DETAILED SYLLABUS FOR M.TECH IN COMPUTER SCIENCE & ENGINEERING (SPECIALIZATION: INFORMATION SECURITY)

UEM
श्रद्धावान लभते ज्ञानम्
UNIVERSITY OF ENGINEERING & MANAGEMENT
Good Education, Good Jobs

DEPT. OF COMPUTER SCIENCE & ENGINEERING

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Course Description

SCHEME – SEMESTER WISE COURSE ALLOCATION

First Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	CC	CSC101	Program Core I- Mathematical foundations of Computer Science	3	0	0	3
2	CC	CSC102	Program Core II-Advanced Data Structures	3	0	4	5
3	DE	CSDxxx	Program Elective I	3	0	0	3
4	DE*	CSDxxx	Program Elective II	3	0	4	5
5	GE	Axxx	Audit Course I	2	0	0	2
6	GE**	Axxx	Audit Course II	2	0	0	2
			Total				20

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	DE	CSD111	Digital Forensic	3	0	0	3
2	DE	**CSD112**	**Ethical Hacking**	3	0	0	3
3	DE	CSD113	Intrusion Detection	3	0	0	3
4	DE*	CSD121	Malware Analysis & Reverse Engineering	3	0	4	5
5	DE*	CSD122	Secure Software Design and Enterprise Computing	3	0	4	5
6	DE*	**CSD123**	**Machine Learning**	3	0	4	5
7	GE	**A101**	**Audit: Research Methodology and IPR**	2	0	0	2
8	GE	A102	Audit: English for Research Paper Writing	2	0	0	2
9	GE	A103	Audit: Disaster Management	2	0	0	2
10	GE	A104	Audit: Sanskrit for Technical Knowledge	2	0	0	2
11	GE**	A105	Audit: Value Education	2	0	0	2
12	GE**	**A106**	**Audit: Constitution of India**	2	0	0	2
13	GE**	A107	Audit: Pedagogy Studies	2	0	0	2
14	GE**	A108	Audit: Stress Management by Yoga	2	0	0	2
15	GE	A009	Audit: Personality Development through Life Enlightenment Skills	2	0	0	2

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Course Description

TITLE OF COURSE: MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

COURSE CODE: CSC101

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Introduction:

Discrete mathematics is mathematics that deals with discrete objects. Discrete objects are those which are separated from (not connected to/distinct from) each other. Integers (aka whole numbers), rational numbers (ones that can be expressed as the quotient of two integers), automobiles, houses, people etc. are all discrete objects. On the other hand real numbers which include irrational as well as rational numbers are not discrete. As you know between any two different real numbers there is another real number different from either of them. So they are packed without any gaps and cannot be separated from their immediate neighbours. In that sense, they are not discrete. In this course, we will be concerned with objects such as integers, propositions, sets, relations and functions, which are all discrete. We are going to learn concepts associated with them, their properties, and relationships among them among others.

Objectives:

To introduce students to language and methods of the area of Discrete Mathematics. The focus of the module is on basic mathematical concepts in discrete mathematics and on applications of discrete mathematics in algorithms and data structures. To show students how discrete mathematics can be used in modern computer science (with a focus on algorithmic applications).

Course Outcomes (CO):
Knowledge:

1. Understand the notion of mathematical thinking, mathematical proofs, and algorithmic thinking, and be able to apply them in problem-solving.
2. Understand the basics of discrete probability and number theory, and be able to apply the methods from these subjects in problem-solving.
3. Be able to use effectively algebraic techniques to analyse basic discrete structures and algorithms.
4. Understand asymptotic notation, its significance, and be able to use it to analyse asymptotic performance for some basic algorithmic examples.

Course Description

5. Understand some basic properties of graphs and related discrete structures, and be able to relate these to practical examples.

Application:

1. Introduction to combinatorics: counting techniques, pigeonhole principle, inclusion-exclusion.
2. Recurrence relations, solving recurrences using generating functions.
3. Master Theorem for solving recurrences.
4. Graphs. Basic graph algorithms. Trees. Applications of graphs.
5. Applications of linear algebra and matrix algebra in algorithms (e.g., in web searching).
6. Algorithmic applications of random processes and Markov chains, for example, cover time in graphs and card shuffling.
7. Partitions, enumerations with symmetries.

Course Contents:

UNIT I: Mathematical Logic: Statements and notations, Connectives, Well-formed formulas, Truth tables, tautology, equivalence implication, Normal forms.

UNIT II: Predicates: Predicative logic, Free & Bound variables, Rules of inference, Consistency, proof of contradiction, Automatic Theorem Proving.

UNIT III: Relations: Properties of Binary Relations, equivalence, compatibility and partial ordering relations, Hasse diagram. Functions: Inverse Function Comports of functions, Recursive Functions, Lattice and its Properties.

UNIT IV: Algebraic structures: Algebraic systems Examples and general properties, Semi groups and monads, groups sub groups, homomorphism, Isomorphism.

UNIT V: Elementary Combinatorics: Basis of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial Multinomial theorems, the principles of Inclusion-Exclusion. Pigeon hole principles and its application

UNIT VI: Recurrence Relation: Generating Functions, Function of Sequences Calculating Coefficient of generating function, Recurrence relations, solving recurrence relation by substitution and Generating funds. Characteristics roots solution of In homogeneous Recurrence Relation.

UNIT VII: Graph Theory: Representation of Graph, DFS, BFS, Spanning Trees, Planar Graphs, Basic Concepts Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers.

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Course Description

TEXT BOOKS:

1. Elements of DISCRETE MATHEMATICS-A computer-oriented approach CL Liu, d p nohapatra, 3rd ed TMH
2. Discrete mathematics for computer scientists & mathematicians JL Mott, A Kandel, TP Baker PHI.

REFERENCE BOOKS:

1. Discrete Mathematics with Applications, Thomas Koshy, Elsevier
2. Discrete Mathematical Structures, Bernand Kolman, Roberty C. Busby, Sharn Cutter Ross, Pearson Education/PHI
3. Discrete Mathematical Structures Theory and application-Malik & Sen.
4. Discrete Mathematics for Computer science, Garry Haggard and others, Thomson.

TITLE OF COURSE: ADVANCED DATA STRUCTURES

COURSE CODE: CSC102

L-T-P: 3-0-4

CREDITS: 5

SYLLABUS

Introduction:

This course examines advanced data structures and algorithms basics. The Topics to be covered (tentatively) include:

- Dictionaries, Hashing, Skip Lists.
- Tree.
- Text Processing.
- Computational Geometry.

Course Objectives (CO):

Students will be able to:

The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem. Students should be able to understand the necessary mathematical abstraction to solve problems. To familiarize students with advanced paradigms and data structure used to solve algorithmic problems. Student should be able to come up with analysis of efficiency and proofs of correctness.

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Course Description

Course Outcomes (CO):

At the end of this course, students will be able to: -

Knowledge:

1. To learn about the data structures/ methods/algorithms mentioned in the course with a comparative perspective so as to make use of the most appropriate data structure/ method/algorithm in a program to enhance the efficiency (i.e. reduce the run-time) or for better memory utilization, based on the priority of the implementation.
2. To understand at least the efficiency aspects of the tree algorithms covered in this course.
3. To convert an inefficient program into an efficient one using the knowledge gathered from this course.
4. To identify suitable data structures and develop algorithms for computational geometry problems.

Application:

1. To implement different types of hashing technique.
2. To develop and analyze algorithms for red-black trees, B-trees and Splay trees.
3. To develop algorithms for text processing applications.
4. To implement String Operations

Course Contents:

Unit 1: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries. Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

Unit 2: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists**.**

Unit 3: Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees.

Unit 4: String Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem.

Unit 5: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees.

References:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
2. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.
3. Horowitz and Sahani:Fundamental of Data Structures in C,2nd Edn, 2008
4. Kruse, Tonso, Leung: Data Structures and Program Design in C, 2000
5. Richard F.Gilberg & Behrouz Forouzan: Data Structures, A Pseudocode Approach withC, 2001.

Course Description

6. Weiss: Data Structures and Algorithm Analysis in C/C++, 3rd Edn, 2006

TITLE OF COURSE: ADVANCED DATA STRUCTURES LAB

COURSE CODE: CSC192

L-T-P: 0-0-4

CREDITS: 2

SYLLABUS

Introduction:

This course examines advanced data structures and algorithms basics. The Topics to be covered (tentatively) include:

- Dictionaries, Hashing, Skip Lists.
- Tree.
- Text Processing.
- Computational Geometry.

Course Objectives:

Students will be able to:

The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem. Students should be able to understand the necessary mathematical abstraction to solve problems. To familiarize students with advanced paradigms and data structure used to solve algorithmic problems. Student should be able to come up with analysis of efficiency and proofs of correctness.

Course Outcomes:

At the end of this course, students will be able to: -

Knowledge:

5. To learn about the data structures/ methods/algorithms mentioned in the course with a comparative perspective so as to make use of the most appropriate data structure/ method/algorithm in a program to enhance the efficiency (i.e. reduce the run-time) or for better memory utilization, based on the priority of the implementation.
6. To understand at least the efficiency aspects of the tree algorithms covered in this course.
7. To convert an inefficient program into an efficient one using the knowledge gathered from this course.

Course Description

8. To identify suitable data structures and develop algorithms for computational geometry problems.

Application:

1. To implement different types of hashing technique.
2. To develop and analyze algorithms for red-black trees, B-trees and Splay trees.
3. To develop algorithms for text processing applications.
4. To implement String Operations

Course Contents:

Unit 1: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries. Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

Unit 2: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists**.**

Unit 3: Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees.

Unit 4: String Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem.

Unit 5: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees.

Exercises that must be done in this course are listed below:

Exercise No.1: Implementation of array operations

Exercise No. 2: Stacks and Queues: adding, deleting elements

Exercise No. 3: Circular Queue: Adding & deleting elements

Exercise No. 4: Merging Problem: Evaluation of expressions operations on multiple stacks & queues

Exercise No. 5: Implementation of linked lists: inserting, deleting, and inverting a linked list.

Exercise No. 6: Implementation of stacks & queues using linked lists, Polynomial addition, and Polynomial multiplication

Exercise No. 7: Sparse Matrices: Multiplication, addition.

Exercise No. 8: Recursive and Non-recursive traversal of Trees

Exercise No. 9: Threaded binary tree traversal. AVL tree implementation

Exercise No. 10: Application of Trees. Application of sorting and searching algorithms

Course Description

References:

7. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
8. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.
9. Horowitz and Sahani:Fundamental of Data Structures in C,2nd Edn, 2008
10. Kruse, Tonso, Leung: Data Structures and Program Design in C, 2000
11. Richard F.Gilberg & Behrouz Forouzan: Data Structures, A Pseudocode Approach withC, 2001.
12. Weiss: Data Structures and Algorithm Analysis in C/C++, 3rd Edn, 2006

TITLE OF COURSE: DIGITAL FORENSIC

COURSE CODE: CSD111

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Pre-requisite: Knowledge is also assumed of basic concepts of Networking.

Introduction:

Digital forensics (sometimes known as digital forensic science) is a branch of forensic science encompassing the recovery and investigation of material found in digital devices, often in relation to computer crime. The term digital forensics was originally used as a synonym for computer forensics but has expanded to cover investigation of all devices capable of storing digital data With roots in the personal computing revolution of the late 1970s and early 1980s, the discipline evolved in a haphazard manner during the 1990s, and it was not until the early 21st century that national policies emerged.

Digital forensics investigations have a variety of applications. The most common is to support or refute a hypothesis before criminal or civil courts. Criminal cases involve the alleged breaking of laws that are defined by legislation and that are enforced by the police and prosecuted by the state, such as murder, theft and assault against the person. Civil cases on the other hand deal with protecting the rights and property of individuals (often associated with family disputes) but may also be concerned with contractual disputes between commercial entities where a form of digital forensics referred to as electronic discovery (ediscovery) may be involved.

Course Outcomes (CO):

1. Upon completion of the course, the student should be able to:
2. Discuss the security issues network layer and transport layer.
3. Apply security principles in the application layer.
4. Explain computer forensics.

Course Description

5. Use forensics tools.
6. Analyze and validate forensics data.

Course Contents:

Module-1: Network Layer Security & Transport Layer Security

IPSec Protocol – IP Authentication Header – IP ESP – Key Management Protocol for IPSec. Transport layer Security: SSL protocol, Cryptographic Computations – TLS Protocol.

Module-2: E-mail security & firewalls

PGP – S/MIME – Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls – Firewall designs – SET for E-Commerce Transactions.

Module-3: Introduction to computer forensics

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques – Incident and incident response methodology – Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. – Forensics Technology and Systems – Understanding Computer Investigation – Data Acquisition.

Module-4: Evidence collection and forensics tools

Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

Module 5: Analysis and validation:

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics.

Text Books

1. Man Young Rhee, “Internet Security: Cryptographic Principles”, “Algorithms and Protocols”, Wiley Publications, 2003.
2. Nelson, Phillips, Enfinger, Steuart, “Computer Forensics and Investigations”, Cengage Learning, India Edition, 2008.

References

1. John R.Vacca, “Computer Forensics”, Cengage Learning, 2005
2. Richard E.Smith, “Internet Cryptography”, 3rd Edition Pearson Education, 2008.

Course Description

3. Marjie T.Britz, “Computer Forensics and Cyber Crime”: An Introduction”, 3rd Edition, Prentice Hall, 2013.

TITLE OF COURSE: ETHICAL HACKING

COURSE CODE: CSD112

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Introduction:

- This course introduces the concept of Ethical Hacking
- Gives the students the opportunity to learn about different tools and techniques in Ethical hacking
- Understand ethics behind hacking and vulnerability disclosure

Course Objectives:

- Introduces the concepts of Ethical Hacking and gives the students the opportunity to learn about different tools and techniques in Ethical hacking and security and practically apply some of the tools.

Program Outcomes (CO):

After completion of course, students would be able to:

- Understand the core concepts related to malware, hardware and software vulnerabilities
- and their causes
- Understand ethics behind hacking and vulnerability disclosure
- Appreciate the Cyber Laws and impact of hacking
- Exploit the vulnerabilities related to computer system and networks using state of the art tools and technologies

Course Contents:

Unit 1:

Introduction to Ethical Disclosure: Ethics of Ethical Hacking, Ethical Hacking and the legal system, Proper and Ethical Disclosure

Unit 2:

Course Description

Penetration Testing and Tools: Using Meta sploit, Using Back Track Live CD Linux Distribution

Unit 3:

Vulnerability Analysis: Passive Analysis, Advanced Static Analysis with IDA Pro, Advanced Reverse Engineering

Unit 4:

Client-side browser exploits, Exploiting Windows Access Control Model for Local Elevation Privilege, Intelligent Fuzzing with Sulley, From Vulnerability to Exploit

Unit 5:

Malware Analysis: Collecting Malware and Initial Analysis, Hacking Malware

Unit 6:

Case study of vulnerability of cloud platforms and mobile platforms & devices.

References:

1. Shon Harris, Allen Harper, Chris Eagle and Jonathan Ness, Gray Hat Hacking: The Ethical Hackers' Handbook, TMH Edition

2. Jon Erickson, Hacking: The Art of Exploitation, SPD

TITLE OF COURSE: INTRUSION DETECTION

COURSE CODE: CSD113

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Pre-requisite: Knowledge is also assumed of basic concepts of networking.

Introduction:

The objective of this course is to provide an in depth introduction to the science and art of intrusion detection. The course covers methodologies, techniques, and tools for monitoring events in computer system or network, with the objective of preventing and detecting unwanted process activity and recovering from malicious behavior.

Course Outcomes (CO):

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Course Description

At the end of this course, students will be able to:

1. Obtain comprehensive knowledge on the subject of intrusion detection
2. Understand the state of the art of intrusion detection research
3. Get a hands-on exposure to the principles and techniques used in intrusion detection, as well as the technical challenges and fundamental limitations of intrusion detection .To become either a capable practitioner or independent researcher in intrusion detection

Course Contents:

Module-1: Overview of intrusions, system intrusion process, dangers of system intrusions, history and state of the art of intrusion detection systems (IDSs): anomaly detection, misuse detection, types of IDS: Network-Based IDS. Host-Based IDS, Hybrid IDS,

Module-2: Intrusion Prevention Systems (IPS): Network-Based IPS, Host-Based IPS, Intrusion Detection Tools, the limitations and open problems of intrusion detection systems, advanced persistent threats, case studies of intrusion detection systems against real-world threats and malware. Main function, function prototyping, call by reference,return by reference, Inline functions and friend functions, virtual function, Concept of Function overloading.

Module-3: Statistical and machine approaches to detection of attacks on computers - Techniques for studying the Internet and estimating the number and severity of attacks, network based attacks, host based attacks. Statistical pattern recognition for detection and classification of attacks, and techniques for visualizing network data, etc.

Text Books

4. Roberto Di Pietro, Luigi V. Mancini, Intrusion Detection System, Springer ,2008

References

5. Anderson, Ross (2001). Security Engineering: A Guide to Building Dependable Distributed Systems. New York: John Wiley & Sons. pp. 387–388. ISBN 978-0-471-38922-4.
6. Anderson, James P., "Computer Security Threat Monitoring and Surveillance," Washing, PA, James P. Anderson Co., 1980.

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Course Description

TITLE OF COURSE: MALWARE ANALYSIS & REVERSE ENGINEERING

COURSE CODE: CSD121

L-T-P: 3-0-4

CREDITS: 5

SYLLABUS

Pre-requisite: Basic knowledge of Computer Networks and various types of attacks.

Introduction:

This course introduces the fundamentals of malware and to set up a protected static and dynamic malware analysis environment. Learn various malware behavior monitoring tools and actionable detection signatures from malware indicators. Learn how to trick malware into exhibiting behaviors that only occur under special conditions.

Course Outcomes (CO):

Upon successful completion of this course, students will:

1. Possess the skills necessary to carry out independent analysis of modern malware sampl using both static and dynamic analysis techniques.
2. Understanding of executable formats, Windows internals and API, and analysis techniqus
3. Extract investigative leads from host and network-based indicators associated with a mali cious program.
4. Apply techniques and concepts to unpack, extract, decrypt, or bypass new anti-analysis te chniques in future malware samples.
5. Basic principle of random number generator: basic principle, applications in image scrambling and encryption ;
6. Achieve proficiency with industry standard tools including IDA Pro, OllyDbg, WinDBG, PE Explorer, ProcMon etc.

Course Contents:

Module-1: Introduction: Introduction to malware, OS security concepts, malware threats, evolution of malware, malware types- viruses, worms, rootkits, Trojans, bots, spyware, adware, logic bombs, malware analysis, static malware analysis, dynamic malware analysis.

Module-2: Static Analysis: X86 Architecture- Main Memory, Instructions, Opcode and Endianness, Operands, Registers, Simple Instructions, The Stack, Conditionals, Branching, Rep Instructions, C Main Method and Offsets. Antivirus Scanning, Fingerprint for Malware, Portable Executable File Format, The PE File Headers and Sections, The Structure of a Virtual Machine, Reverse Engineering- x86 Architecture, recognizing c code constructs in assembly, c++ analysis,

Course Description

Analyzing Windows programs, Anti-static analysis techniques- obfuscation, packing, metamorphism, polymorphism.

Module-3: 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

Module-4: Dynamic Analysis: Live malware analysis, dead malware analysis, analyzing traces of malware- system-calls, api-calls, registries, network activities. Anti-dynamic analysis techniques- anti-vm, runtime-evasion techniques, , Malware Sandbox, Monitoring with Process Monitor, Packet Sniffing with Wireshark, Kernel vs. User-Mode Debugging, OllyDbg, Breakpoints, Tracing, Exception Handling, Patching.

Module-5: Malware Functionality: Downloader, Backdoors, Credential Stealers, Persistence Mechanisms, Privilege Escalation, Covert malware launching- Launchers, Process Injection, Process Replacement, Hook Injection, Detours, APC injection.

Module-6: Malware Detection Techniques: Signature-based techniques: malware signatures, packed malware signature, metamorphic and polymorphic malware signature Non-signature based techniques: similarity-based techniques, machine-learning methods, invariant inferences.

Module-7: Android Malware: Malware Characterization, Case Studies – Plankton, DroidKungFu, AnserverBot, Smartphone (Apps) Security.

Text Books:

1. Practical malware analysis The Hands-On Guide to Dissecting Malicious Software by Michael Sikorski and Andrew Honig ISBN-10: 159327-290-1, ISBN-13: 978-1-59327-290-6, 2012 2
2. Computer viruses: from theory to applications by Filiol, Eric Springer Science & Business Media, 2006.
3. Android Malware by Xuxian Jiang and Yajin Zhou, Springer ISBN 978-1-4614-7393-0, 2005

Reference Books:

1. Hacking exposed™ malware & rootkits: malware & rootkits security secrets & Solutions by Michael Davis, Sean Bodmer, Aaron Lemasters, McGraw-Hill, ISBN: 978-0-07-159119-5, 2010.
2. Windows Malware Analysis Essentials by Victor Marak, Packt Publishing, 2015.

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Course Description

TITLE OF COURSE: MALWARE ANALYSIS & REVERSE ENGINEERING LAB

COURSE CODE: CSD191

L-T-P: 0-0-4

CREDITS: 2

SYLLABUS

Prerequisite: Undergraduate courses in logic and discrete mathematics, assembly, and imperative programming

Objectives:

Students will be capable to get the general malware analysis attacks, impact of reverse engineering on software development.

Course Outcomes:

Students will also be able to handle malware analysis attacks named as static analysis and malware analysis.

Course Contents:

Module-1: Introduction to malware, OS security concepts

Module-2: Static Analysis: X86 Architecture- Main Memory, Instructions, Opcode and Endianness, Operands, Registers, Simple Instructions

Module-3: Perceptual Models: Evaluating perceptual impact, General form of a perceptual model, Examples of perceptual models

Module-4: Dynamic Analysis: Live malware analysis, dead malware analysis, analyzing traces of malware

Module-5: Malware Functionality: Downloader, Backdoors, Credential Stealers, Persistence Mechanisms.

Module-6: Malware Detection Techniques: Signature-based techniques: malware signatures, packed malware signature.

Module-7: Android Malware: Malware Characterization, Case Studies – Plankton, DroidKungFu, AnserverBot, Smartphone (Apps) Security.

List of Experiments

1. Basic analysis
2. Advanced Static Analysis, x86, IDA, Code Constructs
3. Analyzing Windows Programs, Win API, Handles, Windows Internals, Networking, COM
4. Advanced Dynamic Analysis, Debugging Concepts and Tools
5. First Project Assigned Malware Behavior, Malicious Activities and Techniques

6. Data Encoding, and Malware Countermeasures Hiding Data, Malware Countermeasures,
7. Data Encoding, and Malware Countermeasures

References

3. Hacking exposed™ malware & rootkits: malware & rootkits security secrets & Solutions by Michael Davis, Sean Bodmer, Aaron Lemasters, McGraw-Hill, ISBN: 978-0-07-159119-5, 2010.
4. Windows Malware Analysis Essentials by Victor Marak, Packt Publishing, 2015.
5. Practical malware analysis The Hands-On Guide to Dissecting Malicious Software by Michael Sikorski and Andrew Honig ISBN-10: 159327-290-1, ISBN-13: 978-1-59327-290-6, 2012 2
6. Computer viruses: from theory to applications by Filiol, Eric Springer Science & Business Media, 2006.
7. Android Malware by Xuxian Jiang and Yajin Zhou, Springer ISBN 978-1-4614-7393-0, 2005

TITLE OF COURSE: SECURE SOFTWARE DESIGN AND ENTERPRISE COMPUTING

COURSE CODE: CSD122

L-T-P: 3-0-4

CREDITS: 5

SYLLABUS

Pre-requisite: Knowledge is also assumed of basic concepts of networking.

Introduction:

The objective of this course is to fix software flaws and bugs in various software, to make students aware of various issues like weak random number generation, information leakage, poor usability, and weak or no encryption on data traffic. Techniques for successfully implementing and supporting network services on an enterprise scale and heterogeneous systems environment. Methodologies and tools to design and develop secure software containing minimum vulnerabilities and flaws.

Course Outcomes (CO):

At the end of this course, students will be able to:

1. Differentiate between various software vulnerabilities.
2. Software process vulnerabilities for an organization.
3. Monitor resources consumption in a software.
4. Interrelate security and software development process.

Course Contents:

Module-1: Secure Software Design

Course Description

Identify software vulnerabilities and perform software security analysis, Master security programming practices, Master fundamental software security design concepts, Perform security testing and quality assurance.

Module-2: Enterprise Application Development

Describe the nature and scope of enterprise software applications, Design distributed N-tier software application, Research technologies available for the presentation, business and data tiers of an enterprise software application, Design and build a database using an enterprise database system, Develop components at the different tiers in an enterprise system, Design and develop a multi-tier solution to a problem using technologies used in enterprise system, Present software solution.

Module-3: Enterprise Systems Administration

Design, implement and maintain a directory-based server infrastructure in a heterogeneous systems environment, Monitor server resource utilization for system reliability and availability, Install and administer network services (DNS/DHCP/Terminal Services/Clustering/Web/Email).

Module-4: Obtain the ability to manage and troubleshoot a network running multiple services,

Understand the requirements of an enterprise network and how to go about managing them. Handle insecure exceptions and command/SQL injection, Defend web and mobile applications against attackers, software containing minimum Vulnerabilities and flaws. Case study of DNS server, DHCP configuration and SQL injection attack.

Text Books

1. The odor Richardson, Charles N Thies, Secure Software Design, Jones & Bartlett, 2012.

References

2. Kenneth R. van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, Enterprise Software Security,Addison Wesley, 1 st Edition, 2014.

TITLE OF COURSE: SECURE SOFTWARE DESIGN AND ENTERPRISE COMPUTING LAB

COURSE CODE: CSD192

L-T-P: 0-0-4

CREDITS: 2

SYLLABUS

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Course Description

Pre-requisite: Programming skill preferably low level programming like C/C++

Introduction:

To study the different threats, vulnerabilities and controls for a software system and implement some of the widely used algorithms for software security.

Course Outcomes (CO):

At the end of this course, students will be able to:

1. Differentiate between various software vulnerabilities.
2. Software process vulnerabilities for an organization.
3. Monitor resources consumption in a software.
4. Interrelate security and software development process.

Experiments:

1. Study of Network Security fundamentals -Ethical Hacking, Social Engineering practices
2. Study of System threat attacks -Denial of Services
3. Study of Sniffing and Spoofing attacks.
4. Study of Techniques uses for Web Based Password Capturing.
5. Study of Different attacks causes by Virus and Trojans.
6. Study of Anti-Intrusion Technique –Honey pot.
7. Study of Symmetric Encryption Scheme –RC4.
8. Implementation of S-DES algorithm for data encryption
9. Implementation of Asymmetric Encryption Scheme –RSA
10. Study of IP based Authentication

Text Books

1. A. Kahate, Cryptography and network security,Tata McGraw-Hill Education, 2013
2. W. Stallings,Cryptography and network security: principles and practice(p. 743),Upper Saddle River, NJ: Pearson, 2017

References

3. Gary McGraw,Software Security:Building Security In, Addison-Wesley, 2006

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Course Description

TITLE OF COURSE: MACHINE LEARNING

COURSE CODE: CSD123

L-T-P: 3-0-4

CREDITS: 5

SYLLABUS

Introduction:

The goal of this course is:

- Extract features that can be used for a particular machine learning approach in various IOT applications.
- To compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.
- To mathematically analyses various machine learning approaches and paradigms.

Course Objectives:

1. To learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOT nodes.
2. To design and analyses various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
3. Explore supervised and unsupervised learning paradigms of machine learning.
4. To explore Deep learning technique and various feature extraction strategies.

Course Contents:

Unit 1: Supervised Learning (Regression/Classification)

- Basic methods: Distance-based methods, Nearest-Neighbors, Decision Trees, Naive Bayes Linear models: Linear Regression, Logistic Regression, Generalized Linear Models
- Support Vector Machines, Nonlinearity and Kernel Methods
- Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

Unit 2: Unsupervised Learning

- Clustering: K-means/Kernel K-means
- Dimensionality Reduction: PCA and kernel PCA
- Matrix Factorization and Matrix Completion
- Generative Models (mixture models and latent factor models)

Unit 3:

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)

Course Description

Unit 4:

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning

Unit 5

Scalable Machine Learning (Online and Distributed Learning) A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference

Unit 6:

Recent trends in various learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications.

Reference books:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012

2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)

3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

TITLE OF COURSE: MACHINE LEARNING LAB

COURSE CODE: CSD193

L-T-P: 0-0-4

CREDITS: 2

SYLLABUS

Introduction:

Machine learning is a subset of artificial intelligence in the field of computer science that often uses statistical techniques to give computers the ability to "learn" (i.e., progressively improve performance on a specific task) with data, without being explicitly programmed.

Objectives:

- To learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOT nodes.
- To design and analyses various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
- Explore supervised and unsupervised learning paradigms of machine learning.
- To explore Deep learning technique and various feature extraction strategies.

Learning Outcomes:

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Course Description

Knowledge:
After completion of course, students would be able to:

- Extract features that can be used for a particular machine learning approach in various IOT applications.
- To compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.
- To mathematically analyses various machine learning approaches and paradigms.

Application:

1. Virtual Personal Assistants.
2. Predictions while Commuting
3. Social Media Services
4. Online Customer Support
5. Search Engine Result Refining

OS: windows, linux, mac

Prerequisite: python 2.7 or 3.6

ML libraries for python:

pandas

numpy

sklearn

matplotlib

seaborn

Preferred software:

anaconda software

pycharm software

spyder

jupyter notebook

Minimum software:

IDLE

jupyter notebook

Course Contents:

Lab-1: Implement Simple Linear regression.

Take a 2D ndarray X,y

Course Description

1) Make a function to estimate the coefficient of b_0 and b_1

2) Make a function to plot the simple regression line based the dataset

Lab-2: Implement Multiple Linear regression on the boston house pricing dataset using scikit-learn.

1) Take the boston house pricing dataset from scikit learn

2) Set the features and labels

3) Split X,y into training and testing sets

4) create linear regression object

5) Train the model using the training sets

6) Show regression coefficients

7) Check if variance score: 1 means perfect prediction

8) Plot for residual error

9) Setting plot style

10) Plotting residual errors in training data

11) Plotting residual errors in test data

12) Plotting line for zero residual error

13) Plotting legend

14) Plot title

15) Function to show plot

Lab-3: Implement Naive bayes algorithm.

1) Take a 2d NDarray be X/predictor and 1D ndarray be Y/Target

2) Create Gausian Classifier

3) Train the model using traing set

4) Predict output

Lab-4: Implement Random Forests Algorithm on Iris dataset.

1) Load the library with the iris dataset

2) Load scikit's random forest classifier library

3) Load pandas ,Load numpy ,Set random seed

4) Create an object called iris with the iris data

5) Create a dataframe with the four feature variables

6) View the top 5 rows

7) Add a new column with the species names, this is what we are going to try to predict

8) View the top 5 rows

9) Create a new column that for each row, generates a random number between 0 and 1, and if that value is less than or equal to .75, then sets the value of that cell as True and false otherwise. This is a quick and dirty way of randomly assigning some rows to be used as the training data and some as the test data.

10) View the top 5 rows

11) Create two new dataframes, one with the training rows, one with the test rows

12) Show the number of observations for the test and training dataframes

13) Create a list of the feature column's names

14) View features

15) Convert each species name into a digit. So, in this case there are three species, which have been coded as 0, 1, or 2.

16) Create a random forest Classifier. By convention, clf means 'Classifier'

17) Train the Classifier to take the training features and learn how they relate to the training y (the species)

18) Apply the Classifier we trained to the test data (which, remember, it has never seen before)

19) View the predicted probabilities of the first 10 observations

20) Create actual english names for the plants for each predicted plant class

21) View the PREDICTED species for the first five observations preds[0:5]

22) View the ACTUAL species for the first five observations

23) Create a confusion matrix

24) View Feature Importance

25) View a list of the features and their importance scores

Lab-5: Implement Logistic regression on Iris dataset.

1) Load libraries

2) Load data with only two classes

3) Standardize features

4) Create logistic regression object

5) Train model

6) Create new observation

7) Predict class

8) View predicted probabilities

Lab-6: Implement Decision Tree algorithm.

1) Import Library

2) Get X (predictor) and Y (target) for training data set and x_test(predictor) of test_dataset

3) Create tree object

4) Train the model using the training sets

5) Check score

6) Predict Output

Lab-7: Implement K-Nearest Neighbours Classifer.

1) Import libraries

2) Create Dataset

3) Plot the data

4) Convert Data into np.arrays

5) Train the Learner

6) View the Model's Score

7) Apply the Learner to a New Data Point and Predict that

Lab-8: Implement Support Vector Machine in iris dataset.

1) Import Library

2) Get iris dataset

3) Get X (predictor) and Y (target) for training data set and x_test(predictor) of test_dataset

4) Create SVM classification object

5) Rain the model using the training sets

6) Check score

7) Tune Parameters of SVM

8) Use linear kernal the import data from iris data

9) take the first two features.avoid this ugly slicing by using a two-dim dataset

10) Create an instance of SVM and fit out data. Do not scale our data since we want to plot the support vectors

11) Create a mesh to plot in

12) Predict the data and plot the data

Course Description

Lab-9: Implement K-Means Clustering on iris dataset.

1) Import Library

2) Get iris dataset

3) Get X (attributes) for training data set and x_test(attributes) of test_dataset

4) Create KNeighbors classifier object model

5) Train the model using the training sets

6) Check score

7) Predict Output

Lab-10: Implement Principle Component Analysis on iris dataset.

1) Import Library

2) Get iris dataset

3) Get training and test data set as train and test

4) Create PCA obeject

5) Print default k value

6) Factor analysis

7) Reduced the dimension of training dataset using PCA

8) Reduced the dimension of test dataset

Text Books

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012

2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning,

Springer 2009 (freely available online)

3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Course Description

TITLE OF COURSE: RESEARCH METHODOLOGY AND IPR

COURSE CODE: A101

L-T-P: 2-0-0

CREDITS: 2

SYLLABUS

Introduction:

The overall aim of our postgraduate research training programmes is to provide researchers with foundation-level competency in the research skills generic to their area of research studies.The overall objective of the postgraduate research degree programme is:

1. To equip and support our students, academics and other researchers (on campus and off-campus) in Research with the necessary information and skills and enhance their prospects for career advancement.
2. To equip researchers with the specialized research skills necessary for conducting empirical studies in academia and the public sector
3. To equip post-graduate students with transferable skills necessary for professional development either within (e.g., PhD) or outside of academia
4. To promote competent and ethical academic practice for future generations of academics

Course Objectives (CO):

Students will be able to:

The overall aim of the course is to deepen knowledge regarding basic concepts of the research process in occupational therapy from formulating a problem to presenting a proposal for a research project and IPR techniques. Study of Research Methodology in this section of the course is to deepen knowledge and understanding of how to use a quantitative approach and quantitative research methods in occupational therapy research. Course content includes the research process in quantitative studies, formulating quantitative research questions relating to occupational therapy, statistics, and single case-methodology. One of the most important issues, which has been raised due to the emergence of modern biotechnology, is the legal characterization and treatment of trade related biotechnological processes and products, is described as Intellectual Property, which definitely helpful for the students related to their research work.

Course Outcomes:

At the end of this course, students will be able to: -

1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understand that today's world is controlled by Computer, Information Technology, but
5. tomorrow world will be ruled by ideas, concept, and creativity.

Course Description

6. Understanding that when IPR would take such important place in growth of individuals &
7. nation, it is needless to emphasis the need of information about Intellectual Property Right
8. to be promoted among students in general & engineering in particular.
9. Understand that IPR protection provides an incentive to inventors for further research work
10. and investment in R & D, which leads to creation of new and better products, and in turn
11. brings about, economic growth and social benefits.

Course Contents:

Unit 1: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit 2: Effective literature studies approaches, analysis Plagiarism, Research ethics,

Unit 3: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Unit 4: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of

Patenting and Development: technological research, innovation, patenting, development.

International Scenario: International cooperation on Intellectual Property. Procedure for

grants of patents, Patenting under PCT.

Unit 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Unit 6: New Developments in IPR: Administration of Patent System. New developments

in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case

Studies, IPR and IITs.

References:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
3. Ranjit Kumar, 2 ndEdition, “Research Methodology: A Step by Step Guide for beginners”
4. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd,2007.
5. Mayall, “Industrial Design”, McGraw Hill, 1992.
6. Niebel, “Product Design”, McGraw Hill, 1974.
7. Asimov, “Introduction to Design”, Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New Technological Age”, 2016.
9. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

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Course Description

TITLE OF COURSE: DISASTER MANAGEMENT

COURSE CODE: A103

L-T-P: 2-0-0

CREDITS: 2

SYLLABUS

Introduction:

Disasters are seen as the effect of hazards on vulnerable areas. Hazards that occur in areas with low vulnerability do not result in a disaster. Great damage, loss, destruction and devastation to life and property are the results of Disasters. The immeasurable damage caused by disaster varies with the geographical location. In the concerned areas disasters have the following effects: It completely upsets the normal day to day life. Harmfully persuade the emergency systems Depending on the intensity and severity of the disaster the normal needs and processes are badly affected and deteriorated. Disasters are the effect of hazard on vulnerable or defenseless areas. Hazards that occur in areas with low vulnerability do not result in a disaster.

Course Objectives: Students will be able to:

1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

Course Outcomes:

- Develop an understanding of the key concepts, definitions a key perspectives of All Hazards Emergency Management
- Understand the Emergency/Disaster Management Cycle REVISED
- Have a basic understanding for the history of Emergency management

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Course Description

• Develop a basic under understanding of Prevention, Mitigation, Preparedness, Response and Recovery

• Develop a basic understanding for the role of public an private partnerships

Course Contents:

Module-I: Introduction

Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

Module-II: Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

Module-III: Disaster Prone Areas In India: Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

Module-IV: Disaster Preparedness And Management: Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

Module-V: Risk Assessment: Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

Module-VI: Disaster Mitigation: Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

Suggested reading

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.

2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.

3. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep & Deep Publication Pvt. Ltd., New Delhi.

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Course Description

TITLE OF COURSE: CONSTITUTION OF INDIA

COURSE CODE: A106

L-T-P: 2-0-0

CREDITS: 2

SYLLABUS

Introduction:

This course presents the Constitution of India to the technical students who are not always having proper knowledge of it and always unaware about their fundamental rights and fundamental duties as well. Even a brief introduction of the Constitution may create a lot of effect on the minds of the students and may help us to produce a good Engineers and future professors.

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.

2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.

3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

4. Discuss the passage of the Hindu Code Bill of 1956.

Course Contents:

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Course Description

Module-I: History of Making of the Indian Constitution

Brief history of the making of Constitution of India from 1773, Drafting Committee (Composition & Working).

Module-II: Philosophy of the Indian Constitution
Preamble, Salient Features

Module-III: Contours of Constitutional Rights & Duties
Fundamental Rights - Right to Equality, Right to Freedom, Right against Exploitation, Right to freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

Module-IV: Organs of Governance
Parliament – Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

Module-V: Local Administration
District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Module-VI: Election Commission
Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.

2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.

3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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Course Description

Second Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	CC	CS203	Program Core III – Advance Algorithms	3	0	4	5
2	CC	CS204	Program Core IV – Soft Computing	3	0	0	3
3	DE*	CSDxxx	Program Elective III (**CS211)**	3	0	4	5
4	DE	CSDxxx	Program Elective IV (**CS223)**	3	0	0	3
5	GE	Axxx	Audit Course (**A202**)	2	0	0	2
8	PTI	CS205	Mini Project with Seminar	2	0	0	2
			Total				20

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	DE*	**CSD211**	**Data Encryption & Compression**	3	0	0	3
2	DE*	CSD212	Steganography & Digital Watermarking	3	0	0	3
3	DE*	CSD213	Information Theory & Coding	3	0	0	3
4	DE	CSD221	Security Assessment and Risk Analysis	3	0	0	3
5	DE	CSD222	Secure Coding	3	0	0	3
6	DE	**CSD223**	**Biometrics**	3	0	0	3
7	GE	A201	Audit: English for Research Paper Writing	3	0	0	3
8	GE	**A202**	**Audit: Disaster Management**	2	0	0	2
9	GE	A203	Audit: Sanskrit for Technical Knowledge	2	0	0	2
10	GE	A204	Audit: Value Education	2	0	0	2
11	GE	A205	Audit: Constitution of India	2	0	0	2
12	GE	A206	Audit: Pedagogy Studies	2	0	0	2
13	GE	A207	Audit: Stress Management by Yoga	2	0	0	2
14	GE	A208	Audit: Personality Development through Life Enlightenment Skills	2	0	0	2

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Course Description

TITLE OF COURSE: ADVANCE ALGORITHMS

COURSE CODE: CS203

L-T-P: 3-0-4

CREDITS: 5

SYLLABUS

Introduction:
This course examines advanced data structures and algorithms basics. The Topics to be covered (tentatively) include:

- Sorting
- Graph
- Matroids
- Graph Matching
- Flow-Networks
- Matrix Computations
- Shortest Path in Graphs
- Modulo Representation of integers/polynomials
- NP-completeness
- Approximation Algorithms
- Randamized Algorithm

Course Objectives:
Students will be able to:

Introduce students to the advanced methods of designing and analyzing algorithms. The student should be able to choose appropriate algorithms and use it for a specific problem. To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems. Students should be able to understand different classes of problems concerning their computation difficulties. To introduce the students to recent developments in the area of algorithmic design.

Course Outcomes:
At the end of this course, students will be able to: -

Knowledge:

1. Understand the different complexity analysis according different problem. You will examine the algorithms used for various operations on operating systems.

Course Description

2. Visualize different types of algorithm techniques. Become aware of the issues in the management of resources like processor, memory and input-output.
3. Determine the appropriate data structure for solving a particular set of problems.
4. Understand the basic principle of different classes of problems like P,NP,NP-complete.

Application:

1. To Categorize the different problems in various classes according to their complexity.
2. To developalgorithms for different problems
3. To modify the existing algorithm like merge sort, binary search also find out the complexity of the modified algorithm.
4. Students should have an insight of recent activities in the field of the advanced data structure.

Course Contents:

Unit 1: Bubble Sort, Insertion Sort, Merge sort, Quick sort, Topological sort with complexity. Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.

Unit 2: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST. Algorithm to compute maximum bipartite matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.

Unit 3: Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm. Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, LUP decomposition.

Unit 4: Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming. Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem.

Unit 5: Examples, proof of NP-hardness and NP-completeness. Necessity of approximation scheme, Approximation ratio, Vertex cover problem, Travelling salesman problem. Monte carlo and Las Vegas algorithm

References:

1."Introduction to Algorithms" by Cormen, Leiserson, Rivest, Stein.

2. "The Design and Analysis of Computer Algorithms" by Aho, Hopcroft, Ullman.

3. "Algorithm Design" by Kleinberg and Tardos.

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Course Description

TITLE OF COURSE: ADVANCE ALGORITHMS LAB

COURSE CODE: CS293

L-T-P: 0-0-4

CREDITS: 2

SYLLABUS

Pre-requisite: Basic concepts in mathematics and c programming languages.

Introduction:
This course covers basic concepts of design and analysis of algorithm. The Topics to be covered (tentatively) include: Complexity Analysis, Divide and Conquer, Priority queue, Dynamic Programming, Branch and Bound, Backtracking, Greedy Method, Disjoint set manipulation, Lower bound Theory, Graph traversal algorithm, Network Flow, String matching problem, Amortize Analysis, Matrix Manipulation Algorithm, Notion of NP-completeness and Approximation Algorithms.

Objectives:

1. To learn Evaluation ofalgorithm: Computational complexity, order notations, recurrences.
2. To learn Sorting: Insertion sort, merge sort, Quick sort, Linearsort, priority queue.
3. To learn greedy method: Single-source shortest path problem and minimum spanning tree.
4. To learn dynamic programming techniques: Fibonacci, single and all pair shortest paths, knapsack.
5. To learn Graph: representation and algorithms, Breadth-first search(BFS), Depth-first search(DFS), topological sorting.

Course Outcomes (CO):

The students will have a detailed knowledge of the concepts of different type of algorithm techniques, and the analysis of algorithm.Upon the completion of design and analysis of algorithm practical course, the student will be able to:

- Understand which algorithm is used in an applicationto Job scheduling in OS, applicationto Online gamesChess, Sudoku and application to string matching in word processor etc.
- Analyse which algorithm is used to Routing in network,to Range assignment, TSP.

Course Contents:

Exercises that must be done in this course are listed below:

Exercise No.1:

>Implement Binary Search using Divide and Conquer approach

Course Description

> Implement Merge Sort using Divide and Conquer approach

Exercise No.2**:**

>Implement Quick Sort using Divide and Conquer approach

> Find Maximum and Minimum element from an array of integer using Divide and Conquer approach

Exercise No.3**:**

>Find the minimum number of scalar multiplication needed for chain of matrix

Exercise No.4**:**

>Implement all pair of Shortest path for a graph (Floyed- WarshallAlgorithm)

>Implement Single Source shortest Path for a graph (Bellman Ford Algorithm)

Exercise No.5**:**

>Implement 15 Puzzle Problem

Exercise No.6**:**

>Implement 8 Queen problem

>Graph Coloring Problem

Exercise No.7**:**

>Knapsack Problem orJob sequencing with deadlines

>Implement Single Source shortest Path for a graph (Dijkstra Algorithm)

Exercise No.8**: (implement any one of the following problem):**

>Minimum Cost Spanning Tree by Prim's Algorithm

>Minimum Cost Spanning Tree by Kruskal's Algorithm

Exercise No.9**: (implement any one of the following problem):**

>Implement Breadth First Search (BFS)

>Implement Depth First Search (DFS)

Exercise No.10**:**

>Implement Naïve algorithm for string matching.

Text Book:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, “Introduction to Algorithms”, 3rd edition, PHI.
2. .Horowitz and Shani “Fundamentals of Computer Algorithms”, 2nd edition, Orient Black Swan.

Recommended Systems/Software Requirements:

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Course Description

1. Intel based desktop PC with minimum of 166 MHZ or faster processor with at least 64 MB RAM and 100 MB free disk space.
2. Turbo C or TC3 complier in Windows XP or Linux Operating System.

TITLE OF COURSE: SOFT COMPUTING

COURSE CODE: CS204

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Pre-requisite: Knowledge is also assumed of basic concepts of artificial intelligence, data base management system.

Introduction:

This course provides a comprehensive introduction to understand the underlying principles,

Techniques and approaches fuzzy logic.

Course Outcomes (CO):

The course presents basics of artificial intelligence programming including: Basics of AI, Data

Representation, Control structures, Functions, that aims to:

4. Understand fuzzy sets and fuzzy logic systems.
5. Be able to know Classical Sets and Fuzzy Sets and Fuzzy relations, Membership functions, Fuzzy to Crisp conversions.
6. Understand of Neural Network on Hebbian, competitive, Boltzman
7. Understand Genetic Algorithms in different approach.
8. Understand Other Soft Computing techniques likes Ant colony optimization (ACO), Particle Swarm Optimization (PSO).

Course Contents:

Module-1: Introduction:

Introduction to soft computing; introduction to fuzzy sets and fuzzy logic systems; introduction to biological and artificial neural network; introduction to Genetic Algorithm.

Module-2: Fuzzy sets and Fuzzy logic systems:

Classical Sets and Fuzzy Sets and Fuzzy relations : Operations on Classical sets, properties of classical sets, Fuzzy set operations, properties of fuzzy sets, cardinality, operations, and

properties of fuzzy relations. Membership functions : Features of membership functions, standard forms and boundaries, different fuzzification methods. Fuzzy to Crisp conversions: Lambda Cuts for fuzzy sets, fuzzy Relations, Defuzzification methods. Classical Logic and Fuzzy Logic: Classical predicate logic, Fuzzy Logic, Approximate reasoning and Fuzzy Implication Fuzzy Rule based Systems: Linguistic Hedges, Fuzzy Rule based system – Aggregation of fuzzy Rules, Fuzzy Inference System- Mamdani Fuzzy Models – Sugeno Fuzzy Models. Applications of Fuzzy Logic: How Fuzzy Logic is applied in Home Appliances, General Fuzzy Logic controllers, Basic Medical Diagnostic systems and Weather forecasting

Module-3: Neural Network

Introduction to Neural Networks: Advent of Modern Neuroscience, Classical AI and Neural Networks, Biological Neurons and Artificial neural network; model of artificial neuron.

Learning Methods : Hebbian, competitive, Boltzman etc., Neural Network models: Perceptron, Adaline and Madaline networks; single layer network; Back-propagation and multi layer

networks. Competitive learning networks: Kohonen self organizing networks, Hebbian learning; Hopfield Networks. Neuo-Fuzzy modelling: Applications of Neural Networks: Pattern Recognition and classification

Module-4: Genetic Algorithms:

Simple GA, crossover and mutation, Multi-objective Genetic Algorithm (MOGA). Applications of Genetic Algorithm: genetic algorithms in search and optimization, GA based clustering Algorithm, Image processing and pattern Recognition

Module 5: Other Soft Computing techniques: Simulated Annealing, Tabu search, Ant colony optimization (ACO), Particle Swarm Optimization (PSO).

Text Books

1. Fuzzy logic with engineering applications, Timothy J. Ross, John Wiley and Sons.
2. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI
3. Principles of Soft Computing , S N Sivanandam, S. Sumathi, John Wiley & Sons
4. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg
5. Neuro-Fuzzy and Soft computing, Jang, Sun, Mizutani, PHI
6. Neural Networks: A Classroom Approach,1/e by Kumar Satish, TMH,
7. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg, Pearson/PHI
8. A beginners approach to Soft Computing, Samir Roy & Udit Chakraborty, Pearson

References

7. Fuzzy Sets and Fuzzy Logic: Theory and Applications, George J. Klir and Bo Yuan, Prentice Hall
8. Neural Networks: A Comprehensive Foundation (2nd Edition), Simon Haykin, Prentice Hall.

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Course Description

TITLE OF COURSE: DATA ENCRYPTION & COMPRESSION

COURSE CODE: CSD211

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Pre-requisite: Participants will be expected to have a fairly good background in steganography.

Introduction:

This course will cover the concept of security, types of attack experienced, encryption and authentication for deal with attacks, what are Network Perimeter Security, Access Control Lists and Virtual Private Networks.

Course Outcomes (CO):

On successful completion of this course, students will be able to:

7. Understand the significance of cryptography to the modern world and the internet.
8. Understand the rationale behind block cipher design.
9. Perform the cryptanalysis of a simple block cipher.
10. Integrate cryptographic algorithms into software projects.
11. Solve elementary problems in number theory relating to cryptography.
12. Build on number theoretic basics to further their knowledge of advanced methods of cryptography

Course Contents:

Module-1: Introduction to Security, Need for security, Security approaches, Principles of security, Types of attacks.

Module-2: Encryption Techniques, Plaintext, Cipher text, Substitution & Transposition techniques, Encryption & Decryption, Types of attacks, Key range & Size.

Module-3: Symmetric & Asymmetric Key Cryptography, Algorithm types & Modes, DES, IDEA, Differential & Linear Cryptanalysis, RSA, Symmetric & Asymmetric key together, Digital signature, Knapsack algorithm.

Module-4: User Authentication Mechanism, Authentication basics, Passwords, Authentication tokens, Certificate based & Biometric authentication, Firewall.

Module-5: Case Studies of Cryptography, Denial of service attacks, IP spoofing attacks, Secure inter branch payment transactions. Conventional Encryption and Message Confidentiality,

Course Description

Conventional Encryption Principles, Conventional Encryption Algorithms, Location of Encryption Devices, Key Distribution.

Module-6: Public Key Cryptography and Message Authentication, Approaches to Message Authentication, SHA-1, MD5, Public-Key Cryptography Principles, RSA, Digital Signatures, Key Management.

Module-7: Introduction, Need for data compression, Fundamental concept of data compression & coding, Communication model, Compression ratio, Requirements of data compression, Classification.

Module-8: Methods of Data Compression: Data compression-- Loss less & Lossy; Entropy encoding-- Repetitive character encoding, Run length encoding, Zero/Blank encoding; Statistical encoding-- Huffman, Arithmetic & Lempel-Ziv coding; Source encoding-- Vector quantization (Simple vector quantization & with error term); Differential encoding—Predictive coding, Differential pulse code modulation, Delta modulation, Adaptive differential pulse code modulation; Transform based coding : Discrete cosine transform & JPEG standards; Fractal compression

Text Books:

1. Cryptography and Network Security – B. Forouzan, McGraw-Hill.

Reference Books:

1.The Data Compression Book, Nelson, BPB.
2.Cryptography & Network Security: Atul Kahate, TMH

TITLE OF COURSE: STEGANOGRAPHY & DIGITAL WATERMARKING

COURSE CODE: CSD212

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Pre-requisite: Participants will be expected to have a fairly good background in steganography.

Introduction:

Digital watermarking and information hiding are the ascendant technology subjects in information security. A digital watermarking is a mark covertly embedded in a noise-tolerant signal carrier such as an audio, video, image data or other. It is typically used to identify ownership of the copyright of such signal, verify the authenticity or integrity of the carrier signal or to show

Course Description

the identity of its users. Different from digital watermarking, information hiding usually embeds a secret into an unrelated audio, video, image data or other carrier to hide the existence of important information. No matter digital watermarking or information hiding, the embedded mark or hidden secret does not make any distinguishable change or affect carrier actual practice values to meet some visual, auditory, statistical or other invisibility.

Course Outcomes (CO):

By the end of the course, students should be able understand how Digital Watermarking and Steganography works and how can they be used in Applications for making it more secure.

1. To learn about the watermarking models and message coding
2. To learn about watermark security and authentication.
3. To learn about steganography, Perceptual model.
4. Basic knowledge of image carrier: image type, storage format, color model and transfer method etc.
5. Basic principle of random number generator: basic principle, applications in image scrambling and encryption
6. Hash function: basic principle, applications in image authentication
7. Frequency domain transformation: DFT,DCT and DWT
8. Typical methods of information hiding and digital watermarking in spatial and frequency domain;
9. Typical attack methods and evaluation criteria.

Course Contents:

Module-1: 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.

Module-2: 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**.**

Module-3: 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

Module-4: Watermark Security & Authentication: Security requirements, Watermark security and cryptography, Attacks, Exact authentication, Selective authentication, Localization, Restoration.

Module-5: Steganography: Steganography communication, Notation and terminology Information theoretic foundations of steganography, Practical steganographic methods, minimizing the embedding impact, Steganalysis

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Text Books:

4.Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker,"Digital Watermarking and Steganography", Margan Kaufmann Publishers, New York, 2008.

5. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, "Digital Watermarking", Margan Kaufmann Publishers, New York, 2003.

6. Michael Arnold, Martin Schmucker, Stephen D. Wolthusen, "Techniques and Applications of Digital Watermarking and Contest Protection", Artech House, London, 2003.

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Reference Books:

3.1 Juergen Seits, "Digital Watermarking for Digital Media", IDEA Group Publisher, New York, 2005.

4.Peter Wayner, "Disappearing Cryptography, Information Hiding: Steganography & Watermarking", Morgan Kaufmann Publishers, New York, 2002.

TITLE OF COURSE: INFORMATION THEORY & CODING

COURSE CODE: CSD213

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Introduction:

This course is for error–control coding, encoding and decoding of digital data streams, compression and decompression techniques etc.

Objectives:

The student should be made to:

- Understand error–control coding.
- Understand encoding and decoding of digital data streams.
- Be familiar with the methods for the generation of these codes and their decoding techniques.
- Be aware of compression and decompression techniques.
- Learn the concepts of multimedia communication.

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Course Description

Learning Outcomes:
Knowledge:

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

- Design an application with error–control.
- Use compression and decompression techniques.
- Apply the concepts of multimedia communication

Course Contents:

UNIT I : INFORMATION ENTROPY FUNDAMENTALS
Uncertainty, Information and Entropy – Source coding Theorem – Huffman coding –Shannon Fano coding – Discrete Memory less channels – channel capacity – channel coding Theorem – Channel capacity Theorem.

UNIT II : DATA AND VOICE CODING
Differential Pulse code Modulation – Adaptive Differential Pulse Code Modulation – Adaptive subband coding – Delta Modulation – Adaptive Delta Modulation – Coding of speech signal at low bit rates (Vocoders, LPC).

UNIT III : ERROR CONTROL CODING
Linear Block codes – Syndrome Decoding – Minimum distance consideration – cyclic codes – Generator Polynomial – Parity check polynomial – Encoder for cyclic codes – calculation of syndrome – Convolutional codes.

UNIT IV : COMPRESSION TECHNIQUES
Principles – Text compression – Static Huffman Coding – Dynamic Huffman coding – Arithmetic coding – Image Compression – Graphics Interchange format – Tagged Image File Format – Digitized documents – Introduction to JPEG standards.

UNIT V : AUDIO AND VIDEO CODING
Linear Predictive coding – code excited LPC – Perceptual coding, MPEG audio coders – Dolby audio coders – Video compression – Principles – Introduction to H.261 & MPEG Video standards.

TEXT BOOKS:

- Simon Haykin, “Communication Systems”, 4th Edition, John Wiley and Sons, 2001.
- Fred Halsall, “Multimedia Communications, Applications Networks Protocols and Standards”, Pearson Education, Asia 2002; Chapters: 3,4,5.

REFERENCES:

- Mark Nelson, “Data Compression Book”, BPB Publication 1992.
- Watkinson J, “Compression in Video and Audio”, Focal Press, London, 1995.

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Course Description

TITLE OF COURSE: SECURITY ASSESSMENT AND RISK ANALYSIS

COURSE CODE: CSD221

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Introduction:

This course will help to learn the security assessment and risk analysis issues.

Objectives:

The student should be made to security assessment and risk analysis in industry.

Learning Outcomes:

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

- Safety Management.
- Disaster Management
- Legal Provisions regarding safety

Course Contents:

Module-1: Safety Management - Concept of Safety, Applicable areas, unsafe actions &Conditions. Responsibility of Safety - Society, Govt., Management, Union & employees. Safety Officer - Appointment, Qualification, Duties of safety officer. Safety Committee - Membership, Functions & Scope of Safety committee. Motivation & Training of employees for safety in Industrial operations.

Module-2: Disaster Management - Designing, Importance & implementation of Disaster Control Action Plan. Industrial Accidents - Causes & effects of Industrial accidents. Accident Radio Theory, Cost of Accidents, Impact of Accidents on employees, Union, Management & Society & their role & responsibility in the prevention of accidents.

Module-3: Legal Provisions regarding safety, Accident prevention & Compensation to affected employees as under Factories Act-1948,Factories Act(Amendment)1987,Maharashtra Factories Rule-1963,The Mines Act-1952,Maharashtra Safety Officers Rule-1982,The Workmen CompensationAct-1923,ESI Act, Public Liabilities Insurance Act-1991,Fatal Accident Act, Functions of National Safety Council. Accidents, recording, Investigation analysis & reporting. Fire- basic Chemistry/ Mechanism, Reasons, prevention & types of fire, extinction of fire, Loss prevention Association-Objective, formation, scope &significance.

Module-4: Environment Management

Environment Protection Act, 1986 - Definitions, Occupier, Environmental pollution, handling of hazardous substance, offences by companies, penalties for contravention of the Act. Air Pollution Act,1982 - Definition, Occupier, Air Pollution, Chimney, Approval Fuel, Emission, Powers & functions of Central & State Boards, role of approved laboratories, offences by companies,

penalties & procedures. Water Pollution Act, 1974 - Definitions, sewage effluent, trade effluent, outlet, and stream.

Module-5: Powers & functions of Central State Boards, role of approved laboratories, Offences by Companies, Penalties & Procedures. Noise Pollution - Definition of sound & noise, sources of noise, measurement of noise, effect of noise, Physiological, Psychological & behavioral, noise control.

Text Books:

1. Factories Act, 19482. Cost Accounting: Methods and Problems- B.K.Bhar 3. Health in Industry-Donald Hanter 4. Pollution Management in Industies-R.K.Trivedi5. Industrial Engineering- O.P.Khanna

TITLE OF COURSE: SECURE CODING

COURSE CODE: CSD222

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Pre-requisite: Knowledge is also assumed of basic concepts of C language and networking.

Introduction:

This course provides a comprehensive introduction to understand the underlying principles,

Techniques and approaches which constitute a coherent body of knowledge in coding.

Course Outcomes (CO):

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

1. To implement security as a culture and show mistakes that make applications vulnerable to attacks.
2. To understand various attacks like DoS, buffer overflow, web specific, database specific, web-spoofing attacks.
3. To demonstrate skills needed to deal with common programming errors that lead to most security problems and to learn how to develop secure applications.
4. To identify the nature of the threats to software and incorporate secure coding practices throughout the planning and development of the product.

Course Description

5. Able to properly handle application faults, implement secure authentication, authorization and data validation controls used to prevent common vulnerabilities.

Course Contents:

Module-1: Introduction: 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.

Module-2: 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.

Module-3: 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.

Module-4: Secure Coding Techniques: Protection against DoS attacks, Application Failure Attacks, CPU Starvation Attacks, Insecure Coding Practices In Java Technology. ARP Spoofing and its countermeasures. Buffer Overrun-Stack overrun, Heap Overrun, Array Indexing Errors, Format String Bugs. Security Issues in C Language: String Handling, Avoiding Integer Overflows and Underflows and Type Conversion Issues-Memory Management Issues, Code Injection Attacks, Canary based countermeasures using Stack Guard and Propolice. Socket Security, Avoiding Server Hijacking, Securing RPC, ActiveX and DCOM

Module-5: Database and Web-specific issues: SQL Injection Techniques and Remedies, Race conditions, Time of Check Versus Time of Use and its protection mechanisms. Securing Signal Handlers and File Operations. XSS scripting attack and its types –Persistent and Non persistent attack XSS Countermeasures and Bypassing the XSS Filters.

Module-6: Testing Secure Applications: Security code overview, secure software installation. The Role of the Security Tester, Building the Security Test Plan. Testing HTTP-Based Applications, Testing File-Based Applications, Testing Clients with Rogue Servers

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Course Description

Text Books

1. Writing Secure Code, Michael Howard and David LeBlanc,Microsoft Press, 2ndEdition, 2004
2. Buffer Overflow Attacks: Detect, Exploit, Preven tby Jason Deckar, Syngress, 1stEdition, 2005

References

9. Threat Modeling, Frank Swiderski and Window Snyder, Microsoft Professional, 1stEdition, 2004

TITLE OF COURSE: BIOMETRICS

COURSE CODE: CSD223

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Pre-requisite: Knowledge is also assumed of basic concepts in programming languages, algorithms, networking, mathematics etc.

Introduction:

Biometric Systems are automated methods of verifying or recognizing the identity of a living person on the basis of some physiological characteristics, like a fingerprint or face pattern, or some aspects of behavior, like handwriting or keystroke patterns. Some of the most used biometric characteristics are shown in the picture below. A biometric system based on physiological characteristics is more reliable than one which adopts behavioral features, even if the latter may be easier to integrate within certain specific applications.

Course Outcomes (CO):

Upon Completion of the course, the students will be able to

1. Implement basic security algorithms required by the biometric system.
2. Analyze the vulnerabilities in biometric system and hence be able to design a security Solution.
3. Analyze the possible security attacks in complex real time systems and their effective Countermeasures
4. Identify the security issues in the network and resolve it.
5. Formulate research problems in the biometric security field

Course Contents:

Module-I: ATTACKS IN BIOMETRIC

Course Description

Adversary attacks-attacks at the user Interface-Attacks on the biometric processing, Attacks on template database –system security analysis – spoofing and mimicry attacks

Module-II: BIOMETRIC AUTHENTICATION PROTOCOLS

Introduction-biometric based secure cryptographic protocols – biometrics based cryptographic key Regeneration and sharing – Biometrics based session key generation and sharing protocol – performance evaluation strategies.

Module-III: BIOMETRIC CRYPTOGRAPHY

Protection of biometric data –biometric data shuffling scheme- experimental results –security analysis - cryptographic key Reservation - cryptographic key with biometrics-Revocability in key generation system-Adaptations of Generalized key Regeneration scheme –IRIS Biometrics –Face Biometrics –Extension of Key Regeneration scheme.

Module-IV:BIOMETRIC DATA PROTECTION

Biometric data – Concept of personal data – Data protection and privacy – Security criteria for Biometric system – Adoption of security – Revocation procedures – Security and organizational aspects of biometric system.

Module-V:BIOMETRIC MULTI MODAL AND APPLICATIONS

Integration – Multiple traits – Multiple snapshots – Score fusion methods – Applications – Board Security – Identification cards – Biometrics on smart cards – Overview of local and global structure –Mechanism for on card comparison – Off card and On card alignment – Smart textile sensors – Bio signals – Biometrics and intelligence services.

TEXT BOOKS:

1. David Check Ling Ngo,Andrew Beng Jin Teoh,Jiankun Hu "Biometric Security" Cambridge Scholars,2015

2. Els. J.Kindt, —Privacy and data protection issues of Biometric Applications —, Springer,2013.

3. Eliza Yinzi Du, —Biometrics from fiction to practice‖, Panstandford Publishers 2012.

4. James wayman, —Introduction to Biometrics‖, Springer 2011

REFERENCE BOOKS:

1. Liangwang,Xin Geng "Behavioral Biometrics for Human Identifications Intelligent Applications"

Medical Information Science Reference, IGI Global 2010

2. Patrizio campisi "Security and Privacy in Biometrics" Springer 2013

3. Sanjay G.Kanade —Enhancing Information Security and Privacy‖, by combining Biometrics with

Cryptography, Morgan and Claypool Publishers,2012.

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Course Description

TITLE OF COURSE: DISASTER MANAGEMENT

COURSE CODE: A202

L-T-P: 2-0-0

CREDITS: 2

SYLLABUS

Introduction:

Disasters are seen as the effect of hazards on vulnerable areas. Hazards that occur in areas with low vulnerability do not result in a disaster. Great damage, loss, destruction and devastation to life and property are the results of Disasters. The immeasurable damage caused by disaster varies with the geographical location. In the concerned areas disasters have the following effects: It completely upsets the normal day to day life. Harmfully persuade the emergency systems Depending on the intensity and severity of the disaster the normal needs and processes are badly affected and deteriorated. Disasters are the effect of hazard on vulnerable or defenseless areas. Hazards that occur in areas with low vulnerability do not result in a disaster.

Course Objectives: Students will be able to:

1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

Course Outcomes:

- Develop an understanding of the key concepts, definitions a key perspectives of All Hazards Emergency Management
- Understand the Emergency/Disaster Management Cycle REVISED
- Have a basic understanding for the history of Emergency management
- Develop a basic under understanding of Prevention, Mitigation, Preparedness, Response and Recovery
- Develop a basic understanding for the role of public an private partnerships

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Course Description

Course Contents:

Module-I: Introduction

Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

Module-II: Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

Module-III: Disaster Prone Areas In India: Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

Module-IV: Disaster Preparedness And Management: Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

Module-V: Risk Assessment: Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

Module-VI: Disaster Mitigation: Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

Suggested reading

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.

2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.

3. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep & Deep Publication Pvt. Ltd., New Delhi.

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Course Description

TITLE OF COURSE: CONSTITUTION OF INDIA

COURSE CODE: A205

L-T-P: 2-0-0

CREDITS: 2

SYLLABUS

Introduction:

This course presents the Constitution of India to the technical students who are not always having proper knowledge of it and always unaware about their fundamental rights and fundamental duties as well. Even a brief introduction of the Constitution may create a lot of effect on the minds of the students and may help us to produce a good Engineers and future professors.

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.

2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.

3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

4. Discuss the passage of the Hindu Code Bill of 1956.

Course Contents:

Course Description

Module-I: History of Making of the Indian Constitution

Brief history of the making of Constitution of India from 1773, Drafting Committee (Composition & Working).

Module-II: Philosophy of the Indian Constitution
Preamble, Salient Features

Module-III: Contours of Constitutional Rights & Duties
Fundamental Rights - Right to Equality, Right to Freedom, Right against Exploitation, Right to freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

Module-IV: Organs of Governance
Parliament – Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

Module-V: Local Administration
District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Module-VI: Election Commission
Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.

2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.

3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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Course Description

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	DE	CSxxxx	Program Elective V	3	0	0	3
2	OE	CSxxxx	Open Elective	3	0	0	3
3	PTI	CS3008	Dissertation-I /Industrial Project	0	0	20	10
			Total				16

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	DE	CS311	**Data Warehouse & Mining**	3	0	0	3
2	DE	CS312	Web Search & Information Retrieval	3	0	0	3
3	DE	CS313	Data Security and Access Control	3	0	0	3
4	OE	CS321	Business Analytics	3	0	0	3
5	OE	CS322	Industrial Safety	3	0	0	3
6	OE	CS323	Operations Research	3	0	0	3
7	OE	CS324	Cost Management of Engineering Projects	3	0	0	3
8	OE	CS325	Composite Materials	3	0	0	3
9	OE	CS326	**Waste to Energy**	3	0	0	3

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Course Description

TITLE OF COURSE: DATA WAREHOUSE & MINING

COURSE CODE: CSD311

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Pre-requisite: Knowledge is also assumed of basic concepts in data base management system, and mathematics.

Introduction:

The recent years have generated explosive expansion of digital data stored in computer databases as well as increased pressure on companies to keep competitive advantage. This has put Data Mining (DM) as a key method for extracting meaningful information from the flood of digital data collected by businesses, government, and scientific agencies.

Course Outcomes (CO):

This course will serve to broaden the student's understanding of the issues and latest developments in the area of data mining. To reach this goal, the following objectives need to be met:

1. To understand the basic principles, concepts and applications of data warehousing and data mining
2. To introduce the task of data mining as an important phase of knowledge recovery process.
3. Ability to do Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment.
4. Have a good knowledge of the fundamental concepts that provide the foundation of data mining.
5. Design a data warehouse or data mart to present information needed by management in a form that issuable for management client.
6. Have application of Weather Forecasting, Disaster Forecasting, Business Management, Market Analysis and Management Corporate Analysis & Risk Management.
7. Using Big data and hadoop in different data set.
8. Clustering rule process on dataset student.arff using Hadoop system.

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Course Description

Course Contents:

Module 1:

Overview of Data warehousing, Strategic information and the need for Data warehousing, Defining a Data warehouse, Evolution of Data warehousing, Data warehousing and Business Intelligence.

Module 2 :

The Building Blocks of Data warehouse, Defining features – Subject-oriented data, Integrated data, Time-variant data, Nonvolatile data, Data granularity, Data warehouses and Data marts, Architectural Types – Centralized, Independent data marts, Federated, Hub-and-Spoke, Data mart bus, Overview of components - Source Data, Data Staging, Data Storage, Information Delivery, Metadata, and Management and Control components. Definition and architecture in the areas of Data acquisition, Data storage, and Information delivery Distinguishing characteristics – Different objectives and scope, Data content, Complex analysis for faster response, Flexible and Dynamic, Metadata-driven etc Architectural Framework – supporting flow of data, and the Management and Control module Technical architecture – Data acquisition, Data storage, and Information delivery.

Module 3 :

Business Requirements and Data warehouse: Dimensional nature of Business data and Dimensional Analysis, Dimension hierarchies and categories, Key Business. Metrics (Facts), Requirement Gathering methods and Requirements Definition Document (contents). Distinction between architecture and infrastructure, Understanding of how data warehouse infrastructure supports its architecture Components of physical infrastructure, Hardware and Operating systems for data warehouse, Database Software, Collection of Tools, Data warehouse Appliances – evolution and benefits. Business Requirements and Data Design – Structure for Business Dimensions and Key Measurements, Levels of detail. Business Requirements and the Architecture plan, Business Requirements and Data Storage Specifications, Business Requirements and Information Delivery Strategy.

Module 4 :

Understanding the importance of Metadata, Metadata types by functional areas – Data acquisition, Data storage, and Information delivery, Business Metadata – overview of content and examples, Technical Metadata – overview of content and examples, Metadata Requirements, Sources of Metadata, Metadata management – challenges, Metadata Repository, Metadata, integration and standards.

Module 5 :

Concepts of Data warehouse architecture – Definition and architecture in the areas of Data acquisition, Data storage, and Information delivery, Distinguishing characteristics – Different objectives and scope, Data content, Complex analysis for faster response, Flexible and Dynamic, Metadata-driven etc Architectural Framework – supporting flow of data, and the Management and Control module. Technical architecture – Data acquisition, Data storage, and Information delivery. Design decisions, Basics of Dimensional modeling, E-R modeling versus Dimensional modeling, The STAR schema – illustration, Dimension Table, Fact Table, Factless Fact Table, Data granularity, STAR schema keys – Primary, Surrogate, and Foreign, Advantages of the

Course Description

STAR schema, STAR schema examples. Overview of ETL, Requirements of ETL and steps Data extraction – identification of sources and techniques Data transformation – Basic tasks, Transformation types, Data integration and consolidation, Transformation for dimension attributes, Data loading – Techniques and processes, Data refresh versus update, Procedures for Dimension tables, Fact tables : History and incremental loads ETL Tool options.

Module 6 :

Distinction between architecture and infrastructure, Understanding of how data warehouse infrastructure supports its architecture Components of physical infrastructure, Hardware and Operating systems for data warehouse, Database Software, Collection of Tools,Overall concept of Online Analytical Processing (OLAP), OLAP definitions and rules, OLAP characteristics Major features and functions of OLAP – General features, Dimensional analysis, Hypercubes, Drill Down and Roll Up, Slice and Dice, Rotation, Uses and Benefits Familiarity with OLAP models – Overview of variations, MOLAP, ROLAP, HOLAP, DOLAP, Database OLAP, Web OLAP. Web-enabled Data Warehouse – adapting data warehouse for the web Web-based information delivery – Browser technology for data warehouse and Security issues OLAP and Web – Enterprise OLAP, Web-OLAP approaches, OLAP Engine design. Data warehouse Appliances – evolution and benefits

Module 7 :

Overview of Data mining – Definition, Knowledge Discovery Process (Relationships, Patterns, Phases of the process), OLAP versus Data mining, Some aspects of Data mining – Association rules, Outlier analysis, Predictive analytics etc), Concepts of Data mining in a Data warehouse environment, Major Data Mining techniques – Cluster Detection using R Language, Decision Trees, Memory-based Reasoning, Link Analysis, Neural, Networks, Genetic Algorithms etc, Data Mining Applications in industry – Benefits of Data mining using R Language, Discussion on applications in Customer Relationship, Management (CRM), Retail, Telecommunication, Biotechnology, Banking and Finance etc.

Module 8:

Introduction to Big Data Topics, Rise of Big Data, Compare Hadoop vs traditional systems, Limitations and Solutions of existing Data Analytics Architecture, Attributes of Big Data, Types of data, other technologies vs Big Data, Information delivery – queries, reports, analysis, and applications. Idea of using R Language.

Module-9:

Hadoop Architecture and HDFS Topics - What is Hadoop? Hadoop History, Distributing Processing System, Core Components of Hadoop, HDFS Architecture, Hadoop Master – Slave Architecture, Daemon types - Learn Name node, Data node, Secondary Name node. Hadoop Clusters and the Hadoop Ecosystem: Topics - Hadoop Cluster, Pseudo Distributed mode, Type of clusters, Hadoop Ecosystem, Pig, Hive, Oozie, Flume, SQOOP. Hadoop MapReduce Framework: Topics - Overview of MapReduce Framework, MapReduce Architecture, Learn about Job tracker and Task tracker, Use cases of MapReduce, Anatomy of MapReduce Program.

Books Recommended:

1.Data Mining Technology, Third Edition by Arun K Pujari, Universities Press, India

2. Data Warehousing Fundamentals for IT Professionals, Second Edition by Paulraj Ponniah, Wiley India

3. Alex Berson, Stephen J. Smith, “Data Warehousing Data Mining & OLAP”, Tata McGrow-Hill References

References:

1. Data Warehousing, Data Mining, & OLAP – Second Edition by Alex Berson and Stephen J. Smith, Tata McGraw Hill

Course Description

2. Data warehouse Toolkit by Ralph Kimball, Wiley India
3.Gajendra Sharma,"Data Mining Data Warehousing and OLAP", S.K.KATARIA & SONS.
4. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World", PEARSON

TITLE OF COURSE: WEB SEARCH & INFORMATION RETRIEVAL

COURSE CODE: CSD312

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Pre-requisite: Knowledge is also assumed of basic concepts in data base management system, and mathematics.

Introduction:

1. To learn techniques for making recommendations, including non-personalized, content-based, and collaborative filtering
2. To automate a variety of choice-making strategies with the goal of providing affordable, personal, and high-quality recommendations

Course Outcomes (CO):

After completion of course, students would be able to:

1. Design recommendation system for a particular application domain.
2. Evaluate recommender systems on the basis of metrics such as accuracy, rank accuracy, diversity, product coverage, and serendipity

Course Contents:

Module 1:

Introduction: Overview of Information Retrieval, Retrieval Models, Search and Filtering Techniques: Relevance Feedback, User Profiles, Recommender system functions, Matrix operations, covariance matrices, Understanding ratings, Applications of recommendation systems, Issues with recommender system.

Module 2:

Content-based Filtering: High level architecture of content-based systems, Advantages and drawbacks of content based filtering, Item profiles, Discovering features of documents, pre-

processing and feature extraction, Obtaining item features from tags, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.

Module 3:

Collaborative Filtering: User-based recommendation, Item-based recommendation, Model based approaches, Matrix factorization, Attacks on collaborative recommender systems.

Module 4:

Hybrid approaches: Opportunities for hybridization, Monolithic hybridization design: Feature combination, Feature augmentation, Parallelized hybridization design: Weighted, Switching, Mixed, Pipelined hybridization design: CascadebMeta-level, Limitations of hybridization strategies

Module 5:

Evaluating Recommender System: Introduction, General properties of evaluation research, Evaluation designs: Accuracy, Coverage, confidence, novelty, diversity, scalability, serendipity, Evaluation on historical datasets, Offline evaluations.

Module 6:

Types of Recommender Systems: Recommender systems in personalized web search, knowledge-based recommender system, Social tagging recommender systems, Trust-centric recommendations, Group recommender systems.

References:

1. Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge
University Press (2011), 1st ed.
2. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer (2016), 1st ed.
3. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011),
1st ed.

4. Manouselis N., Drachsler

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Course Description

TITLE OF COURSE: DATA SECURITY AND ACCESS CONTROL

COURSE CODE: CSD313

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Introduction:

- This course introduces the concept of Ethical Hacking
- Gives the students the opportunity to learn about different tools and techniques in Ethical hacking
- Understand ethics behind hacking and vulnerability disclosure

Course Objectives:

- The objective of the course is to provide fundamentals of database security. Various access control techniques mechanisms were introduced along with application areas of access control techniques.

Course Outcomes (CO):

After completion of course, students would be able to:

- In this course, the students will be enabled to understand and implement classical models and algorithms
- They will learn how to analyse the data, identify the problems, and choose the relevant models and algorithms to apply.
- They will further be able to assess the strengths and weaknesses of various access control models and to analyse their behaviour.

Course Contents:

Unit 1:

Introduction to Access Control, Purpose and fundamentals of access control, brief history, Policies of Access Control, Models of Access Control, and Mechanisms, Discretionary Access Control (DAC), Non- Discretionary Access Control, Mandatory Access Control (MAC). Capabilities and Limitations of Access Control Mechanisms: Access Control List (ACL) and Limitations, Capability List and Limitations.

Course Description

Unit 2:

Role-Based Access Control (RBAC) and Limitations, Core RBAC, Hierarchical RBAC, Statically Constrained RBAC, Dynamically Constrained RBAC, Limitations of RBAC. Comparing RBAC to DAC and MAC Access control policy.

Unit 3:

Biba's intrigity model, Clark-Wilson model, Domain type enforcement model, mapping the enterprise view to the system view, Role hierarchies- inheritance schemes, hierarchy structures and inheritance forms, using SoD in real system Temporal Constraints in RBAC, MAC AND DAC. Integrating RBAC with enterprise IT infrastructures: RBAC for WFMSs, RBAC for UNIX and JAVA environments Case study: Multi-line Insurance Company

Unit 4:

Smart Card based Information Security, Smart card operating system fundamentals, design and implantation principles, memory organization, smart card files, file management, atomic operation, smart card data transmission ATR, PPS Security techniques- user identification, smart card security, quality assurance and testing, smart card life cycle-5 phases, smart card terminals.

Unit 5:

Recent trends in Database security and access control mechanisms. Case study of Role-Based Access Control (RBAC) systems.

Unit 6:

Recent Trends related to data security management, vulnerabilities in different DBMS.

References:

1. Role Based Access Control: David F. Ferraiolo, D. Richard Kuhn, RamaswamyChandramouli.

2. http://www.smartcard.co.uk/tutorials/sct-itsc.pdf : Smart Card Tutorial.

TITLE OF COURSE: BUSINESS ANALYTICS

COURSE CODE: CS321

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Pre-requisite: Knowledge is also assumed of basic concepts of C language.

Introduction:

Business analytics (BA) refers to the skills, technologies, practices for continuous iterative exploration and investigation of past business performance to gain insight and drive business planning.[1] Business analytics focuses on developing new insights and understanding of

business performance based on data and statistical methods. In contrast, business intelligence traditionally focuses on using a consistent set of metrics to both measure past performance and guide business planning, which is also based on data and statistical methods.

Business analytics makes extensive use of statistical analysis, including explanatory and predictive modelling, and fact-based management to drive decision making. It is therefore closely related to management science. Analytics may be used as input for human decisions or may drive fully automated decisions. Business intelligence is querying, reporting, online analytical processing (OLAP), and "alerts."

In other words, querying, reporting, OLAP, it is alert tools can answer questions such as what happened, how many, how often, where the problem is, and what actions are needed. Business analytics can answer questions like why is this happening, what if these trends continue, what will happen next (predict), and what is the best outcome that can happen (optimize).

Course Outcomes (CO):

At the end of the course the students will be able to

1. Explain the fundamentals of business intelligence.
2. Link data mining with business intelligence.
3. Apply various modelling techniques.
4. Explain the data analysis and knowledge delivery stages.
5. Apply business intelligence methods to various situations.
6. Decide on appropriate technique.

Course Contents:

Module-1: Business intelligence

Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence.

Module-2: Knowledge delivery

The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message.

Module-3: Efficiency

Efficiency measures – The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis

Module-4: Business intelligence applications

Course Description

Marketing models – Logistic and Production models – Case studies.

Module 5: Future of business intelligence

Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology.

Text Books

1. Efraim Turban, Ramesh Sharda, Dursun Delen, "Decision Support and Business Intelligence Systems", 9th Edition, Pearson 2013.

References

10. Larissa T. Moss, S. Atre, "Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making", Addison Wesley, 2003.
11. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", Wiley Publications, 2009.
12. David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager"s Guide", Second Edition, 2012.
13. Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a Killer App", McGraw-Hill, 2007.
14. Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, "The Data Warehouse Lifecycle Toolkit", Wiley Publication Inc.,2007.

TITLE OF COURSE: INDUSTRIAL SAFETY

COURSE CODE: CSD322

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Introduction:

This course will help to learn the security assessment and risk analysis issues.

Objectives:

The student should be made to security assessment and risk analysis in industry.

Course Outcomes (CO):

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

- Safety Management.
- Disaster Management

Course Description

- Legal Provisions regarding safety

Course Contents:

Unit-I: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act

1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit-II: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost

& its relation with replacement economy, Service life of equipment.

Unit-III: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit-IV: Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit-V: Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Reference:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.

2. Maintenance Engineering, H. P. Garg, S. Chand and Company.

3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.

4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

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Course Description

TITLE OF COURSE: OPERATIONS RESEARCH

COURSE CODE: CS323

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Introduction:

The goal of this course is to provide a very common simple intuition enables one to make right decisions and especially show how mathematics is applied to solve fundamental engineering problems. The Topics to be covered (tentatively) include:

Linear programming problems

Transportation and Assignments problems

Inventory Controls

Game Theory

Network Analysis

Queue Theory

Course Objectives:

It lays the required foundation and skills that can be repeatedly employed in subsequent courses at higher levels. Students will acquire the skills and techniques of:

1. Discuss about algebraic solution of the linear problem with certain constrains.
2. Obtain the optimal solution of Transportation and Assignment problems.
3. Discuss about Network Analysis problems.
4. Discuss about six main factor of waiting line.
5. Solve the Nonlinear Programming problems.

Course Outcomes (CO):

Knowledge:

1. Student completing the first unit of this course would be expected to find the solution of linear programming problems using Graphical method and simplex method.
2. At the end of second unit student will be able to assign different jobs to the different person to have the optimum efficiency of working and similar in transportation problems.
3. After the completion of the third unit, student will be able to calculate the shortest path of the graph by several methods and Algorithms.
4. At the end of forth unit student will be able find the optimal no. of servers such that the sum of cost of service and waiting is minimized.

Course Description

5. At Student completing the fifth unit of this course would be expected to find the solution of Nonlinear programming problems using several methods.

Application:

1. First unit of this course would be expected to formulate and solve the linear programming problems with the given constrains.
2. Student will be able to assign different jobs to the different person to have the optimum efficiency of working and similar in transportation problems.
3. Third unit student will be able to calculate the shortest path of the graph by several methods and Algorithms.
4. Forth unit student will be able find the optimal no. of servers such that the sum of cost of service and waiting is minimized.

Course Contents:

Unit: 1 (Linear Programming Problems)

Basic LPP and Applications, LP Problem Formulation, Simultaneous Equations and Graphical Method, Simplex Method, Big-M Method, Duality Theory, Transportation Problems and Assignment Problem

Unit 2: (Network Analysis)
Shortest Path; Floyd Algorithm, Maximal Flow Problem (Ford-Fulkerson); PERT-CPM (Cost Analysis, Crashing, Resource Allocation excluded).

Unit 3: (Inventory Control):

Introduction to EOQ Models of Deterministic and Probabilistic, Safety Stock; Buffer Stock.

Unit 4: (Game Theory):

Introduction; 2-Person Zero – sum Game; Saddle Point; Mini – Max and Maxi – Min Theorems (statement only) and problems; Games without Saddle Point; Graphical Method; Principle of Dominance.

Unit 5: (Queuing Theory):

Introduction, Axiomatic Derivation of the Arrival &Departure (Poisson Queue).Poisson Queue Models: (M/M/1:∞/FIFO) and (M/M/1:N/FIFO).

Text Books:

1. H.A.Taha,“Operations Research”, Pearson
2. P. M.Karak–“Linear Programming and Theory of Games”,ABS Publishing House
3. Ghosh and Chakraborty,“Linear Programming and Theory of Games”,Central Book Agency
4. Ravindran, Philips and Solberg- “Operations Research”,WILEY INDIA

References:

Course Description

1. Kanti Swaroop— "Operations Research",Sultan Chand & Sons
2. Rathindra P.Sen—"Operations Research: Algorithms and Applications", PHI
3. R. Panneerselvam- "Operations Research",PHI
4. A.M.Natarajan,P.Balasubramani and A.Tamilarasi- "Operations Research", Pearson
5. M.V.Durga Prasad–"Operations Research",CENGAGE Learning
6. J. K.Sharma- "Operations Research",Macmillan Publishing Company

TITLE OF COURSE: COST MANAGEMENT OF ENGINEERING PROJECTS

COURSE CODE: CSD324

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Introduction:

The goal of this course is to provide idea about cost management of projects.

Course Objectives:

It lays the required foundation and skills that is required for cost management of a project.

Learning Outcomes:

After conclusion of the course students will able to learn

1. Overview of the Strategic Cost Management Process
2. Project management
3. Various decision-making problems
4. budgets

Course Contents:

Module-I: Introduction and Overview of the Strategic Cost Management Process Cost concepts in decision-making; relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

Module-II: Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration

of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis.

Module-III: Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control;

Module-IV: Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing. Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

References:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

TITLE OF COURSE: COMPOSITE MATERIALS

COURSE CODE: CSD325

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Introduction:

Composites are a relatively new class of materials. In this course the students learn about the benefits gained when combining different materials into a composite. The Motive is to make the students to understand different processing methods, issues, properties and testing methods of different composite materials

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Course Description

Course Outcomes (CO):

At the end of this course, students will be able to:

1. Use of different material to design composites
2. Use of different techniques to process different types of composites and know the limitations of each process
3. Use of Mathematical techniques to predict the macroscopic properties of different Laminates

Course contents:

Module 1 INTRODUCTION TO COMPOSITES

Fundamentals of composites – need for composites – enhancement of properties – classification of composites – Matrix-Polymer matrix composites (PMC), Metal matrix composites (MMC), Ceramic matrix composites (CMC) – Reinforcement – particle reinforced composites, Fibre reinforced composites. Applications of various types of composites. Fiber production techniques for glass, carbon and ceramic fibers

Module2: POLYMER MATRIX COMPOSITES

Polymer resins – thermosetting resins, thermoplastic resins – reinforcement fibres – rovings – woven fabrics – non woven random mats – various types of fibres. PMC processes – hand lay up processes – spray up processes – compression moulding – reinforced reaction injection moulding – resin transfer moulding – Pultrusion – Filament winding – Injection moulding. Fibre reinforced plastics (FRP), Glass Fibre Reinforced Plastics (GFRP). Laminates- Balanced Laminates, Symmetric Laminates, Angle Ply Laminates, Cross Ply Laminates.-applications of PMC in aerospace, automotive industries

Module 3 METAL MATRIX COMPOSITES

Characteristics of MMC, various types of metal matrix composites alloy vs. MMC, advantages of MMC, limitations of MMC, Reinforcements – particles – fibres. Effect of reinforcement – volume fraction – rule of mixtures. Processing of MMC – powder metallurgy process – diffusion bonding – stir casting – squeeze casting, a spray process, Liquid infiltration In-situ reactions-Interface-measurement of interface properties- applications of MMC in aerospace, automotive industries

Module 4: CERAMIC MATRIX COMPOSITES AND SPECIAL COMPOSITES

Engineering ceramic materials – properties – advantages – limitations – monolithic ceramics – need for CMC – ceramic matrix – various types of ceramic matrix composites- oxide ceramics – non oxide ceramics – aluminium oxide – silicon nitride – reinforcements – particles- fibres-whiskers. Sintering – Hot pressing – Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing). applications of CMC in aerospace, automotive industries- Carbon /carbon composites – advantages of carbon matrix – limitations of carbon matrix carbon fibre – chemical vapour

deposition of carbon on carbon fibre perform. Sol-gel technique- Processing of Ceramic Matrix composites.

Module 5: MECHANICS OF COMPOSITES

Lamina Constitutive Equations: Lamina Assumptions – Macroscopic Viewpoint. Generalized Hooke's Law. Reduction to Homogeneous Orthotropic Lamina – Isotropic limit case, Orthotropic Stiffness matrix (Qij), Definition of stress and Moment Resultants. Strain Displacement relations. Basic Assumptions of Laminated anisotropic plates. Laminate Constitutive Equations – Coupling Interactions, Balanced Laminates, Symmetric Laminates, Angle Ply Laminates, Cross Ply Laminates. Laminate Structural Moduli. Evaluation of Lamina Properties from Laminate Tests. QuasiIsotropic Laminates. Determination of Lamina stresses within Laminates.

Text Books

1. Mathews F. L. and Rawlings R. D., "Composite Materials: Engineering and Science", 1st Edition, Chapman and Hall, London, England, 1994.
2. Chawla K. K., "Composite materials", Second Edition, Springer – Verlag, 1998.

References

3. Clyne, T. W. and Withers, P. J., "Introduction to Metal Matrix Composites", Cambridge University Press, 1993.
4. Strong, A.B., "Fundamentals of Composite Manufacturing", SME, 1989.
5. Sharma, S.C., "Composite materials", Narosa Publications, 2000.
6. Broutman, L.J. and Krock,R.M., " Modern Composite Materials", Addison-Wesley, 1967.

TITLE OF COURSE: WASTE TO ENERGY

COURSE CODE: CS326

L-T-P: 3-0-0

CREDITS: 3

SYLLABUS

Introduction: The objective of the course is to provide insights into waste management options by reducing the waste destined for disposal and encouraging the use of waste as a resource for alternate energy production. This course is designed to provide an understanding of the various aspects of Waste to Energy. The various sources of waste generation is analyzed with a focus on

Course Description

its potential for energy production. The need for characterization of wastes will be discussed along with the existing norms for waste utilization for alternate energy source. Various Technological options available for the production of energy form waste will delineated along with economics of using alternate sources. Case studies will be discussed to provide a better understanding of the concepts of "Waste to Energy" in the Indian context.

Course Objectives:

1. To enable students to understand of the concept of Waste to Energy.
2. To link legal, technical and management principles for production of energy form waste.
3. To learn about the best available technologies for waste to energy.
4. To analyze of case studies for understanding success and failures.
5. To facilitate the students in developing skills in the decision making process.

Course Outcomes: On successful completion of this course the students will be able to:

1. Apply the knowledge about the operations of Waste to Energy Plants.
2. Analyze the various aspects of Waste to Energy Management Systems.
3. Carry out Techno-economic feasibility for Waste to Energy Plants.
4. Apply the knowledge in planning and operations of Waste to Energy plants.

Course Contents:

Module-I: Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Module-II: Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods – Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

Module-III: Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Module-IV: Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Module-V: Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion

Course Description

- anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

Suggested reading

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.

2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.

3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.

4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Course Description

Fourth Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	PTI	CS409	Dissertation-II /Industrial Project	0	0	32	16
			Total				16

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points