

Shri Vaishnav Vidyapeeth Vishwavidyalaya
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 (2023-2025)

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 *				
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 Educational Objectives (CEOs):

- Introduces the recurrence relations for analyzing the algorithms.
- Introduces the graphs and their traversals.
- 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.
- Describes how to evaluate and compare different algorithms using worst-case, average-case and best-case analysis.
- Introduces string matching algorithms.
- Introduces linear programming.

Course Outcomes (COs):

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

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

COURSE CODE	CATEGOR Y	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
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SYLLABUS:

UNIT - I

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

Greedy Algorithms - Huffman Codes, Activity Selection Problem. Amortized Analysis.

Graph Algorithms: Topological Sorting, Minimum Spanning trees, Single Source Shortest Paths, Maximum Flow algorithms.

UNIT - III

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

String Matching: Naive String Matching, Rabin-Karp algorithm, matching with finite Automata, Knuth- Morris - Pratt algorithm.

UNIT - V

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

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TEXT BOOK:

1. Introduction to Algorithms," T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, Third Edition, PHI.

REFERENCES:

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

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;

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Course Educational Objective:

To provide students with understanding of biometrics, biometric Equipment and standards applied to security.

Course Outcomes:

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.

UNIT-I

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

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

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UNIT-V

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

TEXT BOOKS:

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

REFERENCES:

1. 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 Educational Objective:

To provide students with understanding of forensic, forensic Equipment and standards applied to security

Course Outcomes:

Understand the threats in networks and security concepts.

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

Syllabus

Unit-I:

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, Social Engineering.

Unit-II

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.

Unit-III:

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,

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Forensic Analysis of OS artifact, Internet Artifacts, File System Artifacts, Registry Artifacts, ApplicationArtifacts, Report Writing, Mobile Forensic- identification, collection and preservation of mobile evidences,social media analysis, data retrieval, Email analysis from mobile phones

UNIT-V:

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, laptops and mobiles, retrieving data from slack space, renamed file, ghosting, compressed files.

Text & References:

- Charles P. Fleegeer, "Security in Computing", Prentice Hall, New Delhi, 2009.
- BehrouzA.Forouzan, —Cryptography & Network Security, Tata McGraw Hill, India, New Delhi, 2009.
- William Stallings, —Cryptography and Network Security, Prentice Hall, New Delhi, 2006
- Chalie Kaufman, Radia Perlman, Mike Speciner, —Network Security: Private Communication in a Public Network, Pearson Education, New Delhi, 2004.
- Neal Krawetz, —Introduction to Network Security, Thomson Learning, Boston, 2007.
- Bruce Schneier, —Applied Cryptography, John Wiley & Sons, New York, 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;

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Course Educational Objective:

Upon completion of the course, the students should be able to:

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

Course Objectives:

- To understand the concept of semantic web and related applications
- To learn knowledge representation using ontology.
- To understand human behaviour in social web and related communities.
- To learn visualization of social networks.
- Collect network data in different ways and from different sources while adhering to legal standards and ethics standards, legal standards and ethics standard.

Course Syllabus:

Unit 1: 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 2: 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

Unit 3: 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

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Unit 4: Exponential Random Graph Modeling

Frameworks for evaluating results in network analysis: autocorrelation, matching techniques, QAPregression, exponential random graphs, and p^* models. Computational considerations

Unit 5: Network Evolution

Actor models; Network dynamics vs behavior dynamics; RSiena; Model creation and estimation; Animation with RSonia;

Text Books and References:

1. Tanmoy Chakraborty, Social Network Analysis, Wiley, 2021
2. Stanley Wasserman, Katherine Faus; Social Network Analysis: Methods and Applications; Cambridge University Press
3. Peter Mika, Social Networks and the Semantic Web, 1st Edition, Springer 2007.
4. Borko Furht, Handbook of Social Network Technologies and Applications, 1st Edition, Springer, 2010.
5. Guandong Xu, Yanchun Zhang and Lin Li, Web Mining and Social Networking – Techniques and applications, First Edition, Springer, 2011.
6. Dion Goh and Schubert Foo, Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively, IGI Global Snippet, 2008.
7. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling, IGI Global Snippet, 2009.
8. John G. Breslin, Alexander Passant and Stefan Decker, The Social Semantic Web, Springer, 2009.
9. Newman, M.E.J. , Networks: An Introduction, Oxford University Press, 2010
10. Stanley Wasserman, Katherine Faus; Social Network Analysis: Methods and Applications, Cambridge Univer

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MTIT323	DCC	Cyber Law and IPR	60	20	20	0	0	3	0	0	3

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Course Objective:

Through this course students should be able to

- describe phases of information security management and functional management
- define information Security Life Cycle and security policy methodology
- illustrate business continuity planning, risk management and security assessment project
- analyze legal, regulatory requirements, and international standards requirements, pertaining to computer security and audit
- examine the legislative measure against cyber crime
- outline various Sections and IT laws on cyber-crimes in different nations

Unit I

Introduction to cyber crime and cyber law, cyber space and information technology, Nature and scope of cyber crime, Jurisdiction of cyber crime.

Unit II

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

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

Overview of amended laws by the IT Act, 2000: The Indian Penal Code, 1860, The Indian Evidence Act, 1872, 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

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

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MTIT323	DCC	Cyber Law and IPR	60	20	20	0	0	3	0	0	3

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Books recommended:

- □ Cyber Security, Cyber Crime and Cyber Forensics: Applications and Perspectives, RaghuSantanam, M. Sethumadhavan, Information Science Reference
- □ Pfleeger, Charles P. and Shari L. Pfleeger. Security in Computing, 4th Edition. Upper SaddleRiver, NJ: Prentice Hall, 2008
- □ Cybercrime: Security and Surveillance in the Information Age, Douglas Thomas; BrianLoader
- □ Computer Crime: A Crime-Fighters Handbook by David Icov
- □ Crime in the Digital Age: Controlling Telecommunications and Cyberspace Illegalities, Peter
- N. Grabosky
- □ Cyberlaw – The Indian Perspective By Pavan Duggal, Saakshar Law Publications. □ Jonathan Rosenoer, “Cyber Law: The law of the Internet”, Springer-Verlag, 1997
- □ Mark F Grady, FransescoParisi, “The Law and Economics of Cyber Security”, CambridgeUniversity Press,

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

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Course Educational Objectives (CEOs):

The student will have ability to:

This course aims to provide an understanding of the various security attacks and knowledge to recognize and remove common coding errors that lead to vulnerabilities. It gives an outline of the techniques for developing a secure application.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The 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
- 5 Effectively apply their knowledge to the construction of secure software systems

UNIT I

10HRS

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.



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UNIT II

9HRS

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

8HRS

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

7HRS

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,FormatString 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 StackGuard and Propolice. Socket Security, Avoiding Server Hijacking, Securing RPC, ActiveX and DCOM.

UNIT V

8HRS

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 File Operations. XSS scripting attack and its types – Persistent and Non persistent attack XSS Countermeasures and Bypassing the XSS Filters.

References:

- Writing Secure Code, Michael Howard and David LeBlanc,Microsoft Press.
- Buffer Overflow Attacks: Detect, Exploit, Prevent by Jason Decker,Syngress.
- Threat Modeling, Frank Swiderski and Window Snyder,Microsoft Professional.



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SEMESTER III (2021-2025)

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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				
-	-	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 mark

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