Department of Computer Science & Engineering
Birla Institute of Technology, Mesra, Ranchi - 835215 (India)

M.Tech Information Security

Institute Vision

To become a Globally Recognized Academic Institution in consonance with the social, economic and ecological environment, striving continuously for excellence in education, research and technological service to the National needs.

Institute Mission

To educate students at Undergraduate, Postgraduate, Doctoral, and Post-Doctoral levels to perform challenging engineering and managerial jobs in industry.

- To provide excellent research and development facilities to take up Ph.D. programmes and research projects.
- To develop effective teaching and learning skills and state of art research potential of the faculty.
- To build national capabilities in technology, education and research in emerging areas.
- To provide excellent technological services to satisfy the requirements of the industry and overall academic needs of society.

Department Vision

The department strives to be recognized globally for outstanding education and research, leading to excellent professionals and innovators in the field of Computer Science and Engineering, who can positively contribute to the society.

Department Mission

To impart quality education and equip the students with strong foundation that could make them capable of handling challenges of the new century.

2. To maintain state of the art research facilities and facilitate interaction with world's leading universities, industries and research organization for constant improvement in the quality of education and research.

Programme Educational Objectives (PEOs) – M.Tech Information Security

PEO1: Students are prepared to identify, analyse and solve research problems emphasizing security   concerns in context of data, computer network and computational system. They are trained to develop practical and efficient solutions to the challenges in the growing field of information security.

PEO2: Students are imparted with strong base of knowledge that makes them suitable for industries, teaching and research.

PEO3: Students are trained in such a way that makes them capable of exploiting and enhancing theoretical and practical knowledge of computer science with focus on security.

PEO 4: Students are inculcated with the sensitivity towards ethics, public policies and their responsibilities towards the society.

PROGRAM OUTCOMES (POs) for MTech (INFORMATION SECURITY)

PO1: An ability to independently carry out research /investigation and development work to solve practical problems.

PO2: An ability to write and present a substantial technical report/document.

PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4: An ability to apply knowledge of mathematics and advanced computing & networking technologies for solving problems.

PO5: An ability to design and conduct experiments and to analyse and interpret data related to software and hardware design solutions.

PO6: An ability to identify, formulate and solve security issues based on the fundamental understanding of concepts related to data communication and computer networks.

COURSE INFORMATION SHEET

Course code: CS501
Course title: MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
Pre-requisite(s): Discrete Mathematics
Co- requisite(s):
Credits: 3   L: 3   T: 0   P: 0
Class schedule per week: 03
Class: M. Tech
Semester / Level: I/5
Branch: Information Security
Name of Teacher:

Course Objectives:
This course enables the students to:

1.	Present basic concepts and techniques of linear algebra, probability, statistics and graph theory
2.	Develop mathematical thinking and problem-solving skill
3.	Provide the foundations of probabilistic and statistical analysis
4.	Explain graphs to formulate computational problems

Course Outcomes
After the completion of this course, students will be able to:

CO1	Demonstrate skills in solving mathematical problems
CO2	Apply knowledge of computing and mathematics appropriate to the discipline
CO3	Analyze problems and identify the computing requirements appropriate to its solution
CO4	Understand basic concepts in probability theory and statistical analysis
CO5	Study the advanced courses in Computer science such as Coding Theory, Artificial Intelligence, Numerical Computation, etc.

SYLLABUS

Module I:
Linear Algebra
Introduction: Matrices and solving set of linear equations, Vector space, Subspace, Linear combination of vectors, Linear dependence and independence of vectors, Bases and dimensions.

(8L)

Module II:
Inner product spaces, Orthogonal vectors and dual vectors, Eigen values and Eigen vectors, Linear programming.

(8L)

Module III:
Probability and Statistics
Frequency distribution and measures of central tendency, mean, median mode, quartiles, measures of dispersions and skewness, standard deviation, mean deviation, coefficient of variation, moments.

(8L)

Module IV:
Probability: definition, Distribution: discrete and continuous, Chi-square test, t-test.

(8L)

Module V:
Graph Theory
Introduction: Graphs and its types, Representation of graphs: Adjacency matrix, Incidence matrix, Adjacency list, Planar graph, Kuratowski's Graphs, Clique and maximum Clique finding algorithms.

(8L)

Books recommended:

TEXT BOOK
1. K. Haffman, and R. Kunze, "Linear Algebra", 2nd Edition, Pearson, 2015.**(T1)**
2. G. Williams, "Linear Algebra with Applications", 4th Edition, John & Bartlett.**(T2)**
3. W. Navidi, "Statistics for Engineers and Scientists", 2nd Edition, TMH, 2008.**(T3)**
4. J.K. Goyal, and J. N. Sharma, "Mathematical Statistics", Krishna Prakashan, 2017**(T4).**

REFERENCE BOOK
1. NarasinghDeo, "Graph Theory with Applications to engineering and Computer Science", Prentice Hall of India, 2001.**(R1)**
2. Douglas B. West, "Introduction to Graph theory", Pearson Education, 2002.**(R2)**

Course Evaluation:
Individual Assignment, Theory (Quiz and End semester) examinations.

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
    1. Student Feedback on Faculty
    2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	1	1	1	1
CO2	3	3	1	1	1	1
CO3	2	3	2	1	1	1
CO4	3	2	1	1	1	1
CO5	3	1	1	1	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2, ,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS502
Course title: ADVANCED DATA STRUCTURES
Pre-requisite(s): Data Structures, Algorithm Analysis
Co- requisite(s):
Credits: 3   L: 3   T: 0   P: 0
Class schedule per week: 03
Class: M. Tech
Semester / Level: I/5
Branch: Information Security
Name of Teacher:

Course Objectives
This course enables the students to:

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

Course Outcomes
After the completion of this course, students are expected to:

CO1	Understand the implementation of symbol table using hashing techniques.
CO2	Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
CO3	Develop algorithms for text processing applications.
CO4	Learn the basic working of advanced heaps.
CO5	Understand the implementation of symbol table using hashing techniques.

SYLLABUS

Module I:
Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries.
Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing,

Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

(8L)

Module II:
Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists

(8L)

Module III:
Trees: Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees

(8L)

Module IV:
Heaps: Balanced Search Trees as Heaps, Array-Based Heaps, Heap-Ordered Trees and Half-Ordered Trees, Leftist Heaps, Skew Heaps, Binomial Heaps, Changing Keys in Heaps, Fibonacci Heaps, Heaps of Optimal Complexity, Double-Ended Heap Structures and Multidimensional Heaps, Heap-Related Structures with Constant-Time Updates.

(8L)

Module V:
Text Processing: Sting 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.

(8L)

Books recommended:

TEXT BOOK
1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++," 2nd Edition, Pearson, 2004.**(T1)**
2. Peter Brass, "Advanced Data Structures," Cambridge University Press, 1stEdition.**(T2)**
3. M T Goodrich, & Roberto Tamassia, "Algorithm Design," John Wiley, 2002.**(T3)**

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment

Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
3 Quizzes	30 % ($3 \times 10\%$)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
     1. Student Feedback on Faculty
     2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	1	1	1	1	1
CO2	2	3	3	1	1	1
CO3	2	3	3	2	1	1
CO4	3	1	1	1	1	1
CO5	3	1	1	1	1	1

If satisfying and $< 34\% = 1$, $34\text{-}66\% = 2$, $> 66\% = 3$

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6
CO3	CD1, CD2, CD3,CD4
CO4	CD1, CD3,CD6
CO5	CD1,CD2, ,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT502
Course title: FUNDAMENTALS OF INFORMATION SECURITY
Pre-requisite(s):
Co- requisite(s):
Credits: 3   L: 3   T: 0   P: 0
Class schedule per week: 03
Class: M. Tech
Semester / Level: I/5
Branch: Information Security
Name of Teacher:

Course Objectives
This course enables the students:

1.	Broad understand of What is security and its terminology
2.	Know about Models for discussing security issues
3.	In depth understanding of Attacks and their counter measures.
4.	Information of how to apply defence in depth
5.	Evaluate available measures to confirm information reliability

Course Outcomes
After the completion of this course, students will be:

CO1	Identify requirements of security and its related terminology
CO2	Classify and compare Attacks and their impact on information security
CO3	Evaluate the types of treats and vulnerabilities in context to the risks associated and their countermeasures.
CO4	Illustrate access control and application of defence against risks and threats.
CO5	Summarize about malware, Malicious code threats, Attack, its prevention and detection

SYLLABUS

Module I:
Basics of Information systems security: Information systems security, Seven domains of it infrastructure, Weak links in security, IT security Policy Framework

(8L)

Module II:
Attacks Threats and Vulnerabilities: Malicious attacks Threats and Vulnerabilities, Attack tools, What is security breach, Malicious softwares, Countermeasures.
Risk management, BIA, BCP and DRP, Assessing risk and Vulnerabilities, Compliance laws, confidentiality of data

(8L)

Module III:
Access Controls basics of access controls, identification methods, authentication processes and requirements, Models and treats to access controls

(8L)

Module IV:
Risk management and information security, risk analysis, evaluating countermeasures, steps to disaster recovery. Types of backups.

(8L)

Module V:
Main types of malware, Malicious code threats, Attack, its prevention and detection, Information security standards.

(8L)

Books recommended:

TEXT BOOK
1. "Fundamentals of Information Systems Security" by David Kim, Michael G. Solomon, 2nd Edition. **(T1)**

REFERENCE BOOK
1. "The Basics of Information Security: Understanding the fundamentals of InfoSec in Theory and practice" by Jason Andres. **(R1)**

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5

Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
   1. Student Feedback on Faculty
   . Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

O	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	1	2	3	2	2
CO2	2	3	3	2	2	2
CO3	2	3	3	2	1	3
CO4	3	3	1	2	2	3
CO5	3	3	2	3	2	3

If satisfying and < 34% = L, 34-66% = M, > 66% = H

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT504
Course title: APPLIED CRYPTOGRAPHY
Pre-requisite(s):
Co- requisite(s):
Credits: 3   L: 3   T: 0   P: 0
Class schedule per week: 03
Class: M. Tech

Course Objectives
This course enables the students:

1.	To understand the foundations of cryptographic attacks.
2.	To gain knowledge of encrypting data, and to choose between different algorithms.
3.	To prepare students for research in the area of cryptography and enhance students communication and problem solving skills
4.	To differentiate between the encryption techniques and know their suitability to an application.
5.	To effectively apply their knowledge to the construction of secure cryptosystems.

Course Outcomes
After the completion of this course, students will be able to:

1.	Understand the various types of cryptographic attacks and the mathematics behind cryptography.
2.	Describe the various types of ciphers and hash functions.
3.	Apply the different cryptographic techniques to solve real life problems.
4.	Evaluate different techniques as to their suitability to various applications.
5.	Develop a cryptosystem keeping in view social issues and societal impacts.

SYLLABUS

Module I:
Foundations – Protocol Building Blocks - Basic Protocols - Intermediate Protocols - Advanced Protocols - Zero-Knowledge Proofs - Zero-Knowledge Proofs of Identity -Blind Signatures - Identity-Based Public-Key Cryptography.

(8L)

Module II:
Key Length - Key Management – Public Key Cryptography versus Symmetric Cryptography - Encrypting Communications Channels - Encrypting Data for Storage - Hardware Encryption versus Software Encryption - Compression, Encoding, and Encryption - Detecting Encryption – Hiding and Destroying Information.

(8L)

Module III:
Information Theory - Complexity Theory - Number Theory - Factoring - Prime Number Generation - Discrete Logarithms in a Finite Field - Data Encryption Standard (DES) – Lucifer - Madryga - NewDES - GOST – 3 Way – Crab – RC5 - Double Encryption - Triple Encryption - CDMF Key Shortening - Whitening.

(8L)

Module IV:
Pseudo-Random-Sequence Generators and Stream Ciphers – RC4 - SEAL - Feedback with Carry Shift Registers - Stream Ciphers Using FCSRs - Nonlinear-Feedback Shift Registers - System-Theoretic Approach to Stream-Cipher Design - Complexity-Theoretic Approach to Stream-

Cipher Design - N- Hash - MD4 - MD5 - MD2 - Secure Hash Algorithm (SHA) - OneWay Hash Functions Using Symmetric Block Algorithms - Using Public-Key Algorithms - Message Authentication Codes

(8L)

Module V:
RSA - Pohlig-Hellman - McEliece - Elliptic Curve Cryptosystems -Digital Signature Algorithm (DSA) - Gost Digital Signature Algorithm - Discrete Logarithm Signature Schemes - Ongchnorr-Shamir -Cellular Automata - Feige-Fiat-Shamir -Guillou-Quisquater - Diffie-Hellman - Station-to-Station Protocol -Shamir's Three-Pass Protocol - IBM Secret-Key Management Protocol - MITRENET - Kerberos - IBM Common Cryptographic Architecture.

(8L)

Books recommended:

TEXT BOOK
1. Bruce Schneier, "Applied Cryptography: Protocols, Algorithms, and Source Code in C", 2nd Edition, John Wiley & Sons, Inc, 1996. **(T1)**
2. Wenbo Mao, "Modern Cryptography Theory and Practice", Pearson Education, 2004. **(T2)**
3. AtulKahate, "Cryptography and Network Security", Tata McGrew Hill, 2003. **(T3)**

REFERENCE BOOK
1. William Stallings, "Cryptography & Network Security Principles and Practice", Pearson Education. **(R1)**

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10

Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
      1. Student Feedback on Faculty
      2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	3	2	2	3
CO2	3	1	3	1	2	3
CO3	2	1	2	2	1	3
CO4	3	1	3	2	1	3
CO5	3	3	2	3	3	1

If satisfying and < 34% = L, 34-66% = M, > 66% = H

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT505
Course title: MOBILE AND WIRELESS SECURITY
Pre-requisite(s): Data Structures
Co- requisite(s):
Credits: 3　　L: 3　　T: 0　　P: 0
Class schedule per week: 03
Class: M. Tech
Semester / Level: I/5
Branch: Information Security
Name of Teacher:

Course Objectives

This course enables the students will be:

1.	Able to understand the internals of the Android mobile OS. Study the Messaging, Graphics, Audio, Video, Camera, GPS, Networking, File System, Touch Sensors, and other subsystems.
2.	Able to understand the combined impact of security on the architecture, design, and security of mobile computing, in the context of Android.
3.	Have a broad knowledge of the state-of-the-art and open problems in mobile and wireless security
4.	Enhance their potential to do research or pursue a career in this rapidly developing area.
5.	Able to be introduced to new, advanced research topics to have hands--on experience with developing security features.

Course Outcomes

After the completion of this course, students will be able to:

1.	Identify state-of-the-art and open problems in mobile and wireless security.
2.	Analyse all relevant aspects of security in mobile and wireless networks.
3.	Assess the impact of integrating media services, location services, in the context of mobile messaging devices on privacy and security.
4.	Summarise developing security features in current Wireless and mobile systems.
5.	Design of secure system and applications on Android.

SYLLABUS

Module I:
Introduction to wireless and mobile networks security, Review of Network Security: from Crypto to Security Protocols – Fundamentals of Wireless & Mobile Systems: key features and mechanisms of wireless and mobile systems, Cryptographic Protocols for Mobile and Wireless Networks, Key Management in Mobile and Wireless Computing, Reasoning about Security and Privacy.

(8L)

Module II:
Privacy and Anonymity in Mobile and Wireless Computing, Public Key Infrastructure in Mobile and Wireless Environments, Security Standards in current Wireless & Mobile Systems: WiFi Security (WEP, WPA, WPA-Enterprise); Cellular Security (GSM, 3G, LTE); –Internet of Things / Wireless Sensor Networks / RFID – Emerging Privacy concerns: location, tracking, traffic analysis, mobile and the cloud.

(8L)

Module III:
Security Architectures and Protocols in WLANs and B3G/4G Mobile Networks, Security and Privacy features into Mobile and Wearable devices, Location Privacy, Wireless Ad hoc and Sensor Networks Security, Role of Sensors to Enable Security.

(8L)

Module IV:
Security of Mobile Computing Platforms – Android and iOS security models – Threats and emerging solutions (e.g., side channel attacks) Security and Privacy in Pervasive Computing, Trust Establishment, Negotiation, and Management, Secure PHY/MAC/routing protocols.

(8L)

Module V:
Security under Resource Constraints (bandwidth, memory, energy, and computation constraints).

(8L)

Books recommended:

TEXT BOOK
1. Stefanos Gritzalis (Editor), Tom Karygiannis (Editor), CharalabosSkianis (Editor), "Security and Privacy in Mobile and Wireless Networking (Emerging Communication and Service Technologies)", Paperback – February 15, 2009. **(T1)**
2. Himanshu Dviwedi, Chris Clark and David Thiel, "Mobile Application Security", 1st Edition. **(T2)**

REFERENCE BOOK
1. Noureddine Boudriga, "Security of Mobile Communications", 2009. **(R1)**
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security: Private Communication in a Public World", 2nd Edition, Prentice Hall, 2002. **(R2)**

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:
Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % $(3 \times 10\%)$
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	2	2	1
CO2	3	1	3	1	1	3
CO3	2	1	2	2	3	3
CO4	3	1	3	2	2	3
CO5	2	1	3	2	2	3

If satisfying and < 34% = L, 34-66% = M, > 66% = H

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT506
Course title: MULTIMEDIA SECURITY
Pre-requisite(s):
Co- requisite(s):
Credits: 3   L: 3   T: 0   P: 0
Class schedule per week: 03
Class: M. Tech
Semester / Level: I/5
Branch: Information Security
Name of Teacher:

Course Objectives
This course enables the students will be able to:

1.	Understand issues related to the protection of digital media.
2.	Know techniques such as selective video encryption for real-time requirements
3.	Identify applications, parameters, and requirements of the digital watermarking
4.	Obtain an understanding for , key management, and streaming media protection
5.	Able to design applications using watermarking and other protection schemes.

Course Outcomes
After the completion of this course, students will be able to:

1.	Identify multiple issues related to the protection of digital media, including audio, image, and video content
2.	Analyzes techniques such as selective video encryption for real-time requirements, chaos-based encryption, key management, and streaming media protection
3.	Illustrates lossless data hiding, scalable image and video authentication, and signature-based media authentication
4.	Assess the applications, parameters, and requirements of the digital watermarking framework
5.	Summarize the vulnerabilities of protection schemes in multimedia content.

<u>SYLLABUS</u>

Module I:
Intro to Multimedia, Basics of digital audio, Basics of digital imaging

(8L)

Module II:
Demands on Info. Security and Protection Demands on Info. Security and Protection, Intellectual property management for digital media

(8L)

Module III:
Secure Delivery of Multimedia Content, Basic cryptography concepts Media encryption techniques/systems "Robust" and secure media hashing, Key management Quantifying security

(8L)

Module IV:
Data Embedding, Basic embedding techniques and theory, Data embedding for various applications, Data embedding for various media types

(8L)

Module V:
Multimedia Fingerprinting: Trace Traitors, Multimedia fingerprinting for tracing traitor, Steganalysis, Non-intrusive forensics, Standardization and Integration, Standardization on media security.

(8L)

Books recommended:

TEXT BOOK
1. Chun-Shien Lu, "Multimedia Security: Steganography and Digital Watermarking Techniques for Protection of Intellectual Property", Hardcover – March 22, 2005. **(T1)**
2. "Multimedia Security: Steganography and Digital Watermarking Techniques for Protection of Intellectual Property", IGI Publishing Hershey, PA, USA ©2004, ISBN: 1591401925. **(T2)**

REFERENCE BOOK
1. BorkoFurht, DarkoKirovski, "Multimedia Security Handbook". **(R1)**

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5

	√	√	√	√	√
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
  1. Student Feedback on Faculty
  2. Student Feedback on Course Outcome
Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	2	2	3
CO2	3	2	3	3	1	3
CO3	3	1	2	2	1	3
CO4	3	1	3	2	2	3
CO5	3	2	1	2	2	3

If satisfying and < 34% = L, 34-66% = M, > 66% = H

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS514
Course title: SOFTWARE METRICS
Pre-requisite(s): Software Engineering, Software Testing
Co- requisite(s):
Credits: 3   L:3   T:0   P: 0
Class schedule per week: 03
Class: M. Tech
Semester / Level: I/5
Branch: Information Security
Name of Teacher:

Course Objectives
After the completion of this course, students will be:

1.	Provide a basic understanding and knowledge of the software metrics.
2.	Understand the importance of Metrics data collection.
3.	Analysis and Metrics for object-oriented systems.
4.	Understand external product attributes Dynamic Metrics and Resource measurement.

Course Outcomes
After the completion of this course, students will be:

CO1	Able to understand the importance of the software development process.
CO2	Analyze the importance of modeling and modeling language.
C03	Design and develop correct and robust software products.
CO4	Explain the business requirements pertaining to software development.
CO5	Design Metrics for object-oriented systems.

SYLLABUS

ModuleI:
Basics of measurement : Measurement in software engineering Scope of software metrics Representational theory of measurement Measurement and models Measurement scales Meaningfulness in measurement Goal-based framework for software measurement Classifying software measures Determining what to measure Software measurement validation Empirical investigation Types of investigation Planning and conducting investigations.

(8L)

ModuleII:
Measuring size, Aspects of software size Length, functionality and complexity Measuring structure Types of structural measures Control-flow structure Modularity and information flow attributes Data structures.

(8L)

ModuleIII:
Modeling software quality Measuring aspects of software quality Software reliability Basics of software reliability Software reliability problem Parametric reliability growth models Predictive accuracy Recalibration of software-reliability growth predictions Importance of operational environment Wider aspects of software reliability.

(8L)

ModuleIV:

The intent of object-oriented metrics distinguishing characteristics of object-oriented metrics various object-oriented metric suites LK suite CK suite and MOOD metrics
Runtime Software Metrics Extent of Class Usage Dynamic Coupling Dynamic Cohesion and Data Structure Metrics.

(8L)

ModuleV:
The intent of component-based metrics, distinguishing characteristics of comp.
Measuring productivity, teams, tools, and methods.

(8L)

Books recommended:

TEXT BOOK
1. "Software Metrics: A rigorous and Practical Approach" by Norman E. Fenton and Shari Lawrence P fleeger, International Thomson Computer Press, 2nd Edition, 1997. **(T1)**
2. "Applied Software Measurement" by Capers Jones, McGraw Hill, 2008. **(T2)**

REFERENCE BOOK
1. "Object-Oriented Software Metrics" by Mark Lorenz, Jeff Kidd, Prentice Hall, 1994. **(R1)**
2. "Practical Software Metrics For Project Management And Process Improvement" by Robert B Grady, Hewlett Packard Professional Books, 1st Edition, 2004.**(R2)**

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)

Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
    1. Student Feedback on Faculty
    2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	2	3	3
CO2	2	2	3	1	1	1
CO3	1	3	3	2	2	2
CO4	3	3	3	2	3	3
CO5	2	1	3	3	3	3

If satisfying and < 34% = L, 34-66% = M, > 66% = H

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS522
Course title: PATTERN RECOGNITION AND APPLICATION
Pre-requisite(s): Linear Algebra, Vector Calculus, Data Structure& Programming
Co- requisite(s):
Credits: 3   L: 3   T: 0   P: 0
Class schedule per week: 03
Class: M.Tech
Semester / Level: I/5
Branch: Information Security
Name of Teacher:

Course Objectives
This course enables the students to:

1.	Be familiar with both the theoretical and practical aspects Pattern Recognition.
2.	Have described the foundation of pattern formation, measurement, and analysis.
3.	Understand the mathematical and computer aspects of while extracting features of an object.
4.	Learn the techniques of clustering and classification for various applications.

Course Outcomes
After the completion of this course, students will be able to:

CO1	Apply their knowledge on Real World Problems while converting these problems to computer compatible problems for Pattern Recognition.
CO2	Solve Decision-making model using Statistical and Mathematical Decision Theory.
CO3	Design clusters for various Pattern using classical and Modern clustering techniques.
CO4	Analyzing various Techniques for Pattern Classification and Clustering.
CO5	Develop Model for Pattern classification through Probabilistic or fuzzy.

SYLLABUS

Module I:
Introduction: Feature Vectors, Classifiers, Supervised, Unsupervised, MATLAB Tools.
Classifiers Based on Bayesian Theory, Linear Classifiers, Nonlinear Classifiers.

(8L)

ModuleII:
Feature Selection, Feature Generation I: Data Transformation and Dimensionality Reduction, Feature Generation II.

(8L)

Module III:
Template Matching, Context Dependent Classification, Super vised Learning.

(8L)

Module IV:
Clustering Basic Concepts, sequential Algorithms.

(8L)

ModuleV:
Hierarchical algorithms, Fuzzy clustering, probabilistic clustering, Hard Clustering, Optimization.

(8L)

Books recommended:

TEXT BOOK
1. "Pattern Recognition" by S Theodoridis, K Koutroumbas, Elsevier, 5thEdition, 2015.**(T1)**
2. "Pattern Recognition" by N NarshimaMurty, Springer, University press, 2nd Edition, 2015. **(T2)**

REFERENCE BOOK
1. R.O.Duda et.al,"Pattern Classification", 2ndEdition, John Wiley, New York, 2002. **(R1)**

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:
Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
1. Student Feedback on Faculty

2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	1	3	3	2	3
CO2	3	1	3	2	1	3
CO3	3	2	2	3	1	3
CO4	3	3	2	1	3	3
CO5	2	1	2	2	1	2

If satisfying and < 34% = L, 34-66% = M, > 66% = H

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT518
Course title: INTERNET OF THINGS
Pre-requisite(s):
Co-requisite(s):
Credits: 3   L:3   T:0   P: 0
Class schedule per week: 03
Class: M. Tech
Semester / Level: I/5
Branch: Information Security
Name of Teacher:

Course Objectives

This course enables the students to:

1.	Understand the basic concept and the IoT Paradigm
2.	Know the state of art architecture for IoT applications
3.	Learn the available protocols used for IoT
4.	Design basic IoT Applications.
5.	Evaluate optimal IoT applications.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Identify the IoT Components and its capabilities
CO2	Explain the architectural view of IoT under real world constraints
CO3	Analyse the different Network and link layer protocols
CO4	Evaluate and choose among the transport layer protocols
CO5	Design an IoT application

SYLLABUS

Module I:

IoT-An Architectural Overview

An Architectural Overview Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management.

(8L)

Module II:

IoT Architecture-State of the Art

State of the art, Reference Model and architecture, IoT Reference Architecture; Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

(8L)

Module III:

Sensor Technology, RFID Technology, WPAN Technologies for IoT/M2M, Cellular and Mobile Network Technologies for IoT/M2M CoAP, REST, Zigbee, Bluetooth

(8L)

Module IV:

Transport & Session Layer Protocols

Mobile IPv6 technology for IoT, 6LoWPAN, Transport Layer TCP, MPTCP, UDP, DCCP, Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT

(8L)

Module V:

Layer Protocols & Security

Introduction, Technical Design constraints. Implementation Examples. Security and Interoperability.

(8L)

Books recommended:

TEXT BOOK

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1stEdition, Academic Press, 2014.**(T1)**
2. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6". **(T2)**

REFERENCE BOOK

1. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer. **(R1)**
2. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI. **(R2)**

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % $(3 \times 10\%)$
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
    1. Student Feedback on Faculty
    2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	1	3	3	2	3
CO2	3	3	3	2	1	3
CO3	3	2	2	3	1	3
CO4	3	1	2	1	3	3
CO5	2	1	2	2	3	3

If satisfying and < 34% = L, 34-66% = M, > 66% = H

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT522
Course title: CYBER SECURITY AND DIGITAL FORENSICS
Pre-requisite(s): Computer Basics, Programming and Problem solving
Co-requisite(s):
Credits:3   L: 3   T: 0   P: 0
Class schedule per week: 03
Class: M. Tech.
Semester / Level: I/5
Branch: Information Technology
Name of Teacher:

Course Objectives
This course enables the students:

1.	Know about computer-based crime.
2.	Understand Technical and legal aspects of computer crime investigations
3.	Know the limitations of law and its enforcement agencies.
4.	Learn the procedures of recovering computer evidence and seize process.

Course Outcomes
After the completion of this course, students will be able to:

CO1	Elaborate on computer-based crime.
CO2	Describe Technical and legal aspects of computer crime investigations
C03	Analyze the limitations of law and its enforcement agencies.
CO4	Compare the procedures of recovering computer evidence and seize process.
CO5	Apply techniques for finding, preserving, presenting, and extracting information from the digital devices.

SYLLABUS

ModuleI:
Introduction: Cyberspace and Criminal Behavior, Traditional problems associated with computer-based crime, e cash problems, Computer Technology and History: Computer Language, Hardware, software, operating system, Internet, Network language.

(8L)

ModuleII:
Early Hackers and Theft Components: Phreakers, Hacking, Commodities, Intellectual property. Contempory computer crime: web based criminal activity, money laundering,

(8L)

Module III:
Identity theft and identity fraud: Typologies of internet theft, virtual identity, credit identity. Prevalence and victim logy, physical methods, of identity theft, phishing, spyware, Trojans, insurance and loan fraud, immigration fraud. Terrorism and organized crime: Terror online, criminal activities, organized crime as cyber gangs. Technology used in organized crime. Data piracy.

(8L)

Module IV:
Avenues for Prosecution and Government efforts: Act, Law enforcement agencies, International efforts, Cyber law and its amendments of current state, other legal considerations.

(8L)

ModuleV:
Forensic Terminologies and Developing forensic capabilities, Searching and seizing computer related evidence, Processing of evidence and report preparation.

(8L)

Books recommended:

TEXT BOOK
1. "Computer Forensics and Cyber Crime" by M.T.Britz, Pearson Education, First Impression, 2012.**(T1)**
2. "Computer Crime and investigation" by E Casey, Springer, 1stEdition, 2001. **(T2)**

REFERENCE BOOK

1. "Computer Crime Investigations and Law" by C Easttom&D.J.Taylor, Carenage Learning. **(R1)**

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
      1. Student Feedback on Faculty
      2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	1	1	2	1
CO2	3	3	3	1	1	2
CO3	3	3	3	2	1	2
CO4	2	3	2	2	2	2
CO5	2	3	2	2	2	2

If satisfying and < 34% = L, 34-66% = M, > 66% = H

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

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COURSE INFORMATION SHEET

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Course code: CS503
Course title: ADVANCED DATA STRUCTURES LAB
Pre-requisite(s):
Co- requisite(s): Advanced Data Structures
Credits:2   L:0   T:0   P:4
Class schedule per week: 04
Class: M. Tech
Semester / Level: I/5
Branch: Info Information Security
Name of Teacher:

Course Objectives

This course enables the students to:

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

Course Outcomes

After the completion of this course, students will be able to:

CO1	Understand to implement the symbol table using hashing techniques.
CO2	Develop program for AVL, Red-Black trees, B-trees and Splay trees
CO3	Develop program for text processing applications
CO4	Learn the basic working of advanced heaps
CO5	Understand the implementation of symbol table using hashing techniques

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SYLLABUS

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List of Programs as Assignments:

1. **Lab Assignment No: 1**
   Write a program to implement a dictionary using the following ADTs. We assume all the entries in the dictionary to be distinct integers.

   a) Binary Search Tree (BST)
   b) Red Black Tree (RBT)

   Each ADT should support five operations, void Insert(val), boolean Delete(val), boolean

Search(val), void ClearADT() and void DisplayADT(). Both search and delete operations should respond with a Boolean value indicating whether the search/delete was successful or not. The objective of this assignment is to compare the performance of BST and RBT ADTs. You have to compute the time taken for completion of operations and study how the running times of ADT operations will vary across the two ADT implementations.

2. **Lab Assignment No: 2**
Implement data structures to maintain a list of elements. In particular, implement the list as an array and as a linked list. Write a program to remove duplicates from the list. The code for remove duplicates functionality should remain the same across the two implementation of the list.
Implement the following sequence of operations on the skip list:
a) Remove ()   b) insert ()   c) Search ()   d) Update ()
Assume the coin flips for the first insertion yield two heads followed by tails, and those for the second insertion yield three heads followed by tails.

3. **Lab Assignment No: 3**
Implement different Hashing functions and Collision Resolution Techniques.

4. **Lab Assignment No: 4**
Implement Kruskal's algorithm for finding the minimum spanning tree of a given (positively) weighted (undirected) graph G. You must use the Union-Find data structure that implements both "union by rank" and "path compression" heuristics.

5. **Lab Assignment No: 5 &6**
Implement the following priority queues:
    a) Binary Heap   b) Binomial Heap   c) Fibonacci Heap

Your program should then create an appropriate priority queue object and perform make Heap () method. After that, you should give the user menu options to insert (key), delete (key), extractMin (), findMin (), decrease (key), increase (key) updateKey (current Key, newKey), and display Heap (filename). You may assume that keys will be unique. For display Heap(filename), you must output the tree structure of the priority queue (including linked list edges in Binomial Heap, etc) as a directed tree in the dot language format1 and store it in a file named filename (given as parameter).

6. **Lab Assignment No: 7&8**
    Implement Text Processing using Huffman Coding.
    Implement the compact representation of the suffix trie for the string "minimize minima".
    Implement a standard trie for the following set of strings: {abab, baba, ccccc, bbaaaa, caa, bbaacc, cbcc, cbca }.

7. **Lab Assignment No: 9 &10**
    One way to mask a message, *M*, using a version of *Steganography*, is to insert random characters into *M* at pseudo-random locations so as to expand *M* into a larger string, *C*.

    For instance, the message,

        ILOVEMOM,

could be expanded into

AMIJLONDPVGEMRPIOM.

It is an example of hiding the string, *M*, in plain sight, since the characters in *M* and *C* are not encrypted. As long as someone knows where the random

Books recommended:

TEXT BOOK
1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++," 2nd Edition, Pearson, 2004. **(T1)**
2. Peter Brass "Advanced Data Structures," Cambridge University Press, 1st Edition. **(T2)**
3. M T Goodrich, & Roberto Tamassia, "Algorithm Design," John Wiley, 2002. **(T3)**

Course Evaluation:
Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):
Implementing of real world problems
POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution

Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
    1. Student Feedback on Faculty
    2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	1	1	1	1	1
CO2	3	2	2	1	1	1
CO3	2	3	3	2	1	1
CO4	3	1	1	1	1	1
CO5	3	1	1	1	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT509
Course title: MATLAB PROGRAMMING
Pre-requisite(s):
Co- requisite(s):
Credits: 2   L: 0   T: 0   P: 4
Class schedule per week: 04
Class: M. Tech
Semester / Level: I/5
Branch: Computer Science and Engineering
Name of Teacher:

Course Objectives

This course enables the students to:

1.	To familiarize the student in introducing and exploring MATLAB
2.	Develop mathematical thinking and problem-solving skill
3.	To enable the student on how to approach for solving Engineering problems using simulation tools.
4.	To provide a foundation in use of this software for real time app

   1. Course Outcomes

After the completion of this course, students will be able to:

CO1	Acquire knowledge about MATLAB environment and build programs to

	solve engineering problems.
CO2	Understand the utility of various MATLAB toolboxes.
CO3	Interpret and visualize simple mathematical functions and operations thereon using MATLAB functions.
CO4	Analyze and solve basic mathematical and data science problems in MATLAB
CO5	Apply concepts of Graphical User Interface (GUI) designing, to develop a GUI based solution to engineering problems

SYLLABUS

List of Programs as Assignments:

1. **Lab Assignment No: 1**
   Objective: To Understand and Implement Matrix Algebra
      1. To create Sparse matrices using the function sparse.
      2. To convert a sparse matrix to full matrix.

2. **Lab Assignment No: 2**
   Objective: To Understand and Implement Data Analysis
   1. To measure the daily high temperatures in three cities with different color.
   2. To solve a different cities temperature do the filter.

3. **Lab Assignment No: 3**
   Objective: To Understand and Implement Data Interpolation
   1. To Draw 2-D random data.
   2. To Draw Threshold of Human Hearing.

4. **Lab Assignment No: 4**
   Objective: To Understand and Implement Cubic Splines
   1. To design Spline differentiation and Integration.
   2. To design interpolated Spiral Y=f(X).

5. **Lab Assignment No: 5**
   Objective: To Understand and Implement Fourier Analysis
   1.To solve the use of the FFT, consider the problem of estimating the continuous Fourier transform of the signal
   $f(t)=2e^{-3t}$ t $\geq$0, where f(t) is gven by
   $F(\omega)=2/(3+j \omega)$
   2. To design sawtooth Waveform at arbitrary points.

6. **Lab Assignment No: 6**

Objective: To Understand and Implement Optimization
1. To solve 1-D minimization and maximization.
2. To design Rosenbrock's banana function.

7. **Lab Assignment No: 7**
   Objective: To Understand and Implement Differential Equations
   1. Design a van der Pol Solution.
   2. To solve Jacobian matrix.
8. **Lab Assignment No: 8**
   Objective: To Understand and Implement Two-Dimensional Graphics
   1. To add new plots to an existing plot by using the hold command.
   2. To create new Figure windows, use the figure command in the Command window or the **New Figure** selection from the **File** menu in the Command or Figure window.

9. **Lab Assignment No: 9**
   Objective: To Understand and Implement Three- Dimensional Graphics
   1. Plot = 2 with 0   5in polar coordinates.
   2. Design a Surface plot using the surf function.

10. **Lab Assignment No: 10**
    Objective: To Understand and Implement Images, Movies, and Sound
    1. To display 8-bit intensity and RGB images.
    2. To convert between indexed images and movie frames.
11. **Lab Assignment No: 11**
    Objective: To Understand and Implement Graphical User Interfaces

    1. Using uigetfile to find the startup.m file on the author's computer.

    2. Write a program using the function **guidata,** which stores and retrieves data in the GUI figure **'ApplicationData'** property.
    3. How to put walls by clicking a mouse button to make an arbitrary maze.
    4. Design a GUI System.

Books recommended:

TEXTBOOK

1. Duane Hanselman, bruce Littlefield, Mastering MATLAB 7, Reason edu., 2nd edition, 2008. **(T1)**
2. Sandeep Nagar, Introduction to MATLAB for Engineers and Scientists: Solutions for Numerical Computation and Modeling, APress, 2017. **(T2)**

REFERENCE BOOK

1. MATLAB Primer by MATHWORKS. **(R1)**

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

Implementing of real-world problems

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓

Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment cs509

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	2	1	1
CO2	3	3	2	2	1	1
CO3	2	3	2	1	2	1
CO4	3	3	2	2	1	1
CO5	3	2	1	1	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1, CD6
CO2	CD1, CD6, CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3, CD6, CD7

CO5	CD1, CD2, CD7

COURSE INFORMATION SHEET

Course code: IT510
Course title: JAVA PROGRAMMING
Pre-requisite(s):
Co- requisite(s): None
Credits:2   L:0   T:0   P:4
Class schedule per week: 04
Class: M. Tech
Semester / Level: I/5
Branch: Information Security
Name of Teacher:

Course Objectives

This course enables the students to:

1.	To familiarize the student in introducing and exploring JAVA.
2.	Knowledge of the structure and model of the Java programming language.
3.	Use the Java programming language for various programming technologies.
4.	To provide a foundation for Java programming language to solve the given problems.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Write, compile, and execute Java programs that may include basic data types and control flow constructs using J2SE or other Integrated Development Environments (IDEs)
CO2	Write, compile, and execute Java programs manipulating Strings and text documents.
CO3	Write, compile, execute Java programs that include GUIs and event driven programming
CO4	Create Applets and GUI
CO5	Executing Client server and socket programming

SYLLABUS

List of Programs as Assignments:

1. <u>Lab Assignment No: 1</u>
  Objective: To Understand and Implement COLLECTION FRAMEWORK
  1. To create sparse matrices using the function sparse.
  2. To convert a sparse matrix to full matrix.

2. <u>Lab Assignment No: 2</u>
  Objective: To Understand and Implement Generic Programming
  1. Write the tasks performed by type erasure?
  2. Write a generic method to exchange the positions of two different elements in an array?

3. <u>Lab Assignment No: 3</u>
  Objective: To Understand and Implement REFLECTION
  1. Write a program that finds and displays inheritance hierarchy of a specified class?
  2. Write a program that shows all public fields of a specified class?

4. <u>Lab Assignment No: 4</u>
  Objective: GUI Development with Swing
  1. Working with Text Fields
  2. Working with Buttons
  3. Working with Lists
  4. Working with Scroll Panes

5. <u>Lab Assignment No: 5</u>
  Objective: Implementing Robust Geometric Primitives
  1. Java Program to Apply Above-Below-on Test to Find the Position of a Point with respect to a Line
  2. Java Program to Compute the Area of a Triangle Using Determinants
  3. Java Program to Compute the Volume of a Tetrahedron Using Determinants
  4. Java Program to Find the Area of any Polygon Using Triangulation

6. <u>Lab Assignment No: 6</u>
  Objective: To Understand and Implement examples on "Convex Hull"
  1. Java Program to Implement Graham Scan Algorithm to Find the Convex Hull
  2. Java Program to Implement Gift Wrapping Algorithm in Two Dimensions
  3. Java Program to Implement Jarvis March to Find the Convex Hull

7. <u>Lab Assignment No: 7</u>
  Objective: To Understand and Implement examples on "Nearest Neighbor Search"
  1. Java Program to Find the Nearest Neighbour Using K-D Tree Search
  2. Java Program to Find Nearest Neighbour Using Voronoi Diagram

8. <u>Lab Assignment No: 8</u>
  Objective: To Understand and Implement Network Programming
  1. Working with URLs
  2. Socket Server Programming

3. Client Server Programming

9. Lab Assignment No: 9
Objective: To Understand and Implement SOCKET PROGRAMMING
1. Write a java socket program to get the resource http://www.google.com/index.html using HTTP protocol?
2. Write a program how do you get the IP address of a machine from its hostname

10. Lab Assignment No: 10
Objective: To Understand and Implement Java Web Applications
1. Simple Servlet
2. Java Web Applications - Get Request
3. Java Web Applications - Post Request

11. Lab Assignment No: 11
Objective: To Understand and Implement Advanced Java Input/output (NIO)
1. File Copying With NIO
2. Working with Buffers
3. Working with File Data

Books recommended:

TEXT BOOKS
1. Uttam K Roy, Advanced JAVA Programming, Oxford University Press, 1st Edition , 2015 **(T1)**
2. HeerbertSchildt, Java: A Beginner's Guide, SeventhEdition,Oracle Press, 2014 **(T2)**

Course Evaluation:
Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):
Implementing of real world problems
POs met through Gaps in the Syllabus

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE
Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60

Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
  1. Student Feedback on Faculty
  2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	2	1	1
CO2	3	3	2	2	1	1
CO3	3	2	2	2	2	1
CO4	3	2	3	2	1	1
CO5	3	2	1	1	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course Code: CS509
Course title: ADVANCED COMPUTER ALGORITHM
Pre-requisite(s): Design and Analysis of Algorithms, Data Structures
Co- requisite(s): None
Credits: 3   L:3   T:0   P: 0
Class schedule per week: 03
Class: M. Tech
Semester / Level: II/5
Branch: Computer Science and Engineering

Course Objectives

After the completion of this course, students will be able to:

CO1	Identify and compare different approaches of computer algorithm for different practical application.
CO2	Student will understand the concept of NP-hard and NP- complete and reducibility.
CO3	Students will be able to design and criticize of a wide range of advanced algorithms techniques namely, approximation, randomized and parallel algorithm.
CO4	Students can analyse the approximation algorithms using approximation ratio and can perform probabilistic analysis of randomized algorithms.
CO5	Students should gain a good understanding on a wide range of advanced algorithmic problems, their relations and variants, and application to real-world problems

Course Outcomes
After the completion of this course, students will be able to:

1.	Identify and relate different algorithm design techniques to real world problems.
2.	describe a non-deterministic solution of different problem also they will be apply the concept of reducibility to convert one problem to another problem.
3.	Apply parallel, randomized and approximate solution of various problem.
4.	Analyse parallel, randomized and approximation algorithms.
5.	Design efficient algorithms for different applications.

SYLLABUS
Module I:
Design Paradigms
Overview of Divide and Conquer, Greedy and Dynamic Programming strategies. Basic search and traversal techniques for graphs, Backtracking, Branch and Bound.

(8L)

Module II :
Theory of NP- Hard and NP-Complete Problems
P, NP and NP-Complete complexity classes; A few NP-Completeness proofs; Other complexity classes.

(8L)

Module III :
Approximation Algorithms Introduction, Combinatorial Optimization, approximation factor, PTAS, FPTAS, Approximation algorithms for vertex cover, set cover, TSP, knapsack, bin packing, subset-sum problem etc. Analysis of the expected time complexity of the algorithms.

(8L)

Module IV :
Parallel Algorithms
Introduction, Models, speedup and efficiency, Some basic techniques, Examples from graph theory, sorting, Parallel sorting networks. Parallel algorithms and their parallel time and processors complexity.

(8L)

Module V :
Probabilistic Algorithms & Randomized Algorithms
Numerical probabilistic algorithms, Las Vegas and Monte Carlo algorithms, Game-theoretic techniques, Applications on graph problems

(8L)

Text Books:
1. T.H. Cormen, C.E.Leiserson, R.L. Rivest, C. Stein, "Introduction to Algorithms", Third Edition, MIT press, ISBN 978-81-203-4007-7.
2. E. Horowitz, S. Sahani, S. Rajasekaran, "Fundamentals of Computer Algorithms", Second Edition, University Press, ISBN 9788173716126.
3. R. Motwani & P. Raghavan, "Randomized Algorithms," Cambridge University Press, 1995.

Reference Books:
1. Vijay V.Vazirani, "Approximation Algorithms", http://www. cc.gatech.edu/fac/Vijay. Vazirani, Springer-Verlag.

Course Evaluation:

Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % ($3 \times 10\%$)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –
1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcome

Course Outcome	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	1	2	3	3	2
CO2	3	1	3	2	3	3
CO3	3	1	3	2	3	3
CO4	3	1	3	2	3	3
CO5	2	1	2	3	3	3

If satisfying and < 34% = L, 34-66% = M, > 66% = H

Mapping Between COs and Course Delivery (CD) methods			
CD	Course Delivery methods	Course Outcome	Course Delivery Method
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5	CD1
CD2	Laboratory experiments/teaching aids		
CD3	Industrial/guest lectures		
CD4	Industrial visits/in-plant training		
CD5	Self- learning such as use of NPTEL materials and internets	CO5	CD5

COURSE INFORMATION SHEET

Course code: IT514
Course title: CRYPTOGRAPHY
Pre-requisite(s):
Co- requisite(s):
Credits:3   L:3   T:0   P:0
Class schedule per week: 03
Class: M. Tech
Semester / Level: II/5
Branch: Information Security

Course Objectives
This course enables the students:

1.	To understand the various types of cryptographic attacks and the mathematics behind cryptography.

2.	To gain knowledge of symmetric and asymmetric ciphers, and hash functions.
3.	Prepare students for research in the area of cryptography and enhance students communication and problem solving skills
4.	To differentiate between the encryption standards, and know their suitability to an application.
5.	To effectively apply their knowledge to the construction of secure cryptosystems.

Course Outcomes

After the completion of this course, students will be able to:

1.	Understand the various types of cryptographic attacks and the mathematics behind cryptography.
2.	Describe the various types of ciphers and hash functions.
3.	Apply the different cryptographic techniques to solve real life problems.
4.	Evaluate different techniques as to their suitability to various applications.
5.	Develop a cryptosystem keeping in view social issues and societal impacts.

SYLLABUS

Module I:
Overview of Cryptography: Security goals, Cryptographic attacks, Mathematics of cryptography.
(8L)

Module II:
Symmetric-Key Cryptography: Substitution Ciphers, Transposition Ciphers, Stream and Block Ciphers. Modern Block and Stream Ciphers, Data Encryption Standard (DES) – Structure, Analysis, Security. Advanced Encryption Standard, AES Ciphers.
(8L)

Module III:
Asymmetric-Key Encipherment: Primality Testing, Factorization, RSA Cryptosystem, Rabin Cryptosystem, ElGamal Cryptosystem.
(8L)

Module IV:
Cryptographic Hash Functions: Introduction, Description of MD Hash family, Digital Signature Schemes, Variations and Applications.
(8L)

Module V:
Entity Authentication: Passwords, Challenge-Response, Zero-Knowledge, Biometrics.

(8L)

Text Books:
1. Behrouz A. Forouzan and D. Mukhopadhyay, "Cryptography & Network Security", McGraw Hill, New Delhi.
2. Wade Traple, "Lawrence C. Washington-Introduction to Cryptography with Coding Theory", Pearson Education.

Reference Books:

1. William Stallings, "Cryptography & Network Security Principles and Practice", Pearson Education.

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids

CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	3	2	2	3
CO2	3	2	1	1	2	1
CO3	3	3	2	1	1	2
CO4	2	2	3	2	1	2
CO5	1	3	1	1	2	1

If satisfying and < 34% = L, 34-66% = M, > 66% = H

Mapping Between COs and Course Delivery (CD) methods			
CD	Course Delivery methods	Course Outcome	Course Delivery Method
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5	CD1
CD2	Laboratory experiments/teaching aids		
CD3	Industrial/guest lectures		
CD4	Industrial visits/in-plant training		
CD5	Self- learning such as use of NPTEL materials and internets	CO5	CD5

Course code: IT515
Course title: DIGITAL FORENSICS
Pre-requisite(s):
Co- requisite(s):
Credits:3   L:3   T:0   P:0
Class schedule per week: 03
Class: M. Tech
Semester / Level: II/5
Branch: Information Security

Course Objectives
This course enables the students:

1.	Broad understand of What is digital forensic and its terminology
2.	Know about ethical hacking and Incidence Response Process and issues
3.	In depth understanding of Attacks and their counter measures.
4.	Information of how to apply Defence through data analysis and file system analysis
5.	Understand the basics of network, e-mail hacking methods tools, and their avoidance

Course Outcomes
After the completion of this course, students will be able to:

1.	Identify requirements of digital forensics its related terminology
2.	Classify and compare hacking methodology and their counter measures
3.	Evaluate the types of hacking and vulnerabilities in context to the risks associated
4.	Illustrate forensic analysis and data analysis on file systems
5.	Summarize Network Intrusions and Attacks, email, mobile hacking issues.

SYLLABUS

Module I:
Basics of Information Systems Security

Digital Forensic, Introduction to Digital Forensic, History of Forensic, Rules of Computer/Digital Forensic, Digital Forensic as a Discipline, Definition of Digital Forensic, Digital Forensic Investigations, Goal of Digital Forensic Investigation, Various DFI Process/Models/Framework, Ethical Issues

Digital Evidences, Introduction, What is Digital Evidence, Rules of Digital Evidence, Characteristics of Digital Evidence, Types of Evidence, Challenges in Evidence Handling, Volatile Evidence, Evidence Handling Procedures, Ethical Issues/Legal Principles of Digital Evidence, Digital Evidence and Metadata

(8L)

Module II:
Attacks Threats and Vulnerabilities

Ethical Hacking Methodology and Tools, Introduction, Types of Hackers, Reason for Hacking, Preventions from Hackers, Impact of Hacking, Steps Performed by Hackers, What is Ethical Hacking, Who is an Ethical Hacker, Ethical Issues, Ethical Hacking Process, Working of an Ethical Hacker, Identifying Types of Ethical Hacks, Different Tools for Ethical Hacking

Incidence Response Process Introduction, Goals of Incident Response, People Involved in Incident Response Process, Incident Response Methodology, Activities in Initial Response, Phases after Detection of an Incident.

(8L)

Module III:
Forensic Duplication Introduction to Forensic Duplication, Rules of Forensic Duplication (Thumb Rule), Necessity of Forensic Duplication, Forensic Duplicates as Admissible Evidence, Important Terms in Forensic Duplicate, Forensic Duplication Tool Requirements, Creating a Forensic Duplicate of a Hard Drive, Creating a Qualified Forensic Duplicate of a Hard Drive.

(8L)

Module IV:
File Systems File Systems, Various Types of File Systems, Introduction to Storage Layers, Hard Disk Drive, Forensic Analysis of File Systems

Data Analysis Preparation Steps for Forensic Analysis, Investigating Windows Systems, Investigating UNIX Systems, Hacker Tools

Network Forensic Introduction to Intrusion Detection System, Types of Intrusion Detection System, Advantages and Disadvantages of IDS, Understanding Network Intrusions and Attacks, Recognizing Pre-Intrusion/Attack Activities, Port Scans, Address Spoofing 10.8 Attacking with Trojans, Viruses, and Worms, Understanding Password Cracking, Understanding Technical Exploits, Collecting Network-Based Evidence, Investigating Routers, Network Protocols.

(8L)

Module V:

E-Mail Forensic Introduction, Working of E-Mail, Steps in the E-Mail Communication, E-Mail Service Protocols, Internet Fraud, Securing Your E-Mail Account, IP Tracking, E-Mail Recover, E-Mail Forensics Analysis Steps, E-Mail Forensic Tools

Mobile Phone Forensics Mobile Hacking ŚSMS and Call Forging, Mobile Phone Forensics, Forensic Procedures, Android Forensics, Mobile Forensic Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Various Computer/Digital Forensic Tools

(8L)

Text Books:

1. Digital Forensic: The Fascinating World of Digital Evidences Author : Dr. Nilakshi Jain, Dr. Dhananjay R. Kalbande

Reference Books:
1. The Basics of Digital Forensics 1st Edition The Primer for Getting Started in Digital Forensics Author:John Sammons.

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars

CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	2	2	3
CO2	3	2	2	1	2	2
CO3	2	3	2	2	1	3
CO4	3	1	3	2	2	2
CO5	2	3	1	1	2	1

If satisfying and < 34% = L, 34-66% = M, > 66% = H

Mapping Between COs and Course Delivery (CD) methods			
CD	**Course Delivery methods**	**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5	CD1
CD2	Laboratory experiments/teaching aids		
CD3	Industrial/guest lectures		
CD4	Industrial visits/in-plant training		
CD5	Self- learning such as use of NPTEL materials and internets	CO5	CD5

COURSE INFORMATION SHEET

Course code:IT601
Course title: CLOUD SECURITY
Pre-requisite(s):
Co- requisite(s): None
Credits: 3   L:3   T: 0   P: 0
Class schedule per week: 03
Class: M. Tech
Semester / Level: II/05

Branch: Information Security
Name of Teacher:

Course Objectives
This course enables the students:

1.	An ability to apply knowledge of mathematics and advanced computing & networking technologies for solving problems.
2.	An ability to design and conduct experiments to analyze and interpret data related to software and hardware design solutions.
3.	An ability to design a system, component or process to meet desired needs within realistic constraints.
4.	An ability to function on multidisciplinary teams using current computer engineering tools and technologies.
5.	An ability to identify, formulate and solve security issues based on the fundamental understanding of concepts related to data communication and computer networks.
6.	Acquire Knowledge of contemporary issues in the field of information security.
7.	An ability to use the techniques, skill and modern engineering tools necessary for employing security practices in the field of computer science.

Course Outcomes:
After the completion of this course, students will be able to:

1.	Understand the basic concepts of security systems and cryptographic protocols, which are widely used in the design of cloud security.
2.	Compare modern security concepts as they are applied to cloud computing.
3.	Assess the security of virtual systems.
4.	Evaluate the security issues related to multi-tenancy.
5.	Appraise compliance issues that arise from cloud computing.

SYLLABUS

Module I:
Security Concepts
Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defence in depth, least privilege, how these concepts apply in the cloud, what these concepts mean and their importance in PaaS, IaaS and SaaS. e.g. User authentication in the cloud; Cryptographic Systems- Symmetric cryptography, stream ciphers, block ciphers, modes of operation, public-key cryptography, hashing, digital signatures, public-key infrastructures, key management, X.509 certificates, OpenSSL.

(8L)

Module II:
Multi-tenancy Issues
Isolation of users/VMs from each other. How the cloud provider can provide this; Virtualization System Security Issues- e.g. ESX and ESXi Security, ESX file system security, storage considerations, backup and recovery; Virtualization System Vulnerabilities- Management console vulnerabilities, management server vulnerabilities, administrative VM vulnerabilities,

guest VM vulnerabilities, hypervisor vulnerabilities, hypervisor escape vulnerabilities, configuration issues, malware.

(8L)

Module III:
Virtualization System-Specific Attacks
Guest hopping, attacks on the VM (delete the VM, attack on the control of the VM, code or file injection into the virtualized file structure), VM migration attack, hyperjacking.

(8L)

Module IV:
Technologies for Virtualization-Based Security Enhancement
IBM security virtual server protection, virtualization-based sandboxing; Storage Security-HIDPS, log management, Data Loss Prevention. Location of the Perimeter.

(8L)

Module V:
Legal and Compliance Issues
Responsibility, ownership of data, right to penetration test, local law where data is held, examination of modern Security Standards (eg PCIDSS), how standards deal with cloud services and virtualization, compliance for the cloud provider vs. compliance for the customer.

(8L)

Text Books:
1. Tim Mather, Subra Kumaraswamy, Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance" O'Reilly Media; 1 edition [ISBN: 0596802765], 2009.
2. Ronald L. Krutz, Russell Dean Vines, "Cloud Security" [ISBN: 0470589876], 2010.

Reference Books:
1. John Rittinghouse, James Ransome, "Cloud Computing" CRC Press; 1 edition [ISBN: 1439806802], 2009.
2. J.R. ("Vic") Winkler, "Securing the Cloud" Syngress [ISBN: 1597495921] 2011.
3. Cloud Security Alliance, "Security Guidance for Critical Areas of Focus in Cloud Computing" 2009. 6

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % $(3 \times 10\%)$
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
     1. Student Feedback on Faculty
     2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	3	2	1	1	2
CO2	3	3	3	3	3	2
CO3	1	3	1	3	2	3
CO4	1	3	2	3	1	2
CO5	2	3	1	3	2	2

If satisfying and < 34% = L, 34-66% = M, > 66% = H

Mapping Between COs and Course Delivery (CD) methods

CD	Course Delivery methods	Course Outcome	Course Delivery Method
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5	CD1
CD2	Laboratory experiments/teaching aids		
CD3	Industrial/guest lectures		
CD4	Industrial visits/in-plant training		
CD5	Self- learning such as use of NPTEL materials and internets	CO5	CD5

COURSE INFORMATION SHEET

Course code: IT516
Course title: DATA MINING AND DATA ANALYSIS
Pre-requisite(s):
Co- requisite(s): None
Credits: 3   L: 0   T: 0   P: 3
Class schedule per week: 03
Class: M. Tech
Semester / Level: II/05
Branch: Information Security
Name of Teacher:

Course Objectives
This course enables the students to:

1.	Explain about the necessity of preprocessing and its procedure.
2.	Generate and evaluate Association patterns
3.	Solve problems using various Classifiers
4.	Learn the principles of Data mining techniques and various mining algorithms.
5.	Learn about traditional and modern data driven approach and problem solving techniques for various datasets

Course Outcomes
After the completion of this course, students will be able to:

CO1	Understand Data Warehousing and Data Mining and its applications and challenges and Create mini data warehouse.
CO2	Apply the association rules for mining applications
CO3	Identify appropriate Classification techniques for various problems with high dimensional data.
CO4	Implement appropriate Clustering techniques for various problems with high dimensional data sets.
CO5	Implement various mining techniques on complex data objects.

SYLLABUS

Module I :
Data Analysis foundation, Numeric and Categorical attributes, Dimensionality reduction.

(8L)

Module II:
Data Warehouse: Introduction, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology, From Data Warehousing to Data Mining. Data Cube Computation and Data Generalization.

(8L)

Module III:
Frequent Pattern Mining, Summarizing Item sets, Item set Mining, Sequence Mining.

(8L)

Module IV:
Classification: Naïve Bayes, KNN, Decision Tree, Classification Performance measures, Classifier evaluation.

(8L)

Module V:
Clustering: K-Means, Agglomerative, Hierarchical, DBSCAN, Spectral and Graph Clustering. Anomaly detection, Statistical, distance and density-based approaches.

(8L)

Text Books:
1. Mohammed J. Zaki, and Wagner Meira Jr., "Data Mining and Analysis: Fundamental Concepts and Algorithms", Cambridge University Press, 2016

2. [Pang-Ning Tan](#), [Michael Steinbach](#), and [Vipin Kumar](#), "Introduction to Data Mining", Pearson, 2014
3. Jiawei Han, and Micheline Kamber, "Data Mining Concepts & Techniques", 3rd Edition, Publisher Elsevier India Private Limited, 2015

Course Evaluation:

Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcome

Course Outcome	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	1	2		3	2
CO2	3	3		2	2	
CO3	2	3	3	2	3	1
CO4		2	3		2	3
CO5	1	2	3	3	2	3

If satisfying and < 34% = L, 34-66% = M, > 66% = H

Mapping Between COs and Course Delivery (CD) methods			
CD	Course Delivery methods	Course Outcome	Course Delivery Method
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5	CD1
CD2	Laboratory experiments/teaching aids		
CD3	Industrial/guest lectures		
CD4	Industrial visits/in-plant training		
CD5	Self- learning such as use of NPTEL materials and internets		

COURSE INFORMATION SHEET

Course code: IT518
Course title: INTERNET OF THINGS
Pre-requisite(s):
Co-requisite(s):
Credits:3　　L:3　　T:0　　P:0
Class schedule per week: 03
Class: M. Tech
Semester / Level: II/05
Branch: Information Security

Course Objectives

This course enables the students:

1.	Understand the basic concept and the Iot Paradigm
2.	Know the state of art architecture for IoT applications
3.	Learn the available protocols used for IoT
4.	Design basic IoT Applications.
5.	Evaluate optimal IoT applications.

Course Outcomes

After the completion of this course, students will be:

CO1	Identify the IoT Components and its capabilities
CO2	Explain the architectural view of IoT under real world constraints
C03	Analyse the different Network and link layer protocols
CO4	Evaluate and choose among the transport layer protocols
CO5	Design an IoT application

SYLLABUS

Module I:

IoT-An Architectural Overview

An Architectural Overview Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management.

(8L)

ModuleII:

IoT Architecture-State of the Art

State of the art, Reference Model and architecture, IoT Reference Architecture; Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

(8L)

Module III:

Sensor Technology, RFID Technology, WPAN Technologies for IoT/M2M, Cellular and Mobile Network Technologies for IoT/M2M CoAP, REST, Zigbee, Bluetooth

(8L)

Module IV:

Transport & Session Layer Protocols

Mobile IPv6 technology for IoT, 6LoWPAN, Transport Layer TCP, MPTCP, UDP, DCCP,

Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT

(8L)

ModuleV:

Layer Protocols & Security

Introduction, Technical Design constraints. Implementation Examples. Security and Interoperability.

(8L)

Books recommended:

TEXT BOOK

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1stEdition, Academic Press, 2014.**(T1)**
2. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6". **(T2)**

REFERENCE BOOK

1. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer. **(R1)**
2. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI. **(R2)**

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
D4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and
Outcomes Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	3	2	1
CO2	3	3	3	2	1	1
C03	3	2	2	3	1	1
CO4	3	3	2	1	3	1
CO5	2	1	2	2	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6, CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2, ,CD5,CD7

Course code: IT570
Course title: **Basics of Python programming**
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0   T:1   P:2
Class schedule per week: 1
Class: M. Tech
Semester / Level:
Branch:

Course Objectives
This course enables the students:

1.	To facilitate skills required to Install and run the Python interpreter
2.	To facilitate skills required to Create and execute Python programs
3.	To introduce the Understanding the concepts offile I/O
4.	To provide skills to read data from a text file using Python
5.	To discover the interesting patterns using appropriate Python visualization libraries

Course Outcomes
After the completion of this course, students will be able to do the following:

1.	Understand how to convert the problems into algorithms
2.	Analyse and develop the algorithms to Python programs.
3.	Design programs with Interactive Input and Output, utilizing arithmetic expression repetitions, decision making, arrays.
4.	Develop modular Python programs using functions
5.	Design programs using file Input and Output.

Syllabus
Module I
Problem Analysis-Formal Definition of a Problem, Algorithms, Flowcharts, Examples for Algorithms and Flowcharts
Introduction to Python- Variables, Operators, Expressions, Evaluation of Expressions, String Operations, Input and Output functions
Module II

Control Statements- Decision making statements, Iterative Statements, Loop Control Statements

Strings and Lists- String Operations, Tuples and Dictionaries-Operations and Examples

Module III

Functions- Function Definition and Call, Mathematical functions, User defined Functions, Parameters and Arguments, Type Conversion and Coercion

Module IV

Files – Different File Operations, File Object Attributes, Directories

Exceptions- Except clause, Exception with arguments, Raising an Exception, User Defined Exceptions

Module V

Introduction to Classes and Objects- Object Oriented Features, Attributes, Instances, Garbage Collection

SYLLABUS

List of Programs as Assignments:

12. **Lab Assignment No: 1**

    Objective: ToImplement basic Python programming.

    Q1. Create a new program called hello world.py. Use this file to write your very
    First "Hello, world!" program.

    Q2. Write a Python program containing exactly one print statement that produces the following output:

    A

    B

    C

    D

    E

    F

13. **Lab Assignment No: 2**

    Objective: To Understand and Implement the concept of if-else-if statements.

    Q1.Write a Python program that requests five integer values from the user. It then prints one of two things: if any of the values entered are duplicates, it prints "DUPLICATES"; otherwise, it prints "ALL UNIQUE".

    Q2. Write a Python program that allows the user to enter a four-digit binary number and displays its value in base 10. Each binary digit should be entered one per line, starting with the leftmost digit, as shown below.

     Enter leftmost digit: 1

    Enter the next digit: 0

    Enter the next digit: 0

    Enter the next digit: 1

    The value is 9

Q3.Develop and test a program that prompts the user for their age and determines approximately how many breaths and how many heartbeats the person has had in their life. The average respiration (breath) rate of people changes during different stages of development. Use the breath rates given below for use in your program:

	Breaths per Minute
Infant	30–60
1 –4 years	20–30
5 –14 years	15–25
adult	12–20

For heart rate, use an average of 67.5 beats per second.

14. **Lab Assignment No: 3**

Objective: To Understand and Implement the flow control statements.

Q1. Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4... 1/10.

Q2. Write a program using a for loop that calculates exponentials. Your program should ask the user for a base 'b' and an exponent 'exp', and calculate b^exp.

Q3. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero. What should your program do if the user input a negative number? As a programmer, you should always consider "edge conditions" like these when you program! (Another way to put it- always assume the users of your program will be trying to find a way to break it! If you don't include a condition that catches negative numbers, what will your program do?)

15. **Lab Assignment No: 4**

Objective: To practice drawing patterns

Q1.Write the program to print the following pattern: ex if the user enters 7, the program would print

```
   *
  **
 ***
 ****
 *****
 ******
*******
 ******
 *****
 ****
 ***
  **
   *
```

Q2.Write a program in python to print the following pattern:

```
       1
      1 1
      121
 1331
        12641
 15101051
1615201561
```

16. **Lab Assignment No: 5**

Objective: To Understand and Implement methods in Python.

Q1.Write a method fact that takes a number from the user and prints its factorial.

Q2. Write a Python function named compare3 that is passed three integers and returns true if the three integers are in order from smallest to largest, otherwise it returns false.

Q3. Write a python function named modCount that is given a positive integer and a second positive integer, m<=n, and returns how many numbers between 1 and n are evenly divisible by m.

17. **Lab Assignment No: 6**

Objective: To Understand and Implement the concept of Recursion

Q1. Write a program to read an integer number. Print the reverse of this number using recursion.

Q2. Write a program that calculates the GCD using recursive functions.

18. **Lab Assignment No: 7**

Objective: To Understand and Implement Sorting techniques

Q1. Write a program to sort the list of elements using Insertion sort.

Q2. Write a program to sort the list of elements using Merge sort.

Q3.Write a program to multiply the two matrices.

19. **Lab Assignment No: 8**

Objective: To Understand and Implement the concept of Strings in Python

Q1. Write a program to check whether string is a palindrome or not.

Q2. Write a program to implement format method available with string object.

20. **Lab Assignment No: 9**

Objective: To Understand and Implement Dictionary

Q1. Program to demonstrate the built in functions within the dictionary.

Q2. Program to implement dictionary as an associative array

21. **Lab Assignment No: 10**

Objective: To Understand and Implement File Handling.

Q1. Program to open the file in the read mode and use of for loop to print each line present in the file.

Q2. Write a Python program to illustrate Append vs write mode.

Q3. Write a Program to read and write data from a file.

Text book:

1. Downey A.,How to think like a computer scientist: Learning with Python.

Reference books:

1.JoseJeeva, Taming Python by Programming, Khanna Publishing House.

2. Jose J. Introduction to Computing and Problem Solving with Python, (ISBN: 978-93-82609-810).

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

Implementing of real world problems

POs met through Gaps in the Syllabus

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –
    1. Student Feedback on Faculty
    2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	2	1	3
CO2	3	3	2	2	1	3
CO3	2	2	2	1	2	1
CO4	3	1	1	3	2	2

CO5	3	2	1	3	1	3

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT523
Course title: BIOMETRIC SECURITY
Pre-requisite(s):
Co- requisite(s):
Credits:3   L:3   T:0   P: 0
Class schedule per week: 03
Class: M. Tech
Semester / Level: II/5
Branch: Information Security

Course Objectives

This course enables the students to:

1.	To understand the brief functioning of biometric system.
2.	To know the different types of biometric and their accuracy.
3.	To increase the likelihood that biometric technologies, when deployed, will be as protective of personal and informational privacy as possible.
4.	To raise awareness of privacy issues for end users and for students.
5.	To increase security of the system as well as data.

Course Outcomes

After the completion of this course, students will be able to:

1.	Demonstrate knowledge of the basic physical and biological science and engineering principles underlying biometric systems.
2.	Identify the sociological and acceptance issues associated with the design and implementation of biometric systems.
3.	Developing new advanced authentication algorithms.
4.	Analyze the accurate discrimination between individuals.
5.	Illustrate the two factor authentication system.

SYLLABUS

Module I:
Biometrics- Introduction- benefits of biometrics over traditional authentication systems -benefits of biometrics in identification systems-selecting a biometric for a system –Applications - Key biometric terms and processes - biometric matching methods -Accuracy in biometric systems.

(8L)

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

(8L)

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

(8L)

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

(8L)

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

(8L)

TEXT BOOKS :

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

REFERENCE BOOKS:

1. John Berger: "Biometrics for Network Security", 1st Edition, Prentice Hall, 2004.

Gaps in the syllabus (to meet Industry/Profession requirements):
POs met through Gaps in the Syllabus:
Topics beyond syllabus/Advanced topics/Design:

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids

CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
1	3	3	3	3	2	1
2	3	3	3	2	1	1
3	3	2	2	3	1	1
4	3	3	2	1	3	1
5	2	1	3	2	1	1

If satisfying and $< 34\% = 1$, $34\text{-}66\% = 2$, $> 66\% = 3$

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2, ,CD5,CD7

Course code: IT504
Course title: APPLIED CRYPTOGRAPHY
Pre-requisite(s):
Co- requisite(s):
Credits:3   L:3   T:0   P:0
Class schedule per week: 03
Class: M. Tech
Semester / Level: II/5
Branch: Information Security

Course Objectives

This course enables the students:

1.	To understand the foundations of cryptographic attacks.
2.	To gain knowledge of encrypting data, and to choose between different algorithms.
3.	Prepare students for research in the area of cryptography and enhance students communication and problem solving skills
4.	To differentiate between the encryption techniques and know their suitability to an application.
5.	To effectively apply their knowledge to the construction of secure cryptosystems.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Understand the various types of cryptographic protocols and the mathematics behind cryptography.
CO2	Describe the various types of ciphers and hash functions.
CO3	Apply the different cryptographic techniques to solve real life problems.
CO4	Evaluate different techniques as to their suitability to various applications.
CO5	Develop a cryptosystem keeping in view social issues and societal impacts.

SYLLABUS

Module I:
Foundations – Protocol Building Blocks - Basic Protocols - Intermediate Protocols - Advanced Protocols - Zero-Knowledge Proofs - Zero-Knowledge Proofs of Identity -Blind Signatures - Identity-Based Public-Key Cryptography.

(8L)

Module II:
Key Length - Key Management – Public Key Cryptography versus Symmetric Cryptography - Encrypting Communications Channels - Encrypting Data for Storage - Hardware Encryption versus Software Encryption - Compression, Encoding, and Encryption - Detecting Encryption – Hiding and Destroying Information.

(8L)

Module III:
Information Theory - Complexity Theory - Number Theory - Factoring - Prime Number Generation - Discrete Logarithms in a Finite Field - Data Encryption Standard (DES) – Lucifer - Madryga - NewDES - GOST – 3 Way – Crab – RC5 - Double Encryption - Triple Encryption - CDMF Key Shortening - Whitening.

(8L)

Module IV:
Pseudo-Random-Sequence Generators and Stream Ciphers – RC4 - SEAL - Feedback with Carry Shift Registers - Stream Ciphers Using FCSRs - Nonlinear-Feedback Shift Registers - System-Theoretic Approach to Stream-Cipher Design - Complexity-Theoretic Approach to Stream-Cipher Design - N- Hash - MD4 - MD5 - MD2 - Secure Hash Algorithm (SHA) - OneWay Hash Functions Using Symmetric Block Algorithms - Using Public-Key Algorithms - Message Authentication Codes

(8L)

Module V:
RSA - Pohlig-Hellman - McEliece - Elliptic Curve Cryptosystems -Digital Signature Algorithm (DSA) - Gost Digital Signature Algorithm - Discrete Logarithm Signature Schemes - Ongchnorr-Shamir -Cellular Automata - Feige-Fiat-Shamir -Guillou-Quisquater - Diffie-Hellman - Station-to-Station Protocol -Shamir's Three-Pass Protocol - IBM Secret-Key Management Protocol - MITRENET - Kerberos - IBM Common Cryptographic Architecture.

(8L)

TEXT BOOKS:

1.   Bruce Schneier, "Applied Cryptography: Protocols, Algorithms, and Source Code in C" John Wiley & Sons, Inc, 2nd Edition, 1996. **(T1)**
2.   Wenbo Mao, "Modern Cryptography Theory and Practice", Pearson Education, 2004. **(T2)**
3.   Atul Kahate, "Cryptography and Network Security", Tata McGrew Hill, 2003.

(T3) REFERENCE BOOKS:

1. William Stallings- Cryptography & Network Security Principles and Practice, Pearson Education. **(R1)**

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	3	1	2	3
CO2	3	3	3	2	2	3
C03	2	3	2	2	1	3
CO4	2	2	3	2	3	2
CO5	3	3	2	1	3	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6, CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2, ,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT524
Course title: IMAGE PROCESSING TECHNIQUES
Pre-requisite(s):
Co- requisite(s):
Credits:3   L:3   T:0   P:0
Class schedule per week: 3
Class: M. Tech
Semester / Level: II/5
Branch: Information Security

Course Objectives
This course enables the students:

1.	Understand the basic concept of Digital Image Processing
2.	To Learn the Fourier Transform & its application
3.	Understand the basic components of filters
4.	Understand the basic concept of Image Compression Fundamentals
5.	Understand the basic concept of Image Segmentation.

Course Outcomes
After the completion of this course, students will be:

1.	Understand the concept of image formation, digitization, and role human visual system plays in perception of image data and spatial filtering techniques for enhancing the appearance of an image.
2.	Acquire an appreciation for various frequency based filtering techniques for enhancing the appearance of an image, duly applying them in different applications.
3.	Discern the difference between noise models, gain an insight into assessing the degradation function and realize different spatial and frequency based filtering techniques for reduction and removal of noise.
4.	Synthesize a solution to image compression using the concept of information theory and lossless and lossy compression techniques.
5.	Design and create practical solutions using morphological and image segmentation operators for common image processing problems and assess the results.

Syllabus

Module I:
Introduction to Digital Image Processing, Elements of Visual Perception, Image Sensing & Acquisition, Sampling and Quantization, Basic Relationships between Pixels, Intensity Transformations, Histogram Processing, Spatial Convolution & Correlation, Smoothing Spatial Filters, Sharpening Spatial Filters.

(8L)

Module II:
Introduction to the Fourier Transform, Discrete Fourier Transform, Properties of the Two-Dimensional Fourier Transform, Image Smoothing using Frequency Domain filters, Image Sharpening using Frequency Domain filters, Selective Filtering, Basics of Fast Fourier Transform, Basics of: Walsh- Hadamard Transform; K-L Transform; Discrete Cosine Transform.

(8L)

Module III:
Model of Image Degradation/Restoration Process, Noise Probability Density Functions, Restoration in presence of Noise only, Periodic Noise Reduction using Frequency Domain filtering, Circulant Matrices, Block Circulant Matrices, Unconstrained Restoration, Constrained Restoration, Basics of Inverse Filtering

(8L)

Module IV:
Image Compression Fundamentals – Coding Redundancy, Interpixel Redundancy, Psychovisual Redundancy, Fidelity Criteria, Image Compression Models– Source Encoder and Decoder, Channel Encoder and Decoder, Elements of Information Theory, Error-Free Compression – Variable-Length Coding, Bit-Plane Coding, Lossless Predictive Coding. Lossy Compression – Lossy Predictive Coding, Transform Coding.Color Fundamentals, Color Models, Basics of Full Color Image Processing.

(8L)

Module V:
Morphological Image Processing- Preliminaries, Dilation and Erosion, Opening and Closing, Hit-or-Miss Transformation, Boundary Extraction, Hole Filling, Connected Components, Convex Hull, Thinning, Thickening, Skeletons, Pruning
Image Segmentation- Fundamentals, Point, Line and Edge Detection, Thresholding, Region Based Segmentation, Segmentation based on color.

(8L)

Text books:
1. Rafael. C. Gonzalez & Richard E. Woods- Digital Image Processing, 3/e Pearson Education, New Delhi - 2009

Reference books:
1. W.K.Pratt-Digital Image Processing, 4/e, John Wiley & sons, Inc. 2006.
2. M. Sonka et al. Image Processing, Analysis and Machine Vision, 2/e, Thomson, Learning, India Edition, 2007.
3. Jayaraman, Digital Image Processing, Tata McGraw-Hill Education, 2011

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training

CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	3	1	2	1
CO2	3	3	3	3	1	1
C03	3	3	3	3	3	1
CO4	2	3	2	3	2	1
CO5	2	3	2	3	3	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6, CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2, ,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS524

Course title: SOFT COMPUTING
Pre-requisite(s):
Co- requisite(s):
Credits:3   L:3   T:0   P:0
Class schedule per week: 3
Class: M. Tech
Semester / Level: II/5
Branch: Information Security

Course Objectives

After the completion of this course, students will be:

1.	To understand the concepts of soft computing
2.	To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.
3.	To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems.
4.	To provide the mathematical background for carrying out the optimization and familiarizing genetic algorithm for seeking global optimum in self-learning situation.
5.	To develop neural network models.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Solve numerical on Fuzzy sets and Fuzzy Reasoning.
CO2	Develop Fuzzy Inference System (FIS).
C03	Solve problems on Genetic Algorithms
CO4	Explain concepts of neural networks
CO5	Develop neural networks models for various applications.

Syllabus
Module I

Introduction: Soft Computing vs. hard computing, soft computing paradigms, Basic mathematics of soft computing, learning and statistical approaches to classification and regression.

Fuzzy Logic: Introduction, Fuzzy set theory and operations, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Membership functions, fuzzification and defuzzification.

(8L)

Module II:

Fuzzy Rule Base System: Fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making. **Applications**: Fuzzy logic in modeling and control, image processing

(8L)

Module III:
Neural Networks: Introduction, Biological neural network, learning paradigms. Artificial Neural Network (ANN): Evolution of Basic neuron modeling, Difference between ANN and human brain, McCulloch-Pitts neuron models, Learning paradigms, activation function, Single layer Perceptron, Perceptron learning, Windrow-Hoff/ Delta learning rule, Multilayer Perceptron, Adaline, Madaline, different activation functions, Back propagation network, momentum, limitation, FBFN, Convolution Networks, Kohonen SOM, Hopfield Networks, HebbNet.

(8L)

Module IV:
Genetic Algorithms: Introduction, working principle, Basic operators and Terminologies like individual, gene, encoding, fitness function and reproduction, Genetic modeling: Significance of Genetic operators, Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, GA optimization problems such as TSP (Travelling salesman problem), Applications:Genetic Algorithm based Back propagation Networks.

(8L)

Module V:
Particle Swarm Optimization: Background, Operations of Particle Swarm Optimization, Basic Flow of Particle Swarm Optimization, Comparison between GA and PSO, Applications of PSO.

Ant Colony Optimization: Ant Colony Optimization Algorithm, Ant System, Ant Colony System, Basic Flow of Ant colony Optimization, Applications of ACO.

(8L)

TEXT BOOKS:

1. S.N. Sivanandam,Principle of Soft Computing, Wiley India.

2. Simon Haykins ,"Neural Networks :A Comprehensive Foundation, Pearson Education,2002

3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications." TMH, New York, 1997.

REFERENCE BOOKS
1. K.S.Ray ,"Soft Computing and Its application", Vol 1, Apple Academic Press.2015
2. K.H.Lee ,"First Course on Fuzzy Theory and App.", Adv in Soft Computing Spinger.2005
3. H.Z.Zimmermann ,"Fuzzy Set Theory and its App " , 4[th]Ed.Spinger Science,2001

 Gaps in the syllabus (to meet Industry/Profession requirements):

 POs met through Gaps in the Syllabus:

 Topics beyond syllabus/Advanced topics/Design:

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	PO1	PO2	PO3	PO4	PO5	PO6

CO1	3	3	2	3	1	1
CO2	3	2	3	3	1	1
C03	3	3	3	2	1	3
CO4	2	2	3	3	1	2
CO5	2	3	3	2	1	1

If satisfying and $< 34\% = 1$, $34\text{-}66\% = 2$, $> 66\% = 3$

<u>**MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD**</u>

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6
CO3	CD1, CD2,
CO4	CD1,CD7
CO5	CD1,CD2,

COURSE INFORMATION SHEET

Course code:IT571
Course title**: Introduction to R Programming**
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T:1 P:2
Class schedule per week: 1
Class: M. Tech
Semester / Level:
Branch:

Course Objectives

1.	To develop problem solving skills
2.	To learn programming and to solve problems using computers
3.	To learn Data Manipulation, Analysis and Visualization using Computers

4.	To introduce students to the key concepts and ideas of a statistical computing environment
5.	To introduce students to fundamental concepts in (scientific) programming in general.

This course enables the students:

Course Outcomes

After the completion of this course, students will be to do the following:

1.	Design programs with Interactive Input and Output, utilizing arithmetic expression, repetitions and decision making
2.	Design programs using the fundamental data structures in R
3.	Develop programs in R interfacing files and URLs
4.	Solve Mathematical problems using R
5.	Design graphs and simulations in R

Syllabus

Module I

Introduction- R reserved words, Variables and Constants, Operators, Operator Precedence

Getting Data in and out of R –Accessing the Keyboard and Monitor, Reading in Larger Datasets

Module II

     Control Statements- if ..else, for loop, while loop, repeat loop, break and next

Data Structures- Vectors, Arrays, Matrices, Lists, Data Frames, Factors, Operations on Dates and Times

Module III

     Strings: Overview of String Manipulation Functions

Functions: Function Syntax, Environment and Scope, Recursive Function

Interfaces to the Outside World: File Connections, Reading Lines of a Text File Reading From a URL Connection

Module IV

Maths in R- Math Functions, Functions for Statistical Distributions, Sorting, Linear Algebra Operations, Set Operations.

Simulation -Generating Random Numbers, Simulating a Linear Model, Random Sampling

Module V

Graphics-Creating Graphs, Customising Graphs

Introduction to Object Oriented Features- Concept of Class and Object

SYLLABUS

List of Programs as Assignments:

1. **<u>Lab Assignment No: 1</u>**

   Objective: To Understand and Implement Data Types
   1. Data Types - R Objects and Attributes
   2. Data Types - Vectors and Lists
   3. Data Types - Matrices
   4. Data Types - Factors
   5. Data Types - Missing Values
   6. Data Types - Data Frames
   7. Data Types - Names Attribute
   8. Data Types - Summary

2. **<u>Lab Assignment No: 2</u>**

   Objective: To Understand and Implement Data Analysis
   1. Reading Tabular Data
   2. Reading Large Tables
   3. Textual Data Formats
   4. Connections: Interfaces to the Outside World
   5. Subsetting - Basics
   6. Subsetting - Lists
   7. Subsetting - Matrices
   8. Subsetting - Partial Matching
   9. Subsetting - Removing Missing Values
   10. Vectorized Operations

3. **<u>Lab Assignment No: 3</u>**

   Objective: To Understand and Implement Swirl
   1. Workspace and Files
   2. Sequences of Numbers
   3. Vectors

4. **<u>Lab Assignment No: 4</u>**

   Objective: To Understand and Implement Cubic Splines
   1. To design Spline differentiation and Integration.
   2. To design interpolated Spiral Y=f(X).

5. **<u>Lab Assignment No: 5</u>**

   Objective: To Understand and Implement Control Structures
   1. If-else
   2. Control Structures - For loops
   3. Control Structures - While loops
   4. Control Structures - Repeat, Next, Break

6. **<u>Lab Assignment No: 6</u>**

   Objective: To Understand and Implement Functions
   1. Functions (part 2)
   2. Scoping Rules - Symbol Binding

3. Scoping Rules - R Scoping Rules
4. Scoping Rules - Optimization Example (OPTIONAL)

7. **Lab Assignment No: 7 &8**
   Objective: To Understand and Implement Loop Functions and Debugging
   1. Loop Functions - lapply
   2. Loop Functions - apply
   3. Loop Functions - mapply
   4. Loop Functions - tapply
   5. Loop Functions – split

8. **Lab Assignment No: 9 & 10**
   Objective: To Understand and Implement Two-Dimensional Graphics
   1. Generating Random Numbers
   2. Simulation - Simulating a Linear Model
   3. Simulation - Random Sampling

Text books:

2. Matloff Norman, The Art of R Programming– A Tour of Statistical Software Design.(T1)

3. Hadley Wickham, Garrett Grolemund, R for Data Science: Import, Tidy, Transform, Visualize, and Model Data, Orielly, 1st Edition. (T2)

Reference books:

1. Grolemund Garret,Hands-On Programming with R.(R1)
2. Gardener Mark,Beginning R: The Statistical Programming Language.(R2)

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

Implementing of real world problems

POs met through Gaps in the Syllabus

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment					
Semester End Examination					

Indirect Assessment –
   1. Student Feedback on Faculty
   2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors

CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	2	1	3
CO2	3	3	2	2	1	2
CO3	2	2	2	3	1	3
CO4	3	1	2	3	1	1
CO5	3	2	1	3	2	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course Code: CS512
Course title: ARTIFICIAL INTELLIGENCE
Pre-requisite(s): Design and Analysis of Algorithms, Data Structures
Co- requisite(s): None
Credits: 3   L:3   T:0   P: 0
Class schedule per week: 03
Class: M. Tech
Semester / Level: II/5
Branch: Information Security

Course Objectives
After the completion of this course, students will be able to:

1.	An ability to apply knowledge of mathematics, science and engineering to both software and hardware design problems.
2.	An ability to design and conduct experiments and to analyze and interpret data related to software and hardware design solutions.
3.	An ability to design a system, component or process to meet desired needs within realistic constraints.
4.	An ability to function on multidisciplinary teams using current computer engineering tools and technologies.
5.	An ability to identify, formulate and solve engineering problems based on a fundamental understanding of concepts of computer engineering topics.

Course Outcomes
After the completion of this course, students will be able to:

CO1	Recall the principles and approaches of artificial intelligence and understand different aspects of Intelligent agent.
CO2	Apply different search techniques for solving real world problems and select the most appropriate solution by comparative evaluation.
CO3	Understanding the various concepts of knowledge representations and demonstrate working. knowledge of reasoning in the presence of incomplete and/or uncertain information.
CO4	To develop a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, Robotics etc.
CO5	Write various types of LISP and PROLOG programs and explore more sophisticated LISP and PROLOG code.

SYLLABUS

Module I :
Introduction: Overview of Artificial Intelligence- Problems of AI, AI Technique, Tic - Tac - Toe Problem.
Intelligent Agents: Agents & Environment, Nature of Environment, Structure of Agents, Goal Based Agents, Utility Based Agents, Learning Agents.
Problem Solving: Problems, Problem Space & Search: Defining The Problem as State Space Search, Production System, Problem Characteristics, Issues in The Design of Search Programs.
(8L)

Module II :
Search Techniques: Solving Problems by Searching, Problem Solving Agents, Searching for Solutions; Uniform Search Strategies: Breadth First Search, Depth First Search, Depth Limited Search, Bi-directional Search, Comparing Uniform Search Strategies.
Heuristic Search Strategies: Greedy Best-First Search, A* Search, Memory Bounded Heuristic Search: Local Search Algorithms & Optimization Problems: Hill Climbing Search, Simulated Annealing Search, Local Beam Search, Genetic Algorithms; Constraint Satisfaction Problems, Local Search for Constraint Satisfaction Problems.
Adversarial Search: Games, Optimal Decisions & Strategies in Games, The Minimax Search Procedure, Alpha-Beta Pruning, Additional Refinements, Iterative Deepening.
(8L)

Module III :
Knowledge & Reasoning: Knowledge Representation Issues, Representation & Mapping, Approaches to Knowledge Representation, Issues in Knowledge Representation.
Using Predicate Logic: Representing Simple Fact in Logic, Representing Instant & ISA Relationship, Computable Functions & Predicates, Resolution, Natural Deduction. **Representing Knowledge Using Rules:** Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning, Matching, Control Knowledge.
(8L)

Module IV :
Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, Bayesian Networks, Dempster -Shafer Theory.
Planning: Overview, Components of A Planning System, Goal Stack Planning, Hierarchical Planning.
Learning: Forms of Learning, Inductive Learning, Explanation Based Learning, Neural Net Learning & Genetic Learning.
(8L)

Module V :
Natural Language Processing: Brief introduction to Syntactic Processing, Semantic Analysis, Discourse & Pragmatic Processing.
Robotics: Introduction, Robot hardware, robotic perception, planning to move, planning uncertain movements, robotic software architecture, application domains.
(8L)

TEXT BOOKS:
1. S. Russel and P. Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Pearson Education.
2. E. Rich & K. Knight, "Artificial Intelligence", 2/e, TMH, New Delhi, 3rd Edition, TMH

REFERENCE BOOKS:
1. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI, New Delhi, 2006.
2. D.W. Rolston, "Principles of AI & Expert System Development", TMH, New Delhi.

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements):
POs met through Gaps in the Syllabus:
Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids

CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes
Mapping of Course Outcomes onto Program Outcome

Course Outcome	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3	3	3	2
CO2	3	3	3	3	3	3
CO3	3	3	3	2	2	3
CO4	3	3	3	2	1	1
CO5	2	2	2	3	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1,
CO3	CD1, CD2, CD3,
CO4	CD1, CD3
CO5	CD1,CD2, CD7

COURSE INFORMATION SHEET

Course code:IT516
Course title: DATA MINING AND DATA ANALYSIS
Pre-requisite(s):
Co- requisite(s): None
Credits: 3   L:3   T: 0   P: 0
Class schedule per week: 03
Class: M. Tech
Semester / Level: II/05
Branch: Information Security
Name of Teacher:

Course Objectives
This course enables the students to:

1.	Explain about the necessity of preprocessing and its procedure.
2.	Generate and evaluate Association patterns
3.	Solve problems using various Classifiers
4.	Learn the principles of Data mining techniques and various mining algorithms.
5.	Learn about traditional and modern data driven approach and problem solving techniques for various datasets

Course Outcomes
After the completion of this course, students will be able to:

CO1	Understand Data Warehousing and Data Mining and its applications and challenges and Create mini data warehouse.
CO2	Apply the association rules for mining applications .
CO3	Identify appropriate Classification techniques for various problems with high dimensional data.
CO4	Implement appropriate Clustering techniques for various problems with high dimensional data sets.

CO5	Implement various mining techniques on complex data objects.

SYLLABUS

Module I :
Data Analysis foundation, Numeric and Categorical attributes, Dimensionality reduction.

(8L)

Module II:
Data Warehouse: Introduction, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology, From Data Warehousing to Data Mining. Data Cube Computation and Data Generalization.

(8L)

Module III:
Frequent Pattern Mining, Summarizing Itemsets, Itemset Mining, Sequence Mining.

(8L)

Module IV:
Classification: Naïve Bayes, KNN, Decision Tree, Classification Performance measures, Classifier evaluation.

(8L)

Module V:
Clustering: K-Means, Agglomerative, Hierarchical, DBSCAN, Spectral and Graph Clustering. Anomaly detection, Statistical, distance and density-based approaches.

(8L)

Text Books:
1. Mohammed J. Zaki, and Wagner Meira Jr., "Data Mining and Analysis: Fundamental Concepts and Algorithms", Cambridge University Press, 2016
2. Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, "Introduction to Data Mining", Pearson, 2014
3. Jiawei Han, and Micheline Kamber, "Data Mining Concepts & Techniques", 3rd Edition, Publisher Elsevier India Private Limited, 2015

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations
Gaps in the syllabus (to meet Industry/Profession requirements):
POs met through Gaps in the Syllabus:
Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % ($3 \times 10\%$)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes
Mapping of Course Outcomes onto Program Outcome

Course Outcome	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	1	2		3	2
CO2	3	3		2	2	
CO3	2	3	3	2	3	1
CO4		2	3		2	3
CO5	1	2	3	3	2	3

If satisfying and < 34% = L, 34-66% = M, > 66% = H

Mapping Between COs and Course Delivery (CD) methods			
CD	**Course Delivery methods**	**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5	CD1
CD2	Laboratory experiments/teaching aids		
CD3	Industrial/guest lectures		
CD4	Industrial visits/in-plant training		
CD5	Self- learning such as use of NPTEL materials and internets		

COURSE INFORMATION SHEET

Course Code: CS510
Course title: ADVANCED ALGORITHM LAB
Pre-requisite(s): Design and Analysis of Algorithms, Data Structures
Co- requisite(s): None
Credits: L:0   T:0   P: 2
Class schedule per week: 04
Class: M. Tech
Semester / Level: II/5
Branch: Computer Science and Engineering

Course Objectives
After the completion of this course, students will be:

1.	Able to match and implement various design strategies of algorithms.
2.	Able to interpret the efficiency of algorithm by changing the places of important steps.
3.	Able to compare approximate and exact solutions.
4.	Able to criticize effect randomness on correctness and efficiency of algorithms.
5.	Able to design approximate, random and parallel solution of different problems. .

Course Outcomes
After the completion of this course, students will be able to:

CO1	Should able to write and explain different algorithm design approaches. .
CO2	Solve real life problems by an appropriate and efficient algorithm. .
CO3	Analyse of an approximate or randomized solution to different practical problem..
CO4	Compare and justify appropriate number of processors required for parallel algorithms. .
CO5	Construct algorithm for various graph problems.

SYLLABUS
List of Programs as Assignments:

1. **Lab Assignment No: 1**
   Divide and Conquer: Binary search, Quick sort, Merge Sort [CO1][CO2]

2. **Lab Assignment No: 2**
   Greedy Algorithm: Prims and Kruskal's algorithm [CO2][CO5]

3. **Lab Assignment No: 3**
   Dynamic Programming: Matrix Chain Multiplication, Longest Common Subsequence [CO1][CO2]

4. **Lab Assignment No: 4**
   Backtracking: N-Queen, Sum of Subset [CO1][CO2]

5. **Lab Assignment No: 5**
   Branch and Bound: Travelling Salesperson Problem, 0/1 Knapsack [CO1][CO2][CO5]

6. **Lab Assignment No: 6**
   Approximation Algorithm: Vertex cover, Travelling salesman problem, set cover [CO3]

7. **Lab Assignment No: 7**
   Polynomial Time Approximation Algorithm: sum of subset, 0/1 Knapsack [CO3]

8. **Lab Assignment No: 8**
   Randomized Algorithm: Las Vegas:- Randomized quicksort, 8-queen problem[CO3]

9. **Lab Assignment No: 9**
   Randomized Algorithm: Monte Carlo:- Randomized List Ranking, Min-Cut Problem[CO3]

10. **Lab Assignment No: 10**
    Parallel Algorithms: Prefix Computation, Merging of two sorted list[CO4]

11. **Lab Assignment No: 11**
    Parallel Graph Algorithms: All pair shortest path algorithm [CO4][CO5]

12. **Lab Assignment No: 12**
    Game Theoretic Techniques: Max-Min and And-Or game tree problems[CO5]

Books recommended:
Text Books:
1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Second Edition, MIT Press/McGraw-Hill, 2001.

2. E. Horowitz, S. Sahani, S. Rajasekaran, "Fundamentals of Computer Algorithms", Second Edition, University Press, ISBN 9788173716126.
3. R. Motwani & P. Raghavan, "Randomized Algorithms," Cambridge University Press, 1995.

Course Evaluation:

Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –
    1. Student Feedback on Faculty
    2. Student Feedback on Course Outcome

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes
Mapping of Course Outcomes onto Program Outcome

Course Outcome	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	1	2	3	3	3
CO2	3	1	3	3	3	3
CO3	3	1	3	3	3	3
CO4	3	1	3	3	3	3
CO5	3	1	3	3	3	3

If satisfying and < 34% = L, 34-66% = M, > 66% = H

Mapping Between COs and Course Delivery (CD) methods			
CD	Course Delivery methods	Course Outcome	Course Delivery Method

CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5	CD1
CD2	Laboratory experiments/teaching aids		
CD3	Industrial/guest lectures		
CD4	Industrial visits/in-plant training		
CD5	Self- learning such as use of NPTEL materials and internets		

COURSE INFORMATION SHEET

Course code: IT517
Course title: Data Mining and data analysis lab
Pre-requisite(s):
Co- requisite(s): None
Credits:2   L: 0   T: 0   P:4
Class schedule per week: 04
Class: M. Tech
Semester / Level: II/05
Branch: Inform Information Security
Name of Teacher:

Course Objectives
This course enables the students to:

1.	Explain about the necessity of preprocessing and its procedure.
2.	Generate and evaluate Association patterns
3.	Solve problems using various Classifiers
4.	Learn the principles of Data mining techniques and various mining algorithms.
5.	Learn about traditional and modern data driven approach and problem solving techniques for various datasets

Course Outcomes

After the completion of this course, students will be able to:

CO1	Understand Data Warehousing and Data Mining and its applications and challenges and Create mini data warehouse.
CO2	Apply the association rules for mining application.
CO3	Identify appropriate Classification techniques for various problems with high dimensional data.
CO4	Implement appropriate Clustering techniques for various problems with high dimensional data sets.
CO5	Implement various mining techniques on complex data objects.

SYLLABUS

List of Programs as Assignments:

1. **Lab Assignment No: 1**
   Q1. Build a Data Warehouse and Explore WEKA tool.

2. **Lab Assignment No: 2**
   Q2. Demonstration of pre processing on various datasets.

3. **Lab Assignment No: 3**

   Q3. Demonstration of Association rule process on dataset using a priori algorithm.

4. **Lab Assignment No: 4**

   Q4. Demonstrate performance of classification on various data sets.

5. **Lab Assignment No: 5**

   Q5. Demonstrate performance of clustering on various data sets.

6. **Lab Assignment No: 6**

   Q6. Demonstrate performance of Regression on various data sets

7. **Lab Assignment No: 7**

Q7. Implement following algorithms for various datasets
   A. A priori Algorithm.
   B. FP-Growth Algorithm.

   C. K-means clustering.

8. Q8. **Lab Assignment No: 8**

   Implement Bayesian Classification for various datasets

9. **Lab Assignment No: 9**

   Q9 Implement Decision Tree for various datasets.

10. **Lab Assignment No: 10**

   Q10. Implement Support Vector Machines.

11. **Lab Assignment No: 11**

   Q11 Applications of classification for web mining.

12. **Lab Assignment No: 12**

   Q12. Case Study on Text Mining or any commercial application

Books recommended:
TEXT BOOKS:
   1. Jiawei Han & Micheline Kamber - Data Mining Concepts & Techniques Publisher Harcourt India. Private Limited.

REFERENCE BOOKS :
   1. G.K. Gupta – Introduction to Data Mining with case Studies, PHI, New Delhi – 2006.
   2. A. Berson & S.J. Smith – Data Warehousing Data Mining, COLAP, TMH, New Delhi – 2004.
   3. H.M. Dunham & S. Sridhar – Data Mining, Pearson Education, New Delhi, 2006.

Course Evaluation:
Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce
Gaps in the syllabus (to meet Industry/Profession requirements):
Implementing of real world problems
POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:
POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Indirect Assessment –
1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	2		1
CO2	3	3	2		1	

CO3	2	3	2	1	1	1
CO4	3				1	1
CO5	3	2	1			1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT519
Course title: INTERNET OF THINGS LAB
Pre-requisite(s):
Co-requisite(s):
Credits:2   L:0   T:0   P:4
Class schedule per week: 04
Class: M. Tech
Semester / Level: II/05
Branch: Information Security

Course Objectives
This course enables the students:

1.	Understand the basic concept and the Iot Paradigm
2.	Know state of art architecture for IoT applications
3.	Learn the available protocols used for IoT
4.	Design basic IoT Applications.
5.	Evaluate optimal IoT applications.

Course Outcomes
After the completion of this course, students will be:

CO1	Identify the IoT Components and its capabilities
CO2	Explain the architectural view of IoT under real world constraints
C03	Analyse the different Network and link layer protocols
CO4	Evaluate and choose among the transport layer protocols
CO5	Design an IoT application

SYLLABUS

List of Programs as Assignments:

1. **Lab Assignment No: 1**
    Glowing LEDs.
   Toggling LED's.

2. **Lab Assignment No: 2**
   Transmitting a string through UART
   Controlling LEDs blinking pattern through UART.

3. **Lab Assignment No: 3**
   Echo each character typed on HyperTerminal
   Digital IO configuration.
   Timer based LED Toggle.

4. **Lab Assignment No: 4**
   Scanning the available SSID's in the range of Wi-FI Mote.
   Connect to the SSID of choice

5. **Lab Assignment No: 5**
   Demonstration of a peer to peer network topology.
   check the connectivity to any device in the same network.

6. **Lab Assignment No: 6**
   Send hello world to TCP server existing in the same network
   Reading of atmospheric pressure value from pressure sensor.

7. **Lab Assignment No: 7**
   I2C protocol study
   Reading Temperature and Relative Humidity value from the sensor.
   Reading Light intensity value from light sensor.

8. **Lab Assignment No: 8**
   Proximity detection with IR LED.
   Generation of alarm through Buzzer.

9. **Lab Assignment No: 9**
   Timestamp with RTC
   IO Expander.
   Relay control.
10. **Lab Assignment No: 10**
    I2C based 12-channel ADC
    EEPROM read and write
11. **Lab Assignment No: 11**
    Transmitting the measured physical value from the UbiSense Over the Air.

Books recommended:

TEXT BOOK
3. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1stEdition, Academic Press, 2014.**(T1)**
4. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI. **(T2)**

REFERENCE BOOK
3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer. **(R1)**
4. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6". **(R2)**

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution

Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
    1. Student Feedback on Faculty
    2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
D4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	3	2	1
CO2	3	3	3	2	1	1
C03	3	2	2	3	1	1
CO4	3	3	2	1	3	1
CO5	2	1	2	2	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6, CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2, ,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT511
Course title: R PROGRAMMING
Pre-requisite(s):
Co- requisite(s): None
Credits: 2   L: 0   T: 0   P: 4
Class schedule per week: 04
Class: M. Tech
Semester / Level: II/5
Branch: Information Security
Name of Teacher:

Course Objectives

This course enables the students to:

1.	To familiarize the student in introducing and exploring R
2.	Develop basic thinking for data analysis.
3.	To enable the student on how to approach for statistical Analysis
4.	To provide a foundation in use of this software

Course Outcomes

After the completion of this course, students will be able to:

CO1	Manipulate data within R
CO2	Perform basic data analysis procedures
CO3	Create plots
CO4	Implement programming features like accessing R packages, writing R functions
CO5	Simulation & Profiling with R

SYLLABUS

List of Programs as Assignments:

1. **Lab Assignment No: 1**
Objective: To Understand and Implement Data Types
    1. Data Types - R Objects and Attributes
    2. Data Types - Vectors and Lists
    3. Data Types - Matrices
    4. Data Types - Factors
    5. Data Types - Missing Values
    6. Data Types - Data Frames
    7. Data Types - Names Attribute
    8. Data Types - Summary
2. **Lab Assignment No: 2**
Objective: To Understand and Implement Data Analysis
    1. Reading Tabular Data
    2. Reading Large Tables
    3. Textual Data Formats
    4. Connections: Interfaces to the Outside World
    5. Subsetting - Basics
    6. Subsetting - Lists
    7. Subsetting - Matrices
    8. Subsetting - Partial Matching
    9. Subsetting - Removing Missing Values
    10. Vectorized Operations
3. **Lab Assignment No: 3**
Objective: To Understand and Implement Swirl
    1. Workspace and Files
    2. Sequences of Numbers
    3. Vectors
4. **Lab Assignment No: 4**
Objective: To Understand and Implement Cubic Splines
1. To design Spline differentiation and Integration.
2. To design interpolated Spiral Y=f(X).

5. **Lab Assignment No: 5**
Objective: To Understand and Implement Control Structures
    1. If-else
    2. Control Structures - For loops
    3. Control Structures - While loops
    4. Control Structures - Repeat, Next, Break
6. **Lab Assignment No: 6**
Objective: To Understand and Implement Functions

1. Functions (part 2)
2. Scoping Rules - Symbol Binding
3. Scoping Rules - R Scoping Rules
4. Scoping Rules - Optimization Example (OPTIONAL)
7. **Lab Assignment No: 7 &8**
   Objective: To Understand and Implement Loop Functions and Debugging
   1. [Loop Functions - lapply]
   2. Loop Functions - apply
   3. Loop Functions - mapply
   4. Loop Functions - tapply
   5. Loop Functions – split
8. **Lab Assignment No: 9 & 10**
   Objective: To Understand and Implement Two-Dimensional Graphics
   1. Generating Random Numbers
   2. Simulation - Simulating a Linear Model
   3. Simulation - Random Sampling

Books recommended:

TEXT BOOKS

1. Norman Matloff, The Art of R Programming, A Tour of Statistical Software Design 1st Edition, **(T1)**
2. Hadley Wickham, Garrett Grolemund, R for Data Science: Import, Tidy, Transform, Visualize, and Model Data, Orielly, 1st Edition. **(T2)**

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

Implementing of real world problems

POs met through Gaps in the Syllabus

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	2	1	1
CO2	3	3	2	2	1	1
CO3	2	2	2	1	1	1
CO4	3	1	1	1	1	1
CO5	3	2	1	1	1	1

If satisfying and $< 34\% = 1$, $34\text{-}66\% = 2$, $> 66\% = 3$

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT507
Course title: DATA COMMUNICATION AND COMPUTER NETWORKS
Pre-requisite(s):
Co-requisite(s):
Credits:3   L:3   T:0   P:0
Class schedule per week: 03
Class: M. Tech
Semester / Level: III/05
Branch: Information Security

Course Objectives
This course enables the students:

1.	To build an understanding of the fundamental concepts of the data communication model and communications architecture.
2.	To study characteristics of communication mediums and the characteristics of signals propagated through different transmission media, including concepts of transmission impairments.
3.	To understand the basic principles of signal encoding techniques, error-detection, and error-correction techniques.
4.	To understand techniques for flow control and multiplexing for maximum utilization of bandwidths in the data communications process.
5.	To understand the various switching techniques and routing techniques for efficient transmission.

Course Outcomes
After the completion of this course, students will be able to:

1.	Understand and be able to explain the principles of a layered protocol architecture; be able to identify and describe the system functions in the correct protocol layer and further describe how the layers interact.
2.	Understand, explain and calculate digital transmission over different types of communication media.
3.	Understand, explain and solve mathematical problems for data-link and network protocols.
4.	Describe the principles of access control to shared media and perform performance calculations.
5.	Understand and explain the principles and protocols for route calculations and be able to perform such calculations.

SYLLABUS

Module I:
Data Communications and Networking Overview: A Communications Model, Data Communications, Data Communication Networking.
Protocol Architecture: The Need for Protocol Architecture, A Simple Protocol Architecture, OSI, The TCP/IP Protocol Architecture
Data Transmission: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity.

(8L)

Module II:
Guided and Wireless Transmission: Guided Transmission Media, Wireless Transmission, Wireless Propagation, Line-of-Sight Transmission.
Signal Encoding Techniques:
Digital Data Digital Signals, Digital Data Analog Signals, Analog Data Digital Signals, Analog Data Analog Signals.

(8L)

Module III :
Digital Data Communication Techniques: Asynchronous and Synchronous Transmission, Types of Errors, Error Detection, Error Correction, Line Configurations, Interfacing.
Data Link Control: Flow Control, Error Control, High-Level Data Link Control (HDLC).
Multiplexing: Frequency Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing.

(8L)

Module IV :
Circuit Switching and Packet Switching: Switching Networks, Circuit-Switching Networks, Circuit-Switching Concepts, Control Signalling, Soft switch Architecture, Packet-Switching Principles, X.25, and Frame Relay.

(8L)

Module V:
Asynchronous Transfer Model: Protocol Architecture, ATM Logical Connections, ATM Cells, Transmission of ATM Cells, ATM Service Categories, ATM Adaptation Layer.
Routing in Switched Networks: Routing in Circuit-Switching Networks, Routing in Packet-Switching Networks, Least-Cost Algorithms.

(8L)

Text Books:
1. W. Stallings, "Data and Computer Communications", 7th Edition, Pearson Edition/ PHI, New Delhi, 2016.

Reference Books:
1. B. A. Forouzan, "Data Communications and Networking", 4th Edition, TMH, New Delhi 2015.
2. P.C. Gupta, "Data Communications and Computer Networks", PHI, New Delhi 2006.

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	3	2	1

CO2	2	2	1	3	2	1
CO3	3	2	2	1	2	1
CO4	3	2	3	2	3	1
CO5	1	1	1	2	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT520
Course title: NETWORK SECURITY
Pre-requisite(s):
Co-requisite(s):
Credits: 3   L:3   T:0   P:0
Class schedule per week: 03
Class: M. Tech
Semester / Level: III/6
Branch: Information Security

Course Objectives
This course enables the students:

1.	Able to understand the fundamentals of security algorithms currently
2.	Able to understand E-mail security, PEM& S/MIME, PGP, Firewalls.
3.	Have a broad knowledge of the state-of-the-art and open problems in network security
4.	Enhance their potential to do research or pursue a career in this rapidly developing area.
5.	Able to be introduced to new developing security features.

Course Outcomes

After the completion of this course, students will be able to:

1.	Identify state-of-the-art and open problems in network security
2.	Analyse all relevant aspects of security in networks like E-mail security, PEM& S/MIME, PGP, Firewalls.
3.	Assess the impact of Modes of Operation and problems in network
4.	Summarise developing security features in networking systems and Real time communication security
5.	Design of secure system and applications

SYLLABUS

Module I:

Introduction to networking: OSI Reference model, Active vs Passive attacks, Layers and cryptography, multilevel model of security.

(8L)

Module II:

Modes of Operation: encrypting large messages, Generating MAC's, Multiple Encryption DES, Hash and message digest: Using Hash for encrypting, MD2, MD4, MD5, SHA1.

(8L)

Module III:

Authentication Systems, Password authentication systems, authentication protocols, tructed intermediates, session key establishment.

Security handshake pitfalls: mutual authentication, Integrity / encryption of data, mediated authentication, strong password protocols.

(8L)

Module IV:

Real time communication security: Session key establishment, perfect forward secrecy, DOS, clogging protection, Arranging for parallel computation, session resumption, data steam protection, plausible deniability.

(8L)

Module V:

E mail security, PEM& S/MIME, PGP, Firewalls.

(8L)

Text Books:

1. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security: Private Communication in a Public World", 2nd Edition, Prentice Hall, 2002.

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

Course Evaluation:

Individual assignment, Theory (Quiz and End semester) examinations

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % $(3 \times 10\%)$
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	2	2	1
CO2	3	3	3	1		1
CO3	2	3	2		2	

CO4	3	2	2	3	2	
CO5	2	1	1	2	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT602
Course title: **CYBER SECURITY**
Pre-requisite(s):
Co-requisite(s):
Credits: 3   L:3   T:0   P:0
Class schedule per week: 03
Class: M. Tech
Semester / Level: III/6
Branch: Information Security

Course Objectives
This course enables the students:

1.	Provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
2.	Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes
3.	Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools.

4.	E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics.

Course Outcomes

After the completion of this course, students will be able to:

1.	Understand relevant legislation and codes of ethics.
2.	Apply Computer forensics and digital detective and various processes, policies and procedures.
3.	Understand E-discovery, guidelines and standards, E-evidence, tools and environment.
4.	Learn the techniques of Email and web forensics and network forensics tools.
5.	Integrate techniques to recover data from computer and hand held devices.

SYLLABUS

Module I:

Introduction to Cybercrime, Classifications of Cyber Crimes, Local and Global perspectives on Cybercrime, Cyber offences, Cyberstalking, Cyber crime and cloud computing, cyber crimes through hand held devices.

(8L)

Module II:

Tools and Methods used in Cybercrime, phishing, steganography, attacks on wireless network. The legal perspectives of Cybercrime and cybersecurity

(8L)

Module III :

Understanding Digital forensic, Forensics science, computer forensics, and digital forensics. Criminalistics, Analysis of cyber-criminalistics area, Holistic approach to cyber-forensics.

(8L)

Module IV:

Case studies Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation., specific tools and techniques, Forensic auditing.

(8L)

Module V:

Computer forensic tools, Forensics of Hand held devices, tools for hand held device forensics., intellectual property in the cyberspace, The ethical dimension of Cybercrimes

(8L)

Text Books:
1. Cyber Security by Nina Godbole, Sunit Belapure Wiley Indian Print 2014
2. John Sammons, The Basics of Digital Forensics, Elsevier
3. A Practical Guide to computer forensics Investigations by D.R.Hyaes, Person IT education 2014.

Reference Books:

1. Guide to Computer Forensics and Investigations: Processing Digital evidence by Bil Nelson, A Philips, Christopher Stuarts. Cengage Learning Fifth Edition 2015.

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

Course Evaluation:
Individual assignment, Theory (Quiz and End semester) examinations

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	2	2	1
CO2	3	3	2		1	
CO3	2	1	2	2		
CO4	3	3	3	2	2	
CO5	2	1		2	1	1

If satisfying and $< 34\% = 1$, $34\text{-}66\% = 2$, $> 66\% = 3$

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code:IT521
Course title: DATA COMMUNICATION AND COMPUTER NETWORKS Lab
Pre-requisite(s):
Co- requisite(s): DATA COMMUNICATION AND COMPUTER NETWORKS Credits: 2
    L: 0   T: 0   P: 4
Class schedule per week: 04
Class: M.Tech
Semester / Level: III/05
Branch: Information security
Name of Teacher:

Course Objectives

This course enables the students to:

1.	To familiarize the student in introducing and exploring various Network topologies and networking protocols
2.	To understand the use of client/server architecture in application
3.	To enable the student on how to approach for networking problems using networking simulation tools.
4.	To Design reliable servers using both TCP and UDP sockets
5.	Familiar with network tools and network programming.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Express programming & simulation for networking problems.
CO2	Get a thorough understanding of various aspects of networking devices
CO3	Design and implement simulation of a simple LAN and a WAN that meet a specific set of criteria
CO4	Identify the elements of a communication network
CO5	Simulate various OSI layer protocols using C/C++/ Java

SYLLABUS

List of Programs as Assignments:

1. **Lab Assignment No: 1**
Q1. To familiarize with the Lab Network Topology, Locating different interfaces, routers and switches. Studying different pools of IP addresses.
Q2. Implement the data link layer framing methods such as character, character stuffing, and bit stuffing.
Q3. To learn and observe the usage of different networking commands e.g.PING, TRACEROUTE. Learning remote login using telnet session. Measuringtypical average delays between different locations of the network.

2. **Lab Assignment No: 2**

Q1. What is the IP of the machine you are using? Compare it with the IP of your neighbors. Are the IPs of your neighbors same? Why or Why not?

Q2. Ping" is a tool used to determine if a server is responding and to estimate the round trip time of a message sent to that server. Use the ping command for the following URLs and record the success or failure statistics along with the average round trip time.

a) google.com
b) facebook.com
c) bitmesra.ac.in

Q3. Trace the route that is taken when you try to access:
a) google.com
b) facebook.com
c) bitmesra.ac.in

Q4. Network Commands on Linux / Unix

3. **Lab Assignment No: 3**
Q1. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC 32.
Q2. Implementation of Sub-netting and Super-netting.
Q3. To study different types of transmission media, various topologies, and configure modem of computer HUB and Switches.

4. **Lab Assignment No: 4**
Q1. Write a C/C++ program to determine if the IP address is in Class A, B, C, D, or E.
Q2. Write a C/C++ program to determine if the IP address is in Class A, B, or C.
Q3. Write a C/C++ program to translate dotted decimal IP address into 32 bit address.

Q4. To implement a routing protocol and check its connectivity in a variable length subnet masked network

Q5. Write a C/C++ program to perform bit stuffing and de-stuffing.

5. **Lab Assignment No: 5**

Q1. Implement Dijkstra's algorithm to compute the Shortest path through a graph.

Q2. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm

Q3. Take an example subnet of hosts. Obtain broadcast tree for it.

6. **Lab Assignment No: 6**
Q1. Build implementations of the Internet protocols
Q2. Implementation of Stop and Wait Protocol and Sliding Window Protocol.
Q3. Write a code simulating ARP /RARP protocols.

7. **Lab Assignment No: 7**
Q1. Create a socket for HTTP for web page upload and download
Q2. Write a code simulating PING and TRACEROUTE commands.

8. **Lab Assignment No: 8**
Q1. Study and implement model for Socket Programming and Client – Server model.
Q2. Experiments with NS2(or any other simulator) to study behavior (especially performance of) link layer protocols such as Ethernet and 802.11 wireless LAN.

9. **Lab Assignment No: 9**
Q1. Experimental study of application protocols such as HTTP, FTP,SMTP, using network packet sniffers and analyzers such as **Wireshark**. Small exercises in socket programming in C/C++/Java..

10. **Lab Assignment No: 10**

Q1. Take a 64 bit playing text and encrypt the same using DES algorithm.
Q2. Write a program to break the above DES coding
Q3. Using RSA algorithm encrypts a text data and Decrypt the same bjective: To Understand and Implement Data Interpolation

11. **Lab Assignment No: 11**
Q1. Applications using TCP and UDP Sockets like d. DNS e. SNMP f. File Transfer
Q2. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS
Q3. Echo client and echo server b. Chat c. File Transfer

Books recommended:

TEXT BOOKS
1. William Stallings, Data and Computer Communication, Prentice Hall of India.
2. Behrouz A. Forouzan, Data Communication and Networking, McGraw-Hill.

3. Andrew S. Tanenbaum, Computer Networks, Prentice Hall.

REFERENCE BOOKS

1. W. Richard Stevens, TCP/IP Illustrated, Volume 1, Addison-Wesley
2. Douglas Comer, Internetworking with TCP/IP, Volume 1, Prentice Hall of India.

Course Evaluation:
Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce
Gaps in the syllabus (to meet Industry/Profession requirements):
Implementing of real world problems
POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
1. Student Feedback on Faculty

2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	2	2	1
CO2	3	3	2		1	
CO3	2	3	2	1	1	1
CO4	3				1	1
CO5	3	2	1	2	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT603
Course title: PYTHON PROGRAMMING LAB
Pre-requisite(s):
Co- requisite(s): None
Credits: 2   L: 0   T: 0   P: 4
Class schedule per week: 04
Class: M.Tech
Semester / Level: III/6
Branch: Information Security
Name of Teacher:

Course Objectives
This course enables the students to:

1.	To introducewith fundamentals and grammar of Python programming.
2.	To understand and be able to use basic programming principles such as data types, variable, conditionals, loops, recursion and function calls.
3.	To learn how to use basic data structures such as List, Dictionary and be able to manipulate text files and images.
4.	To understand the process and skills necessary to effectively attempt a programming problem and implement it with a specific programming language -- Python.
5.	To understand a python program written by someone else and be able to debug and test the same.

Course Outcomes
After the completion of this course, students will be able to:

CO1	To use their problem solving abilities to implement programs in Python.
CO2	To apply Python in software development, testing and systems administration environments.
CO3	To develop Python applications for a variety of uses
CO4	To understand the fact that there is more than one right solution to a problem.
CO5	Work in industry environment with good enough knowledge about Python programming.

SYLLABUS

List of Programs as Assignments:

1. **Lab Assignment No: 1**
   Objective: ToImplement basic Python programming.
   Q1. Create a new program called hello world.py. Use this file to write your very
   First "Hello, world!" program.
   Q2. Write a Python program containing exactly one print statement that produces the following output:
   A
   B
   C
   D
   E
   F

2. **Lab Assignment No: 2**
   Objective: To Understand and Implement the concept of if-else-if statements.
   Q1.Write a Python program that requests five integer values from the user. It then prints one of two things: if any of the values entered are duplicates, it prints "DUPLICATES"; otherwise, it prints "ALL UNIQUE".
   Q2. Write a Python program that allows the user to enter a four-digit binary number and displays its value in base 10. Each binary digit should be entered one per line, starting with the leftmost digit, as shown below.
    Enter leftmost digit: 1
   Enter the next digit: 0
   Enter the next digit: 0
   Enter the next digit: 1
   The value is 9
   Q3.Develop and test a program that prompts the user for their age and determines approximately how many breaths and how many heartbeats the person has had in their life. The average respiration (breath) rate of people changes during different stages of development. Use the breath rates given below for use in your program:

	Breaths per Minute
Infant	30–60
1 –4 years	20–30

5 –14 years   15–25
adult   12–20
For heart rate, use an average of 67.5 beats per second.

3. **Lab Assignment No: 3**

   Objective: To Understand and Implement the flow control statements.

   Q1. Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4... 1/10.

   Q2.Write a program using a for loop that calculates exponentials. Your program should ask the user for a base 'b' and an exponent 'exp', and calculate b^exp.

   Q3. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero. What should your program do if the user input a negative number? As a programmer, you should always consider "edge conditions" like these when you program! (Another way to put it- always assume the users of your program will be trying to find a way to break it! If you don't include a condition that catches negative numbers, what will your program do?)

4. **Lab Assignment No: 4**

   Objective: To practice drawing patterns

   Q1.Write the program to print the following pattern: ex if the user enters 7, the program would print

   ```
       *
      **
      ***
     ****
     *****
    ******
   *******
   ******
    *****
     ****
     ***
      **
       *
   ```

   Q2.Write a program in python to print the following pattern:
   ```
           1
           1 1
           121
    1331
   ```

12641
15101051
1615201561

5. **Lab Assignment No: 5**
   Objective: To Understand and Implement methods in Python.
   Q1.Write a method fact that takes a number from the user and prints its factorial.
   Q2. Write a Python function named compare3 that is passed three integers and returns true if the three integers are in order from smallest to largest, otherwise it returns false.
   Q3. Write a python function named modCount that is given a positive integer and a second positive integer, m<=n, and returns how many numbers between 1 and n are evenly divisible by m.

6. **Lab Assignment No: 6**
   Objective: To Understand and Implement the concept of Recursion
   Q1. Write a program to read an integer number. Print the reverse of this number using recursion.
   Q2. Write a program that calculates the GCD using recursive functions.

7. **Lab Assignment No: 7**
   Objective: To Understand and Implement Sorting techniques
   Q1.Write a program to sort the list of elements using Insertion sort.
   Q2. Write a program to sort the list of elements using Merge sort.
   Q3.Write a program to multiply the two matrices.

8. **Lab Assignment No: 8**
   Objective: To Understand and Implement the concept of Strings in Python
   Q1. Write a program to check whether string is a palindrome or not.
   Q2. Write a program to implement format method available with string object.

9. **Lab Assignment No: 9**
   Objective: To Understand and Implement Dictionary
   Q1. Program to demonstrate the built in functions within the dictionary.
   Q2. Program to implement dictionary as an associative array.

10. **Lab Assignment No: 10**
    Objective: To Understand and Implement File Handling.
    Q1. Program to open the file in the read mode and use of for loop to print each line present in the file.
    Q2. Write a Python program to illustrate Append vs write mode.
    Q3. Write a Program to read and write data from a file.

Books recommended:

TEXT BOOKS
1. Krishna P. R., Object Oriented Programming through JAVA, 1st Edition, Universities Press, 2008.
2. Patrick Naghton& H. Schildt – The Complete Reference Java 2, Tata McGraw Hill Publication, New Delhi.
3. Dietel,Dietel - Java How to program , 7th edition; Pearson Education , New Delhi.

REFERENCE BOOKS

1. C. Horstmann,G. Cornell - Core Java 2 Vol I & Vol II ; Pearson Education , New Delhi.
2. Balagurusamy -Programming in Java, 2nd Edition; Tata McGraw Hill Publication; New Delhi.

Course Evaluation:
Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce
Gaps in the syllabus (to meet Industry/Profession requirements):
Implementing of real world problems
POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE
Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –
      1. Student Feedback on Faculty
      2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
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CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	1	1	3	1
CO2	2	1	1	1	3	2
CO3	1	2	3	3	3	1
CO4		1	1	3	2	2
CO5	1	1	2	2	1	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
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CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT604
Course title: WEB APP DEVELOPMENT LAB
Pre-requisite(s):
Co- requisite(s): None
Credits: 2   L: 0   T: 0   P: 4
Class schedule per week: 04
Class: M.Tech
Semester / Level: III/6
Branch: Information Security
Name of Teacher:

Course Objectives
This course enables the students to:

1.	To get familiar with basics of the Internet Programming.
2.	To acquire knowledge and skills for creation of web site considering both client and server side programming
3.	To gain ability to develop responsive web applications
4.	To explore different web extensions and web services standards

Course Outcomes
After the completion of this course, students will be able to:

CO1	Analyze a web page and identify its elements and attributes.
CO2	Implement interactive web page(s) using HTML, CSS and JavaScript.
CO3	Demonstrate Rich Internet Application.
CO4	Build Dynamic web sites using server side Programming and Database connectivity.

SYLLABUS

List of Programs as Assignments:
1. **Lab Assignment No: 1**
   Objective: To Understand and Implement HTML
   Q1. To create a simple html file to demonstrate the use of different tags.
   Q2. To create an html file to link to different html page which contains images, tables, and also link within a page.
   Q3. To create an html page with different types of frames such as floating frame, navigation frame & mixed frame.
   Q4. To create a registration form as mentioned below.
   Create an html page named as "registration.html"
   a) set background colors
   b) use table for alignment
   c) provide font colors & size

2. **Lab Assignment No: 2**
   Objective: To Understand and Implement CSS
   Q1. To create an html file by applying the different styles using inline, external & internal style sheets.
   1. Create a external style sheet named as "external_css.css" and provide some styles for h2, hr, p & a tags.
   2. Create an html file named as "Style_sheet.html"
   a) Include the external style sheet with necessary tag.
   b) Include the internal style sheet for body tags & also use class name, so that the style can be applied for all tags.
   c) Include a tags with inline style sheet.

3. **Lab Assignment No: 3**
   Objective: To Understand and Implement JavaScript
   Q1. To write a Javascript program to define a user defined function for sorting the values in an array.
   Q2. Create an html page named as "exception.html" and do the following.
   1. within the script tag write code to handle exception
   a) define a method RunTest() to get any string values(str) from the user and cll the method Areletters(str).
   b) In Areletters(str) method check whether str contain only alphabets (a-z, AZ), if not throw exception.
   c) Define a exception method Input Exception(str) to handle the exception thrown bythe above method.
   2. Within the body tag define a script tag to call Runtest() method defined.
   Q3. To display the calendar using javascript code by getting the year from the user.
   Q4. To create a html page to display a new image & text when the mouse comes over the existing content in the page.

4. **Lab Assignment No: 4**

Objective: To Understand and Implement ASP

Q1. To create an ASP file to find the no of hits on the page and to have rotating banner content.

Q2. To create a table of content using ASP program & navigate within the pages.

Q3. Create an ASP file named as request.asp

a) Create a simple form to get the first name & last name and a button submit. When the button is clicked the values in the text box are printed by response object by Request.QueryString

b) Create a hyperlink with some values defined in the tag & display the same using request & response object.

Q4.To display all the content in the database using ASP program.

Lab Assignment No: 5

Objective: To Understand and Implement Java Servlets

Q1. To create a simple servlet program to display the date (using Tomcat server).

Q2. To create a servlet program to retrieve the values entered in the html file (Using NetBeans IDE).

Q3. To display the cookie values that are entered in the html page using servlet program. (using NetBean IDE).

Lab Assignment No: 6

Objective: To Understand and Implement XML

Q1. To create a simple catalog using XML file

Q2. To create external style sheet and using the style sheet in xml file.

Lab Assignment No: 7

Objective: To Understand and Implement PHP

Q1. To create a php program to demonstrate the different file handling methods.

Q2. To create a php program to demonstrate the different predefined function in array, Math, Data & Regular Expression.

Books recommended:

TEXT BOOKS
1. Web Technologies: A Computer Science Perspective , Jeffrey C Jackson , Pearson Education , India.
2. Stephen Wynkoop, Running a perfect website, QUE, 1999

REFERENCE BOOKS
1. Eric Ladd, Jim O' Donnel, Using HTML 4, XML and Java, Prentice Hall of India-QUE, 1999
2. Chris Bates, Web Programming - Building Intranet applications, Wiley Publications, 2004
3. Deitel, Deitel & Nieto, Internet and World Wide Web - How to Program, Pearson Education Asia, 2000

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

Implementing of real world problems
POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment –

    1. Student Feedback on Faculty
    2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars

CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	3	1	2	2	
CO2	1	3	3	1	1	2
CO3	2		1	2	2	1
CO4	1	3	3	1	1	

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3
CO2	CD2, CD3,CD6
CO3	CD1, CD2, CD3,CD6
CO4	CD3,CD6,CD7