambiguity, Dynamic Programming parsing, Shallow parsing Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs, Feature structures, Unification of feature structures
UNIT – 4	Semantics And Pragmatics: Requirements for representation, First-Order Logic, Description Logics, Syntax-Driven Semantic analysis, Semantic attachments, Word Senses, Relations between Senses, Thematic Roles, selectional restrictions, Word Sense Disambiguation(WSD), WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods, Word Similarity using Thesaurus and Distributional methods.
UNIT – 5	Discourse Analysis And Lexical Resources: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm, Coreference Resolution, Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill’s Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC), Deep learning applications for NLP.

Text Books:

1. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 2nd Edition, Daniel Jurafsky, James H. Martin, Pearson Publication, 2014.
2. Natural Language Processing with Python, First Edition, Steven Bird, Ewan Klein and



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering

M.Tech CSE R25

Edward Loper, O'Reilly Media.

Reference Books:

1. Language Processing with Java and Ling Pipe Cookbook, 1st Edition, Breck Baldwin, Atlantic Publisher, 2015.
2. Natural Language Processing with Java, 2nd Edition, Richard M Reese, O'Reilly Media, 2015.
3. Handbook of Natural Language Processing, 2nd Edition, Nitin Indurkha, Fred J. Damerau, Chapman and Hall/CRC Press.
4. Natural Language Processing and Information Retrieval, 3rd Edition, Tanveer Siddiqui, U.S. Tiwary, Oxford University Press.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

II Semester	SECURE CODING	L	T	P	C
		3	0	0	3

Course Objectives:

The main objectives of the course are to make students

- Understand various security attacks and knowledge to recognize and remove common coding errors that lead to vulnerabilities.
- Recognize opportunities to apply secure coding principles

UNIT	CONTENTS
UNIT – 1	Introduction- Need for secure systems, Proactive security development process, Security principles to live by, threat modelling.
UNIT – 2	Secure Coding in C- Character strings- String manipulation errors, String Vulnerabilities and exploits, Mitigation strategies for strings, Pointers, Mitigation strategies in pointer based vulnerabilities, Buffer Overflow based vulnerabilities
UNIT – 3	Secure Coding in C++ and Java- Dynamic memory management, Common errors in dynamic memory management, Memory managers, Double –free vulnerabilities, Integer security, Mitigation strategies
UNIT – 4	Database and Web Specific Input Issues- Quoting the Input, Use of stored procedures, Building SQL statements securely, XSS related attacks and remedies
UNIT – 5	Software Security Engineering- Requirements engineering for secure software: Misuse and abuse cases, SQUARE process model, Software security practices, knowledge for architecture and design

Text Books:

1. Writing Secure Code, 2nd Edition, Michael Howard, David LeBlanc, Microsoft Press.
2. Secure Coding in C and C++, Robert C. Seacord, 2nd edition, Pearson Education, 2013

Reference Books:

1. Software Security Engineering: A guide for Project Managers, 1st ed, Julia H. Allen, Sean J. Barnum, Robert J. Ellison, Gary McGraw, Nancy R. Mead, Addison-Wesley Professional.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

II Semester	BLOCK CHAIN TECHNOLOGIES	L	T	P	C
		3	0	0	3

Course Objectives:

The main objectives of the course are to

- Understand the Evolution and Fundamentals of Blockchain Technology
- Apply Cryptographic Principles in Blockchain Systems
- Evaluate the Underlying Technologies and Structures in Blockchain
- Compare and Analyze Consensus Mechanisms and Smart Contract Platforms
- Explore Real-World Applications and Limitations of Blockchain Technology

UNIT	CONTENTS
UNIT – 1	Introduction to Blockchain: Introduction, history of Bitcoin and origins of Blockchain, Fundamentals of Blockchain and key components (Chapter 1-book1), Permission and Permission-less platforms (Chapter 1-book2), Introduction to Cryptography, SHA256 and ECDSA, Hashing and Encryption, Symmetric/ Asymmetric keys, Private and Public Keys(Chapter 3-book2).
UNIT – 2	Technologies Borrowed in Blockchain: Technologies Borrowed in Blockchain, hash pointers, Digital cash, Bitcoin blockchain, Wallet, Blocks, Merkle Tree, hardness of mining, Transaction verifiability, Anonymity, forks, Double spending, Mathematical analysis of properties of Bitcoin, Bitcoin,- the challenges and solutions. (Chapter 3-book2).
UNIT – 3	Consensus Mechanisms: Consensus Algorithms: Proof of Work (PoW) as random oracle, Formal treatment of consistency, Liveness and Fairness, Proof of Stake (PoS) based Chains, Hybrid models (PoW + PoS), Byzantine Models of fault tolerance. (Chapter 1-book2)
UNIT – 4	Ethereum: Ethereum, Ethereum Virtual Machine (EVM), Wallets for Ethereum, Solidity, Smart Contracts (Chapter 5-book1), The Turing Completeness of Smart Contract Languages and verification challenges, Using smart contracts to enforce legal contracts, Comparing Bitcoin scripting vs. Ethereum Smart Contracts, Some attacks on smart contracts (Chapter 6 and Chapter 7-book2)
UNIT – 5	Hyperledger Fabric: Hyperledger fabric, the plug and play platform and mechanisms in permissioned blockchain, Beyond Cryptocurrency, applications of blockchain in cyber security, integrity of information, E-Governance and other contract enforcement mechanisms, Limitations of blockchain as a technology, myths vs reality of blockchain technology (Chapter 16-book1), (Chapter 9 -book2)



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

Text Books:

1. Blockchain Technology, Chandramouli Subramanian, Asha A George, Abhilash K A, Meena Karthikeyan, University Press, 2020.
2. Mastering Blockchain - Distributed ledger technology, decentralization, and smart contracts explained, Imran Bashir, 2nd ed. Edition, 2018, pakct publication

Reference Books:

1. Shukla, M. Dhawan, S.Sharma, S.Venkatesan, “Blockchain Technology: Cryptocurrency and Applications”, Oxford University Press, 2019.
2. Cryptography and network security principles and practice, William Stallings, Pearson, 8th edition,

WebReferences:

1. <https://drive.google.com/file/d/1PtYaDmWYaqPVGjKDnMYGWO5eoI5wMPtJ/view>
2. <https://archive.nptel.ac.in/courses/106/104/106104220/>
3. <https://www.tutorialspoint.com/blockchain/index.htm>



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

II Semester	DEVOPS	L	T	P	C
		3	0	0	3

Course Objectives:

The main objectives of this course are to:

- Describe the agile relationship between development and IT operations.
- Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
- Implement automated system update and DevOps lifecycle.

UNIT	CONTENTS
UNIT – 1	Introduction to DevOps: Introduction to SDLC, Agile Model. Introduction to DevOps. DevOps Features, DevOps Architecture, DevOps Lifecycle, Understanding Workflow and principles, Introduction to DevOps tools, Build Automation, Delivery Automation, Understanding Code Quality, Automation of CI/ CD. Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples
UNIT – 2	Source Code Management (GIT): The need for source code control, The history of source code management, Roles and code, source code management system and migrations. What is Version Control and GIT, GIT Installation, GIT features, GIT workflow, working with remote repository, GIT commands, GIT branching, GIT staging and collaboration. Unit Testing-Codecoverage: Junit ,nUnit & Code Coverage with Sonar Qube, SonarQube - Code Quality Analysis.
UNIT – 3	Build Automation - Continuous Integration (CI): Build Automation, CI, CI tools, Introduction to Jenkins (With Architecture), Jenkins workflow, Jenkins master slave architecture, Jenkins Pipelines, Pipeline Basics - Jenkins Master, Node, Agent, and Executor Freestyle Projects& Pipelines, Jenkins for Continuous Integration, Create and Manage Builds, User Management in Jenkins Schedule Builds, Launch Builds on Slave Nodes.
UNIT – 4	Continuous Delivery: Importance of Continuous Delivery, Continuous Deployment Flow, Containerization with Docker: Introduction to Docker, Docker installation, Docker commands, Images & Containers, Docker File, running containers, working with containers and publish to Docker Hub. Testing Tools: Introduction to Selenium and its features, Java Script testing
UNIT – 5	Configuration Management - Ansible: Introduction to Ansible, Ansible tasks Roles, Jinja2 templating, Vaults, Deployments using Ansible. Containerization Using Kubernetes: Introduction to Kubernetes Namespace & Resources, CI/CD - On OCP, BC, DC & Config Maps, Deploying Apps on Open shift Container



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

	Pods. Introduction to Puppet master and Chef
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Text Books

1. Joyner, Joseph., DevOps for Beginners: DevOps Software Development Method Guide for Software Developers and It Professionals, 1st Edition Mihails Konoplow.
2. Alisson Machado de Menezes., Hands-on DevOps with Linux, 1st Edition, BPB Publications, India, 2021.

Reference Books

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley;
2. Gene Kim Je Humble, Patrick Debois, John Willis. The DevOps Handbook, 1st Edition, IT Revolution Press, 2016.
3. Verona , Joakim Practical DevOps, 1st Edition, Packt Publishing, 2016.
4. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's View point. Wiley publications. ISBN:9788126579952

Web Resources:

1. <https://archive.nptel.ac.in/courses/106/104/106104220/>
2. <https://www.tutorialspoint.com/blockchain/index.htm>



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

II Semester	SOCIAL MEDIA ANALYTICS	L	T	P	C
		3	0	0	3

Course Objectives

The main objectives of the course are to make students to

- Understand the Evolution of the Web and the Role of Social Media and Utilize Hyperlink Analytics in Social Media
- Explore the Fundamentals of Social Media Analytics
- Apply Text Analytics to Social Media Content and Analyze Social Media User Actions and Engagement

UNIT	CONTENTS
UNIT – 1	Introduction To Social Media World Wide Web, Web 1.0, Web 2.0, Web 3.0, Social Media, Core Characteristics Of Social Media, Types Of Social Media, Social Networking Sites, Using Facebook For Business Purposes, Content Communities
UNIT – 2	Social Media Analytics Overview Purpose Of Social Media Analytics, Social Media Vs. Traditional Business Analytics, Seven Layers Of Social Media Analytics, Types Of Social Media Analytics, Social Media Analytics Cycle, Challenges To Social Media Analytics, Social Media Analytics Tools. Case Study: The Underground Campaign That Scored Big
UNIT – 3	Social Media Text Analytics Types Of Social Media Text, Purpose Of Text Analytics, Steps In Text Analytics, Social Media Text Analysis Tools. Case Study: Tapping Into Online Customer Opinions
UNIT – 4	Social Media Actions Analytics Introduction To Actions Analytics, Common Social Media Actions, Actions Analytics Tools. Case Study: Cover-More Group
UNIT – 5	Social Media Hyperlink Analytics Types Of Hyperlinks, Hyperlink Analytics, Types Of Hyperlink Analytics, Hyperlink Analytics Tools. Case Study: Hyperlinks And Viral YouTube Videos

Text Books:

1. Seven Layers Of Social Media Analytics Mining Business Insights From Social Media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, And Location Data By Gohar F. Khan ISBN: 1507823207, ISBN-13: 9781507823200



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

Reference Books:

1. Social Media Analytics: Techniques And Insights For Extracting Business Value Out Of Social Media By Matthew Ganis, Avinash Kohirkar, Pearson Education.
2. Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics, Marshall Sponder, MGH.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

II Semester	MACHINE LEARNING LAB	L	T	P	C
		0	0	4	2

Course Objectives:

The main objective of the course is to learn and apply central tendency measures and Data pre-processing techniques, classification & regression algorithms, and different clustering algorithms for a problem.

Software Required: Python/R/Weka

UNIT	CONTENTS
Experiment– 1	Compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation.
Experiment– 2	Apply the following Pre-processing techniques for a given dataset. a. Attribute selection b. Handling Missing Values c. Discretization d. Elimination of Outliers
Experiment– 3	Apply KNN algorithm for classification and regression
Experiment– 4	Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results
Experiment– 5	Demonstrate decision tree algorithm for a regression problem
Experiment– 6	Apply Random Forest algorithm for classification and regression
Experiment– 7	Demonstrate Naïve Bayes Classification algorithm
Experiment– 8	Apply Support Vector algorithm for classification
Experiment– 9	Demonstrate simple linear regression algorithm for a regression problem
Experiment– 10	Apply Logistic regression algorithm for a classification problem
Experiment– 11	Demonstrate Multi-layer Perceptron algorithm for a classification problem
Experiment– 12	Implement the K-means algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of the Euclidean distance of each example from its class center. Test the performance of the algorithm as a function of the parameters K.
Experiment– 13	Demonstrate the use of Fuzzy C-Means Clustering
Experiment– 14	Demonstrate the use of Expectation Maximization based clustering algorithm



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

II Semester	CRYPTOGRAPHY & NETWORK SECURITY LAB	L	T	P	C
		0	0	4	2

Course Objectives:

The main objective of this course is to implement various encryption and decryption mechanisms

List of Experiments:

Experiment 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.

Experiment 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.

Experiment 3:

Write a Java program to perform encryption and decryption using the following algorithms
a. Ceaser cipher b. Substitution cipher c. Hill Cipher

Experiment 4:

Write a C/JAVA program to implement the DES algorithm logic.

Experiment 5:

Write a C/JAVA program to implement the Blowfish algorithm logic.

Experiment 6:

Write a C/JAVA program to implement the Rijndael algorithm logic.

Experiment 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.

Experiment 8:

Write a Java program to implement RSA algorithm.

Experiment 9:

Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.

Experiment 10:

Calculate the message digest of a text using the SHA-1 algorithm in JAVA.

Experiment 11:

Calculate the message digest of a text using the MD5 algorithm in JAVA.



University College of Engineering Kakinada (A)
Department of Computer Science and Engineering
M.Tech CSE R25

III Semester	RESEARCH METHODOLOGY AND IPR	L	T	P	C
		3	0	0	3

Course Objectives:

The main objectives of the course are to make students to

- Understand the concept of a research problem
- Develop skills in the research process and learn effective literature review techniques
- Explore the nature and significance of intellectual property (IP)

UNIT	CONTENTS
UNIT – 1	Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations
UNIT – 2	Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee
UNIT – 3	Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT
UNIT – 4	Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.
UNIT – 5	New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs

Reference Books:

1. Stuart Melville, Wayne Goddard, “Research methodology: an introduction for science & engineering students”
2. Wayne Goddard, Stuart Melville, “Research Methodology: An Introduction”
3. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
4. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd.
5. Mayall, “Industrial Design”, McGraw Hill.
6. Niebel, “Product Design”, McGraw Hill.
7. Asimov, “Introduction to Design”, Prentice Hall.