



Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Shri Vaishnav Institute of Information Technology

Choice Based Credit System (CBCS) in the light of NEP-2020

M. Tech CSE

SEMESTER- III (2025-27)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTCS311N	DSE	Simulation and Modeling	60	20	20	30	20	3	0	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; *Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

The student will have ability to:

1. Introduce students to simulation and modeling techniques.
2. Provide a way for students with opportunities to develop basic simulation and modeling
3. Introduce concepts of modeling layers of society's & industrial real-world problems.
4. Build tools to view and control simulations and their results.

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Characterize a given engineering system in terms of its essential elements, that is, purpose, parameters, constraints, performance requirements, subsystems, interconnections and environmental context.
2. Develop a modeling strategy for a real world engineering system, which considers prediction and evaluation against design criteria, and integrates any required sub-system models.
3. Assess and select a model for an engineering system taking into consideration its suitability to facilitate engineering decision making and predicted advantages over alternative models.
4. Interpret the simulation results of an engineering system model, within the context of its capabilities and limitations, to address critical issues in an engineering project.

SYLLABUS

UNIT I

9 HOURS

Basic Simulation Modeling: The Nature of simulation system, models and simulation, discrete-event simulation, simulation of a single-server queuing, alternative approaches to modeling and coding simulations, network simulation, parallel and distributed simulation, simulation across the internet and web based simulation, steps in a sound simulation study, other types of simulation: continuous simulation, combined discrete-continuous simulation, Monte Carlo simulation, advantages, disadvantages and pitfalls of simulation.

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UNIT II	9 HOURS
Modeling Complex Systems: Introduction, list processing in simulation, approaches to storing lists in a computer linked storage allocation. Simulation examples using any simulation language: Single-server Queuing simulation with time-shared computer model, job-shop model, and event-list manipulation.	
UNIT III	9 HOURS
Discrete System Modeling: Classification of simulation models the simulation process, system investigation validation and translation, simulation of complex discrete-event systems with application in industrial and service organization tactical planning and management aspects, Random variable generation and analysis.	
UNIT IV	9 HOURS
Simulation Software: Comparison of simulation packages with programming languages classification of simulation software, general-purpose simulation packages, object-oriented simulation, building valid, credible and appropriately detailed simulation models, experimental design, sensitivity analysis and optimization simulation of manufacturing systems.	
UNIT V	9 HOURS
Embedded System Modeling: Embedded systems and system level design, models of computation, specification languages, hardware/software code design, system partitioning, application specific processors and memory, low power design. Real-Time system modeling, Fixed Priority scheduling, Dynamic Priority Scheduling. Data Communication Network modeling, IP network intradomain (e.g. OSPF, RIP) routing simulation.	
TEXTBOOKS:	
1.	Law Kelton,"Simulation Modeling and Analysis", McGraw-Hill

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REFERENCE:

1. Geoffrey Gordon, "System Simulation", PHI
2. Communication Systems S. Haykin, John Wiley & Sons.
3. Communication Systems: A.B. Carlson, Mc-Graw-HW.

LIST OF PRACTICALS

1. Simulate CPU scheduling algorithm using queueing system a) FCFS b) SJF c) Priority.
2. Simulate multiplexer/concentrator using queueing system.
3. Simulate congestion control algorithms.. Simulate Disk scheduling algorithms.. Simulate a Manufacturing shop and write a program in GPSS.
4. Simulate Telephone system model and write a program in SIMSCRIPT
5. Implementation of Link state routing algorithm
6. Implementation of data encryption and decryption
7. Implementation of VoIP using OPNET network simulator.
8. Install Network Simulator 2 and study network topologies.

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COURSE OBJECTIVES:

The student will have ability to:

1. To understand the basic principles, concepts and applications of data mining.
2. To identify and implement several methods to enhance and develop information systems and to manage the information system resources.
3. To develop skills of using recent data mining software for solving practical problems.
4. To gain experience of doing independent study and research.

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Show how to plan, acquire, and maintain information systems using data mining techniques.
2. Identify components in typical data mining architecture.
3. Understand typical knowledge discovery process and the different algorithms available by popular commercial data mining software.
4. Obtain hands-on experience with some popular data mining software.

SYLLABUS

UNIT I 9 HOURS

Data Mining: Introduction, KDD v/s Data Mining, stages of data mining process, Functionalities of data, task primitives, Pre-processing, Issues and Challenges, Application areas.

UNIT II 9 HOURS

Classification: Basic concepts, IR rules, Classification techniques, Decision tree, Covering rules, Model evaluation, practical issues. **Clustering:** Cluster/2, Partitioning methods, hierarchical methods, conceptual method. cluster analysis. outlier analysis.

UNIT III 9 HOURS

Association Algorithms: Rules, item sets, Generating item sets and rules, mining association, Correlation analysis.

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Prediction: Instance-based (nearest neighbour), Statistical (naive bayes), Bayesian networks, linear model.

UNIT IV

9 HOURS

Other DM tools and techniques & Web Mining: Fuzzy C-Mean algorithm, Genetic algorithm, Web Mining, Web content mining, Web structure Mining, Web Usage Mining. Temporal and spatial data mining, Training and testing data

UNIT V

9 HOURS

Text mining, Data Mining of Image and Video: A case study. Image and Video representation techniques, feature extraction and selection, motion analysis, content-based image and video retrieval, measuring the effectiveness of data mining techniques. Market baskets analysis, automatic cluster detection, link analysis, generic algorithms, data mining and corporate data warehouse, OLAP, Data mining software.

TEXTBOOKS:

1. “Introduction to data mining” by Tan, Steinbach & Kumar (2006), Pearson Publication.

REFERENCE:

1. Data Mining: Concepts and Techniques, Third Edition by Han, Kamber & Pei (2013)
2. Data Mining Techniques ; Arun K.Pujari ; University Press.
3. Data Mining; Adriaans & Zantinge; Pearson education.

LIST OF PRACTICALS

1. Introduction about launching the Weka tool.
2. Introduction to Weka Explorer.
3. Introduction to the classification of Mining techniques.
4. Introduction to Attribute Relation File Format (ARFF).
5. Analysis of weather data
6. Experiment on mining association rules
7. Preprocessing, Classification and Visualization technique experiment on data set.

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8.	Experiments on decision trees, rules
9.	Experiments with Weka on Prediction
10.	Demonstration of clustering rule process on dataset using k-mean.
11.	Demonstration of Association rule process on dataset test.arff using apriori algorithm.
12.	To perform Clustering technique on Customer dataset.
13.	To perform Association technique on Agriculture dataset.
14.	To perform classification technique on Weather dataset.

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COURSE OBJECTIVES:

The student will have ability to:

1. To impart the fundamentals concepts of mobile communication systems.
2. To introduce various technologies and protocols involved in mobile communication.
3. To enable the student to synthesis and analyze wireless and mobile cellular communication systems over a stochastic fading channel
4. To provide the student with an understanding of advanced multiple access techniques

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. By the end of the course, the student will be able to analyze and design wireless and mobile cellular systems.
2. By the end of the course, the student will have the ability to work in advanced research wireless and mobile cellular programs.
3. No specific programming language is required.

SYLLABUS

UNIT I

9 HOURS

Introduction to Cellular Mobile Systems: A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, overview of generations of cellular systems. Elements of Cellular Radio Systems Design and Interference: General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems, Introduction to co-channel interference, co-channel measurement design of antenna system, antenna parameter and their effects.

UNIT II

9 HOURS

Cell Coverage for Signal & Antenna Structures: General introduction, obtaining the mobile point to point mode, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model – characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation, Characteristics of basic antenna structures, antenna at cell site, mobile antennas.

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Frequency Management & Channel Assignment, Hand Off & Dropped Calls: Frequency Management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment, why hand off, types of hand off and their characteristics, dropped call rates & their evaluation.

UNIT III

9 HOURS

Modulation methods and coding for error detection and correction: Introduction to Digital modulation techniques, modulation methods in cellular wireless systems, OFDM, Block Coding, convolution coding and Turbo coding. Multiple access techniques: FDMA, TDMA, CDMA: Time-division multiple access (TDMA), code division multiple access (CDMA), CDMA capacity, probability of bit error considerations, CDMA compared with TDMA.

UNIT IV

9 HOURS

Mobile IP – Dynamic Host Configuration Protocol-Mobile Ad Hoc Routing Protocols– Multicast routing-TCP over Wireless Networks – Indirect TCP – Snooping TCP – Mobile TCP – Fast Retransmit / Fast Recovery – Transmission/Timeout Freezing-Selective Retransmission – Transaction Oriented TCP- TCP over 2.5 / 3G wireless Networks

UNIT V

9 HOURS

APPLICATION LAYER: WAP Model- Mobile Location based services -WAP Gateway –WAP protocols – WAP user agent profile- caching model-wireless bearers for WAP - WML – WML Scripts – WTA - iMode- SyncML

TEXTBOOKS:

1. William, C. Y. Lee, “Mobile Cellular Telecommunications”, 2nd Edition, McGraw Hill, 1990.
2. Mischa Schwartz, “Mobile Wireless Communications”, Cambridge University Press, UK, 2005

REFERENCE:

1. “Mobile Communication Hand Books”, 2nd Edition, IEEE Press.
2. Theodore S Rappaport, “Wireless Communication Principles and Practice”, 2nd Edition, Pearson Education, 2002.
3. Lawrence Harte, “3G Wireless Demystified”, McGraw Hill Publications, 2001.

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1.	Experiment of Wireless channel modeling and diversity using MATLAB
2.	Experiment of broadband wireless channel modeling using MATLAB
3.	Experiment of Spread Spectrum communication technique using MATLAB
4.	Experiment of CDMA using MATLAB
5.	Perform following experiments using CDMA trainer kit a-Spread spectrum and dispread spectrum experiment b-Carrier extraction experiment
6.	CDMA mobile communication system using CDMA trainer kit.
7.	Experiment of 3G network using 3G UMTS Communications Network Lab.
8.	Experiment of 4G network using 4G LTE Communications Network Lab
9.	Experiment of UWB system using MATLAB
10.	Analysis of MIMO Diversity using MATLAB

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COURSE OBJECTIVES:

The student will have ability to:

1. To develop professionals required to meet the needs of the industry in processing voluminous data
2. To promote an academic career for further research in theoretical as well as applied aspects of Big Data Analytics in providing an innovative, cost-effective processing of information for enhanced insight & decision making
3. To develop the spirit of entrepreneurship in providing solutions in this emerging domain
4. To generate professional who are good in core competency skills of Computer Science & Engineering as well as Big Data Analytics

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Be able to apply the knowledge of computing tools and techniques in the field of Big Data for solving real world problems encountered in the Software Industries.
2. Be able to analyze the various technologies & tools associated with Big Data.
3. Be able to identify the challenges in Big Data with respect to IT Industry and pursue quality research in this field with social relevance.

SYLLABUS

UNIT I 9 HOURS

INTRODUCTION TO BIG DATA 7 Big Data and its Importance, Four V's of Big Data , Drivers for Big Data , Introduction to Big Data Analytics , Big Data Analytics applications. Data science process , roles, stages in data science project , working with data from files , working with relational databases , exploring data , managing data , cleaning and sampling for modeling and validation , introduction to NoSQL

UNIT II 9 HOURS

Choosing and evaluating models , mapping problems to machine learning, evaluating clustering models, validating models , cluster analysis , K-means algorithm, Naïve Bayes , Memorization Methods , Linear and logistic regression , unsupervised methods. BIG DATA TECHNOLOGIES 8 Hadoop's Parallel World , Data discovery , Open source

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technology for Big Data Analytics , cloud and Big Data ,Predictive Analytics , Mobile Business Intelligence and Big Data , Crowd Sourcing Analytics , Inter- and Trans-Firewall Analytics - Information Management.

UNIT III 9 HOURS

P Reading and getting data into R , ordered and unordered factors , arrays and matrices , lists and data frames , reading data from files , probability distributions , statistical models in R - manipulating objects , data distribution. ROCESSING BIG DATA 7 Integrating disparate data stores - Mapping data to the programming framework - Connecting and extracting data from storage - Transforming data for processing - Subdividing data in preparation for Hadoop Map Reduce.

UNIT IV 9 HOURS

HADOOP MAPREDUCE, Employing Hadoop Map Reduce - Creating the components of Hadoop Map Reduce jobs - Distributing data processing across server farms -Executing Hadoop Map Reduce jobs - Monitoring the progress of job flows - The Building Blocks of Hadoop Map Reduce - Distinguishing Hadoop daemons - Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.

UNIT V 9 HOURS

ADVANCED ANALYTICS PLATFORM 7 Real-Time Architecture , Orchestration and Synthesis Using Analytics Engines , Discovery using Data at Rest , Implementation of Big Data Analytics , Big Data Convergence , Analytics Business Maturity Model.BIG DATA TOOLS AND TECHNIQUES 8 Installing and Running Pig , Comparison with Databases , Pig Latin , UserDefine Functions , Data Processing Operators , Installing and Running Hive , Hive QL , Tables , Querying Data , User-Defined Functions , Oracle Big Data.

TEXTBOOKS:

1. Michael Minelli, Michehe Chambers, “Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today’s Business”, 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.

REFERENCE:

1. Arvind Sathi, “Big Data Analytics: Disruptive Technologies for Changing the Game”, 1st Edition, IBM Corporation, 2012.

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MTCS314N	DSE	Big Data Analysis	60	20	20	30	20	3	0	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; *Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

2.	Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, 1st Edition, Wiley and SAS Business Series, 2012.
3.	Tom White, “Hadoop: The Definitive Guide”, 3rd Edition, O’reilly, 2012.

LIST OF PRACTICALS

1.	Set up a pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on Ubuntu Linux.
2.	Configuration of a multi-node Hadoop cluster(one master and multiple slaves)
3.	MapReduce application for word counting on Hadoop cluster
4.	Unstructured data into NoSQL data and do all operations such as NoSQL query with API.
5.	K-means clustering using map reduce
6.	Page Rank Computation
7.	Mahout machine learning library to facilitate the knowledge build up in big data analysis.
8.	Application of Recommendation Systems using Hadoop/mahout libraries.
9.	Application of SPARK for data analysis.
10.	

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTCS314N	DSE	Big Data Analysis	60	20	20	30	20	3	0	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTCS2052	DSE	Natural Language Processing	60	20	20	30	20	3	0	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; *Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

The student will have ability to:

1. Student shall be able to understand approaches to discourse, generation, dialogue and summarization with in Natural Language Processing.
2. Student shall be able to use core algorithms and data structures used in Natural Language Processing.
3. Student shall be able to build statistical NLP components, such as n-gram language models, text classifiers and part-of-speech taggers that learn from such corpora.
4. Student shall be able to understand machine learning techniques used in NLP, including hidden Markov models and others.

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Understand approaches to discourse, generation, dialogue and summarization within Natural Language Processing.
2. Implement core algorithms and data structures used in Natural Language Processing.
3. Build statistical Natural Language Processing (NLP) components, such as N-gram language models, Text classifiers and Part-of-speech taggers, that learn from such corpora.
4. Use machine learning techniques used in NLP, including Hidden Markov Models (HMMs) and probabilistic context-free grammars, clustering and unsupervised methods as applied within NLP.

SYLLABUS

UNIT I 9 HOURS

Introduction: Knowledge in Speech and Language Processing, Ambiguity, Models and Algorithms, Language, Thought, and Understanding, The State of the Art and The Near-Term Future, Some Brief History, Applications. The problem of ambiguity. The role of machine learning. Brief history of the field. **Words:** Regular Expressions and Automata, Morphology and Finite-State Transducers, N-grams Models, Hidden Markov and Maximum Entropy Models.

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MTCS2052	DSE	Natural Language Processing	60	20	20	30	20	3	0	2	4

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UNIT II		9 HOURS
Speech: Phonetics, Computational Phonology and Text-to-Speech, Probabilistic Models of Pronunciation and Spelling, Speech Synthesis, Hidden Markov Models, Automatic Speech Recognition, Speech Recognition: Advanced Topics. Computational Phonology.		
UNIT III		9 HOURS
Syntax: Word Classes and Part-of-Speech Tagging, Formal Grammars and treebanks of English, Syntactic Parsing, Efficient parsing for context-free grammars (CFGs), Lexicalized and Probabilistic Parsing, Statistical parsing and probabilistic CFGs (PCFGs), Statistical Parsing, Features and Unification, Language and Complexity.		
UNIT IV		9 HOURS
Semantics and Pragmatics: The Representation of Meaning, Lexical semantics and Word-Sense Disambiguation (WSD), Word Net, Computational Semantics, Computational Lexical Semantics, Semantic Analysis, Compositional semantics, Semantic Role Labeling and Semantic Parsing, Computational Discourse.		
UNIT V		9 HOURS
Applications: Information Extraction (IE), Question Answering (QA) and Summarization, Word Sense Disambiguation, Dialog and Conversational Agents, Language Generation, Machine Translation (MT).		
TEXTBOOKS:		
1.	Jurafsky, David, and James H. Martin. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition. Upper Saddle River, NJ: Prentice-Hall, 2000. ISBN: 0130950696.	
2.	Manning, Christopher D., and Hinrich Schütze. Foundations of Statistical Natural Language Processing. Cambridge, MA: MIT Press, 1999. ISBN: 0262133601.	
REFERENCE:		
1.	Bird, S., Klein, E., Loper, E.(2009). Natural Language Processing with Python. Sebastopol, CA: O'Reilly Media.	

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MTCS2052	DSE	Natural Language Processing	60	20	20	30	20	3	0	2	4

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LIST OF PRACTICALS	
1.	Program for morphological features of a word and its Analysis.
2.	Program to generate word forms from root and suffix information.
3.	Program to understand the morphology of a word by the use of Add-Delete table.
4.	Program to calculate bi-grams from a given corpus and calculate probability of a sentence.
5.	Program to apply add-one smoothing on sparse bi-gram table.
6.	Program to calculate emission and transition matrix which will be helpful for tagging Parts of Speech using Hidden Markov Model.
7.	Program to find POS tags of words in a sentence using Viterbi decoding.
8.	Program to know the importance of context and size of training corpus in learning Parts of Speech.
9.	Program to understand the concept of chunking and get familiar with the basic chunk tagset.
10.	Program to know the importance of selecting proper features for training a model and size of training corpus in learning how to do chunking.

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MTCS322N	DSE	Human Computer Interaction	60	20	20	30	20	3	0	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; *Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

The student will have ability to:

1. To facilitate communication between students of psychology, design, and computer science on user interface development projects.
2. To provide the future user interface designer with concepts and strategies for making design decisions.
3. To expose the future user interface designer to tools, techniques, and ideas for interface design.
4. To introduce the student to the literature of human-computer interaction.

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Explain the fundamental concepts, principles, and importance of Human-Computer Interaction, including human factors, usability, and user-centered design.
2. Analyze user requirements and apply HCI design principles to develop effective, accessible, and user-friendly interface designs.
3. Evaluate interactive systems using usability testing techniques, heuristic evaluation, and user feedback to improve user experience.
4. Design and prototype interactive user interfaces by applying HCI methodologies, design guidelines, and modern interface development tools.

SYLLABUS

UNIT I 9 HOURS

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 9 HOURS

Design process , Human interaction with computers, importance of human ,characteristics human consideration, Human interaction speeds, and understanding business junctions Screen Designing:- Design goals , Screen planning

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MTCS322N	DSE	Human Computer Interaction	60	20	20	30	20	3	0	2	4

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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 9 HOURS

Windows, New and Navigation schemes selection of window, selection of devices based and screen based controls.

UNIT IV 9 HOURS

Components, text and messages, Icons and increases, Multimedia, colors, uses problems, choosing colors. Software tools, Specification methods, interface, Building Tools.

UNIT V 9 HOURS

Interaction Devices , Keyboard and function keys , pointing devices , speech recognition digitization and generation , image and video displays , drivers.

TEXTBOOKS:

1. The essential guide to user interface design, Wilbert O Galitz, WileyDreamTech.
2. Designing the user interface. 3rd Edition Ben Shneidermann , Pearson Education Asia

REFERENCE:

1. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech,
3. User Interface Design, Soren Lauesen , Pearson Education.

LIST OF PRACTICALS

1. Othogonal Corners.
2. Web page Aesthetics.
3. Metabolic Pathways.
4. Graph Algorithms.

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MTCS322N	DSE	Human Computer Interaction	60	20	20	30	20	3	0	2	4

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5.	DAG Map.
6.	Euler Diagrams.
7.	Shortest Path.
8.	Aural Table.
9.	Screen Layout.
10.	Spring Dynamic Graph.

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MTCS323N	DSE	Network & Web Security	60	20	20	30	20	3	0	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; *Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

The student will have ability to:

1. Understand the fundamental principles of access control models and techniques, authentication and secure system design.
2. Apply methods for authentication, access control, intrusion detection and prevention.
3. Identify and mitigate software security vulnerabilities in existing systems.
4. Understand the role of firewalls, IPSec, Virtual Private Networks and identity management, etc.

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. To master information security governance, and related legal and regulatory issues
2. To master understanding external and internal threats to an organization
3. To be familiarity with information security awareness and a clear understanding of its importance
4. To master fundamentals of secret and public cryptography

SYLLABUS

UNIT I 9 HOURS

Introduction to Security in Networks – Characteristics of Networks – Intrusion – Kinds of security breaches – Plan of attack - Points of vulnerability – Methods of defense – Control measures – Effectiveness of controls

UNIT II 9 HOURS

Basic encryption and decryption, Encryption techniques, Characteristics of good encryption systems, Secret key cryptography, Data Encryption Standard, International Data Encryption Algorithm, Advanced Encryption Standard, Hash and MAC algorithms

UNIT III 9 HOURS

Public Key encryptions, Introduction to number theory, RSA algorithm, Diffie-Hellman Digital Signature standard, Elliptic Curve cryptography, Digital signatures and authentication, Trusted intermediaries, Security handshake pitfalls

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MTCS323N	DSE	Network & Web Security	60	20	20	30	20	3	0	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; *Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

UNIT IV	9 HOURS
Network security basics, TCP/IP vulnerabilities Layer wise: Packet Sniffing, ARP spoofing, port scanning, IP spoofing, TCP syn flood, DNS Spoofing, Internet Security Protocols: SSL, TLS, IPSEC, Secure Email and S/MIME, Denial of Service: Classic DOS attacks, Source Address spoofing, ICMP flood, SYN flood, UDP flood, Distributed Denial of Service, Defenses against Denial of Service Attacks. Firewalls, Intrusion Detection Systems: Host Based and Network Based IDS, Honey pots.	
UNIT V	9 HOURS
User Authentication and session management, Cookies, Secure HTTP, SQL Injection Techniques, Cross Site Scripting, Cross-Site Request Forgery, Session Hijacking and Management, Phishing and Pharming Techniques, Web Services Security.	
TEXTBOOKS:	
1.	Computer Security Principles and Practice, by William Stallings, Pearson Education.
REFERENCE:	
1.	Information security Principles and Practice by Mark Stamp, Wiley publication.
2.	Network security bible 2nd edition, Eric Cole, Wiley India.
3.	Charlie Kaufman, Radia Perlman and Mike Speciner, “Network Security: Private Communication in a public world”, Prentice Hall India, 2nd Edition, 2002.
LIST OF PRACTICALS	
1.	Design and implement the RSA cryptosystem.
2.	Implement Digital signature scheme using RSA.
3.	Simulate the Buffer overflow attack.
4.	Simulate the Salami attack.

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MTCS323N	DSE	Network & Web Security	60	20	20	30	20	3	0	2	4

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5.	Design and implement a program for adding passwords to a file. The program should be able to filter out weak passwords (based on dictionary words or variants) and store the strong passwords by creating a hash of user ID and password.
6.	Study of a packet sniffer like wireshark, or tcpdump. Use this tool to capture and analyze data in packets.
7.	Download and install nmap. Use it with different options to scan open ports, perform OS fingerprinting, do a ping scan, tcp port scan, udp port scan, etc
8.	Detect ARP spoofing using open source tool ARPWATCH.
9.	Use of iptables in linux to create firewalls.

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MTCS324N	DSE	Wireless Sensor Adhoc Network	60	20	20	30	20	3	0	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; *Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

The student will have ability to:

1. To introduce the characteristics, basic concepts and systems issues in mobile and pervasive computing
2. To illustrate architecture and protocols in pervasive computing and to identify the trends and latest development of the technologies in the area.
3. To give practical experience in the area through the design and execution of a modest research project.
4. To design successful mobile and pervasive computing applications and services

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. To discover the characteristics of pervasive computing applications including the major system components and architectures of the systems.
2. To analyze the strengths and limitations of the tools and devices for development of pervasive computing systems.
3. To explore the characteristics of different types of mobile networks on the performance of a pervasive computing system.
4. To analyze and compare the performance of different data dissemination techniques and algorithms for mobile real-time applications

SYLLABUS

UNIT I

9 HOURS

What is an Ad Hoc Network? Heterogeneity in Mobile Devices , Wireless Sensor Networks ,Traffic Profiles , Types of Ad hoc Mobile Communications , Types of Mobile Host Movements Challenges Facing Ad hoc Mobile Networks , Ad hoc wireless Internet . Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks , Classifications of Routing Protocols , Table Driven Routing Protocols , Destination Sequenced Distance Vector (DSDV) , Wireless Routing Protocol (WRP) , Cluster Switch Gateway Routing (CSGR) , Source, Initiated On, Demand Approaches , Ad hoc On, Demand Distance Vector Routing (AODV) , Dynamic Source Routing (DSR) , Temporally Ordered

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MTCS324N	DSE	Wireless Sensor Adhoc Network	60	20	20	30	20	3	0	2	4

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Routing Algorithm (TORA) , Signal Stability Routing (SSR) ,Location, Aided Routing (LAR) , Power, Aware Routing (PAR) , Zone Routing Protocol (ZRP).

UNIT II

9 HOURS

Issues in Designing a Multicast Routing Protocol , Operation of Multicast Routing Protocols , An Architecture Reference Model for Multicast Routing Protocols , Classifications of Multicast Routing Protocols , Tree, Based Multicast Routing Protocols, Mesh ,Based Multicast Routing Protocols , Summary of Tree and Mesh based Protocols , Energy, Efficient Multicasting ,Multicasting with Quality of Service Guarantees , Application , Dependent Multicast Routing ,Comparisons of Multicast Routing Protocols - Design Goals of a Transport Layer Protocol for Ad hoc Wireless Networks ,Classification of Transport Layer Solutions , TCP over 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 III

9 HOURS

Issues and Challenges in Providing QoS in Ad hoc Wireless Networks , Classifications of QoS Solutions , MAC Layer Solutions , Network Layer Solutions , QoS Frameworks for Ad hoc Wireless Networks Energy Management in Ad hoc Wireless Networks , Introduction , Need for Energy Management in Ad hoc Wireless Networks , Classification of Energy Management Schemes , Battery Management Schemes , Transmission Power Management Schemes , System Power Management Schemes.

UNIT IV

9 HOURS

Single node architecture Hardware components, energy consumption of sensor nodes, Network architecture , Sensor network scenarios, types of sources and sinks, single hop versus multi-hop networks, multiple sinks and sources, design principles, Development of wireless sensor networks. physical layer and transceiver design consideration in wireless sensor networks, Energy usage profile, choice of modulation, Power Management , MAC protocols , fundamentals of wireless MAC protocols, low duty cycle protocols and wakeup concepts, contention-based protocols, Schedule-based protocols SMAC, BMAC, Traffic adaptive medium access protocol (TRAMA), Link Layer protocols fundamentals task and requirements, error control, framing, link management.

UNIT V

9 HOURS

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M. Tech CSE

SEMESTER- III (2025-27)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTCS324N	DSE	Wireless Sensor Adhoc Network	60	20	20	30	20	3	0	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; *Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Gossiping and agent-based uni-cast forwarding, Energy-efficient unicast, Broadcast and multicast, geographic routing, mobile nodes, Data-centric routing , SPIN, Directed Diffusion, Energy aware routing, Gradient-based routing , COUGAR, ACQUIRE, Hierarchical Routing , LEACH, PEGASIS, Location Based Routing , GAF, GEAR, Data aggregation , Various aggregation techniques. Introduction to TinyOS , NesC, Interfaces, modules, configuration, Programming in TinyOS using

TEXTBOOKS:

1. C. Siva Ram Murthy and B. S. Manoj, “Ad Hoc Wireless Networks Architectures and Protocols”, Prentice Hall, PTR, 2004.
2. C. K. Toh, “Ad Hoc Mobile Wireless Networks Protocols and Systems”, Prentice Hall, PTR, 2001.

REFERENCE:

1. Holger Karl , Andreas willig, “Protocol and Architecture for Wireless Sensor Networks”, John wiley publication, Jan 2006.
2. K.Akkaya and M.Younis, “ A Survey of routing protocols in wireless sensor networks”, Elsevier Adhoc Network Journal, Vol.3, no.3,pp. 325-349, 2005.
3. I.F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci, “Wireless sensor networks: a survey”, computer networks, Elsevier, 2002, 394 - 422.

LIST OF PRACTICALS

1. Develop unicast routing protocols using any suitable Network Simulator for (Mobile Ad hoc Networks) MANET to find the best route using the any one of routing protocols from each category from table-driven (e.g., link state or DSDV) on demand (e.g., DSR, AODV, TORA), hybrid (e.g., ZRP, contact-based architectures) and hierarchical (e.g., cluster based.) The efficient path/route should be established for source and destination data transmission using routing protocols. Understand the advantages and disadvantages of each routing protocol types by observing the performance metrics of the routing protocol. In that way the best application/environment suitable routing protocol can be identified in each category.
2. Develop multicast routing protocols using any suitable Network Simulator for MANET in which session nodes are connecting through either tree(MAODV, MCEDAR) or mesh (ODMRP, CAMP, FGMP) structure. Analyze the performance metrics of multicast routing protocols with unicast routing protocols.

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3.	Develop MAC Protocol using any suitable Network Simulator for MANETs to send the packet without any contention through wireless link using the following MAC protocols; (CSMA/CA (802.11), MACA, MACAW, PAMAS, and SMAC). Analyze its performance with increasing node density and mobility.

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