

Curriculum

M.Tech. in Computer Science

And

Information Security

UNIVERSITY



UNIVERSITY

JIS University
Agarpara, Kolkata

M.Tech Computer Science and Engineering
Specialization In
Information Security

M.Tech Sem-I.

SEMESTER-I							
Sl. No.	Type	Course No.	Course Name	L	T	P	Credits
THEORY							
1	BS	PCT1001	Mathematical foundations of Computer Science	3	0	0	3
2	CS	PCI1001	Program Core I- Advanced Data Structures	3	1	0	4
3	CS	PCI1002	Program Core II . Ethical Hacking	3	1	0	4
4	CS	PCI1003	Program Core III Information Retrieval	3	1	0	4
5	ES	PCI1004	Professional Elective I- A. Malware Analysis & Reverse Engineering B. Digital Forensic C. Machine Learning	3	0	0	3
6	HS	JSC1001	Research Methodology and IPR	2	0	0	2
PRACTICAL							
7	CS	PCI1101	Laboratory 1 (Advanced Data Structures)	0	0	4	2
8	CS	PCI1102	Laboratory 2 (Ethical Hacking)	0	0	4	2
TOTAL				17	3	8	24

M.Tech Sem- II

SEMESTER-II							
Sl. No.	Type	Course No.	Course Name	L	T	P	Credits
THEORY							
1	CS	PCI2001	Program Core III – Advance Algorithms	3	1	0	4
2	CS	PCI2002	Program Core IV –Soft Computing	3	0	0	3
3	CS	PCI2003	Program Core V –	3	1	0	4

			Advance Software Engineering				
4	CS	PCI2004	Professional Elective II – A. Data Encryption & Compression. B. Steganography & Digital Watermarking. C. Information Theory & Coding	3	1	0	4
5	CS	PCI2005	Professional Elective III – A. Security Assessment and Risk Analysis B. Secure Coding C. Biometrics	3	0	0	3
PRACTICAL							
5	CS	PAM2101	Advance Algorithms Laboratory	0	0	4	2
6	CS	PAM2102	Soft Computing Laboratory	0	0	4	2
SESSIONAL							
8	ES	PAM2301	Term Paper	2	0	0	1
9	MC		Internship	0	0	0	1
SWAYAM-NPTEL							
3	CS	NPTEL	Professional Elective II	3	0	0	3
TOTAL				17	3	9	24

Note: Internship to be done between end of 2nd semester and beginning of 3rd semester

M.Tech III Sem*

SEMESTER-III							
Sl. No.	Type	Course No.	Course Name	L	T	P	Credits
THEORY							
1	CS	PCI3001	Program Core VI Blockchain	3	1	0	4
2	PECS	PCI3002	Professional Elective IV – A. Data Warehousing & Mining B. Web Search & Information Retrieval C. Database Security and Access Control	3	0	0	3
3	PECS	PCI3003	Open Elective A. Business Analytics B. Industrial Safety	3	0	0	3

			C. Operations Research D. Cost Management of Engineering Projects E. Composite Materials Waste to Energy				
PRACTICAL							
4	CS	PCI3101	Blockchain Laboratory	0	0	4	2
5	PRO J	PCI3201	Thesis I	0	0	16	8
MANDATORY NON-CGPA COURSE							
6	MC	PCI3501	BOS recommended ONLINE courses	Classes and evaluation procedures are as per the policy of the online course providers/Board of Governing Body			
TOTAL				9	1	20	20

*Students going for Industrial Project/Thesis will complete these courses through MOOCs.

SEMESTER-IV							
Sl. No.	Type	Course No.	Course Name	L	T	P	Credits
SESSIONAL (ONLY INTERNAL EVALUATION)							
1	PRO J	PCI4201	Thesis II	0	0	16	8
2	SEMI NER	PCI4202	Seminar & Viva Voce	0	0	4	4
TOTAL				0	0	20	12

The program offers several elective courses, focusing on different aspects of Information Security. A student can choose to do any course from given program elective set.

Program Outcomes of CSE (M.Tech.) program:

The main outcomes of the CSE (M.Tech.) program are given here. At the end of the program a student is expected to have:

1. An understanding of the theoretical foundations and the limits of computing.
2. An ability to adapt existing models, techniques, algorithms, data structures, etc. for efficiently solving problems.
3. An ability to design, develop and evaluate new computer based systems for novel applications which meet the desired needs of industry and society.

4. Understanding and ability to use advanced computing techniques and tools.
5. An ability to undertake original research at the cutting edge of computer science & its related areas.
6. An ability to function effectively individually or as a part of a team to accomplish a stated goal.
7. An understanding of professional and ethical responsibility.
8. An ability to communicate effectively with a wide range of audience.
9. An ability to learn independently and engage in life-long learning.
10. An understanding of the impact of IT related solutions in an economic, social and environmentcontext

Syllabus, course objective and course outcomes for various post graduation courses.

UNIVERSITY

**M.Tech. in Computer Science and
Engineering**

Information Security

1st Year 1st Semester Curriculum

UNIVERSITY

Course Code	PCT1002			
Course Title	Mathematical Foundation of Computer Science			
Category	BS			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	48			
Pre-requisites				

Learning Objective:

To understand the mathematical fundamentals that is prerequisites for variety of courses like

Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics,

Machine learning. To develop the understanding of the mathematical and logical basis to many modern techniques in information technology like machine learning, programming languagedesign, and concurrency. To study various sampling and classification problems.

Course Outcomes:

CO1: To understand the basic notions of discrete and continuous probability.

CO2: To understand the methods of statistical inference, and the role that sampling distributionsplay in those methods

CO3: To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.

CO4: Utilize the statistical tools in multi variable distributions

CO5: Understand the ggraphical methods to solve and find the roots of the equations.

Course Contents:

Module 1:

[7L]

Probability mass, density, and cumulative distribution functions, parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains

Module 2: [7L]

Random samples, sampling distributions of estimators, Methods of Moments and Maximum Likelihood.

Module 3: [8L]

Statistical inference, Introduction to multivariate statistical models: regression and classification problems, principal components analysis, The problem of over fitting model assessment.

Module 4: [11L]

Graph Theory: Isomorphism, Planar graphs, graph colouring, Hamilton circuits and Euler cycles. Permutations and Combinations with and without repetition. Specialized techniques to solve combinatorial enumeration problems

Module 5: [10L]

Computer science and engineering applications: Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning

Module 6: [5L]

Recent Trends in various distribution functions in mathematical field of computer science for varying fields like bioinformatics, soft computing, and computer vision.

Text/References Books:

1. John Vince, Foundation Mathematics for Computer Science, Springer.
2. K. Trivedi. Probability and Statistics with Reliability, Queuing, and Computer Science Applications. Wiley.
3. M. Mitzenmacher and E. Upfal. Probability and Computing: Randomized Algorithms and Probabilistic Analysis.
4. Alan Tucker, Applied Combinatorics, Wiley

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
---------------------	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	-------	-------	-------

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3

Course Code	PCI1001				
Course Title	Advanced Data Structures				
Category	CS				
LTP& Credits	L	T	P	Credits	
	3	1	0	4	
Total Contact Hours	48				
Pre-requisites	UG level course in Data Structures				

Learning Objective:

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

Course Outcomes:

- CO1:** To , understand the ADT/libraries, and use it to design algorithms
- CO2:** Understand the implementation of symbol table using hashing techniques.
- CO3:** Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
- CO4:** Develop algorithms for text processing applications
- CO5:** Identify suitable data structures and develop algorithms for computational geometry problems.

Course Contents:

Module 1:

[7L]

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.

Module 2: [5L]

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

Module 3: [9L]

Trees: Binary Search Trees, AVL Trees, Height-balanced Tree Red Black Trees, 2-3 Trees, B-Trees, Splay Trees.

Module 4: [12L]

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

Module 5: [10L]

Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quad trees, k-D Trees.

Module 6: [5L]

Recent Trends in Hashing, Trees, and various computational geometry methods for efficiently solving the new evolving problem

Text/References Books:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
2. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI1002				
Course Title	Ethical Hacking				
Category	CS				
LTP& Credits	L	T	P	Credits	
	3	1	0	4	
Total Contact Hours	48				
Pre-requisites	Computer Programming, Web Programming, Computer Networks				

Learning Objectives:

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

Course Outcomes:

CO1: To understand the concept of hacking.

CO2: Understand the core concepts related to malware, hardware and software vulnerabilities and their causes

CO3: Understand ethics behind hacking and vulnerability disclosure

CO4: Appreciate the Cyber Laws and impact of hacking

CO5: Exploit the vulnerabilities related to computer system and networks using state of the art tools and technologies

Course Contents:

Module 1:

[9L]

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

Module 2: [8L]

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

Module 3: [9L]

Vulnerability Analysis: Passive Analysis, Advanced Static Analysis with IDAPro,
Advanced Reverse Engineering

Module 4: [10L]

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

Module 5: [8L]

Malware Analysis: Collecting Malware and Initial Analysis, Hacking Malware

Module 6: [4L]

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

Text/References Books:

1. Shon Harris, Allen Harper, Chris Eagle and Jonathan Ness, Gray Hat Hacking: The Ethical Hackers' Handbook, TMH Edition
2. Jon Erickson, Hacking: The Art of Exploitation, SPD

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI1003			
Course Title	Information Retrieval			
Category	CS			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	48			
Pre-requisites	Probabilistic approach Computer Programming			

Learning Objective:

Learn to write code for text indexing and retrieval Learn to evaluate information retrieval systems
 Learn to analyze textual and semi-structured data sets. Learn to evaluate information retrieval systems . Learn about text similarity measure Understanding about search engineText Classification

Course Outcomes:

- CO1:** To Understand Document as Vector Performance evolution metric for IR
- CO2:** To understand search Engine functionality
- CO3:** To understand various Supervised and Unsupervised learning Method
- CO4:** To understand about search engineText
- CO5:** To analyze textual and semi-structured data sets

Course Contents:

Module 1:

[6L]

Overview of text retrieval systems Boolean retrieval. The term vocabulary and postings lists.Dictionaries and tolerant retrieval.Index construction and compression

Module 2:

[8L]

Retrieval models and implementation: Vector Space Models Vector Space Model. TF-IDF Weight. Evaluation in information retrieval.

Module 3:

[8L]

Query expansion and feedback Relevance feedback. pseudo relevance feedback.

Query Reformulation.

Module 4:

[6L]

Probabilistic models; statistical language models Okapi/BM25; Language models
KL-divergence, Smoothing.

Module 5:

[10L]

Text classification & Text clustering The text classification problem, Naive Bayes text Classification. k- nearest neighbors, Support vector Machine, Feature Selection. Vector-space clustering; K-means algorithm. Hierarchical clustering. DBSCAN algorithm PAM and PAMK, EM algorithm.

Module 6:

[4L]

Web search basics, crawling, indexes, Link analysis, Web Characteristic. Crawling, Web As a graph Page Rank, Hubs and Authorities.

Module 7:

[6L]

IR applications Information extraction, Question answering, Opinion summarization, Social Network

Text/References Books:

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Introduction to Information Retrieval, Cambridge University Press. 2008. <http://nlp.stanford.edu/IR-book/information-retrieval-book.html>
2. ChengXiang Zhai, Statistical Language Models for Information Retrieval (Synthesis Lectures Series on Human Language Technologies), Morgan & Claypool Publishers, 2008. <http://www.morganclaypool.com/doi/abs/10.2200/S00158ED1V01Y200811HLT>

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI1004A				
Course Title	Malware Analysis and Reverse Engineering				
Category	CS				
LTP& Credits	L	T	P	Credits	
	3	0	0	3	
Total Contact Hours	48				
Pre-requisites	Computer Programming, Compiler Design				

Learning Objectives:

The objective of this course is to provide an insight to fundamentals of malware analysis which includes analysis of JIT compilers for malware detection in legitimate code. DNS filtering and reverse engineering is included.

Course Outcomes:

- CO1:** To understand the concept of malware and reverse engineering
- CO2:** Implement tools and techniques of malware analysis
- CO3:** To Understand fundamentals of malware analysis
- CO4:** To analysis of JIT compilers for malware detection
- CO5:** To Understand reverse engineering

Course Contents:

Module 1:

[12L]

Fundamentals of Malware Analysis (MA), Reverse Engineering Malware (REM) Methodology, Brief Overview of Malware analysis lab setup and configuration, Introduction to key MA tools and techniques, Behavioral Analysis vs. Code Analysis, Resources for Reverse-Engineering Malware (REM) Understanding Malware Threats, Malware indicators, Malware Classification, Examining ClamAV Signatures, Creating Custom ClamAV Databases, Using YARA to Detect Malware Capabilities, Creating a Controlled and Isolated Laboratory, Introduction to MA Sandboxes, Ubuntu, Zeltser's REMnux, SANS SIFT, SandboxSetup and Configuration New Course Form, Routing TCP/IP Connections, Capturing and Analyzing Network Traffic, Internet simulation using INetSim, Using Deep Freeze to Preserve Physical Systems, Using FOG for Cloning and Imaging Disks, Using MySQL Database to Automate FOG Tasks, Introduction to Python, Introduction to x86 Intel assembly language, Scanners: Virus Total,

Jotti, and NoVirus Thanks, Analyzers: Threat Expert, CWSandbox, Anubis, Joebox, Dynamic Analysis Tools: Process Monitor, Regshot, HandleDiff, Analysis Automation Tools: Virtual Box, VM Ware, Python , Other Analysis Tools

Module 2: [7L]

Malware Forensics

Using TSK for Network and Host Discoveries, Using Microsoft Offline API to Registry Discoveries , Identifying Packers using PEiD, Registry Forensics with Reg Ripper Plu-gins:, Bypassing Poison Ivy's Locked Files, Bypassing Conficker's File System ACL Restrictions, Detecting Rogue PKI Certificates.

Module 3: [9L]

Malware and Kernel Debugging

Opening and Attaching to Processes, Configuration of JIT Debugger for Shellcode Analysis, Controlling Program Execution, Setting and Catching Breakpoints, Debugging with Python Scripts and Py Commands, DLL Export Enumeration, Execution, and Debugging, Debugging a VMware Workstation Guest (on Windows), Debugging a Parallels Guest (on Mac OS X). Introduction to WinDbg Commands and Controls, Detecting Rootkits with WinDbgScripts, Kernel Debugging with IDA Pro.

Module 4: [8L]

Memory Forensics and Volatility

Memory Dumping with MoonSols Windows Memory Toolkit, Accessing VM Memory Files Overview of Volatility, Investigating Processes in Memory Dumps, Code Injection and Extraction, Detecting and Capturing Suspicious Loaded DLLs, Finding Artifacts in Process Memory, Identifying Injected Code with Malfind and YARA.

Module 5: [7L]

Researching and Mapping Source Domains/IPs

Using WHOIS to Research Domains, DNS Hostname Resolution, Querying Passive DNS, Checking DNS Records, Reverse IP Search New Course Form, Creating Static Maps, Creating Interactive Maps.

Module 6: [5L]

Case study of Finding Artifacts in Process Memory, Identifying InjectedCode with Malfind and YARA

Text/Reference Books:

1. Michael Sikorski, Andrew Honig "Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software" publisher William Pollock

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI1004B				
Course Title	Digital Forensics				
Category	CS				
LTP& Credits	L	T	P	Credits	
	3	0	0	3	
Total Contact Hours	48				
Pre-requisites	Cybercrime and Information Warfare, Computer Networks				

Learning Objective:

Provides an in-depth study of the rapidly changing and fascinating field of computer forensics. Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes. Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools. E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics.

Course Outcomes:

- CO1:** Understand relevant legislation and codes of ethics
- CO2:** Computer forensics and digital detective and various processes, policies and procedures
- CO3:** E-discovery, guidelines and standards, E-evidence, tools and environment

CO4: Email and web forensics and network forensics

CO5: To understand detect and prevent digital crimes Knowledge on digital forensics legislations

Course Contents:

Module 1: [9L]

Digital Forensics Science: Forensics science, computer forensics, and digital forensics. Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics

Module 2: [8L]

Cyber Crime Scene Analysis: 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.

Module 3: [9L]

Evidence Management & Presentation: Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.

Module 4: [10L]

Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case,

Network Forensics: open-source security tools for network forensic analysis, requirements for preservation of network data.

Module 5: [8L]

Mobile Forensics: mobile forensics techniques, mobile forensics tools.

Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008.

Module 6: [4L]

Recent trends in mobile forensic technique and methods to search and seizure

electronic evidence

Text/References Books:

1. John Sammons, The Basics of Digital Forensics, Elsevier
2. John Vacca, Computer Forensics: Computer Crime Scene Investigation, Laxmi Publications

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI1004C				
Course Title	Machine learning				
Category	CS				
LTP& Credits	L	T	P	Credits	
	3	0	0	3	
Total Contact Hours	48				
Pre-requisites					

Course Objective:

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

Course Outcomes:

CO1: Differentiate between various software vulnerabilities

CO2: Software process vulnerabilities for an organization

CO3: Monitor resources consumption in a software.

CO4: Interrelate security and software development process.

CO5: To explore Deep learning technique and various feature extraction strategies

Course Contents:

Module 1: [10L]

Supervised Learning (Regression/Classification)

Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes

Linear models: Linear Regression, Logistic Regression, Generalized

Linear Models

Support Vector Machines, Nonlinearity and Kernel Methods

Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

Module 2: [7L]

Unsupervised Learning

Clustering: K-means/Kernel K-means

Dimensionality Reduction: PCA and kernel PCA

Matrix Factorization and Matrix Completion

Module 3: [6L]

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

Module 4: [9L]

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

Module 5: [9L]

Scalable Machine Learning (Online and Distributed Learning)

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

Module 6: [5L]

Recent trends in various learning technique of machine learning and classification methods for IOT

applications. Various models for IOT applications.

Text/References Books:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	JSC1101				
Course Title	Research Methodology and IPR				
Category	CS				
LTP& Credits	L	T	P	Credits	
	2	1	0	2	
Total Contact Hours	36				
Pre-requisites					

Learning Objective:

Demonstrate the ability to choose methods appropriate to research aims and objectives.
Understand the limitations of particular research methods. Develop skills in qualitative and quantitative data analysis and presentation. Develop advanced critical thinking skills.

COURSE OUTCOME:

CO1: Understand research problem formulation

CO2: Analyze research related information

C03: Follow research ethics

C04: Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity

C05: To Develop advanced critical thinking skills.

Course Contents:

Module 1:

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

Module 2:

Effective literature studies approaches, analysis Plagiarism, Research ethics,

Module 3:

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

Module 4:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Module 5:

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

Module 6:

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies,

IPR and IITs.

Text/Reference Books:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2 nd Edition , "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
5. Mayall , "Industrial Design", McGraw Hill, 1992.
6. Niebel , "Product Design", McGraw Hill, 1974.
7. Asimov , "Introduction to Design", Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
9. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI1101				
Course Title	Advance Data structure Laboratory				
Category	CS				
LTP& Credits	L	T	P	Credits	
	0	0	4	2	

Total Contact Hours	36
Pre-requisites	Computer Programming, Data structure

Learning Objectives:

The fundamental design, analysis, and implementation of basic data structures.. Basic concepts in the specification and analysis of programs.. Principles for good program design, especially the uses of data abstraction. The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem. Students should be able to understand the necessary mathematical abstraction to solve problems. To familiarize students with advanced paradigms and data structure used to solve algorithmic problems. Student should be able to come up with analysis of efficiency and proofs of correctness.

Course Outcomes:

CO1: To differentiate how the choices of data structure and algorithm methods impact the performance of a program.

CO2: To solve problems based on different data structures and also write programs.

CO3: To identify appropriate data structure and algorithmic methods in solving a problem.

CO4: To discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing.

CO5: To compare and contrast the benefits of dynamic and static data structures implementations

Course Contents:

List of Experiments:

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods: a) Linear search b) Binary search
2. Write Java programs to implement the following using arrays and linked lists
3. Write Java programs to implement the following using an array. a) Stack ADT b) Queue ADT
4. Write a Java program that reads an infix expression and converts the expression to postfix form. (Use stack ADT).
5. Write a Java program that uses both a stack and a queue to test whether the given string is a palindrome or not.
6. Write Java programs to implement the following using a singly linked list. a) Stack ADT b) Queue ADT
7. Write a Java program to perform the following operations: a) Construct a binary search tree of elements. b) Search for a key element in the above binary search tree. c) Delete an element from

the above binary search tree.

8. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
9. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in a) Preorder b) Inorder c) Postorder
10. Write Java programs for the implementation of bfs and dfs for a given graph.
11. Write Java programs for implementing the following sorting methods: a) Bubble sort b) Insertion sort c) Quick sort d) Merge sort e) Heap sort f) Radix sort g) Binary tree sort
12. Write a Java program to perform the following operations: a) Insertion into a B-tree b) Searching in a B-tree

Text/References Books:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
2. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI1102				
Course Title	Ethical Hacking Laboratory				
Category	CS				
LTP& Credits	L	T	P	Credits	
	0	0	4	2	
Total Contact Hours	36				
Pre-requisites	Computer Programming, Linux				

Learning Objectives:

After going through this module, you will be able to: Know the hacking of Footprinting and Reconnaissance. Study and understand how to gather and review information related, using

different foot printing techniques Study and understand website information like archived website and, extract contents of a website. Study and understand trace out email. Study and understand to fetch DNS information.

Course Outcomes:

CO1: To understand the concept of hacking.

CO2: Understand the core concepts related to malware, hardware and software vulnerabilities and their causes

CO3: Understand ethics behind hacking and vulnerability disclosure

CO4: Appreciate the Cyber Laws and impact of hacking

CO5: Exploit the vulnerabilities related to computer system and networks using state of the art tools and technologies

Course Contents:**List of Experiments:**

1. Foot printing and Reconnaissance: Performing foot printing using Google Hacking, website information, information about an archived website, to extract contents of a website, to trace any received email, to fetch DNS information [2days]
2. Scanning networks, Enumeration and sniffing: Use port scanning. network scanning tools, IDS tool, sniffing tool and generate reports. [2days]
3. Malware Threats: Worms, viruses, Trojans: Use Password cracking, Dictionary attack., Encrypt and decrypt passwords, DoS attack, ARP poisoning in windows, Ifconfig, ping, netstat, traceroute, Steganography tools. Self-Learning Topics: using additional hacking tools. [6days]
4. Developing and implementing malwares : Creating a simple keylogger in python, creating a virus, creating a trojan. Self-Learning Topics: Additional implementation of hacking tools [6days]
5. Hacking web servers, web applications: Hacking a website by Remote File Inclusion, Disguise as Google Bot to view hidden content of a website, to use Kaspersky for Lifetime without Patch [6days]
6. sql injection and Session hijacking : SQL injection for website hacking, session hijacking. Self Learning Topics: using additional of hacking tools. [4days]
7. Wireless network hacking, cloud computing security, cryptography : Using Cryptool to encrypt and decrypt password, implement encryption and decryption using Ceaser Cipher. Self-Learning Topics: implementing additional encryption algorithms. [6days]
8. Pen testing : Penetration Testing using Metasploit and metasploitable [4days]

Text/Reference Books:

1. Hacking: A Beginners' Guide to Computer Hacking, Basic Security, And Penetration Testing by John Slavio
2. The Basics of Hacking and Penetration Testing by Patrick Engebretson
3. Hacking: The Art of Exploitation by Jon Erickson
4. Penetration Testing – A Hands-On Introduction to Hacking

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

**M.Tech. in Computer Science and
Engineering**

Information Security

1st Year 2nd Semester Curriculum

UNIVERSITY

Course Code	PCI2001			
Course Title	Advanced Algorithms			
Category	CS			
LTP& Credits	L	T	P	Credits
	3	1	0	4
Total Contact Hours	48			
Pre-requisites	UG level course in Algorithm Design and Analysis			

Learning Objectives:

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

Course Outcomes:

- CO1:** Analyze the complexity/performance of different algorithms.
- CO2:** Determine the appropriate data structure for solving a particular set of problems
- CO3:** Categorize the different problems in various classes according to their complexity.
- CO4:** Students should have an insight of recent activities in the field of the advanced datastructure.
- CO5:**

Course Contents:

Module 1:

[6L]

Sorting: Review of various sorting algorithms, topological sorting

Graph: Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkstra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.

Module 2:

[8L]

Matroids: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST.

Graph Matching: Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.

Module 3:

[9L]

Flow-Networks: Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm.

Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition

Module 4:

[10L]

Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming.

Modulo Representation of integers/polynomials: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem.

Discrete Fourier Transform (DFT): In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schonhage-Strassen Integer Multiplication algorithm

Module 5:

[10L]

Linear Programming: Geometry of the feasibility region and Simplex algorithm

NP-completeness: Examples, proof of NP-hardness and NP-completeness.

One or more of the following topics based on time and interest

Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm

Module 6:

[5L]

Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures..

Text/Reference Books:

1. "Introduction to Algorithms" by Cormen, Leiserson, Rivest, Stein.
2. "The Design and Analysis of Computer Algorithms" by Aho, Hopcroft, Ullman.
3. "Algorithm Design" by Kleinberg and Tardos.

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI2002				
Course Title	Soft Computing				
Category	CS				
LTP& Credits	L	T	P	Credits	
	3	0	0	3	
Total Contact Hours	48				
Pre-requisites					

Learning Objective:

Aims to provide comprehensive understanding of soft computing approaches for AI problemsolving. Develops in depth knowledge on concepts related to different types of neural networks.Provides in depth knowledge on concepts related to Fuzzy logic, membership value assignment and reasoning with fuzzy quantities.Helps to understand the development of Fuzzy Inference systems and Fuzzy expert systems.Introduces the concepts related to Genetic algorithms for learning from examples.

Course Outcomes:

CO1: Build neural networks to extract patterns from data.

CO2: Build fuzzy inference systems and develop fuzzy expert systems.

CO3: Write genetic algorithms for learning the hyper parameters for data classification.

CO4:

CO5:

Course Content:

Module 1:

Introduction to Soft computing, Artificial Neural Network: An Introduction, Evolution of Neural Networks, Basic Models of Artificial Neural Network, Important Terminologies of ANNs, McCulloch–Pitts Neuron, Linear Separability, Hebb Network

Module 2:

Supervised Learning Network, Perceptron Networks, Adaptive Linear Neuron (Adaline), Multiple Adaptive Linear Neurons, Back-Propagation Network, Radial Basis Function Network, Time Delay Neural Network, Associative Memory Networks, Hopfield Networks

Module 3:

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets, Classical Relations and Fuzzy Relations, Tolerance and Equivalence Relations, Noninteractive Fuzzy Sets, Membership Function, Features of the Membership Functions, Fuzzification, Methods of Membership Value Assignments, Methods of Membership Value Assignments, Defuzzification

Module 4:

Fuzzy Arithmetic and Fuzzy Measures, Measures of Fuzziness, Fuzzy Rule Base and Approximate Reasoning, Fuzzy Propositions, Formation of Rules, Decomposition of Rules (Compound Rules), Aggregation of Fuzzy Rules, Fuzzy Reasoning (Approximate Reasoning), Fuzzy Inference Systems (FIS), Overview of Fuzzy Expert System

Module 5:

Genetic Algorithm, Introduction, Biological Background, Genetic Algorithm and Search Space, Basic Terminologies in Genetic Algorithm, General Genetic Algorithm, Operators, Stopping Condition for Genetic Algorithm Flow, Constraints, Problem Solving Using Genetic Algorithm, The Schema Theorem, Classification of Genetic Algorithm, Advantages and Limitations of Genetic Algorithm, Applications of Genetic Algorithm

Text/Reference Books:

1. S.N. Sivanandam, S.N. Deepa, Principles of Soft Computing, 3ed, Wiley India.
2. Fakhreddine O. Karray, Clarence W. De Silva, Soft Computing and Intelligent Systems Design: Theory, Tools and Applications, 1e, Pearson.
3. Fundamentals of Neural Networks – Laurene Fausett, Prentice Hall India, New Delhi,

1994.

4. Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3 ed, Wiley India
5. E – Neuro Fuzzy and Soft computing – Jang J.S.R., Sun C.T and Mizutami, Prentice hall New Jersey, 1998

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI2003				
Course Title	Advanced Software Engineering				
Category	CS				
LTP& Credits	L	T	P	Credits	
	3	1	0	4	
Total Contact Hours	48				
Pre-requisites	UG level course in Software Engineering				

COURSE OBJECTIVE:

A broad and critical understanding of all the processes for engineering high quality software and the principles, concepts and techniques associated with software development. An ability to analyze and evaluate problems and draw on the theoretical and technical knowledge to develop solutions and systems. A range of skills focused on the analysis of requirements, design and implementation of reliable and maintainable software, with strong emphasis on engineering principles applied over the whole development lifecycle. An awareness of current research in software development, the analytical skills and research techniques for their critical and independent evaluation and their application to new problems

CO1: Explore customer needs and market insights to identify software product opportunities

CO2: Define product requirements, create a strategy, and establish a roadmap for product rollout

CO3: Implement robust, maintainable, and scalable software products using contemporary software architectural and design principles

CO4: Develop, test, and deploy software while adhering to best practices, including automation with continuous integration and delivery

CO5: Manage the software product lifecycle using agile methodologies and rapid release cycles

Course Content:

Module 1:

[9L]

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, legacy software, Software myths. A Generic view of process: Software engineering - A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models. Process models: The waterfall model, Incremental process models, Evolutionary process models, specialized process models, The Unified process.

Module 2:

[9L]

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document. Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management. System models: Context Models, Behavioral models, Data models, Object models, structured methods

Module 3:

[10L]

Design Engineering: Design process and Design quality, Design concepts, the design model, pattern-based software design. Creating an architectural design: software architecture, Data design, Architectural styles and patterns, Architectural Design, assessing alternative architectural designs, mapping data flow into a software architecture. Modeling component-level design: Designing class-based components, conducting componentlevel design, object constraint language, designing conventional components. Performing User interface design: Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.

Module 4:

[10L]

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging. Product metrics: Software Quality, Frame work for Product metrics, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance. Metrics for Process and Products: Software Measurement, Metrics for software quality

Module 5:

[10L]

Risk management: Reactive vs Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan. Quality Management: Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards. Configuration Management: Configuration Management planning, Change management, Version and release management, System building, CASE tools for configuration management.

Text/Reference Books:

1. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
2. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
3. Fundamentals of Software Engineering, Rajib Mall, PHI, 2005
4. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
5. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.
6. Software Engineering2: Specification of systems and languages, Diner Bjorner, Springer International edition, 2006.
7. Software Engineering: A practitioner's Approach, Roger S Pressman, sixth edition. McGraw Hill International Edition, 2005
8. Software Engineering, Ian Sommerville, seventh edition, Pearson education, 2004.

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI2004A				
Course Title	Data Encryption & Compression				
Category	CS				
LTP& Credits	L	T	P	Credits	
	3	0	0	3	
Total Contact Hours	48				
Pre-requisites	Computer Programming, Compiler Design				

v

COURSE OBJECTIVE
This course will cover the concept of security , types of attack experienced, encryption and authentication for deal with attacks, what is data compression, need and techniques of data compression

LECTURE WITH BREAKUP	NO. OF
LECTURES	
Unit 1: Introduction to Security: Need for security, Security approaches, Principles of security, Types of attacks. Encryption Techniques: Plaintext, Cipher text, Substitution & Transposition techniques, Encryption & Decryption, Types of attacks, Key range & Size.	8
Unit 2: Symmetric & Asymmetric Key Cryptography: Algorithm types & Modes, DES, IDEA, Differential & Linear Cryptanalysis, RSA, Symmetric & Asymmetric key together, Digital signature, Knapsack algorithm. User Authentication Mechanism: Authentication basics, Passwords, Authentication tokens, Certificate based & Biometric authentication, Firewall.	10

Unit 3: Case Studies Of Cryptography: Denial of service attacks, IP spoofing attacks, Secure inter branch payment transactions, Conventional Encryption and Message Confidentiality, Conventional Encryption Principles, Conventional Encryption Algorithms, Location of Encryption Devices, Key Distribution. Public Key Cryptography and Message Authentication: Approaches to Message Authentication, SHA-1, MD5, Public-Key Cryptography Principles, RSA, Digital, Signatures, Key Management.	9
Unit 4: Introduction: Need for data compression, Fundamental concept of data compression & coding, Communication model, Compression ratio, Requirements of data compression, Classification. Methods of Data Compression: Data compression-- Loss less & Lossy	7
Unit 5: Entropy encoding-- Repetitive character encoding, Run length encoding, Zero/Blank encoding; Statistical encoding-- Huffman, Arithmetic & Lempel-Ziv coding; Source encoding-- Vector quantization (Simple vector quantization & with error term); Differential encoding-- Predictive coding, Differential pulse code modulation, Delta modulation, Adaptive differential pulse code modulation; Transform based coding : Discrete cosine transform & JPEG standards; Fractal compression	10
Unit 6: Recent trends in encryption and data compression techniques.	4
COURSE OUTCOMES	
After completion of course, students would be:	
At the end of this course the student will have the knowledge of plaintext, cipher text, RSA and other cryptographic algorithm, Key Distribution, Communication Model, Various models for data compression	

Text/References Books:

1. Cryptography and Network Security by B. Forouzan, McGraw-Hill.
2. The Data Compression Book by Nelson, BPB.
3. Cryptography & Network Security by AtulKahate, TMH.

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI2004B				
Course Title	Steganography and Digital Watermarking				
Category	CS				
LTP& Credits	L	T	P	Credits	
	3	0	0	3	
Total Contact Hours	48				
Pre-requisites	Image Processing				

COURSE OBJECTIVE	
The objective of course is to provide a insight to steganography techniques. Watermarking techniques along with attacks on data hiding and integrity of data is included in this course.	
LECTURE WITH BREAKUP	NO. OF LECTURES
Unit 1: Steganography: Overview, History, Methods for hiding (text, images, audio, video, speech etc.), Issues: Security, Capacity and Imperceptibility, Steganalysis: Active and Malicious Attackers, Active and passive steganalysis,	8
Unit 2: Frameworks for secret communication (pure Steganography, secret key, public key steganography), Steganography algorithms (adaptive and non-adaptive),	8
Unit 3: Steganography techniques: Substitution systems, Spatial Domain, Transform domain techniques, Spread spectrum, Statistical steganography, Cover Generation and cover selection, Tools: EzStego, FFEncode, Hide 4 PGP, Hide and Seek, S Tools etc.)	9
Unit 4: Detection, Distortion, Techniques: LSB Embedding, LSB Steganalysis using primary sets, Texture based	6

Unit 5: Digital Watermarking: Introduction, Difference between Watermarking and Steganography, History, Classification (Characteristics and Applications), Types and techniques (Spatial-domain, Frequency-domain, and Vector quantization based watermarking), Attacks and Tools (Attacks by Filtering, Remodulation, Distortion, Geometric Compression, Linear Compression etc.), Watermark security & authentication.	12
Unit 6: Recent trends in Steganography and digital watermarking techniques. Case study of LSB Embedding, LSB Steganalysis using primary sets.	5
COURSE OUTCOMES	
After completion of course, students would be:	
Learn the concept of information hiding.	
Survey of current techniques of steganography and learn how to detect and extract hidden information.	
Learn watermarking techniques and through examples understand the concept.	

Text/Reference Books:

- Peter Wayner, "Disappearing Cryptography–Information Hiding: Steganography & Watermarking", Morgan Kaufmann Publishers, New York, 2002.
- Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, TonKalker, "Digital Watermarking and Steganography", Morgan Kaufmann Publishers, New York, 2008.
- Information Hiding: Steganography and Watermarking-Attacks and Countermeasures by Neil F. Johnson, Zoran Duric, Sushil Jajodia
- Information Hiding Techniques for Steganography and Digital Watermarking by Stefan Katzenbeisser, Fabien A. P. Petitcolas

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI2004C			
Course Title	Information Theory and Coding			
Category	CS			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	48			
Pre-requisites	Probability Theory, Computer Networks			

COURSE OBJECTIVE

- The objective of this course is to provide an insight to information coding techniques, error correction mechanism. Various compression techniques for text, video and image are covered for thorough knowledge of efficient information conveying systems.

LECTURE WITH BREAKUP	NO. OF LECTURES
Unit 1: Information and entropy information measures, Shannon's concept of Information. Channel coding, channel mutual information capacity (BW),	8
Unit 2: Theorem for discrete memory less channel, information capacity theorem, Error detecting and error correcting codes,	9
Unit 3: Types of codes: block codes, Hamming and Lee metrics, description of linear block codes, parity check Codes, cyclic code, Masking techniques,	8
Unit 4: Compression: loss less and lossy, Huffman codes, LZW algorithm, Binary Image compression schemes, run length encoding, CCITT group 3 1-DCompression, CCITT group 3 2D compression, CCITT group 4 2DCompression.	10
Unit 5: Convolutional codes, sequential decoding. Video image Compression: CITT H 261 Video coding algorithm, audio (speech) Compression. Cryptography and cipher.	9
Unit 6: Case study of CCITT group 3 1-DCompression, CCITT group 3 2D compression.	4

COURSE OUTCOMES

After completion of course, students would be:

- The aim of this course is to introduce the principles and applications of information theory.
- The course will study how information is measured in terms of probability and entropy.

- The students learn coding schemes, including error correcting codes, The Fourier perspective; and extensions to wavelets, complexity, compression, and efficient coding of audio-visual information.

Text/Reference Books:

- Fundamentals in information theory and coding, Monica Borda, Springer.
- Communication Systems: Analog and digital, Singh and Sapre, TataMcGraw Hill.
- Multimedia Communications Fred Halsall.
- Information Theory, Coding and Cryptography R Bose.
- Multimedia system Design Prabhat K Andleigh and Kiran Thakrar.

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI2005A			
Course Title				
Category	CS			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	48			
Pre-requisites	Computer Programming, Compiler Design			

Course Code	PCI2005A
Course Name	Security Assessment and Risk Analysis
Credits	3
Pre-Requisites	Computer and Network Security

Total Number of Lectures:48

COURSE OBJECTIVE
- Describe the concepts of risk management - Define and differentiate various Contingency Planning components

Integrate the IRP, DRP, and BCP plans into a coherent strategy to support sustained organizational operations.
Define and be able to discuss incident response options, and design an Incident Response Plan for sustained organizational operations.

LECTURE WITH BREAKUP	NO. OF LECTURES
Unit 1: SECURITY BASICS: Information Security (INFOSEC) Overview: critical information characteristics – availability information states – processing security countermeasures education, training and awareness, critical information characteristics – confidentiality critical information characteristics – integrity, information states – storage, information states – transmission, security countermeasures policy, procedures and practices, threats, vulnerabilities.	8
Unit 2: Threats to and Vulnerabilities of Systems: definition of terms (e.g., threats, vulnerabilities, risk), major categories of threats (e.g., fraud, Hostile Intelligence Service (HOIS), malicious logic, hackers, environmental and technological hazards, disgruntled employees, careless employees, HUMINT, and monitoring), threat impact areas, Countermeasures: assessments (e.g., surveys, inspections), Concepts of Risk Management: consequences (e.g., corrective action, risk assessment), cost/benefit analysis of controls, implementation of cost effective controls, monitoring the efficiency and effectiveness of controls (e.g., unauthorized or inadvertent disclosure of information), threat and vulnerability assessment	11
Unit 3: Security Planning: directives and procedures for policy mechanism, Risk Management: acceptance of risk (accreditation), corrective actions information identification, risk analysis and/or vulnerability assessment components, risk analysis results evaluation, roles and responsibilities of all the players in the risk analysis process, Contingency Planning/Disaster Recovery: agency response procedures and continuity of operations, contingency plan components, determination of backup requirements, development of plans for recovery actions after a disruptive event, development of procedures for off site processing, emergency destruction procedures, guidelines for determining critical and essential workload, team member responsibilities in responding to an	9
emergency situation	

Unit 4: POLICIES AND PROCEDURES Physical Security Measures: alarms, building construction, cabling, communications centre, environmental controls (humidity and air conditioning), filtered power, physical access control systems (key cards, locks and alarms) Personnel Security Practices and Procedures: access authorization/verification (need to know), contractors, employee clearances, position sensitivity, security training and awareness, systems maintenance personnel, Administrative Security Procedural Controls: attribution, copyright protection and licensing , Auditing and Monitoring: conducting security reviews, effectiveness of security programs, investigation of security breaches, privacy review of accountability controls, review of audit trails and logs	8
Unit 5: Operations Security (OPSEC): OPSEC surveys/OPSEC planning INFOSEC: computer security – audit, cryptography encryption (e.g., point to point, network, link), cryptography key management (to include electronic key), cryptography strength (e.g., complexity, secrecy, characteristics of the key)	9
Unit 6: Case study of threat and vulnerability assessment	3

COURSE OUTCOMES
After completion of course, students would be:
- Capable of recommending contingency strategies including data backup and recovery and alternate site selection for business resumption planning - Skilled to be able to describe the escalation process from incident to disaster in case of security disaster. - Capable of Designing a Disaster Recovery Plan for sustained organizational operations. - Capable of Designing a Business Continuity Plan for sustained organizational operations.

Text/Reference Books:

- Principles of Incident Response and Disaster Recovery, Whitman & Mattord, Course Technology ISBN: 141883663X
- (Web Link) http://www.cnss.gov/Assets/pdf/nstissi_4011.pdf

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	
Course Title	
Category	
LTP& Credits	
Total Contact Hours	
Pre-requisites	

Course Code	PCI2005B
Course Name	Secure Coding
Credits	3
Pre-Requisites	Computer Programming, Compiler Design, Web programming

Total Number of Lectures:48

COURSE OBJECTIVE	
- Understand the basics of secure programming. - Understand the most frequent programming errors leading to software vulnerabilities. - Identify and analyze security problems in software. - Understand and protect against security threats and software vulnerabilities. - Effectively apply their knowledge to the construction of secure software systems	
LECTURE WITH BREAKUP	NO. OF LECTURES
Unit 1: Introduction to software security, Managing software security risk, Selecting software development technologies, An open source and closed source, Guiding principles for software security, Auditing software, Buffet overflows, Access control, Race conditions, Input validation, Password authentication	10
Unit 2: Anti-tampering, Protecting against denial of service attack, Copy protection schemes, Client-side security, Database security, Applied cryptography, Randomness and determinism	7
Unit 3: Buffer Overrun, Format String Problems, Integer Overflow, and Software Security Fundamentals SQL Injection, Command Injection, Failure to Handle Errors, and Security Touchpoints	9

Unit 4: Cross Site Scripting, Magic URLs, Weak Passwords, Failing to Protect Data, Weak random numbers, improper use of cryptography	8
Unit 5: Information Leakage, Race Conditions, Poor usability, Failing to protect network traffic, improper use of PKI, trusting network name resolution	8
Unit 6: Case study of Cross Site Scripting, Magic URLs, Weak Passwords Buffer overflows, Access control, Race conditions.	6
COURSE OUTCOMES	
After completion of course, students would be able to:	
Write secure programs and various risk in the softwares.	
Eliminate security problems in the open source software.	
Real time software and vulnerabilities associated with them.	
Interrelate security and software engineering.	

Text/Reference Books:

1. J. Viega, M. Messier. Secure Programming Cookbook, O'Reilly.
2. M. Howard, D. LeBlanc. Writing Secure Code, Microsoft
3. J. Viega, G. McGraw. Building Secure Software, Addison Wesley

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI2004C			
Course Title				
Category	CS			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	48			
Pre-requisites	Computer Programming, Compiler Design			

Course Code	PCI2005C
Course Name	Biometrics
Credits	3
Pre-Requisites	Image Processing

Total Number of Lectures: 48

COURSE OBJECTIVE
The objective of this course is to introduce Bio-metric and traditional authentication methods. Application of bio-metric systems in government sector and various face recognition and finger print recognition methods are included.

LECTURE WITH BREAKUP	NO. OF LECTURES
Unit 1:	
Introduction and Definitions of bio-metrics, Traditional authenticated methods and technologies.	7
Unit 2: Bio-metric technologies: Fingerprint, Face, Iris, Hand Geometry, Gait Recognition, Ear, Voice, Palm print, On-Line Signature Verification, 3D Face Recognition, Dental Identification and DNA.	10
Unit 3: The Law and the use of multi bio-metrics systems.	6
Unit 4: Statistical measurement of Bio-metric. Bio-metrics in Government Sector and Commercial Sector.	11
Unit 5: Case Studies of bio-metric system, Bio-metric Transaction. Bio-metric System Vulnerabilities.	9
Unit 6: Recent trends in Bio-metric technologies and applications in various domains. Case study of 3D face recognition and DNA matching.	5

COURSE OUTCOMES
After completion of course, students would be:
- Perform R&D on bio-metrics methods and systems. - A good understanding of the various modules constituting a bio-metric system. - Familiarity with different bio-metric traits and to appreciate their relative significance. - A good knowledge of the feature sets used to represent some of the popular bio-metric traits. - Evaluate and design security systems incorporating bio-metrics. - Recognize the challenges and limitations associated with bio-metrics.

Text/Reference Books:

1. Biometrics for network security, Paul Reid, Hand book of Pearson
2. D. Maltoni, D. Maio, A. K. Jain, and S. Prabhakar, Handbook of Fingerprint Recognition, Springer Verlag, 2003.
3. A. K. Jain, R. Bolle, S. Pankanti (Eds.), BIOMETRICS: Personal Identification in Networked Society, Kluwer Academic Publishers, 1999.
4. J. Wayman, A.K. Jain, D. Maltoni, and D. Maio (Eds.), Biometric Systems: Technology, Design and Performance Evaluation, Springer, 2004.
5. Anil Jain, Arun A. Ross, Karthik Nanda kumar, Introduction to biometric, Springer, 2011.
6. Biometric Systems: Technology, Design and Performance Evaluation, J. Wayman, A.K. Jain, D. Maltoni, and D. Maio

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI2101				
Course Title	Advance Algorithm Lab				
Category	CS				
LTP& Credits	L	T	P	Credits	
	0	0	4	2	
Total Contact Hours	36				
Pre-requisites					

Learning Objective:

The course should enable the students to: The fundamental design, analysis, and implementation of basic data structures. Learn basic concepts in the specification and analysis of programs. Understand principles of good program design, especially the uses of data

abstraction.

Course Outcomes:

CO1: Analyse a variety of algorithms with practical applications and the resource requirements of each

CO2: Determine the most suitable algorithm for any given task and then apply it to the problem.

CO3: Demonstrate adequate comprehension of the theory of intractability and prove when certain kinds of problems are intractable

CO4: Work with advance algorithms

CO5:

Course Content:

Software Packages required:

Open source tools for building neural network models, fuzzy logic and genetic algorithms

List of Experiments:

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods: a) Linear search b) Binary search
2. Write Java programs to implement the following using arrays and linked lists a) List ADT.
3. Write Java programs to implement the following using an array. a) Stack ADT b) Queue ADT
4. Write a Java program that reads an infix expression and converts the expression to postfix form. (Use stacks ADT).
5. Write a Java program to implement circular queue ADT using an array.
6. Write a Java program that uses both a stack and a queue to test whether the given string is a palindrome or not.
7. Write Java programs to implement the following using a singly linked list. a) Stack ADT b) Queue ADT
8. Write Java programs to implement the deque (double ended queue) ADT using a) Array b) Singly linked list c) Doubly linked list.
9. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
10. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in a) Preorder b) Inorder c) Postorder.
11. Write Java programs for the implementation of bfs and dfs for a given graph.
12. Write a Java program that implements KMP algorithm for pattern matching

Text/Reference Books:

1. Data Structures and Algorithms in java, 3rd edition, A.Drozdek, Cengage Learning.
2. Data Structures and algorithms in Java, 2nd Edition, R.Lafore, Pearson Education
3. Data Structures using Java, D.S.Malik and P.S. Nair, Cengage Learning

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI2102				
Course Title	Soft Computing Lab				
Category	CS				
LTP& Credits	L	T	P	Credits	
	0	0	4	2	
Total Contact Hours	48				
Pre-requisites					

Learning Objective:

Aims to provide comprehensive understanding of soft computing approaches for AI problemsolving. Develops in depth knowledge on concepts related to different types of neural networks.Provides in depth knowledge on concepts related to Fuzzy logic, membership value assignment and reasoning with fuzzy quantities.Helps to understand the development of Fuzzy Inference systems and Fuzzy expert systems.Introduces the concepts related to Genetic algorithms for learning from examples.

Course Outcomes:

- CO1:** Implement neural networks to solve real world problems
CO2: Choose appropriate pre-trained model to solve real time problem

CO3: Parameter tuning using Genetic algorithms

CO4: Write genetic algorithms for learning the hyper parameters for data classification.

CO5: Implement Fuzzy Inference

Course Content:

Software Packages required:

Open source tools for building neural network models, fuzzy logic and genetic algorithms

List of Experiments:

1. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
2. Implement multilayer perceptron algorithm for MNIST Hand written Digit Classification.
3. Design a neural network for classifying movie reviews (Binary Classification) using IMDB dataset.
4. Design a neural Network for classifying news wires (Multi class classification) using Reuters dataset.
5. Design a neural network for predicting house prices using Boston Housing Price dataset.
6. Implement fuzzy inference for image segmentation.
7. Implement the house price prediction problem with fuzzy reasoning
8. Implement the Fuzzy C-Means algorithm for clustering
9. Implement the basic concepts of genetic algorithms for learning
10. Implement genetic algorithms for hyper parameter tuning in neural networks for classifying IMDB dataset.

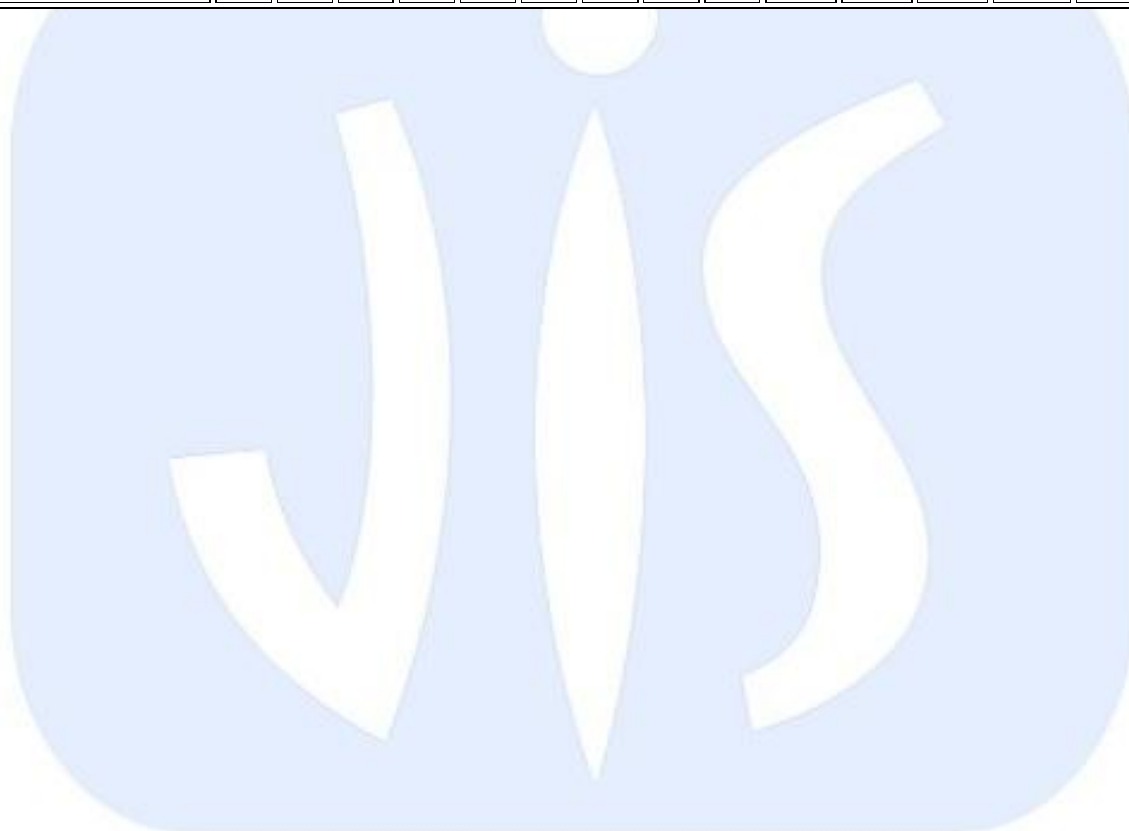
Text/Reference Books:

1. Ivan Grudin, “Learning Genetic Algorithms with Python”, BPB publishers, 2021
2. Rajasekaran and Pai, “Neural Networks, Fuzzy Logic and Evolutionary Algorithms: Synthesis and Applications, PHI, 2017

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
------------------------	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	-------	-------	-------

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO- 1	PSO- 2	PSO- 3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3



UNIVERSITY

**M.Tech. in Computer Science and
Engineering**

Information Security

2nd Year 3rd Semester Curriculum

UNIVERSITY

Course Code	PCI3001			
Course Title	Blockchain			
Category	CS			
LTP& Credits	L	T	P	Credits
	3	1	0	4
Total Contact Hours	48			
Pre-requisites				

Learning Objectives:

The block chain technology course allows the students to explore the driving force behind the crypto currency Bit coin. Along with the Decentralization, Cryptography, Bit coins with its alternative coins, Smart contracts and outside of currencies.

Course Outcome:

- CO1:** Understand the types, benefits and limitation of blockchain
- CO2:** Explore the blockchain decentralization and cryptography concepts.
- CO3:** Enumerate the Bitcoin features and its alternative options.
- CO4:** Describe and deploy the smart contracts
- CO5:** Summarize the blockchain features outside of currencies

Course Contents:

Module 1:
[8L]

Blockchain 101: Distributed systems, History of block chain, Introduction to block chain, Types of blockchain, CAP theorem and block chain, Benefits and limitations of block chain

Module 2:
[11L]

Decentralization and Cryptography: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations. Cryptography and Technical Foundations: Cryptographic primitives, Asymmetric cryptography, Public and private keys

Module 3:
[8L]

Bitcoin and Alternative Coins A: Bitcoin, Transactions, Blockchain, Bitcoin payments B: Alternative Coins, Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash

Module 4:
[11L]

Smart Contracts and Ethereum 101: Smart Contracts: Definition, Ricardian contracts. Ethereum 101: Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts.

Module 5:
[10L]

Alternative Blockchains: Blockchains Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media

COURSE OUTCOMES
At the end of the course the student will be able to:

- Understand the types, benefits and limitation of blockchain.
- Explore the blockchain decentralization and cryptography concepts.
- Enumerate the Bitcoin features and its alternative options.
- Describe and deploy the smart contracts
- Summarize the blockchain features outside of currencies

Text/reference Books:

1. Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Author- Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1-8712-544-5, 2017
2. Bitcoin and Cryptocurrency Technologies, Author- Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Princeton University, 2016
3. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Author- Daniel Drescher, Apress, First Edition, 2017
4. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Andreas M. Antonopoulos, O'Reilly Media, First Edition, 2014

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI3002A			
Course Title	Data Warehousing & Mining			
Category	CS			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	48			
Pre-requisites	Databases, Probability			

Learning Objectives:

The objective of this course is to introduce data warehousing and mining techniques. Application of data mining in web mining, pattern matching and cluster analysis is included to aware students of broad data mining areas

Course Outcome:

- CO1:** Study of different sequential pattern algorithms
CO2: Study the technique to extract patterns from time series data and its application in realworld.
CO3: Can extend the Graph mining algorithms to Web mining
CO4: Help in identifying the computing framework for Big Data
CO5: To become aware of current experimental and theoretical IR research.

Course Contents:

Module 1: [7L]

Introduction to Data Warehousing; Data Mining: Mining frequent patterns, association and correlations; Sequential Pattern Mining concepts, primitives, scalable methods;

Module 2: [8L]

Classification and prediction; Cluster Analysis – Types of Data in Cluster Analysis, Partitioning methods, Hierarchical Methods; Transactional Patterns and other temporal based frequent patterns,

Module 3: [8L]

Mining Time series Data, Periodicity Analysis for time related sequence data, Trend analysis, Similarity search in Time-series analysis;

Module 4: [11L]

Mining Data Streams, Methodologies for stream data processing and stream data systems, Frequent pattern mining in stream data, Sequential Pattern Mining in Data Streams, Classification of dynamic data streams, Class Imbalance Problem; Graph Mining; Social Network Analysis;

Module 5: [9L]

Web Mining, Mining the web page layout structure, mining web link structure, mining multimedia data on the web, Automatic classification of web documents and web usage mining; Distributed Data Mining.

Module 6: [5L]

Recent trends in Distributed Warehousing and Data Mining, Class Imbalance Problem; Graph Mining; Social Network Analysis

Text/Reference Books:

1. Jiawei Han and M Kamber , Data Mining Concepts and Techniques, , Second Edition, Elsevier Publication, 2011.
2. Vipin Kumar, Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach, Addison Wesley, 2006.
3. G Dong and J Pei, Sequence Data Mining, Springer, 2007.

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI3002B				
Course Title	Web Search and Information Retrieval				
Category	CS				
LTP& Credits	L	T	P	Credits	
	3	0	0	3	
Total Contact Hours	48				
Pre-requisites					

Learning Objectives:

The objective of the course is to introduce information retrieval models and query languages. Application of web search and information retrieval in social networks is also included..

Course Outcome:

- CO1:** To identify basic theories and analysis tools as they apply to information retrieval.
- CO2:** To develop understanding of problems and potentials of current IR systems.
- CO3:** To learn and appreciate different retrieval algorithms and systems.

C04: To apply various indexing, matching, organizing, and evaluating methods to IR problem.

C05: To become aware of current experimental and theoretical IR research.

Course Contents:

Module 1: [7L]

Information retrieval model, Information retrieval evaluation, Searching the Web

Module 2: [9L]

Document Representation, Query languages and query operation, Meta-datasearch

Module 3: [9L]

Indexing and searching, Scoring and ranking feature vectors

Module 4: [11L]

Ontology, domain specific search, parallel and distributed information retrieval..

Module 5: [7L]

Text and multimedia languages, Social networks.

Module 6: [5L]

Recent trends in Web search and Information retrieval techniques.

Text/Reference Books:

1. C. D. Manning, P. Raghavan and H. Schütze, Introduction to Information Retrieval, Cambridge University Press, 2008 (available at <http://nlp.stanford.edu/IR-book/>).
2. Chakrabarti, S. (2002). Mining the web: Mining the Web: Discovering knowledge from hypertextdata. Morgan-kaufman.
3. B. Croft, D. Metzler, T. Strohman, Search Engines: Information Retrieval in Practice, Addison-Wesley, 2009 (available at <http://ciir.cs.umass.edu/irbook/>).
4. R. Baeza-Yates, B. Ribeiro-Neto, Modern Information Retrieval, Addison-Wesley,

2011 (2ndEdition).

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI3002C				
Course Title	Database Security and Access Control				
Category	CS				
LTP& Credits	L	T	P	Credits	
	3	0	0	3	
Total Contact Hours	48				
Pre-requisites	Database Management				

Learning Objectives:

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

Course Outcome:

C01: Students will be enabled to understand and implement classical models and algorithms.

C02: They will learn how to analyze the data, identify the problems.

C03: They will choose the relevant models and algorithms to apply.

C04: They will further be able to assess the strengths and weaknesses of various access control models and to analyze their behaviour.

C05:

Course Contents:**Module 1:** [5L]

Introduction to Access Control, Purpose and fundamentals of access control, brief history,

Module 2: [9L]

- Policies of Access Control, Models of Access Control, and Mechanisms, Discretionary Access Control (DAC), Non- Discretionary Access Control , Mandatory Access Control (MAC). Capabilities and Limitations of Access Control Mechanisms: Access Control List (ACL) and Limitations, Capability List and Limitations,

Module 3: [8L]

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

Module 4: [11L]

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

Module 5: [11L]

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

Module 6: [4L]

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

Text/Reference Books:

1. Role Based Access Control: David F. Ferraiolo, D. Richard Kuhn, Ramaswamy Chandramouli.
2. <http://www.smartcard.co.uk/tutorials/sct-itsc.pdf> : Smart Card Tutorial.

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI3003A			
Course Title	Business Analytics			
Category	OE			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	48			
Pre-requisites				

Learning Objectives:

Understand the role of business analytics within an organization. Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making. To become familiar with processes needed to develop, report, and analyze business data. Use decision-making tools/Operations research techniques. Manage business process using analytical and management tools. Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

Course Outcome:

CO1: Students will demonstrate knowledge of data analytics.

C02: Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.

C03: Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.

C04: Students will demonstrate the ability to translate data into clear, actionable insights

C05:

Course Contents:

Module 1:

[9L]

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

Module 2:

[8L]

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Module 3:

[9L]

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.

Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Module 4:

[10L]

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.

Monte Carlo Simulation and Risk Analysis: Monte Carlo Simulation Using Analytic Solver

Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Module 5:

[8L]

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Module 6:

[4L]

Recent Trends in : Embedded and collaborative business intelligence, Visualdata recovery, Data Storytelling and Data journalism.

Text/Reference Books:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G.Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education.

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI3003B			
Course Title	Industrial Safety			
Category	OE			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	48			
Pre-requisites				

Learning Objectives:

The objectives of industrial safety systems are clear: Prevent incidents: Minimize the likelihood of accidents and injuries, ensure the well-being of industrial employees and protect machinery, materials and property. Minimize disruptions: Avoid work stoppages and production losses caused by accidents.

Course Outcome:

C01: Students should able to apply the dynamic programming to solve problems of discrete and continuous variables

C02: Students should able to apply the concept of non-linear programming

C03: Students should able to carry out sensitivity analysis

C04: Student should able to model the real world problem

C05:

Course Contents:

Module 1:

[9L]

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Module 2:

[9L]

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Module 3:

[10L]

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

corrosion, corrosion prevention methods.

Module 4:

[10L]

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

Module 5:

[10L]

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

Text/Reference Books:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, McGraw Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI3003C			
Course Title	Operations Research			
Category	OE			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	48			
Pre-requisites				

Learning Objectives:

The purpose of operations research is to achieve the best performance under the given circumstances . Optimization also involves comparing and narrowing down potential options. Simulation- This involves building models or replications in order to try out and test solutions before applying them.

Course Outcome:

C01: Students should able to apply the dynamic programming to solve problems of discrete and continuous variables

C02: Students should able to apply the concept of non-linear programming

C03: Students should able to carry out sensitivity analysis

C04: Student should able to model the real world problem

C05:

Course Contents:

Module 1:

[9L]

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

Module 2:

[9L]

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

Module 3:

[10L]

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

Module 4:

[10L]

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Module 5:

[10L]

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

References:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI3003D			
Course Title	Cost Management of Engineering Projects			
Category	OE			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	48			
Pre-requisites				

Learning Objectives:

Explain the behavior of constituents in the composite materials . Enlighten the students in different types of reinforcement . Develop the student's skills in understanding the different manufacturing methods available for composite material. Illuminate the knowledge and analysis skills in applying basic laws in mechanics to the composite materials.

Course Outcome:

C01:
C02:
C03:
C04:
C05:

Course Contents:**Module 1:****[8L]**

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

Module 2:**[12L]**

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non- technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Module 3:**[18L]**

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

Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Module 4:

[10L]

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

Text/Reference Books:

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

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI3003E			
Course Title	Composite Materials			
Category	OE			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	48			
Pre-requisites				

Learning Objectives:

Explain the behavior of constituents in the composite materials . Enlighten the students in different types of reinforcement . Develop the student's skills in understanding the different manufacturing methods available for composite material. Illuminate the knowledge and analysis skills in applying basic

laws in mechanics to the composite materials.

Course Outcome:

C01:
C02:
C03:
C04:
C05:

Course Contents:

Module 1:

[8L]

INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

Module 2:

[10L]

REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

Module 3:

[10L]

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

Module 4:

[8L]

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and preregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

Module 5:

[12L]

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

Text/Reference Boks:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.
3. Hand Book of Composite Materials-ed-Lubin.
4. Composite Materials – K.K.Chawla.
5. Composite Materials Science and Applications – Deborah D.L. Chung.
6. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	PCI3003F			
Course Title	Waste to Energy			
Category	OE			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	48			
Pre-requisites				

Learning Objectives:

The objective of the course is to provide insights into waste management options by reducing the waste destined for disposal and encouraging the use of waste as a resource for alternate energy production. This course is designed to provide an understanding of the various aspects of Waste to Energy. The various sources of waste generation is analysed with a focus on its potential for energy production. The need for characterization of wastes will be discussed along with the existing norms for waste utilization for alternate energy source. Various Technological options available for the production of energy form waste will delineated along with economics of using alternate sources. Case studies will be discussed to

provide a better understanding of the concepts of “Waste to Energy” in the Indian context

Course Outcome:

- C01:** To enable students to understand of the concept of Waste to Energy
C02: To link legal, technical and management principles for production of energy form waste.
C03: To learn about the best available technologies for waste to energy.
C04: To analyze of case studies for understanding success and failures.
C05: To facilitate the students in developing skills in the decision making process.

CourseContents:**Module 1:****[8L]**

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

Module 2:**[8L]**

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

Module 3:**[10L]**

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

Module 4:**[8L]**

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

Module 5:**[14L]**

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban

waste to energy conversion - Biomass energy programme in India.

Text/ Reference Books:

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, TataMcGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

UNIVERSITY

**M.Tech. in Computer Science and
Engineering**

Information Security

2nd Year 4th Semester Curriculum

SEMESTER-IV							
Sl. No.	Type	Course No.	Course Name	L	T	P	Credits
SESSIONAL (ONLY INTERNAL EVALUATION)							
1	PRO J	PCI4201	Thesis II	0	0	16	8
2	SEMI NER	PCI4202	Seminar & Viva Voce	0	0	4	4
TOTAL				0	0	20	12

UNIVERSITY