



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 with Specialization in Information Security)

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*				
MTIT313	DCC	Secure Coding	60	20	20	0	0	3	0	0	3

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 fundamental principles of secure software development and the importance of writing secure code to protect applications from cyber threats.
- 2 To develop an understanding of common software vulnerabilities, secure coding standards, and best practices for preventing security flaws during software development.
- 3 To familiarize students with secure design principles, authentication, authorization, input validation, encryption, error handling, and secure session management techniques.
- 4 To provide practical experience in identifying, analyzing, testing, and mitigating security vulnerabilities using secure coding tools and techniques.

COURSE OUTCOMES:

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

- 1 Understand the basics of secure programming.
- 2 Understand the most frequent programming errors leading to software vulnerabilities.
- 3 Identify and analyze security problems in software
- 4 Understand and protect against security threats and software vulnerabilities

SYLLABUS

UNIT I

10 HOURS

Security, CIA Triad, Viruses, Trojans, and Worms In a Nutshell, Security Concepts- exploit, threat, vulnerability, risk, attack. Malware Terminology: Rootkits, Trapdoors, Botnets, Key loggers, Honeypots. Active and Passive Security Attacks. IP Spoofing, Tear drop, DoS, DDoS, XSS, SQL injection, Smurf, Man in middle, Format String attack. Types of Security Vulnerabilities- buffer overflows, Invalidated input, race conditions, access-control problems, weaknesses in authentication, authorization, or cryptographic practices. Access Control Problems.

UNIT II

9 HOURS

Need for secure systems: Proactive Security development process, Secure Software Development Cycle (S-

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MTIT313	DCC	Secure Coding	60	20	20	0	0	3	0	0	3

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SDLC), Security issues while writing SRS, Design phase security, Development Phase, Test Phase, Maintenance Phase, Writing Secure Code – Best Practices SD3(Secure by design, default and deployment), Security principles and Secure Product Development Timeline.

UNIT III

8 HOURS

Threat modelling process and its benefits: Identifying the Threats by Using Attack Trees and rating threats using DREAD, Risk Mitigation Techniques and Security Best Practices. Security techniques, authentication, authorization. Defence in Depth and Principle of Least Privilege

UNIT IV

7 HOURS

Secure Coding Techniques: Protection against DoS attacks, Application Failure Attacks, CPU Starvation Attacks, Insecure Coding Practices In Java Technology. ARP Spoofing and its countermeasures. Buffer Overrun- Stack overrun, Heap Overrun, Array Indexing Errors, Format String Bugs. Security Issues in C Language: String Handling, Avoiding Integer Overflows and Underflows and Type Conversion Issues- Memory Management Issues, Code Injection Attacks, Canary based countermeasures using Stack Guard and Pro police. Socket Security, Avoiding Server Hijacking, Securing RPC, ActiveX and DCOM.

UNIT V

8 HOURS

Database and Web-specific issues: SQL Injection Techniques and Remedies, Race conditions, Time of Check Versus Time of Use and its protection mechanisms. Validating Input and M.Tech. in Cyber Security 36 Interprocess Communication, Securing Signal Handlers and FileOperations. XSS scripting attack and its types – Persistent and Non persistent attack XSS Countermeasures and Bypassing the XSS Filters.

TEXTBOOKS:

1. Writing Secure Code, Michael Howard and David LeBlanc, Microsoft Press

REFERENCE:

1. Buffer Overflow Attacks: Detect, Exploit, Prevent by Jason Deckar, Syngress.
2. Threat Modeling, Frank Swiderski and Window Snyder, Microsoft Professional.

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MTIT311	DCC	Advance Algorithm	60	20	20	0	0	3	0	0	3

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	Introduces the recurrence relations for analyzing the algorithms.
2	Introduces the graphs and their traversals.
3	Describes major algorithmic techniques (divide-and-conquer, greedy, dynamic programming, Brute Force, Transform and Conquer approaches) and mention problems for which each technique is appropriate.
4	Introduces string matching algorithms.

COURSE OUTCOMES:

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

1	Ability to analyze the performance of algorithms.
2	Ability to choose appropriate data structures and algorithm design methods for a specified application.
3	Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs

SYLLABUS

UNIT I	9 HOURS
Introduction: Role of Algorithms in computing, Order Notation, Recurrences, Probabilistic Analysis and Randomized Algorithms. Sorting and Order Statistics: Heap sort, Quick sort and Sorting in Linear Time. Advanced Design and Analysis Techniques: Dynamic Programming- Matrix chain Multiplication, Longest common Subsequence and optimal binary Search trees.	
UNIT II	9 HOURS
Greedy Algorithms - Huffman Codes, Activity Selection Problem. Amortized Analysis. Graph Algorithms: Topological Sorting, Minimum Spanning trees, Single Source Shortest Paths, Maximum Flow algorithms.	

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UNIT III	9 HOURS
Sorting Networks: Comparison Networks, Zero-one principle, bitonic Sorting Networks, Merging Network, Sorting Network. R16 B.TECH CSE. Matrix Operations- Strassen's Matrix Multiplication, inverting matrices, Solving system of linear Equations.	
UNIT IV	9 HOURS
String Matching: Naive String Matching, Rabin-Karp algorithm, matching with finiteAutomata, Knuth- Morris - Pratt algorithm.	
UNIT V	9 HOURS
NP-Completeness and Approximation Algorithms: Polynomial time, polynomial time verification, NP-Completeness and reducibility, NP-Complete problems. Approximation Algorithms- Vertex cover Problem, Travelling Sales person problem	
TEXTBOOKS:	
1.	Introduction to Algorithms," T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, Third Edition, PHI.
REFERENCE:	
1.	Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Galgotia publications pvt. Ltd.
2.	Design and Analysis Algorithms - Parag Himanshu Dave, Himanshu Bhalchandra Dave Publisher: Pearson
3.	Algorithm Design: Foundations, Analysis and Internet examples, M.T. Goodrich and R. Tomassia, John Wiley and sons.
4.	Data structures and Algorithm Analysis in C++, Allen Weiss, Second edition, Pearson education

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MTIT321	DCC	Biometric System and Security	60	20	20	0	0	3	0	0	3

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COURSE OBJECTIVES:

The student will have ability to:

1	To provide students with understanding of biometrics, biometric Equipment and standards applied to security.
2	To introduce the fundamental concepts, principles, and components of biometric systems and their role in modern security applications.
3	To develop an understanding of various biometric modalities such as fingerprint, face, iris, palmprint, voice, and behavioral biometrics, along with their recognition techniques.
4	To familiarize students with biometric system architecture, feature extraction, matching algorithms, performance evaluation, and standards used in biometric authentication.

COURSE OUTCOMES:

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

1	Demonstrate knowledge of the basic physical and biological science and engineering principles underlying biometric systems.
2	Understand and analyze biometric systems at the component level and be able to analyze and design basic biometric system applications.
3	Be able to work effectively in teams and express their work and ideas orally and in writing.
4	Identify the sociological and acceptance issues associated with the design and implementation of biometric systems.
5	Understand various Biometric security issues.

SYLLABUS

UNIT I	9 HOURS
Biometrics- Introduction- benefits of biometrics over traditional authentication systems - benefits of biometrics in identification systems-selecting a biometric for a system Applications - Key biometric terms and processes - biometric matching methods -Accuracy in biometric systems.	
UNIT II	9 HOURS

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MTIT321	DCC	Biometric System and Security	60	20	20	0	0	3	0	0	3

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Physiological Biometric Technologies: Fingerprints - Technical description – characteristics - Competing technologies - strengths – weaknesses – deployment - Facial scan –
Technical description - characteristics - weaknesses-deployment - Iris scan - Technical description – characteristics - strengths – weaknesses – deployment - Retina vascular pattern

UNIT III

9 HOURS

Technical description – characteristics - strengths – weaknesses –deployment - Handscan - Technical description- characteristics - strengths – weaknesses deployment – DNA biometrics. Behavioral Biometric Technologies: Handprint Biometrics - DNA Biometrics.

UNIT IV

9 HOURS

signature and handwriting technology - Technical description –classification – keyboard / keystroke dynamics- Voice – data acquisition - feature extraction - characteristics - strengths – weaknesses-deployment.

UNIT V

9 HOURS

Multi biometrics and multi factor biometrics - two-factor authentication with passwords - tickets and tokens – executive decision - implementation plan.

TEXTBOOKS:

- Samir Nanavathi, Michel Thieme, and Raj Nanavathi : “Biometrics -Identity verification in a network”, 1st Edition, Wiley Eastern, 2002.
- John Chirillo and Scott Blaul : “Implementing Biometric Security”, 1st Edition, Wiley Eastern Publication, 2005.

REFERENCE:

- John Berger: “Biometrics for Network Security”, 1st Edition, Prentice Hall, 2004.

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MTIT312	DCC	Digital Forensic Security Audit	60-	20	20	0	0	3	0	0	3

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COURSE OBJECTIVES:

The student will have ability to:

1	To provide students with understanding of forensic, forensic Equipment and standards applied to security
2	To develop knowledge of digital evidence acquisition, preservation, analysis, documentation, and reporting while maintaining the integrity and admissibility of evidence.
3	To familiarize students with security audit frameworks, vulnerability assessment, risk analysis, compliance standards, and audit procedures for information systems and networks.
4	To provide practical exposure to forensic investigation tools, log analysis, malware analysis, incident response, and security audit techniques used in real-world scenarios.

COURSE OUTCOMES:

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

1	Apply authentication applications in different networks.
2	Understand security services for email.
3	Awareness of firewall and it applications.

SYLLABUS

UNIT I	9 HOURS
Ethical hacking, Attack Vectors, Cyberspace and Criminal Behaviour, Clarification of Terms, Traditional Problems associated with Computer Crimes, Realms of Cyber world, brief history of the internet, contaminants and destruction of data, unauthorized access, computer intrusions, white-collar crimes, viruses and malicious code, virus attacks, pornography, software piracy, mail bombs, exploitation, stalking and obscenity in internet, Cyber psychology, SocialEngineering.	
UNIT II	9 HOURS
Introduction to Digital forensics, Forensic software and handling, forensic hardware and handling, analysis and advanced tools, forensic technology and practices, Biometrics: face, iris and fingerprint recognition, Audio-video evidence collection, Preservation and Forensic Analysis.	

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MTIT312	DCC	Digital Forensic Security Audit	60-	20	20	0	0	3	0	0	3

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UNIT III	9 HOURS
Auditing: Internal Audit and IT Audit Function, IT Governance, Frameworks, Standards, and Regulations, Identifying information assets, Risk assessment, Risk management, Types of Auditing, ISO 27001,	
UNIT IV	9 HOURS
Forensic Analysis of OS artifact, Internet Artifacts, File System Artifacts, Registry Artifacts, Application Artifacts, Report Writing, Mobile Forensic- identification, collection and preservation of mobile evidences, social media analysis, data retrival, Email analysis from mobile phones	
UNIT V	9 HOURS
Forensic Tools and Processing of Electronic Evidence Introduction to Forensic Tools, Usage of Slack space, tools for Disk Imaging, Data Recovery, Vulnerability Assessment Tools, Encase and FTK tools, Anti Forensics and probable counters, retrieving information, process of computer forensics and digital investigations, processing of digital evidence, digital images, damaged SIM and data recovery, multimedia evidence, retrieving deleted data: desktops, laptopsand mobiles, retrieving data from slack space, renamed file, ghosting, compressed files.	
TEXTBOOKS:	
1.	Charles P. Fleegeer, "Security in Computing", Prentice Hall, New Delhi, 2009.
REFERENCE:	
1.	William Stallings, —Cryptography and Network Security, Prentice Hall, New Delhi, 2006
2.	Chalie Kaufman, Radia Perlman, Mike Speciner, —Network Security: Private Communication in a Public Networkl, Pearson Education, New Delhi, 2004.

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MTIT322	DCC	Social Network Analysis	60	20	20	0	0	3	0	0	3

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 Develop semantic web related applications.
- 2 Represent knowledge using ontology.
- 3 Predict human behaviour in social web and related communities.

COURSE OUTCOMES:

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

- 1 To understand the concept of semantic web and related applications
- 2 To learn knowledge representation using ontology.
- 3 To understand human behaviour in social web and related communities.
- 4 To learn visualization of social networks.

SYLLABUS

UNIT I

9 HOURS

Introduction to Social Network Analysis

Introduction to Semantic Web: Limitations of current Web, Development of Semantic Web, Emergence of the Social Web; Social Network analysis: Definition, scope, development of Social Network Analysis, key concepts and measures in network analysis; steps in social network analysis: network definition, manipulation, calculation, visualization; electronic sources for network analysis: Electronic discussion networks; Blogs and online communities, Web-based networks, Applications of Social Network Analysis, Technological networks; Sampling and data characteristics, Review of Graph Properties /Visualization

UNIT II

9 HOURS

Large-scale Structure of Networks / Algorithms

Shortest-paths and the small-world effect; Degree distributions; Power laws and scale-free networks; clustering coefficients; Basic graph algorithms: computing properties of nodes and dyads; Maximum flow; Network Growth Models; Link Analysis; Prediction; Cascade Behavior and Network Effects; Anomaly Detection

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MTIT322	DCC	Social Network Analysis	60	20	20	0	0	3	0	0	3

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UNIT III		9 HOURS
Ego Analysis / Bi-partite networks Analysis of local networks; Structural holes theory; Measures of constraint; Bi-partite and affiliation networks; One-mode projections and analyse.		
UNIT IV		9 HOURS
Exponential Random Graph Modelling Frameworks for evaluating results in network analysis: autocorrelation, matching techniques, QA Pregression, exponential random graphs, and p* models. Computational considerations		
UNIT V		9 HOURS
Network Evolution Actor models; Network dynamics vs behavior dynamics; RSiena; Model creation and estimation; Animation with RSonia;		
TEXTBOOKS:		
1.	Tanmoy Chakraborty, Social Network Analysis, Wiley, 2021	
REFERENCE:		
1.	Stanley Wasserman, Katherine Faus; Social Network Analysis: Methods and Applications; Cambridge University Press	
2.	Peter Mika, Social Networks and the Semantic Web, 1st Edition, Springer 2007.	

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MTIT323	DCC	Cyber Lawand IPR	60	20	20	0	0	3	0	0	3

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COURSE OBJECTIVES:

The student will have ability to:

1	Describe phases of information security management and functional management
2	Define information Security Life Cycle and security policy methodology
3	Illustrate business continuity planning, risk management and security assessment project
4	Analyses legal, regulatory requirements, and international standards requirements, pertaining to computer security and audit

COURSE OUTCOMES:

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

1	Examine the legislative measure against cyber crime
2	Outline various Sections and IT laws on cyber-crimes in different nations

SYLLABUS

UNIT I	9 HOURS
Introduction to cyber crime and cyber law, cyber space and information technology, Nature and scope of cyber crime, Jurisdiction of cyber crime.	
UNIT II	9 HOURS
Important definitions under IT Act 2000, Cyber crime issues: unauthorized access, White collar crimes, viruses, malwares, worms, Trojans, logic bomb, Cyber stalking, voyeurism, obscenity in internet, Software piracy,	
UNIT III	9 HOURS
IT Act 2000, offences under IT Act and IT (amendment) Act, 2008. CRPC overview, Case studies, Role of intermediaries, Electronic evidence, Cyber terrorism, espionage, warfare and protected system	
UNIT IV	9 HOURS
Overview of amended laws by the IT Act, 2000: The Indian Penal Code, 1860, The Indian Evidence Act, 1872,	

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTIT323	DCC	Cyber Lawand IPR	60	20	20	0	0	3	0	0	3

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.

The Banker's Book Evidence Act, 1891, The Reserve Bank of India Act, 1934, Cyber Theft and the Indian Telegraph Act, 1885. Relevant Case laws. Digital Signatures and certificate-legal issues

UNIT V

9 HOURS

Intellectual Property rights: Introduction to IP, Copyright, Related Rights, Trademarks, Geographical Indications, Industrial Design, Patents, Licensing and transfer of technology, WIPO Treaties, Copyrights Act, Patents Act, Trademarks Act

TEXTBOOKS:

1. Cyber Security, Cyber Crime and Cyber Forensics: Applications and Perspectives, Raghu Santanam, M. Set humadhavan, Information Science Reference
2. Pfleeger, Charles P. and Shari L. Pfleeger. Security in Computing, 4th Edition. Upper Saddle River, NJ: Prentice Hall, 2008

REFERENCE:

1. Cybercrime: Security and Surveillance in the Information Age, Douglas Thomas; Brian Loader
2. Computer Crime: A Crime-Fighters Handbook by David Icove N. Grabosky
3. Cyberlaw – The Indian Perspective By Pavan Duggal, Saakshar Law Publications. Jonathan Rosenoer, "Cyber Law: The law of the Internet", Springer-Verlag, 1997

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