M.TECH (CYBER FORENSICS & INFORMATION SECURITY)
Department of CSE, JNTUHCEH

COURSE STRUCTURE
(Applicable for the Batch admitted from the Academic Year 2018-19 onwards)

I SEMESTER

S.No	Code	Subject	L	T	P	Credits
1	PC 1	Advanced Data Structures	3	-	-	3
2	PC 2	Mathematical Foundations of Cryptography	3	-	-	3
3	PE I	Program Elective - I	3	-	-	3
4	PE II	Program Elective - II	3	-	-	3
5	Laboratory 1	Advanced Data Structures Lab	-	-	4	2
6	Laboratory 2	Based on Program Elective I	-	-	4	2
7	PW	Research Methodology & IPR	2	-	-	2
8	Audit I	Audit Course - I	2	-	-	0
		TOTAL	**16**	**0**	**8**	**18**

Program Elective I

1. Information Security
2. Blockchain Technology
3. Ethical Hacking
4. Machine Learning

Program Elective II

1. Web & Database Security
2. Mobile Application Security
3. Social Media Security
4. Lightweight Cryptography

II SEMESTER

S.No	Code	Subject	L	T	P	Credits
1	PC 3	Advanced Algorithms	3	-	-	3
2	PC 4	Systems and Network Security	3	-	-	3
3	PE III	Program Elective - III	3	-	-	3
4	PE IV	Program Elective - IV	3	-	-	3
5	Laboratory 3	Systems and Network Security Lab	-	-	4	2
6	Laboratory 4	Based on Program Elective - IV	-	-	4	2
7	PW	MINI PROJECT with Seminar	-	-	4	2
8	Audit II	Audit Course - II	2	-	-	0
		TOTAL	**14**	**0**	**12**	**18**

Program Elective III

1. Cloud Computing Security
2. Privacy preserving Information Processing
3. Computer Security & Audit Assurance
4. Parallel Computing

Program Elective IV

1. Cyber Crime Investigation & Digital Forensics
2. Data Analytics for Fraud Detection
3. Digital Watermarking and Steganography
4. SOA & Micro-services

III SEMESTER

Group Code	Group	Subject	L	T	P	Credits
	PE V	Program Elective - V	3	-	-	3
	OEC	Open Elective	3	-	-	3
	PW	Project/ Dissertation Phase – I	-	-	20	10
		TOTAL	**6**	**0**	**20**	**16**

Program Elective V

1. Ad hoc and Sensor Networks
2. Cyber laws and Security Policies
3. Internet of Things
4. Social, Web and Mobile Analytics

IV SEMESTER

Group Code	Group	Subject	L	T	P	Credits
	PW	Project/ dissertation Phase – II	-	-	32	16
		TOTAL	**0**	**0**	**32**	**16**

Open Elective

1. Information Security
2. Ethical Hacking

Audit Course I & II

1. English for Research paper writing
2. Soft Skills
3. Value Education

M.Tech CFIS I Semester

L	T	P	C
3	0	0	3

ADVANCED DATA STRUCTURES

Prerequisites

1. A course on " Data Structures"

Objectives

1. Introduces the heap data structures such as leftist heaps, binomial heaps, fibonacci and min-max heaps
2. Introduces a variety of data structures such as disjoint sets, hash tables, search structures and digital search structures

Outcomes

1. Ability to select the data structures that efficiently model the information in a problem
2. Ability to understand how the choice of data structures impact the performance of programs
3. Can Design programs using a variety of data structures, including hash tables, search structures and digital search structures

UNIT - I

Heap Structures

Introduction, Min-Max Heaps, Leftist trees, Binomial Heaps, Fibonacci heaps.

UNIT - II

Hashing and Collisions

Introduction, Hash Tables, Hash Functions, different Hash Functions:- Division Method, Multiplication Method, Mid-Square Method, Folding Method, Collisions

UNIT - III

Search Structures

OBST, AVL trees, Red-Black trees, Splay trees,

Multiway Search Trees

B-trees., 2-3 trees

UNIT - IV

Digital Search Structures

Digital Search trees, Binary tries and Patricia, Multiway Tries, Suffix trees, Standard Tries, Compressed Tries

UNIT - V

Pattern matching

Introduction, Brute force, the Boyer –Moore algorithm, Knuth-Morris-Pratt algorithm, Naïve String , Harspool, Rabin Karp

Textbooks:

1. Fundamentals of data structures in C++ Sahni, Horowitz, Mehatha, Universities Press.
2. Introduction to Algorithms, TH Cormen, PHI

References:

1. Design methods and analysis of Algorithms, SK Basu, PHI.
2. Data Structures & Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education.
3. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition, Universities Press.

M.Tech CFIS I Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

MATHEMATICAL FOUNDATIONS OF CRYPTOGRAPHY

Objectives

1. Build a solid mathematical basis to understand foundations of cryptography
2. Formally understand the notions related to security authentication and privacy.
3. Provide a rigorous treatment of the emerging and key subject subarea of CSE - security.

Outcomes

1. Students will gain an understanding of cryptosystems widely used to protect data security on the internet, and be able to apply the ideas in new situations as needed.

UNIT- I

Basic functions of cryptography - Encryption Schemes ,Digital Signatures ,Fault Tolerant Protocols and Zero-Knowledge Proofs

The Computational Model: P , NP , and NP- Completeness, Probabilistic Polynomial Time, Non-Uniform Polynomial Time

UNIT- II

Computational Difficulty

One-Way Functions Definitions, Strong One- Way Functions, Weak

One-Way Functions, Universal One-Way Function, Trapdoor One-Way Permutations Computational Indistinguishability: Definition, Relation to Statistical Closeness, Indistinguishability by Repeated Experiments, Indistinguishability by Circuits

UNIT - III

Zero-Knowledge Proof Systems

Zero-Knowledge Proofs, Perfect and Computational Zero-Knowledge, An Example (Graph Isomorphism in PZK) Zero-Knowledge with Respect to Auxiliary Inputs

UNIT - IV

Encryption Schemes

Private-Key versus Public-Key Schemes, The Syntax of Encryption Schemes, Semantic Security, Indistinguishability of Encryptions, Stream--Ciphers, Preliminaries: Block

--Ciphers

UNIT- V

Digital Signatures and Message Authentication: Attacks and security, Variants

Constructions of Message Authentication Schemes: Applying a pseudorandom function to the document

Textbook:

1. Foundations of Cryptography (two volumes), Oded Goldreich, Cambridge university Press, 2004. (Indian print available).

References:

1. Introduction to Modern Cryptography, J.Katz, Y.Lindell, Chapman Hall, USA 2007.
2. Modern cryptography - Theory and practice, Wen Bo Mao, Prentice Hall, USA, 2003 (Indian edition available)

M.Tech CFIS I Semester

L	T	P	C
3	0	0	3

INFORMATION SECURITY
(Program Elective - I)

Prerequisites

1. A Course on "Computer Networks"
2. A Course on "Mathematics"

Objectives

1. To understand the fundamentals of Cryptography
2. To understand various key distribution and management schemes
3. To understand how to deploy encryption techniques to secure data in transit across data networks
4. To apply algorithms used for secure transactions in real world applications

Outcomes

1. Demonstrate the knowledge of cryptography, network security concepts and applications.
2. Ability to apply security principles in system design.
3. Ability to identify and investigate vulnerabilities and security threats and mechanisms to counter them

UNIT-I

Security Attacks

(Interruption, Interception, Modification and Fabrication),

Security Services

(Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security.

Classical Encryption Techniques, DES, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operation, Blowfish, Placement of Encryption Function, Traffic Confidentiality, key Distribution, Random Number Generation.

UNIT-II

Public key Cryptography

Principles, RSA algorithm, Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography.

Message authentication and Hash Functions, Authentication Requirements and Functions, Message Authentication, Hash Functions and MACs Hash and MAC Algorithms SHA-512, HMAC.

UNIT -III

Digital Signatures

Authentication Protocols, Digital signature Standard, Authentication Applications,Kerberos, X.509 Directory Authentication Service.

Email Security: Pretty Good Privacy (PGP) and S/MIME.

UNIT-IV

IP Security

Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

Web Security

Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

UNIT-V

Intruders, Viruses and Worms Intruders, Viruses and related threats Firewalls: Firewall Design Principles, Trusted Systems, Intrusion Detection Systems.

Textbook

1. Cryptography and Network Security (principles and approaches), William Stallings, 4th Edition Pearson Education.

References:

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Principles of Information Security, Whitman, Thomson.

M.Tech CFIS I Semester

L	T	P	C
3	0	0	3

BLOCKCHAIN TECHNOLOGY
(Program Elective - I)

Prerequisites

1. Knowledge in security and applied cryptography;
2. Knowledge in distributed databases

Objectives

1. Give an introduction to block chain technology and Cryptocurrency

Outcomes

1. Learn about research advances related to one of the most popular technological areas today.

UNIT- I
Introduction

Block chain or distributed trust, Protocol, Currency, Cryptocurrency,
How a Cryptocurrency works, Crowdfunding

UNIT- II
Extensibility of Blockchain concepts

Digital Identity verification , Block chain Neutrality , Digital art , Blockchain Environment

UNIT- III
Blockchain Science

Gridcoin , Folding coin, Blockchain Genomics ,Bitcoin MOOCs

UNIT - IV
Currency

Token ,Tokenizing ,Campuscoin , Coindrop as a strategy for Public adoption, Currency Mut iplicity , Demurrage currency

UNIT - V
Technical challenges

Business model challenges , Scandals and Public perception , Government Regulations

Text Books

1 . Blockchain Blue print for Economy, Melanie Swan, SPD Oreilly.

References

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition, Daniel Drescher

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3	0	0	3

ETHICAL HACKING
(Program Elective - I)

Prerequisites

1. A course on "Operating Systems"
2. A course on "Computer Networks"
3. A course on "Network Security and Cryptography"

Objectives

1. The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.
2. The course includes-Impacts of Hacking; Types of Hackers; Information Security Models; Information Security Program; Business Perspective; Planning a Controlled Attack; Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration)

Outcomes

1. Gain the knowledge of the use and availability of tools to support an ethical hack
2. Gain the knowledge of interpreting the results of a controlled attack
3. Understand the role of politics, inherent and imposed limitations and metrics for planning of a test
4. Comprehend the dangers associated with penetration testing

UNIT- I

Introduction

Hacking Impacts, The Hacker

Framework

Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration

Information Security Models

Computer Security, Network Security, Service Security, Application Security, Security Architecture

Information Security Program

The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking

UNIT - II

The Business Perspective

Business Objectives, Security Policy, Previous Test Results, Business Challenges

Planning for a Controlled Attack

Inherent Limitations, Imposed Limitations, Timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement

UNIT - III

Preparing for a Hack - Technical Preparation, Managing the Engagement

Reconnaissance - Social Engineering, Physical Security, Internet Reconnaissance

UNIT - IV

Enumeration

Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase

Exploitation

Intutive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern

UNIT - V

Deliverable

The Deliverable, The Document, Overal Structure, Aligning Findings, Presentation

Integration

Integrating the Results, Integration Summary, Mitigation, Defense Planning, Incident Management, Security Policy, Conclusion

Textbook:

1. The Ethical Hack: A Framework for Business Value Penetration Testing, Auerbach Publications, James S. Tiller, CRC Press

References:

1. Ethical Hacking and Countermeasures Attack Phases, EC-Council, Cengage Learning
2. Hands-On Ethical Hacking and Network Defense, Michael Simpson, Kent Backman, James Corley, Cengage Learning

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L	T	P	C
3	0	0	3

MACHINE LEARNING
(Program Elective - I)

Prerequisites

1. A Course on "Data Structures"
2. Knowledge on statistical methods

Objectives

1. This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
2. To understand computational learning theory.
3. To study the pattern comparison techniques.

Outcomes

1. Understand the concepts of computational intelligence like machine learning
2. Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
3. Understand the Neural Networks and its usage in machine learning application.

UNIT - I

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning

Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias**.**

Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

UNIT - II

Artificial Neural Networks-1– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

UNIT - III

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.

Computational learning theory – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning.

Instance-Based Learning- Introduction, *k*-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT- IV

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

Reinforcement Learning – Introduction, the learning task, *Q*–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT - V

Analytical Learning-1- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.

Analytical Learning-2-Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.

Combining Inductive and Analytical Learning – Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis.

Textbook:

1. Machine Learning, Tom M. Mitchell, vMcGraw-Hill

Reference:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

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	3	**0**	**0**	**3**

WEB & DATABASE SECURITY
(Program Elective - II)

Objectives

1. Give an Overview of information security
2. Give an overview of Access control of relational databases

Outcomes

Students should be able to

1. Understand the Web architecture and applications
2. Understand client side and service side programming
3. Understand how common mistakes can be bypassed and exploit the application
4. Identify common application vulnerabilities

UNIT - I

The Web Security

The Web Security Problem ,Risk Analysis and Best Practices

Cryptography and the Web : Cryptography and Web Security, Working Cryptographic Systems and Protocols , Legal Restrictions on Cryptography ,Digital Identification

UNIT - II

The Web Privacy

The Web's War on Your Privacy, Privacy-Protecting Techniques , Backups and Antitheft, Web Server Security, Physical Security for Servers, Host Security for Servers, Securing Web Applications

UNIT - III

Database Security

Recent Advances in Access Control, Access Control Models for XML, Database Issues in Trust Management and Trust Negotiation, Security in Data Warehouses and OLAP Systems

UNIT - IV

Security Re-engineering for Databases

Concepts and Techniques , Database Watermarking for Copyright Protection , Trustworthy Records Retention , Damage Quarantine and Recovery in Data Processing Systems , Hippocratic Databases: Current Capabilities.

UNIT - V

Future Trends Privacy in Database Publishing

A Bayesian Perspective, Privacy-enhanced Location-based Access Control , Efficiently Enforcing the Security and Privacy Policies in a Mobile Environment

Text Books

1. Web Security ,Privacy and Commerce ,Simson GArfinkel, Gene Spafford,O'Reilly .
2. Handbook on Database security applications and trends ,Michael Gertz, Sushil Jajodia

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3	0	0	3

MOBILE APPLICATION SECURITY
(Program Elective – II)

Prerequisites

1. Undergraduate level knowledge of Network Security

Objectives

1. Gain in-depth knowledge on mobile security and its relation to the new security based protocols.
2. Apply proactive and defensive measures to counter potential threats, attacks and intrusions.

Outcomes

1. By the end of this course students will be able to learn security based protocols , attacks and intrusions

UNIT-I

Top Mobile Issues and Development Strategies:

Top Issues Facing Mobile Devices, Physical Security , Secure Data Storage (on Disk), Strong Authentication with Poor Keyboards , Multiple-User Support with Security, Safe Browsing Environment , Secure Operating Systems, Application Isolation, Information Disclosure, Virus, Worms, Trojans, Spyware, and Malware , Difficult Patching/Update Process, Strict Use and Enforcement of SSL, Phishing , Cross-Site Request Forgery (CSRF), Location Privacy/Security, Insecure Device Drivers, Multifactor Authentication, Tips for Secure Mobile Application Development .

UNIT-II

WAP and Mobile HTML Security

WAP and Mobile HTML Basics , Authentication on WAP/Mobile HTML Sites , Encryption , Application Attacks on Mobile HTML Sites ,Cross-Site Scripting , SQL Injection , Cross-Site Request Forgery , HTTP Redirects , Phishing , Session Fixation , Non-SSL Login , WAP and Mobile Browser Weaknesses , Lack of HTTPOnly Flag Support , Lack of SECURE Flag Support , Handling Browser Cache , WAP Limitations.

UNIT-III

Bluetooth Security

Overview of the Technology , History and Standards , Common Uses , Alternatives , Future , Bluetooth Technical Architecture , Radio Operation and Frequency, Bluetooth Network Topology , Device Identification , Modes of Operation , Bluetooth Stack ,Bluetooth Profiles , Bluetooth Security Features , Pairing , Traditional Security Services in Bluetooth, Security “Non-Features” , Threats to Bluetooth Devices and Networks, Bluetooth Vulnerabilities , Bluetooth Versions Prior to v1.2, Bluetooth Versions Prior to v2.1.

UNIT-IV

SMS Security

Overview of Short Message Service, Overview of Multimedia Messaging Service, Wireless Application Protocol (WAP), Protocol Attacks , Abusing Legitimate Functionality, Attacking Protocol Implementations, Application Attacks , iPhone Safari , Windows Mobile MMS, Motorola RAZR JPG Overflow, Walkthroughs ,Sending PDUs ,Converting XML to WBXML.

UNIT-V

Enterprise Security on the Mobile OS

Device Security Options , PIN , Remote, 346 Secure Local Storage, Apple iPhone and Keychain, Security Policy Enforcement, Encryption, Full Disk Encryption, E-mail Encryption, File Encryption , Application Sandboxing, Signing, and Permissions , Application Sandboxing, Application Signing, Permissions , Buffer Overflow Protection ,Windows Mobile , iPhone ,Android ,BlackBerry , Security Feature Summary.

Textbook:

1. Mobile Application Security, Himanshu Dwivedi, Chris Clark, David Thiel, TATA McGRAW-Hill.

References:

1. Mobile and Wireless Network Security and Privacy, Kami S.Makki,et al, Springer.
2. Android Security Attacks Defenses, Abhishek Dubey, CRC Press

M.Tech CFIS I Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

SOCIAL MEDIA SECURITY
(Program Elective – II)

Objectives

1. Give introduction about the networks, its use, the need of security

Outcomes

1. Learn about browser's risks
2. Learn about Social Networking, Understands the risks while using social media. Guidelines for social networking
3. Understand how to secure different web browsers.
4. Understand how an e-mail works does; learn threats involved using an email communication, safety measures while using e-mail.

UNIT - I

Introduction to Social Media, Understanding Social Media,Different Types and Classifications,The Value of Social Media, Cutting Edge Versus Bleeding Edge,The Problems That Come With Social Media, Is Security Really an Issue? Taking the Good With the Bad

UNIT - II

Dark side

Cyber crime ,Social Engineering ,Hacked accounts **,** cyberstalking, cyberbullying, predators, phishing, hackers

UNIT - III

Being bold versus being overlooked

Good social media campaigns , Bad social media campaigns, Sometimes it's better to be overlooked ,Social media hoaxes, The human factor ,Content management, Promotion of social media

UNIT - IV

Risks of Social media

Introduction Public embarrassment, Once it's out there, it's out there False information, Information leakage, Retention and archiving, Loss of data and equipment

UNIT - V

Policies and Privacy

Blocking users controlling app privacy ,Location awareness, Security Fake accounts passwords ,privacy and information sharing

Textbooks:

1.Interdisciplinary Impact Analysis of Privacy in Social Networks,Recognizing Your Digital Friends, Encryption for Peer-to-Peer Social NetworksCrowdsourcing and Ethics ,Authors: Altshuler Y, Elovici Y, Cremers A.B, Aharony N, Pentland A. (Eds.) .

2. Social media security https://www.sciencedirect.com/science/article/pii/B9781597498660000

M.Tech CFIS I Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

LIGHTWEIGHT CRYPTOGRAPHY
(Program Elective - II)

Prerequisites

1. Undergraduate level knowledge of Network Security

Objectives

1. Gain in-depth knowledge on Lightweight Cryptography and its relation to the new security in RFID tags
2. Apply proactive and defensive measures to counter potential threats, attacks and intrusions.

Outcomes

1. Ability to learn Cryptographic based solutions, attacks and intrusions.
2. Understand security and privacy issues in radio frequency identification (RFID) systems.
3. Understanding multiple ways to attack and defend in industrial systems.

UNIT – I

Anti-counterfeiting and RFID - Anti-Counterfeiting and Supply Chain Security, Networked RFID Systems, PC Network Architecture, A Security Primer .

UNIT –II

Security and Privacy Current Status - Addressing Insecurities and Violations of Privacy, RFID Tag Vulnerabilities in RFID Systems, From Identification to Authentication – A Review of RFID Product Authentication Techniques.

UNIT – III

Network Based Solutions - EPC System for a Safe & Secure Supply Chain and How it is Applied , The Potential of RFID and NFC in Anti-Counterfeiting , Improving the Safety and Security of the Pharmaceutical Supply Chain .

UNIT- IV

Cryptographic Solutions - Product Specific Security Based on RFID Technology, Strengthening the Security of Machine-Readable Documents, Enhancing Security of Class I Generation 2 RFID against Traceability and Cloning .

UNIT –V

Low-cost Cryptraphic solutions : A Random Number Generator for Application in RFID Tags , A Low Cost Solution to Cloning and Authentication Based on a Lightweight Primitive, Lightweight Cryptography for Low Cost RFID .

Text book

1. Networked RFID Systems and Lightweight Cryptography by Peter H. Cole · Damith C. Ranasinghe First edition ,Springer publication 2008.

References

1. RFID Security and Privacy by Yingjiu Li , Robert H. Deng
2. RFID HANDBOOK by Klaus Finkenzeller, Third edition Wiley Publications

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0	0	4	2

ADVANCED DATA STRUCTURES LAB

Prerequisites

1. A course on "Computer Programming & Data Structures"

Objectives

1. Introduces the basic concepts of Abstract Data Types.
2. Reviews basic data structures such as stacks and queues.
3. Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs, and B-trees.
4. Introduces sorting and pattern matching algorithms

Outcomes

1. Ability to select the data structures that effeciently model the information in a problem.
2. Ability to assess efficiency trade-offs among different data structure implementations or combinations.
3. Implement and know the application of algorithms for sorting and pattern matching.
4. Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and B-trees.

List of Programs

1. Write a program to perform the following operations:
   a) Insert an element into a binary search tree.
   b) Delete an element from a binary search tree.
   c) Search for a key element in a binary search tree.

2. Write a program for implementing the following sorting methods:
   a) Merge sort b) Heap sort c) Quick sort

3. Write a program to perform the following operations:
   a) Insert an element into a B- tree.
   b) Delete an element from a B- tree.
   c) Search for a key element in a B- tree.

4. Write a program to perform the following operations:
   a) Insert an element into a Min-Max heap
   b) Delete an element from a Min-Max heap
   c) Search for a key element in a Min-Max heap

5. Write a program to perform the following operations:
   a) Insert an element into a Leftist tree
   b) Delete an element from a Leftist tree
   c) Search for a key element in a Leftist tree

6. Write a program to perform the following operations:
   a) Insert an element into a binomial heap
   b) Delete an element from a binomial heap.
   c) Search for a key element in a binomial heap

7. Write a program to perform the following operations:
   a) Insert an element into a AVL tree.
   b) Delete an element from a AVL search tree.
   c) Search for a key element in a AVL search tree.

8. Write a program to perform the following operations:
   a) Insert an element into a Red-Black tree.
   b) Delete an element from a Red-Black tree.
   c) Search for a key element in a Red-Black tree.

9. Write a program to implement all the functions of a dictionary using hashing.
10. Write a program for implementing Knuth-Morris-Pratt pattern matching algorithm.
11. Write a program for implementing Brute Force pattern matching algorithm.
12. Write a program for implementing Boyer pattern matching algorithm.

Textbooks:

1. Fundamentals of Data structures in C, E.Horowitz, S.Sahni and Susan Anderson Freed, 2nd Edition ,Universities Press
2. Data Structures Using C – A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson education.
3. Introduction to Data Structures in C, Ashok Kamthane

References:

1. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education
2. C Programming with problem solving, J.A. Jones & K. Harrow, DreaM.Tech Press
3. Data structures: A Pseudocode Approach with C, R.F.Gilberg And B.A.Forouzan, ,2nd Edition , Cengage Learning.

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	0	**0**	**4**	**2**

INFORMATION SECURITY LAB

Prerequisites

1. A Course on "Computer Networks"

Co-requisite

1. A course on "Network Security and Cryptography"

Objectives

1. To get practical exposure of Cryptography algorithms

Outcomes

1. Get the skill to provide security services like authentication confidentiality to the real systems.
2. Get the knowledge to solve security issues in day to day life.

List of Experiments

1. Perform an Experiment for port scanning with nmap
2. Setup a honepot and monitor the honipot on the network
3. Instal a jcrpt tool(or any other eqvivalent) and demonstrate Asymmetric ,Symmetric crypto algorithm ,Hash and Digital/PKI signatures studied in theory Network security and management
4. Using snort perform realtime traffic analysis and packet logging
5. Generate minimum 10 passwords of length 12 cahracters using open ssl command
6. Perform practical approach to implement Footprinting-Gathering target information using Dmitry-Dmagic,UAtester
7. Write a program to perform encryption and decryption using the following substitution ciphers.
8. Caeser cipher
9. Play fair cipher
10. Hill Cipher
11. Write a program to implement the DES algorithm.
12. Write a program to implement RSA algorithm.
13. Calculate the message digest of a text using the SHA-1 algorithm.
14. Working with sniffers for monitoring network communication (Wireshark).
15. Configuring S/MIME for email communication.
16. Using Snort, perform real time traffic analysis and packet logging.

Textbook:

1. Cryptography and Network Security (principles and approaches) by William Stallings Pearson Education, 4th Edition.

References:

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Principles of Information Security, Whitman, Thomson.

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BLOCKCHAIN TECHNOLGY LAB

Objectives

1. The main objective of this course is to provide the knowledge in implementing Block chains using hash algorithms and bitcoins generation

Outcomes

1. By the end of this course students will be able to learn various Hash Algorithms and generation of Bitcoins.

List of Experiments

1. Implement Block hash using SHA-256 algorithm using java code or python code
2. Implement Message authentication using Java code or Python code.
3. Implement MD5 algorithm using Java code or python code
4. Implement RIPEMD-160 algorithm using Java code or python code
5. Implement Whirlpool algorithm using Java code or python code
6. Write a case study how the Bitcoins were generated and implemented.

Textbook

1. Blockchain Blue print for Economy, Melanie Swan, SPD Oreilly

References

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition, by Daniel Drescher

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ETHICAL HACKING LAB

Objectives

1. The aim of the course is to introduce the methodologies framework tools of ethical hacking to get awareness in enhancing the security
2. To get knowledge on various attacks and their detection

Outcomes

1. Gain the knowledge of the use and availability of tools to support an ethical hack
2. Gain the knowledge of interpreting the results of a controlled attack

List of Experiments

1. Setup a honey pot and monitor the honey pot on network
2. Write a script or code to demonstrate SQL injection attacks
3. Create a social networking website login page using phishing techniques
4. Write a code to demonstrate DoS attacks
5. Install rootkits and study variety of options
6. Study of Techniques uses for Web Based Password Capturing.
7. Install jcrypt tool (or any other equivalent) and demonstrate Asymmetric, Symmetric Crypto algorithm, Hash and Digital/PKI signatures studied in theory Network Security And Management
8. Implement Passive scanning ,active scanning,session hizaking,cookies extraction using Burp suit tool

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MACHINE LEARNING LAB

Objective

1. To get an overview of the various machine learning techniques.

Outcomes

1. Understand complexity of Machine Learning algorithms and their limitations;
2. Understand modern notions in data analysis oriented computing;
3. Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;
4. Be capable of performing experiments in Machine Learning using real-world data.

List of Experiments

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday?
2. Extract the data from database
3. Implement k-nearest neighbours classification
4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k-means clustering with 3 means (i.e., 3 centroids)

VAR1	VAR2	CLASS
1.713	1.586	0
0.180	1.786	1
0.353	1.240	1
0.940	1.566	0
1.486	0.759	1
1.266	1.106	0
1.540	0.419	1
0.459	1.799	1
0.773	0.186	1

5. The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.

medium skiing design single twenties no -> highRisk
high golf trading married forties yes -> lowRisk
low speedway transport married thirties yes -> medRisk
medium football banking single thirties yes -> lowRisk
high flying media married fifties yes -> highRisk
low football security single twenties no -> medRisk
medium golf media single thirties yes -> medRisk
medium golf transport married forties yes -> lowRisk
high skiing banking single thirties yes -> highRisk
low golf unemployed married forties yes -> highRisk

Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `medRisk' in the dataset?

6. Implement linear regression.
7. Implement Naïve Bayes theorem to classify the English text.
8. Implement an algorithm to demonstrate the significance of genetic algorithm.
9. Implement the finite words classification system using Back-propagation algorithm.

Textbook:

1. Machine Learning – Tom M.Mitchell,-MGH

Reference:

1. Machine Learning : An Algorithmic Perspective, Stephen Marsland, Taylor & Francis

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RESEARCH METHODOLOGIES & IPR

Objectives

1. Introduce research paper writing and induce paper publication skills.
2. Give the introduction to Intellectual Property Rights

Outcomes

1. Ability to distinguish research methods
2. Ability to write and publish a technical research paper
3. Ability to review papers effectively
4. IPR and Patent filing

UNIT – I

Introduction

Objective of Research; Definition and Motivation; Types of Research; Research Approaches; Steps in Research Process; Criteria of Good Research; Ethics in Research.

Research Formulation and Literature Review

Problem Definition and Formulation; Literature Review; Characteristics of Good Research Question; Literature Review Process.

UNIT – II

Data Collection

Primary and Secondary Data; Primary and Secondary Data Sources; Data Collection Methods; Data Processing; Classification of Data.

Data Analysis

Statistical Analysis; Multivariate Analysis; Correlation Analysis; Regression Analysis; Principle Component Analysis; Samplings;

UNIT – III

Research Design

Need for Research Design; Features of a Good Design; Types of Research Designs; Induction and Deduction.

Hypothesis Formulation and Testing

Hypothesis; Important Terms; Types of Research Hypothesis; Hypothesis Testing; Z-Test; t-Test; f-Test; Making a Decision; Types of Errors; ROC Graphics.

UNIT – IV

Test Procedures

Parametric and Non Parametric Tests; ANOVA; Mann-Whitney Test; Kruskal-Wallis Test; Chi-Square Test; Multi-Variate Analysis.

Presentation of the Research Work

Business Report; Technical Report; Research Report; General Tips for Writing Report; Presentation of Data; Oral Presentation; Bibliography and References; Intellectual Property Rights; Open-Access Initiatives; Plagiarism.

UNIT – V

Law of Patents, Patent Searches, Ownership, Transfer

Patentability – Design Patents – Double Patenting – Patent Searching – Patent Application Process – Prosecuting the Application, Post-issuance Actions, Term and Maintenance of Patents. Ownership Rights – Sole and Joint Inventors – Inventions Made by Employees and Independent Contractors – Assignment of Patent Rights – Licensing of Patent Rights – Invention Developers and Promoters.

Patent Infringement, New Developments and International Patent Law

Direct Infringement – Inducement to Infringe – Contributory Infringement – First Sale Doctrine – Claims Interpretation – Defenses to Infringement – Remedies for Infringement – Resolving an Infringement Dispute – Patent Infringement Litigation. New Developments in Patent Law

Textbooks

1. Research Methodology. Methods & Technique , Kothari. C.R.
2. Research Methodology, S.S Vinod Chandra, S Anand Hareendran, Pearson
3. Intellectual Property – Copyrights, Trademarks, and Patents by Richard Stim, Cengage Learning

References

1. Practical Research : planning and Design,Paul D. Leedy and Jeanne E. Ormrod, (8th Edition)
2. A Hand Book of Education Research , NCTE
3. Methodology of Education Research , K.S. Sidhu.
4. Tests, Measurements and Research methods in Behavioural Sciences, A.K. Singh.
5. Statistical Methods, Y.P. Agarwal.
6. Methods of Statistical Ananlysis, P.S Grewal.
7. Fundamentals of Statistics ,S.C. Gupta, V.K. Kapoor.
8. Intellectual Property Rights by Deborah E. Bouchoux, Cengage Learning.
9. Managing Intellectual Property The Strategic Imperative, Vinod V.Sople, 2nd edition, PHI Learning Private Limited.

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ADVANCED ALGORITHMS

Prerequisites

1. A course on "Computer Programming & Data Structures"
2. A course on "Advanced Data Structures & Algorithms"

Objectives

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. Describes how to evaluate and compare different algorithms using worst-case, average-case and best-case analysis.
5. Introduces string matching algorithms
6. Introduces linear programming.

Outcomes

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

UNIT – I

Classification of algorithms, Algorithm Specifications

Mathematical analysis of Recursive Algorithms: – Introduction to recurrence equations, formulation of recurrence equations, Techniques for solving recurrence equations, Solving recurrence equations, Solving Recurrence Equations using polynomial reduction, Divide and conquer recurrences

UNIT – II

Graphs

Graph representations, Graph traversals

Brute Force Approaches

Computational Geometry Problems-Closest pair problem, Convex Hull Problem, Exhaustive Searching- Magic Squares problem, Container Loading problem, Knapsack Problem, Assignment Problem

UNIT – III

Divide and Conquer approach

Multiplication of long integers, Strassen's matrix multiplication, Fourier Transform

Greedy algorithms

Coin change problem, Scheduling problems, knapsack problem, optimal storage on tapes, optimal tree problems, optimal graph problems

UNIT – IV

Transform and Conquer approach

Matrix operations- Gaussian Elimination method, LU decomposition, Crout's method of decomposition

Dynamic Programming

Computing binomial coefficients, Multistage graph problem, Transitive Closure and Warshall algorithm, Floyd warshall all pairs shortest path problem, TSP, Flow shop scheduling algorithm

UNIT – V

String algorithms

Basic string algorithms, Longest Common Subsequences.

Linear Programming, Graphical method for solving LPP, Simplex method, Minimization problems, Principle of Duality, Max Flow problem

Text Books

1. Design and Analysis of Algorithms, S.Sridhar, OXFORD University Press

References

1. Introduction to Algorithms, T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, 2nd edition, PHI Pvt. Ltd./ Pearson Education.
2. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Universities Press.
3. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education

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SYSTEMS AND NETWORK SECURITY

Prerequisites

1. A Course on "Computer Networks"
2. A Course on "Network Security"

Objectives

1. A brief explanation of the objective is to provide knowledge on different types of Intrusions occur at various Network levels , and level of security provisions required when the systems are used at different networks in LAN,WAN

Outcomes

1. Students will get the knowledge in detection, protection of Intrusions.
2. It gives an opportunity to students to get awareness on the level of security required for a system in Intranet ,Internet ,cellular networks

UNIT - I

Detecting System Intrusions

Monitoring Key Files in the System, Zero Day attacks, Fullpacket capture devices ,Data correlation ,SEIM, Network-Based Detection of System Intrusions

Preventing System Intrusions

Symptoms of Intrusions ,Security policies , Risk Analysis ,Controlling user Access, Intrusion Prevention capabilities

UNIT - II

Guarding Against Network Intrusions

Traditional Reconnaissance and Attacks, Malicious Software, Defense in Depth, Preventive Measures, Intrusion Monitoring and Detection, Reactive Measures, Network-Based Intrusion Protection

Internet Security - Internet Protocol Architecture,. Internet Threat Model, Defending against Attacks on the Internet, Internet Security Checklist

UNIT - III

Intranet Security

Smartphones and Tablets in the Intranet ,Security ConsiderationsPlugging the Gaps: NAC and AccessControl, Measuring Risk: Audits,. Guardian at the Gate: Authentication,and Encryption ,Wireless Network Security , Shielding the Wire: NetworkProtection,Weakest Link in Security: User Training , Documenting the Network: Change Management

UNIT - IV

Local Area Network Security

Identify Network Threats, Establish Network Access Controls, Risk Assessment, Listing Network Resources, Threats, Security Policies, The Incident-Handling Process, Secure Design Through Network, Access Controls , IDS Defined NIDS: Scope and Limitations, Firewalls , Dynamic NAT Configuration Packet Filtering: IP Filtering Routers, Application-Layer Firewalls: Proxy Servers

UNIT - V

Cellular Network Security - The State of the Art of Cellular Network Security, Cellular Network Attack Taxonomy, Cellular Network Vulnerability Analysis

RFID Security - RFID challenges ,RFID protections

Text Books

1. Network and System Security ,John R Vacca , 2nd edition , Syngress publications

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CLOUD COMPUTING SECURITY
(Program Elective - III)

Objectives

1. Guiding Security design principles for Cloud Computing
2. Be able to understand the legal, security, forensics, personal & data privacy issues within Cloud environment
3. Understand the concepts and guiding principles for designing and implementing appropriate safeguards and countermeasures for Cloud based IT services

Outcomes

1. Approaches to designing cloud services that meets essential Cloud infrastructure characteristics on demand computing, shared resources, elasticity and measuring usage.
2. Design security architectures that assures secure isolation of physical and logical infrastructures
3. Understand the industry security standards, regulatory mandates, audit policies and compliance requirements for Cloud based infrastructures.

UNIT - I

Introduction to cloud – Basic Concepts and Terminology – Concepts and Models of cloud computing – Cloud delivery and deployment models.

UNIT - II

Cloud enablers and security – Internet, Broadband, Data centre and virtualization technologies

UNIT - III

Web and Multitenant services – Cloud security,

UNIT - IV

Agent threats: Cloud infrastructure mechanisms, Specialized cloud mechanisms,

UNIT - V

Cloud Management and Cloud Security. AWS, Azure and Google case study

Text Books

1. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, T. Mather, S. Kumaraswamy, S. Latif, O'Reilly Series, 2009.
2. Cloud Computing: Concepts, Technology & Architecture, T. Erl, R. Puttini, Z. Mahmood Prentice Hall, 2013.

References

1. The Google file system. In Proceedings of the nineteenth ACM symposium on Operating systems principles (SOSP '03). ACM, New York, NY, USA, 29-43.
2. MapReduce: simplified data processing on large clusters. Commun. ACM 51, 1, 107-113, 2008.
3. Controlling data in the cloud: outsourcing computation without outsourcing control. In Proceedings of the 2009 ACM workshop on Cloud computing security (CCSW '09). ACM, New York, NY, USA, 85-90, 2009.

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PRIVACY PRESERVING INFORMATION PROCESSING
(Program Elective - III)

Objectives

1. Techniques in protecting data privacy and data security when the data is released to public.

Outcomes

1. To get knowledge in various data privacy issues and their preventions

UNIT - I

Malware

Exploring Timeline-Based Malware Classification,Screening Smartphone Applications Using Behavioural Signatures .

Authentication and Authorization

Evolving a Secure Internet , Enhancing Click-Draw Based Graphical Passwords Using Multi-Touchon Mobile Phones, Applying DAC Principles to the RDF Graph Data Model

UNIT - II

Network Security/ Cryptography

Extraction of ABNF Rules from RFCs to Enable Automated Test Data Generation , Key Derivation Function: The SCKDF Scheme

UNIT - III

Software Security

Improving Mobile Device Security with Operating System-Level Virtualization, Generating Realistic Application Workloads for Mix-Based Systems for Controllable, Repeatable and Usable Experimentation

UNIT - IV

Privacy Protection

Enforcement of Privacy Requirements ,Towards Security-Enhanced and Privacy-Preserving Mashup Compositions, On Privacy-Preserving Ways to Porting the Austrian eID System to the Public Cloud .

UNIT - V

Risk Analysis and Security Metrics

Using the Conflicting Incentives Risk Analysis Method Performance Analysis of Scalable Attack Representation Models

Security Management/Forensic

Secure Outsourcing: An Investigation of the Fit between Clients and Providers

Text Books

1. Security and privacy protection in information processing systems by
   Lech J. Janczewski, Henry B .Wolfe, Sujeet Shenoi

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COMPUTER SECURITY & AUDIT ASSURANCE
(Program Elective - III)

Objectives

1. To introduce the fundamental concepts and techniques in computer and network security,
2. An overview of information security and auditing, and to expose students to the latest trend of computer attack and defence

Outcomes

1. Describe fundamental concepts of information security and systems auditing
2. Analyze the latest trend of computer security threats and defence
3. Identify security weaknesses in information systems, and rectify them with appropriate security mechanisms
4. Explain the security controls in the aspects of physical, logical and operational security control

UNIT - I

System Audit and Assurance – Characteristics of Assurance services , Types of Assurances services ,Certified Information system auditor , Benefits of Audits for Organization, COBIT

UNIT - II

Internal Control and Information system Audit - Internal Control, Detective control, Corrective Control ,Computer Assisted Audit Tools and Techniques

UNIT - III

Conducting Audit – Standard practices, policies, Audit planning, Risk Assessment, Information gathering techniques, Vulnerabilities, System security testing, conducting Audits for Banks

UNIT - IV

Network Security and Control ,Internet Banking Risks and Control , Operating System Risks and Control , Operational Control Overview

UNIT - V

Business Continuity and Disaster Recovery Planning Control – Databackup/storage, Developing appropriate Disaster recovering strategy, Business Impact analysis

Text Books

1. Information System Audit and Assurance, D. P. Dube, Ved Prakash Gulati; Tata McGraw-Hill Education, 01-Jan2005
2. Auditing IT Infrastructures for Compliance, Martin Weiss, Michael G. Solomon; Jones & Bartlett Publishers, 10Jul-2015

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PARALLEL COMPUTING
(Program Elective - III)

Prerequisites

1. A Course on “Computer Organization & Architecture”
2. A Course on “Operating Systems”
3. A Course on “Computer Programming”

Objectives

1. To introduce the foundations of parallel Computing
2. To learn various parallel computing architectures and programming models
3. To gain knowledge of writing efficient parallel programs

Outcomes

1. Ability to understand the concepts of parallel architectures
2. Ability to select the data structures that efficiently model the information in a problem.
3. Ability to develop an efficient parallel algorithm to solve it.
4. Ability to implement an efficient and correct code to solve it, analyse its performance

UNIT - I

Parallel Computing

Introduction, Motivation and scope - Parallel Programming Platforms – Basic Communication Operations

UNIT - II

Principles of Parallel Algorithm Design - Analytical Modelling of Parallel Programs

UNIT - III

Programming using Message Passing Paradigm(MPI) - Programming Shared Address Space Platforms(PThreads)

UNIT - IV

Dense Matric Algorithms (Matrix-Vector Multiplication , Matrix-Matrix Multiplication) Sorting Algorithms (Issues, Bubble Sort, Quick Sort, Bucket Sort, Enumeration Sort, Radix Sort)

UNIT - V

Graph Algorithms (Minimum Spanning Tree: Prim's Algorithm

Single-Source Shortest Paths: Dijkstra's Algorithm) Search Algorithms (DFS, BFS)

Textbook

1. Introduction to Parallel Computing, Second Edition, Ananth Grama, George Karypis, Vipin Kumar, Anshul Gupta, Addison-Wesley, 2003, ISBN: 0201648652

References

1. Parallel Computing – Theory and Practice, Second Edition, Michaek J. Quinn, Tata McGraw-Hill Edition.
2. Parallel Computers – Architectures and Programming, V. Rajaraman, C. Siva Ram Murthy,PHI.

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CYBER CRIME INVESTIGATION & DIGITAL FORENSICS
(Program Elective - IV)

Prerequisites

1. Knowledge of information technology fundamentals (computer hardware, operating systems, applications and networking) is required.

Objectives

1. An introduction to the methodology and procedures associated with digital forensic analysis in a network environment

Outcomes

1. Obtain and analyze digital information for possible use as evidence in civil, criminal or administrative cases.
2. They will learn about the importance of digital forensic principles and procedures, legal considerations, digital evidence controls

UNIT – I

Foundations of Digital Forensics : Digital Evidence ,Principles of Digital Forensics, Challenging aspects of Digital Evidence

The Role of computers in crime, Cyber Crime Law

UNIT – II

Digital Investigations : Digital Investigation process models, Applying Scientific method in Digital Investigations ,Handling A digital Crime scene:Fundamental Principles, Surveying and Preserving Digital Investigation

UNIT - III

Voilent Crime and Digital Investigation : The role of Computers in violent crime , Processing Digital crime scene , Investigative Reconstruction ,Digital Evidence as Alibi

UNIT - IV

Cyberstalking , Computer basics for Digital Forensics , Applying Forensics science to computers, Digital Evidence on windows systems, Digital Evidence on unix systems

UNIT - V

Network Forensics : Networks basics for Digital Investigators, Applying Forensics science to networks, Digital Evidence on physical and datalink layers, Digital Evidence on Network and Transport layers.

Text Books

1. Digital Evidence and computer Crime by Eoghan Casey Academic Press Third Edition
2. Real Digital Forensics for Handheld Devices , E. P. Dorothy, Auerback Publications, 2013.
2. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics, J. Sammons, Syngress Publishing, 2012.
3. Handbook of Digital Forensics and Investigation, E. Casey, Academic Press, 2010

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DATA ANALYTICS FOR FRAUD DETECTION
(Program Elective - IV)

Objectives

1. Discuss the overall process of how data analytics is applied
2. Discuss how data analytics can be used to better address and identify risks
3 . Help mitigate risks from fraud and waste for our clients and organizations

Outcomes

1. Formulate reasons for using data analysis to detect fraud.
2. Explain characteristics and components of the data and assess its completeness.
3. Identify known fraud symptoms and use digital analysis to identify unknown fraud symptoms.
4. Automate the detection process.
5. Verify results and understand how to prosecute fraud

UNIT - I

Introduction: Defining Fraud, Anomalies versus ,Fraud, Types of Fraud, Assess the Risk of Fraud, Fraud Detection, Recognizing Fraud, Data Mining versus Data Analysis and Analytics, Data Analytical Software, Anomalies versus Fraud within Data, Fraudulent Data Inclusions and Deletions

UNIT - II

The Data Analysis Cycle, Evaluation and Analysis, Obtaining Data Files, Performing the Audit, File Format Types, Preparation for Data Analysis, Arranging and Organizing Data, Statistics and Sampling, Descriptive Statistics, Inferential Statistics

UNIT - III

Data Analytical Tests , Benford’s Law, Number Duplication Test , Z-Score, Relative Size Factor Test, Same-Same-Same Test , Same-Same-Different Test

UNIT - IV

Advanced Data Analytical Tests

Correlation, Trend Analysis, , GEL-1 and GEL-2 , Skimming and Cash Larceny, Billing schemes : and Data Familiarization, , Benford’s Law Tests, Relative Size Factor Test , Match Employee Address to Supplier data

UNIT - V

Payroll Fraud , Expense Reimbursement Schemes , Register disbursement schemes

Textbook:

1. Fraud and Fraud Detection: A Data Analytics Approach by Sunder Gee , Wiley

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DIGITAL WATERMARKING AND STEGANOGRAPHY
(Program Elective - IV)

Objectives

1. To learn about the watermarking models and message coding
2. To learn about watermark security and authentication.
3. To learn about steganography Perceptual models

Outcomes

1. Know the History and importance of watermarking and steganography
2. Analyze Applications and properties of watermarking and steganography
3. Demonstrate Models and algorithms of watermarking
4. Possess the passion for acquiring knowledge and skill in preserving authentication of Information
5. Identify theoretic foundations of steganography and steganalysis

UNIT - I

Introduction

Information Hiding, Steganography and Watermarking – History of watermarking – Importance of digital watermarking – Applications – Properties – Evaluating watermarking systems.

Watermarking models & message coding

Notation – Communications – Communication based models – Geometric models – Mapping messages into message vectors – Error correction coding – Detecting multi-symbol watermarks.

UNIT - II

Watermarking with side information & analyzing errors

Informed Embedding – Informed Coding – Structured dirty-paper codes - Message errors – False positive errors – False negative errors – ROC curves – Effect of whitening on error rates.

UNIT - III

Perceptual models

Evaluating perceptual impact – General form of a perceptual model –
Examples of perceptual models – Robust watermarking approaches - Redundant Embedding, Spread Spectrum Coding, Embedding in Perceptually significant coefficients

UNIT - IV

Watermark security & authentication

Security requirements – Watermark security and cryptography – Attacks – Exact authentication – Selective authentication – Localization – Restoration.

UNIT - V

Steganography

Steganography communication – Notation and terminology – Information-theoretic foundations of steganography – Practical steganographic methods – Minimizing the embedding impact – Steganalysis

Text Books

1. Digital Watermarking and Steganography, Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker, Margan Kaufmann Publishers, New York, 2008.
2. Digital Watermarking, Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Margan Kaufmann Publishers, New York, 2003.
3. Techniques and Applications of Digital Watermarking and Contest Protection, Michael Arnold, Martin Schmucker, Stephen D. Wolthusen ,Artech House, London, 2003.
4. Digital Watermarking for Digital Media, Juergen Seits, IDEA Group Publisher, New York, 2005.
5. Disappearing Cryptography – Information Hiding: Steganography & Watermarking, Peter Wayner, Morgan Kaufmann Publishers, New York, 2002.

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SOA & MICRO-SERVICES
(Program Elective - IV)

Pre-requisites:

The course assumes a reasonable comfort and background about Information Technology and Management Information Systems.

Objectives

1. To gain understanding of the basic principles of service orientation
2. To learn service oriented analysis techniques
3. To learn technology underlying the service design
4. To learn the concepts such as SOAP, Registering and Discovering Services.

Outcomes

At the end of this course, students are expected to gain the following learning:

1. Get the foundations and concepts of service based computing
2. Advocate the importance and means of technology alignment with business
3. Understanding the basic operational model of web services,
4. Gain the knowledge of key technologies in the service oriented computing arena
5. Apply and practice the learning through a real or illustrative project/case study.

UNIT - I

Software Architecture: Need for Software Architecture **,** Objectives of Software Architecture, Types of Information Technology (IT) Architecture, Architectural Patterns and Styles

Architecting Process for Software Applications : Architectural Considerations ,Architecting Process for Software Applications , Level 0: High-Level Architecture , Level 1: Solution Architecture Detailed Design

UNIT - II

SOA and MSA Basics: Service Orientation in Daily Life, Evolution of SOA and MSA Service-oriented Architecture and Microservices architecture –Drivers for SOA, Dimensions of SOA, Conceptual Model of SOA, Standards And Guidelines for SOA, Emergence of MSA

Service-Oriented Architecture: Considerations for Enterprise-wide SOA, Strawman Architecture for Enterprise-wide SOA, Enterprise SOA Reference Architecture, Object-oriented Analysis and Design (OOAD) Process, Service-oriented Analysis and Design (SOAD) Process

UNIT - III

Service-Oriented Applications: Considerations for Service-oriented Applications, Patterns for SOA, Pattern-based Architecture for Service-oriented Applications **,** Composite Applications, Composite Application Programming Model

Service-Oriented Analysis and Design: Need for Models, Principles of Service Design Non-functional Properties for Services, Design of Activity Services (or Business Services) Design of Data Services, Design of Client Services, Design of Business Process Services

UNIT - IV

Microservices Architecture: Trend in SOA – Microservices Architecture (MSA): Services Model for Cloud and Mobile Solutions, API Adoption on the Rise, Challenges and Takeways from SOA Implementations Architecture Trend – Microservices Architecture, Microservices Architecture in Action
Cloud and MSA: Cloud Services, Hybrid Cloud Services, Considerations for Hybrid Cloud Services, Cloud Services and MSA, MSA for SMAC Solutions

UNIT - V

Mobile and MSA: Mobile Technologies, Types of Mobile Applications, MSA for mobile solutions
Case Study: SOA – Loan Management System (LMS) PoC, MSA – APIary PoC

Textbook:

1. Shankar Kambhampaty, Service - Oriented Architecture & Microservices Architecture, 3ed: For Enterprise, Cloud, Big Data and Mobile , ISBN: 9788126564064,Wiley

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SYSTEMS AND NETWORK SECURITY LAB

Objectives

1. The main objective is to get knowledge in Configuring DNS Server ,Detecting malicious codes and analysing networks through tools ,implementing various Encryption algorithms

Outcomes

1. Get the knowledge in detection ,protection of Intrusions ,malicious codes
2. To get awareness on DNS server, webcrawler, encryption the level of security required for a system in Intranet ,Internet ,cellular networks

List of Experiments

1. Write a procedure to Logon and Logoff to linux in both Text mode and graphical mode.
2. Configure a DNS Server with a domain name of your choice.
3. Configure FTP on Linux Server. Transfer files to demonstrate the working of the same.
4. Detection of Malicious Code in Registry and Task Manager
5. Checking for rootkits existence in windows.
6. Extracting website map using sam spade (any web crawler)
7. Techniques to stop web crawler
8. Sniff the network traffic while performing port scanning using Nmap.
9. Perform port scanning on Metasploitable 2 vulnerable VM
10. Install JCrypt tool (or any other equivalent) and demonstrate Asymmetric, Symmetric crypto algorithm, Hash and Digital/PKI signatures studied in theory Network Security and Management.

11. Write a client-server program where client sends a text message to server and server sends the text message to client by changing the case(uppercase and lowercase) of each character in the message.

12. Write a client-server program to implement following classical encryption techniques:

(I) Ceaser cipher (II) Transposition cipher
(III) Row substitution cipher (IV)Hill cipher

Text Books

1. Network and System Security ,John R Vacca , 2nd edition , Syngress publications

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CYBER CRIME INVESTIGATION & DIGITAL FORENSICS LAB

Objectives

1. To provide students with a comprehensive overview of collecting, investigating, preserving, and presenting evidence of cyber crime left in digital storage devices, emails, browsers, mobile devices using different Forensics tools
2. To Understand file system basics and where hidden files may lie on the disk, as well as how to extract the data and preserve it for analysis.
3. Understand some of the tools of e-discovery.
4. To understand the network analysis ,Registry analysis and analyse attacks using different forensics tools

Outcomes

1. Learn the importance of a systematic procedure for investigation of data found on digital storage media that might provide evidence of wrong-doing
2. To Learn the file system storage mechanisms and retrieve files in hidden format
3. Learn the use of computer forensics tools used in data analysis.
4. Learn how to find data that may be clear or hidden on a computer disk, find our the open ports for the attackers through network analysis , Registry analysis.

Experiments

1. **Perform email analysis** using the tools like Exchange EDB viewer , MBOX viewer and View user mailboxes and public folders , Filter the mailbox data based on various criteria, Search for particular items in user mailboxes and public folders
2. **Perform Browser history analysis** and get the downloaded content , history ,saved logins,s earches ,websites visited etc using Foxton Forensics tool,Dumpzilla .
3. **Perform mobile analysis** in the form of retrieving call logs ,SMS log ,all contacts list using the forensics tool like SAFT
4. **Perfrom Registry analysis** and get boottime logging using process monitor tool
5. **Perform Disk imaging and cloning the** using the X-way Forensics tools
6. **Perform Data Analysis i.e** History about open file and folder, and view folder actions using Lastview activity tool
7. **Perform Network analysis** using the Network Miner tool **.**
8. **Perform information for incident response** using the crowd Response tool
9. **Perform File type detection using** Autospy tool
10. **Perform Memory capture and analysis** using the Live RAM capture or any forensic tool

Textbooks

1. Real Digital Forensics for Handheld Devices , E. P. Dorothy, Auerback Publications, 2013.
2. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics, J. Sammons, Syngress Publishing, 2012.
3. Handbook of Digital Forensics and Investigation, E. Casey, Academic Press, 2010
4. Malware Forensics Field Guide for Windows Systems: Digital Forensics Field Guides, C. H. Malin, E. Casey and J. M. Aquilina, Syngress, 2012
5. The Best Damn Cybercrime and Digital Forensics Book Period, J. Wiles and A.Reyes, Syngress, 2007.

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DATA ANALYTICS FOR FRAUD DETECTION LAB

Objective

1. The main objective is to perform data analysis and detect fraud activities

Outcome

1. Gain knowledge in performing fraud detection by data analysis using different tools

List Of Experiments

1. Perform data analysis i.e history about open file and folder, and view folder actions using last view activity tool
2. Perform file type detection using auto spy tool
3. Perform network analysis using the network miner tool
4. Create a social networking website login page using phishing techniques
5. Analyse ddos attacks and write code to prevent ddos attacks
6. Analyse sql injection attacks and write code to prevent ddos attacks
7. Analyse buffer overflow attacks and write code to prevent ddos attacks .
8. Perform memory capture and analysis using the live ram capture or any forensic tool

Text Books

1. Fraud and Fraud Detection: A Data Analytics Approach by Sunder Gee , Wiley

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DIGITAL WATERMARKING AND STEGANOGRAPHY LAB

Objective

1. To provide knowledge in implementing watermarking and stegnography lab

Outcomes

1. To implement watermarking techniques and Stegnography techniques using code

List of Experiments

1. Write a code to implement watermarking in the document.
2. Write a code to remove watermarking from the document
3. Write a code to hide the data in image
4. Write a code to hide the photo in plain sight
5. Write a code to hide to implement Information hiding
6. Implement the Hiding the text in image using stegnography S-Tool
7. Write a code to retrieve the hidden image from data
8. Write a code to retrieve the hidden text from image
9. Write a code to extract photo from plainsight
10. Write a code to implement encryption using stegnography

Textbooks:

1. Digital Watermarking and Steganography, Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker,“Margan Kaufmann Publishers, New York, 2008.
2. Digital Watermarking, Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Margan Kaufmann Publishers, New York, 2003.
3. Techniques and Applications of Digital Watermarking and Contest Protection, Michael Arnold, Martin Schmucker, Stephen D. Wolthusen ,Artech House, London, 2003.
4. Digital Watermarking for Digital Media, Juergen Seits, IDEA Group Publisher, New York, 2005.
5. Disappearing Cryptography – Information Hiding: Steganography & Watermarking, Peter Wayner, Morgan Kaufmann Publishers, New York, 2002.

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SOA & MICRO-SERVICES LAB

Prerequisites

1. A Course on “OOPS through JAVA”

Objectives:

1. To learn how to implement and deploy web service client and server.

Outcomes

1. Students will be able to learn webservices, SOA Principles

List of Programs:

1. Write a program to implement a) Web based service consumer b) Windows application based web service.
2. Develop at least 5 components such as Order Processing, Payment Processing, etc., using .NET component technology.
3. Develop at least 5 components such as Order Processing, Payment Processing, etc., using EJB component technology
4. Develop a Service Orchestration Engine (workflow) using WS-BPEL and implement service composition. For example, a business process for planning business travels will invoke several services. This process will invoke several airline companies (such as American Airlines, Delta Airlines etc.) to check the airfare price and buy at the lowest price.
5. Develop a J2EE client to access a .NET web services
6. Build a microservice to track vehicle information.

Textbooks:

1. Web Services & SOA Principles and Technology, Second Edition, Michael P. Papazoglou.
2. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India.
3. Developing Enterprise Web Services, S. Chatterjee, J. Webber, Pearson Education.

References:

1. XML, Web Services, and the Data Revolution, F.P.Coyle, Pearson Education.
2. Building web Services with Java, 2nd Edition, S. Graham and others, Pearson Education.
3. Java Web Services, D.A. Chappell & T. Jewell, O’Reilly, SPD.
4. McGovern, et al., “Java web Services Architecture”, Morgan Kaufmann Publishers, 2005.

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ADHOC AND SENSOR NETWORKS
(Program Elective - V)

Prerequisites

1. A course on “Computer Networks”
2. A course on “Mobile Computing”

Objectives

1. To understand the concepts of sensor networks
2. To understand the MAC and transport protocols for ad hoc networks
3. To understand the security of sensor networks
4. To understand the applications of adhoc and sensor networks

Outcomes

1. Ability to understand the state of the art research in the emerging subject of Ad Hoc and Wireless Sensor Networks
2. Ability to solve the issues in real-time application development based on ASN.
3. Ability to conduct further research in the domain of ASN

UNIT - I

Introduction to Ad Hoc Networks

Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

Routing in MANETs

Criteria for classification, Taxonomy of MANET routing algorithms, Topology-based routing algorithms-**Proactive**: DSDV; **Reactive**: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-**Location Services**-DREAM, Quorum-based; **Forwarding Strategies:** Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

UNIT - II

Data Transmission

Broadcast Storm Problem, **Rebroadcasting Schemes**-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. **Multicasting: Tree-based:** AMRIS, MAODV; **Mesh-based:** ODMRP, CAMP; **Hybrid:** AMRoute**,** MCEDAR.

UNIT - III

Geocasting

Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR**.**

TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT - IV

Basics of Wireless, Sensors and Lower Layer Issues

Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

UNIT - V

Upper Layer Issues of WSN

Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

Textbooks:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P.Aggarwal, World Scientific Publications, March 2006, ISBN – 981–256–681–3.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

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CYBER LAWS AND SECURITY POLICIES
(Program Elective - V)

Objectives

1. To understand the computer security issues
2. To make secure system planning, policies

Outcomes

1. Describe laws governing cyberspace and analyze the role of Internet Governance in framing policies for Internet security
2. the importance of ethics in legal profession and determine the appropriate ethical and legal behaviour according to legal frameworks

UNIT - I

Introduction to Computer Security: Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity.

UNIT - II

Secure System Planning and administration, Introduction to the orange book, Security policy requirements, accountability, assurance and documentation requirements, Network Security, The Red book and Government network evaluations.

UNIT - III

Information security policies and procedures: Corporate policies- Tier 1, Tier 2 and Tier3 policies -
process management-planning and preparation-developing policies-asset classification policy-developing standards.

UNIT - IV

Information security: fundamentals-Employee responsibilities- information classification-Information handling- Tools of information security- Information processing-secure program administration.

UNIT - V

Organizational and Human Security: Adoption of Information Security Management Standards, Human
Factors in Security- Role of information security professionals.

References:

1. Computer Security Basics (Paperback)", Debby Russell and Sr. G.T Gangemi, 2ndEdition, O' Reilly Media, 2006.
2. Information Security policies and procedures: A Practitioner'sReference", Thomas R. Peltier, 2nd Edition Prentice Hall, 2004.
3. Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions, Kenneth J. Knapp, IGI Global, 2009.
4. Information Security Fundamentals, Thomas R Peltier, Justin Peltier and John blackley, 2ndEdition, Prentice Hall, 1996
5. Cyber law: the Law of the Internet, Jonathan Rosenoer, Springer-verlag, 1997
6. Cyber Security Essentials, James Graham, Averbach Publication T & F Group.

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INTERNET OF THINGS
(Program Elective - V)

Objectives

1. Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design & develop IOT Devices.

Outcomes

1. Able to understand the application areas of IOT
2. Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
3. Able to understand building blocks of Internet of Things and characteristics.

UNIT - I

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

UNIT - II

IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT. Basics of IoT System Management with NETCOZF, YANG-NETCONF, YANG, SNMP NETOPEER

UNIT - III

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling. Python packages - JSON, XML, HTTP Lib, URL Lib, SMTP Lib.

UNIT - IV

IoT Physical Devices and Endpoints - Introduction to Raspberry PI - Interfaces (serial, SPI, I2C). Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT - V

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs. Webserver – Web server for IoT, Cloud for IoT, Python web application framework. Designing a RESTful web API

Textbooks:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

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SOCIAL, WEB AND MOBILE ANALYTICS
(Program Elective - V)

Objective

1. Students must demonstrate knowledge of collecting and managing the relevant data of web and Social media analytics, identify the social business analytics and analyzing mobile data analytics with respect to publishers, operators and e-mail marketing.

Outcomes:

1. Understand the basic concepts of Web and Social Analytics.
2. Explain the process of collecting relevant data.
3. Identify the common business objectives.
4. Understand the concepts of mobile analytics.
5. Explain the concepts of mobile customer experience.
6. Analyze the mobile analytics for publisher, operator and email marketing.

UNIT- I

Social Network Data: Introduction: Definition of Network Data, Structural and Composition Variables, Modes, Affiliation Variables, Boundary Specification and Sampling, What Is Your Population?, Sampling, Types of Networks, One-Mode Networks, Two-Mode Networks, Ego-centered and Special Dyadic Networks, Network Data, Measurement and Collection, Measurement, Collection, Longitudinal Data Collection, Measurement Validity, Reliability, Accuracy, Error

UNIT - II

Rethinking Web Analytics: Meet Web Analytics 2.0, The What: Clickstream, The How Much: Multiple Outcomes Analysis, The Why: Experimentation and Testing.

The Awesome World of Click Stream Analysis: Metrics, Standard Metrics Revisited: Eight Critical Web Metrics, Visits and Visitors, Time on Page and Time on Site, Bounce Rate, Exit Rate, Conversion Rate, Engagement, Web Metrics Demystified, Four Attributes of Great Metrics, Example of a Great Web Metric, Strategically-aligned Tactics for Impactful Web Metrics, Diagnosing the Root Cause of a Metric’s Performance—Conversion, Leveraging Custom Reporting, Starting with Macro Insights

UNIT - III

The Key to Glory: Measuring Success: Focus on the “Critical Few”, Five Examples of Actionable Outcome KPIs, Task Completion Rate, Share of Search, Visitor Loyalty and Recency, RSS/Feed Subscribers, % of Valuable Exits, Moving Beyond Conversion Rates, Cart and Checkout Abandonment, Days and Visits to Purchase, Average Order Value, Primary Purpose (Identify the Convertible), Measuring Macro and Micro Conversions, Examples of Macro and Micro Conversions, Quantifying Economic Value, Measuring Success for a Non-ecommerce Website, Visitor Loyalty, Visitor Recency, Length of Visit, Depth of Visit, Measuring B2B Websites.

UNIT-IV

Emerging Analytics: Social, Mobile, and Video: Measuring the New Social Web: The Data Challenge, The Content Democracy Evolution, The Twitter Revolution, Analyzing Offline Customer Experiences (Applications), Analyzing Mobile Customer Experiences, Mobile Data Collection: Options, Mobile Reporting and Analysis, Measuring the Success of Blogs, Raw Author Contribution, Holistic Audience Growth, Citations and Ripple Index, Cost of Blogging, Benefit (ROI) from Blogging, Quantifying the Impact of Twitter, Growth in Number of Followers, Message Amplification, Click-Through Rates and Conversions, Conversation Rate, Emerging Twitter Metrics, Analyzing Performance of Videos, Data Collection for Videos, Key Video Metrics and Analysis, Advanced Video Analysis.

UNIT-V

Mobile Analytics: How Mobile Is Different than Other Digital Channels

Understanding the Current Mobile Market Landscape, Growth in Smartphone Adoption, The Battle Between iOS and Android, The Explosion of Global Mobile Web Traffic, The Introduction of Mobile Advertising, Identifying What Is Next for Mobile Marketing, Increased Use of Apple Passbook, Improvements in Facebook's Mobile Functionality, Expansion of Location-Based Technologies, Increased Strength of Mobile Measurement, The Current State of Measuring Mobile, Marketing Activities, Mobile Device Reporting, Audience/Visitor Metrics, Mobile App Performance, The Future State of Measuring Mobile Marketing, Activities

Textbooks:

1. Stanley Wasserman, Katherine Faust, "Social Network Analysis: Methods And Applications" **Cambridge** University Press. (Chapter -1)
2. Avinash Kaushik, Web Analytics 2.0, The Art of Online Accountability & Science of Customer Centricity, Wiley Publishing, Inc., (Chapter-2, Chapter-3 & chapter-4)
3. Chuck Hemann, Ken Burbary, **Digital Marketing Analytics:** Making Sense of Consumer Data in a Digital World, Que Publishing, (Chapter-5)

References:

1. Social, Web and Mobile Analytics (IBM ICE Publication)
2. Robert A. Hanneman and Mark Riddle, "Introduction to social network methods", University of California, 2005.
3. Jure Leskovec,Stanford Univ.Anand Rajaraman,Milliway Labs, Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2 edition, 2014.
4. Wasserman, S., & Faust, K, "Social Network Analysis: Methods and Applications", Cambridge University Press; 1 edition, 1994.

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INFORMATION SECURITY
(Open Elective)

Prerequisites

1. A Course on "Computer Networks"
2. A Course on "Mathematics"

Objectives

1. To understand the fundamentals of Cryptography
2. To understand various key distribution and management schemes
3. To understand how to deploy encryption techniques to secure data in transit across data networks
4. To apply algorithms used for secure transactions in real world applications

Outcomes

1. Demonstrate the knowledge of cryptography, network security concepts and applications.
2. Ability to apply security principles in system design.
3. Ability to identify and investigate vulnerabilities and security threats and mechanisms to counter them.

UNIT-I

Security Attacks

(Interruption, Interception, Modification and Fabrication),

Security Services

(Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security.

Classical Encryption Techniques, DES, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operation, Blowfish, Placement of Encryption Function, Traffic Confidentiality, key Distribution, Random Number Generation.

UNIT-II

Public key Cryptography

Principles, RSA algorithm, Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography.

Message authentication and Hash Functions, Authentication Requirements and Functions, Message Authentication, Hash Functions and MACs Hash and MAC Algorithms SHA-512, HMAC.

UNIT -III

Digital Signatures

Authentication Protocols, Digital signature Standard, Authentication Applications,Kerberos, X.509 Directory Authentication Service.

Email Security: Pretty Good Privacy (PGP) and S/MIME.

UNIT-IV

IP Security

Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

Web Security

Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

UNIT-V

Intruders, Viruses and Worms Intruders, Viruses and related threats Firewalls: Firewall Design Principles, Trusted Systems, Intrusion Detection Systems.

Textbook:

1. Cryptography and Network Security (principles and approaches), William Stallings, 4th Edition Pearson Education.

References:

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Principles of Information Security, Whitman, Thomson.

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ETHICAL HACKING
(Open Elective)

Prerequisites

1. A course on “Operating Systems”
2. A course on “Computer Networks”
3. A course on “Network Security and Cryptography”

Objectives

1. The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.
2. The course includes-Impacts of Hacking; Types of Hackers; Information Security Models; Information Security Program; Business Perspective; Planning a Controlled Attack; Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration)

Outcomes

1. Gain the knowledge of the use and availability of tools to support an ethical hack
2. Gain the knowledge of interpreting the results of a controlled attack
3. Understand the role of politics, inherent and imposed limitations and metrics for planning of a test
4. Comprehend the dangers associated with penetration testing

UNIT- I

Introduction

Hacking Impacts, The Hacker

Framework

Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration

Information Security Models

Computer Security, Network Security, Service Security, Application Security, Security Architecture

Information Security Program

The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking

UNIT - II

The Business Perspective

Business Objectives, Security Policy, Previous Test Results, Business Challenges

Planning for a Controlled Attack

Inherent Limitations, Imposed Limitations, Timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement

UNIT - III

Preparing for a Hack

Technical Preparation, Managing the Engagement

Reconnaissance

Social Engineering, Physical Security, Internet Reconnaissance

UNIT - IV

Enumeration

Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase

Exploitation

Intutive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern

UNIT - V

Deliverable

The Deliverable, The Document, Overal Structure, Aligning Findings, Presentation

Integration

Integrating the Results, Integration Summary, Mitigation, Defense Planning, Incident Management, Security Policy, Conclusion

Textbook:

1. The Ethical Hack: A Framework for Business Value Penetration Testing, Auerbach Publications, James S. Tiller, CRC Press

References:

1. Ethical Hacking and Countermeasures Attack Phases, EC-Council, Cengage Learning
2. Hands-On Ethical Hacking and Network Defense, Michael Simpson, Kent Backman, James Corley, Cengage Learning

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VALUE EDUCATION
(Audit Course - I)

Objectives

Students will be able to

1. Understand value of education and self-development
2. Imbibe good values in students
3. Let the should know about the importance of character

Outcomes

Students will be able to

1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality

UNIT – I

Values and self-development-Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non-moral valuation. Standards and principles. Value judgements

UNIT – II

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline.

UNIT - III

Personality and Behavior Development – Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of Self-destructive habits. Association and Cooperation. Doing best for saving nature.

UNIT – IV

Character and Competence-Holy books vs Blind faith , Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively.

Textbook:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi.

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ENGLISH FOR RESEARCH PAPER WRITING
(Audit Course - II)

Objectives:

Students will be able to:

1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title
4. Ensure the good quality of paper at very first-time submission

UNIT - I

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT - II

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.

UNIT - III

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT - IV

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT - V

Skills are needed when writing the Methods, Skills needed when writing the Results, Skills are needed when writing the Discussion, Skills are needed when writing the Conclusions

UNIT - VI

Useful phrases, how to ensure paper is as good as it could possibly be the first – time submission

Suggested Studies:

1. Goldbort R(2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
5. Highman M(1998P), Handbook of Writing for the Mathematical Seiences, SIAM. Highman's Book
6. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011