# PALLAVI ENGINEERING COLLEGE HYDERABAD

## B.Tech. In COMPUTER SCIENCE AND ENGINEERING (CYBER SECURITY)
### COURSE STRUCTURE & SYLLABUS (PR24 Regulations)
### Applicable from AY 2024-25 Batch

### I Year I Semester

| S.No. | Course Code | Course Title | L | T | P | Credits |
|-------|-------------|--------------|---|---|---|---------|
| 1. | PMA101BS | Matrices and Calculus | 3 | 1 | 0 | 4 |
| 2. | PCH102BS | Engineering Chemistry | 3 | 1 | 0 | 4 |
| 3. | PCS103ES | Programming for Problem Solving | 3 | 0 | 0 | 3 |
| 4. | PEE104ES | Basic Electrical Engineering | 2 | 0 | 0 | 2 |
| 5. | PME105ES | Computer Aided Engineering Graphics | 1 | 0 | 4 | 3 |
| 6. | PCS106ES | Elements of Computer Science & Engineering | 0 | 0 | 2 | 1 |
| 7. | PCH107BS | Engineering Chemistry Laboratory | 0 | 0 | 2 | 1 |
| 8. | PCS108ES | Programming for Problem Solving Laboratory | 0 | 0 | 2 | 1 |
| 9. | PEE109ES | Basic Electrical Engineering Laboratory | 0 | 0 | 2 | 1 |
|  |  | Induction Program |  |  |  |  |
|  |  | **Total** | **12** | **2** | **12** | **20** |

### I Year II Semester

| S.No. | Course Code | Course Title | L | T | P | Credits |
|-------|-------------|--------------|---|---|---|---------|
| 1. | PMA201BS | Ordinary Differential Equations and Vector Calculus | 3 | 1 | 0 | 4 |
| 2. | PPH202BS | Applied Physics | 3 | 1 | 0 | 4 |
| 3. | PME203ES | Engineering Workshop | 0 | 1 | 3 | 2.5 |
| 4. | PEN204HS | English for Skill Enhancement | 2 | 0 | 0 | 2 |
| 5. | PEC205ES | Electronic Devices and Circuits | 2 | 0 | 0 | 2 |
| 6. | PCS206ES | Python Programming Laboratory | 0 | 1 | 2 | 2 |
| 7. | PPH207BS | Applied Physics Laboratory | 0 | 0 | 3 | 1.5 |
| 8. | PEN208HS | English Language and Communication Skills Laboratory | 0 | 0 | 2 | 1 |
| 9. | PCS209ES | IT Workshop | 0 | 0 | 2 | 1 |
|  |  | **Total** | **13** | **4** | **12** | **20** |

## II YEAR I SEMESTER

| S. No. | Course Code | Course Title | L | T | P | Credits |
|--------|-------------|--------------|---|---|---|---------|
| 1 | PCY301PC | Digital Electronics | 3 | 0 | 0 | 3 |
| 2 | PCY302PC | Data Structures | 3 | 0 | 0 | 3 |
| 3 | PCY303PC | Computer Oriented Statistical Methods | 3 | 1 | 0 | 4 |
| 4 | PCY304PC | Computer Organization and Architecture | 3 | 0 | 0 | 3 |
| 5 | PCY305PC | Object Oriented Programming through Java | 3 | 0 | 0 | 3 |
| 6 | PCY306PC | Data Structures Lab | 0 | 0 | 3 | 1.5 |
| 7 | PCY307PC | Object Oriented Programming through Java Lab | 0 | 0 | 3 | 1.5 |
| 8 | PCY308PC | Data visualization- R Programming/ Power BI | 0 | 0 | 2 | 1 |
| 9 | *PMC309 | Gender Sensitization Lab | 0 | 0 | 2 | 0 |
| | | **Total** | 15 | 1 | 10 | 20 |

## II YEAR II SEMESTER

| S. No. | Course Code | Course Title | L | T | P | Credits |
|--------|-------------|--------------|---|---|---|---------|
| 1 | PCY401PC | Discrete Mathematics | 3 | 0 | 0 | 3 |
| 2 | PSM402MS | Business Economics & Financial Analysis | 3 | 0 | 0 | 3 |
| 3 | PCY403PC | Operating Systems | 3 | 0 | 0 | 3 |
| 4 | PCY404PC | Computer Networks | 3 | 0 | 0 | 3 |
| 5 | PCY405PC | Software Engineering | 3 | 0 | 0 | 3 |
| 6 | PCY406PC | Operating Systems Lab | 0 | 0 | 2 | 1 |
| 7 | PCY407PC | Computer Networks Lab | 0 | 0 | 2 | 1 |
| 8 | PCY408PC | Real-time Research Project/ Field Based Project | 0 | 0 | 4 | 2 |
| 9 | PCY409PC | Node JS/ React JS/ Django | 0 | 0 | 2 | 1 |
| 10 | *PMC410 | Constitution of India | 3 | 0 | 0 | 0 |
| | | **Total** | 18 | 0 | 10 | 20 |

## PCY301PC: DIGITAL ELECTRONICS

**B.Tech. II Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objectives:** This course aims at through understanding of binary number system, logic gates, combination logic and synchronous and asynchronous logic.

**Course Outcomes:**
1. Know the characteristics of various components. Know about the logic families and realization of logic Gates
2. Understand the utilization of components.
3. Design and analyze small signal amplifier circuits.
4. Learn Postulates of Boolean algebra and to minimize Combinational functions.
5. Design and analyze combinational and sequential circuits.

**UNIT - I:**
**BOOLEAN ALGEBRA AND LOGIC GATES:** Digital Systems, Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, complements, Signed binary numbers, Binary codes, Binary Storage and Registers, Binary logic.
Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, other logic operations, Digital logic gates.

**UNIT - II:**
**GATE – LEVEL MINIMIZATION:** The map method, Four-variable map, Five-Variable map, product of sums simplification Don't-care conditions, NAND and NOR implementation other Two-level implementations, Exclusive - Or function.

**UNIT - III:**
**COMBINATIONAL LOGIC:** Combinational Circuits, Analysis procedure Design procedure, Binary Adder-Subtractor Decimal Adder, Binary multiplier, magnitude comparator, Decoders, Encoders, Multiplexers, HDL for combinational circuits.

**UNIT - IV:**
**SEQUENTIAL LOGIC:** Sequential circuits, latches, Flip-Flops Analysis of clocked sequential circuits, state Reduction and Assignment, Design Procedure. Registers, shift Registers, Ripple counters, synchronous counters, other counters.

**UNIT - V**
**MEMORIES AND ASYNCHRONOUS SEQUENTIAL LOGIC:** Introduction, Random-Access Memory, Memory Decoding, Error Detection and correction Read-only memory, Programmable logic Array programmable Array logic, Sequential Programmable Devices.
Introduction, Analysis Procedure, Circuits with Latches, Design Procedure, Reduction of state and Flow Tables, Race-Free state Assignment Hazards, Design Example.

**TEXT BOOKS:**

1. Digital Design - Third Edition, M. Morris Mano, Pearson Education/PHI.
2. Digital Principles and Applications Albert Paul Malvino Donald P. Leach TATA McGraw Hill Edition.
3. Fundamentals of Logic Design, Roth, 5th Edition, Thomson.

**REFERENCE BOOKS:**

1. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.
2. Switching and Logic Design, C.V.S. Rao, Pearson Education
3. Digital Principles and Design - Donald D.Givone, Tata McGraw Hill, Edition.
4. Fundamentals of Digital Logic and Microcomputer Design, 5TH Edition, M. Rafiquzzaman John Wiley.

## PCY302PC: DATA STRUCTURES

**B.Tech. II Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Prerequisites:** Programming for Problem Solving

**Course Objectives**
- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
- Introduces sorting and pattern matching algorithms

**Course Outcomes:**
1. Ability to select the data structures that efficiently model the information in a problem.
2. Ability to assess efficiency trade-offs among different data structure implementations orcombinations.
3. Implement and know the application of algorithms for sorting and pattern matching.
4. Design programs using a variety of data structures, including hash tables, binary and generaltree structures, search trees, tries, heaps, graphs, and AVL-trees.
5. Ability to implement searching and sorting algorithms.

**UNIT - I**

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks- Operations, array and linked representations of stacks, stack applications, Queues- operations, array and linked representations.

**UNIT - II**

Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching.
Hash Table Representation: hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, and rehashing, extendible hashing.

**UNIT - III**

Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, B- Trees, B+ Trees, AVL Trees, Definition, Height of an AVL Tree, Operations - Insertion, Deletion and Searching, Red -Black, Splay Trees.

**UNIT - IV**

Graphs: Graph Implementation Methods. Graph Traversal Methods.
Sorting: Quick Sort, Heap Sort, External Sorting- Model for external sorting, Merge Sort.

**UNIT - V**

Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer -Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

**TEXT BOOKS:**
1. Fundamentals of Data Structures in C, 2 nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C - A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

**REFERENCE BOOK:**
1. Data Structures: A Pseudocode Approach with C, 2 nd Edition, R. F. Gilberg and B.A.Forouzan, Cengage Learning.

## PCY303PC: COMPUTER ORIENTED STATISTICAL METHODS

B.Tech. II Year I Sem.

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Pre-requisites:** Mathematics courses of first year of study.

**Course Objectives:** To learn
- The theory of Probability, Probability distributions of single and multiple random variables
- The sampling theory, testing of hypothesis and making statistical inferences
- Stochastic process and Markov chains.

**Course outcomes:**
1. Apply the concepts of probability and distributions to some case studies. Apply the concepts of discrete probability distributions.
2. Apply the concepts of continuous probability distributions.
3. Assess the sampling theory and making inferences.
4. Correlate the material of one unit to the material in other units.
5. Resolve the potential misconceptions and hazards in each topic of study.

### UNIT - I: Probability                                                    10 L
Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Baye's Rule,
**Random Variables and Probability Distributions:** Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions.

### UNIT - II: Expectation and discrete distributions                        10 L
Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem.
**Discrete Probability Distributions:** Binomial Distribution, Poisson distribution.

### UNIT - III: Continuous and Sampling Distributions                        10 L
Uniform Distribution, Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial Distributions.
**Fundamental Sampling Distributions:** Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, t - Distribution, F- Distribution.

### UNIT - IV: Sample Estimation & Tests of Hypotheses                        10 L
Introduction, Statistical Inference, Classical Methods of Estimation, Single Sample: Estimating the mean, standard error of a point estimate, prediction interval. Two sample: Estimating the difference between two means, Single sample: Estimating a proportion, Two samples: Estimating the difference between two proportions, Two samples: Estimating the ratio of two variances.
**Statistical Hypotheses:** General Concepts, Testing a Statistical Hypothesis, Single sample: Tests concerning a single mean, Two samples: tests on two means, One sample: test on a single proportion. Two samples: tests on two proportions, Two- sample tests concerning variances.

### UNIT-V: Stochastic Processes and Markov Chains                            8L
Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, n-step transition probabilities, Markov chain, Steady state condition, Markov analysis.

**TEXT BOOKS:**

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics For Engineers & Scientists, 9th Ed. Pearson Publishers.

2. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.

3. S.D.Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi.

**REFERENCE BOOKS:**

1. T.T. Soong, Fundamentals of Probability and Statistics For Engineers, John Wiley & Sons, Ltd, 2004.

2. Sheldon M Ross, Probability and statistics for Engineers and scientists, academic press.

3. Miller and Freund's, Probability and Statistics for Engineers, 8th Edition, Pearson Educations.

## PCY304PC: COMPUTER ORGANIZATION AND ARCHITECTURE

**B.Tech. II Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Co-requisite:** A Course on "Digital Electronics".
**Pre-requisite:** Basic skills in "IT Workshop"

**Course Objectives**
- The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
- It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
- Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

**Course Outcomes:**
1. Understand the basics of instruction sets and their impact on processor design.
2. Demonstrate an understanding of the design of the functional units of a digital computer system.
3. Evaluate cost performance and design trade-offs in designing and constructing a computerprocessor including memory.
4. Design a pipeline for consistent execution of instructions with minimum hazards.
5. Recognize and manipulate representations of numbers stored in digital computers

## UNIT - I
Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.
Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.
Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

## UNIT - II
Microprogrammed Control: Control memory, Address sequencing, micro program example, design of control unit.
Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

## UNIT - III
Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.
Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating - point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

## UNIT - IV
Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.
Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

## UNIT - V
Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.

Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor arbitration, Interprocessor communication and synchronization, Cache Coherence.

**TEXT BOOK:**

1. Computer System Architecture – M. Morris Mano, Third Edition, Pearson/PHI.

**REFERENCE BOOKS:**

1. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, V th Edition, McGraw Hill.
2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
3. Structured Computer Organization – Andrew S. Tanenbaum, 4 th Edition, PHI/Pearson.

## PCY305PC: OBJECT ORIENTED PROGRAMMING THROUGH JAVA

**B.Tech. II Year I Sem.**                                                         L  T  P  C
                                                                                   3  0  0  3

### Course Objectives

- To Understand the basic object-oriented programming concepts and apply them in problem solving.
- To Illustrate inheritance concepts for reusing the program.
- To Demonstrate multitasking by using multiple threads and event handling
- To Develop data-centric applications using JDBC.
- To Understand the basics of java console and GUI based programming

### Course Outcomes:

1. Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
2. Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
3. Use multithreading concepts to develop inter process communication.
4. Understand the process of graphical user interface design and implementation using AWT or swings.
5. Develop applets that interact abundantly with the client environment and deploy on the server.

### UNIT - I

Object oriented thinking and Java Basics- Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. A way of viewing world - Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

### UNIT - II

Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring java.io.

### UNIT - III

Exception handling and Multithreading– Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception subclasses. String handling, Exploring java.util. Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads. Enumerations, autoboxing, annotations, generics.

### UNIT - IV

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, checkbox groups, choices,

lists panels - scrollpane, dialogs, menubar, graphics, layout manager - layout manager types - border, grid, flow, card and grid bag.

## UNIT - V

Applets - Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets. Swing - Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons - The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

## TEXT BOOKS:

1. Java the complete reference, 7th edition, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson education.

## REFERENCE BOOKS:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley & sons.
2. An Introduction to OOP, third edition, T. Budd, Pearson education.
3. Introduction to Java programming, Y. Daniel Liang, Pearson education.
4. An introduction to Java programming and object-oriented application development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education
7. Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH.
8. Java and Object Orientation, an introduction, John Hunt, second edition, Springer. 9. Maurach's Beginning Java2 JDK 5, SPD.

## PCY306PC: DATA STRUCTURES LAB

**B.Tech. II Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

**Prerequisites:** A Course on "Programming for problem solving".

**Course Objectives:**
- It covers various concepts of C programming language
- It introduces searching and sorting algorithms
- It provides an understanding of data structures such as stacks and queues.

**Course Outcomes:**
1. Develop a program using linear data structures such as array and circular queue
2. Develop a program for basic operations of Stack and its applications
3. Construct a program using Non-linear data structures and their applications such as trees and graphs
4. Construct a program using linear data structures for Linked Lists
5. Ability to implement searching and sorting algorithms.

### List of Experiments:

1. Write a program that uses functions to perform the following operations on singly linked list.:
   i) Creation    ii) Insertion    iii) Deletion    iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.:
   i) Creation    ii) Insertion    iii) Deletion    iv) Traversal
3. Write a program that uses functions to perform the following operations on circular linked list.:
   i) Creation    ii) Insertion    iii) Deletion    iv) Traversal
4. Write a program that implement stack (its operations) using
   i) Arrays    ii) Pointers
5. Write a program that implement Queue (its operations) using
   i) Arrays    ii) Pointers
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
   i) Quick sort    ii) Heap sort    iii) Merge sort
7. Write a program to implement the tree traversal methods( Recursive and Non Recursive).
8. Write a program to implement
   i) Binary Search tree    ii) B Trees    iii) B+ Trees    iv)    AVL trees    v) Red - Black trees
9. Write a program to implement the graph traversal methods.
10. Implement a Pattern matching algorithms using Boyer- Moore, Knuth-Morris-Pratt

**TEXT BOOKS:**
1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C - A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.

**REFERENCE BOOK:**
1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.

## PCY307PC: OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

**B.Tech. II Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

**Course Objectives:**
- To write programs using abstract classes.
- To write programs for solving real world problems using the java collection framework.
- To write multithreaded programs.
- To write GUI programs using swing controls in Java.
- To introduce java compiler and eclipse platform.
- To impart hands-on experience with java programming.

**Course Outcomes:**
1. Able to write programs for solving real world problems using the java collection framework.
2. Able to write programs using abstract classes.
3. Develop Simple Java Programs using inheritance and Exception Handling.
4. Able to write multithreaded programs.
5. Able to write GUI programs using swing controls in Java.

**Note:**
1. Use LINUX and MySQL for the Lab Experiments. Though not mandatory, encourage the use of the Eclipse platform.

2. The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list as needed.

**List of Experiments:**
1. Use Eclipse or Net bean platform and acquaint yourself with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.

2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.

3. A) Develop an applet in Java that displays a simple message.
B) Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.

4. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.

5. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.

6. Write a Java program for the following:
Create a doubly linked list of elements.

Delete a given element from the above list.
Display the contents of the list after deletion.

7. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in the selected color. Initially, there is no message shown.

8. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

9. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.

10. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).

11. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).

12. Write a Java program that correctly implements the producer - consumer problem using the concept of inter thread communication.

13. Write a Java program to list all the files in a directory including the files present in all its subdirectories.

**REFERENCE BOOKS:**
1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.
3. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.
4. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell, Pearson.
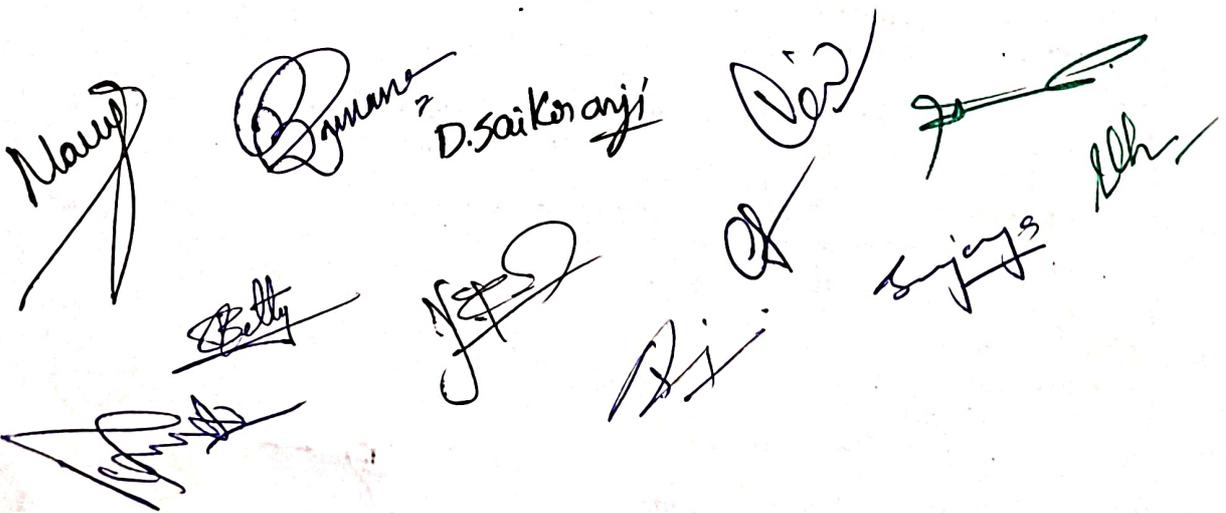
## PCY308PC: DATA VISUALIZATION - R PROGRAMMING/ POWER BI

**B.Tech. II Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objectives:**
- Effective use of Business Intelligence (BI) technology (Tableau) to apply data visualization
- To discern patterns and relationships in the data.
- To build Dashboard applications.
- To communicate the results clearly and concisely.
- To be able to work with different formats of data sets.

**Course Outcomes:** At the end of the course a student should be able to
1. Understand How to import data into Tableau.
2. Understand Tableau concepts of Dimensions and Measures.
3. Develop Programs and understand how to map Visual Layouts and Graphical Properties.
4. Create a Dashboard that links multiple visualizations.
5. Use graphical user interfaces to create Frames for providing solutions to real world problems.

**Lab Problems:**

1. Understanding Data, What is data, where to find data, Foundations for building Data Visualizations, Creating Your First visualization?

2. Getting started with Tableau Software using Data file formats, connecting your Data to Tableau, creating basic charts(line, bar charts, Tree maps),Using the Show me panel.

3. Tableau Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom calculations and fields.

4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Tools and Menus, Formatting specific parts of the view.

5. Editing and Formatting Axes, Manipulating Data in Tableau data, Pivoting Tableau data.

6. Structuring your data, Sorting and filtering Tableau data, Pivoting Tableau data.

7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using the Size panels, customizing filters, Using and Customizing tooltips, Formatting your data with colors.

8. Creating Dashboards &amp; Storytelling, creating your first dashboard and Story, Design for different displays, adding interactivity to your Dashboard, Distributing &amp; Publishing your Visualization.

9. Tableau file types, publishing to Tableau Online, Sharing your visualizations, printing, and Exporting.

10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.

**REFERENCE BOOKS:**
1. Microsoft Power BI cookbook, Brett Powell, 2nd edition.
2. R Programming for Data Science by Roger D. Peng (References)
3. The Art of R Programming by Norman Matloff Cengage Learning India.

## *PMC309: GENDER SENSITIZATION LAB

**B.Tech. II Year I Sem.**                                             L T P C
                                                                       0 0 2 0

### COURSE DESCRIPTION
This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies - to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

### Objectives of the Course
- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

### Learning Outcomes
➢ Students will have developed a better understanding of important issues related to gender in contemporary India.
➢ Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
➢ Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
➢ Students will acquire insight into the gendered division of labor and its relation to politics and economics.
➢ Men and women students and professionals will be better equipped to work and live together as equals.
➢ Students will develop a sense of appreciation of women in all walks of life.
➢ Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

### Unit-I: UNDERSTANDING GENDER
Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

## Unit – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

## Unit – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

## Unit – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".
Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life_."

## Unit – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

Note: Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.
  ➢ *Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".*

  - ESSENTIAL READING: The Textbook, "*Towards a World of Equals: A Bilingual Textbook on Gender*" written by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Akademi, Telangana Government in 2015.

ASSESSMENT AND GRADING:
  • Discussion & Classroom Participation: 20%
  • Project/Assignment: 30%
  • End Term Exam: 50%

## PCY401PC: DISCRETE MATHEMATICS

**B.Tech. II Year II Sem.**

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**Course Objectives:**
- Introduces elementary discrete mathematics for computer science and engineering.
- Topics include formal logic notation, methods of proof, induction, sets, relations, algebraic structures, elementary graph theory, permutations and combinations, counting principles; recurrence relations and generating functions.

**Course Outcomes:**
1. Understand and construct precise mathematical proofs
2. Apply logic and set theory to formulate precise statements
3. Analyze and solve counting problems on finite and discrete structures
4. Describe and manipulate sequences
5. Apply graph theory in solving computing problems

**UNIT - I**
**Mathematical logic:** Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

**UNIT - II**
**Set theory:** Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

**UNIT - III**
**Algebraic Structures:** Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as Partially Ordered Sets, Boolean Algebra.

**UNIT - IV**
**Elementary Combinatorics:** Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems, The Principle of Exclusion.

**UNIT - V**
**Graph Theory:** Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

**TEXT BOOKS:**
1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe I. Mott, Abraham Kandel, Teodore P. Baker, Prentis Hall of India, 2nd ed.

**REFERENCE BOOKS:**
1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

## PSM402MS: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

**B.Tech. II Year II Sem.**                                                          L  T  P  C
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**Course Objective:** To learn the basic business types, impact of the economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

**Course Outcome:**

1. The students will understand the various Forms of Business and the impact of economic variables on the Business.
2. Understand the elasticity of the demand of the product, different types, and measurement of elasticity of demand and factors influencing on elasticity of demand and supply
3. Recognize the Production function, features of Iso- Quants and IsoCosts, Market Structure, Pricing aspects are learnt
4. The Students can study the firm's financial position by analyzing the Financial Statements of a Company.
5. Evaluate different types of financial ratios knowing liquidity, solvency and profitability position of business.

**Unit – I: Introduction to Business and Economics .**
**Business:** Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.
**Economics:** Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply and Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

**UNIT - II: Demand and Supply Analysis**
**Elasticity of Demand:** Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.
**Supply Analysis:** Determinants of Supply, Supply Function and Law of Supply.

**UNIT - III: Production, Cost, Market Structures & Pricing**
**Production Analysis:** Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.
**Cost analysis:** Types of Costs, Short run and Long run Cost Functions.
**Market Structures:** Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition. **Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

**UNIT - IV: Financial Accounting:** Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts (Simple Problems).

**UNIT - V: Financial Ratios Analysis:** Concept of Ratio Analysis, Importance and Types of Ratios, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios - Analysis and Interpretation (simple problems).

**TEXT BOOKS:**

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata Mc -Graw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012.

**REFERENCE BOOKS:**

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

## PCY403PC: OPERATING SYSTEMS

**B.Tech. II Year II Sem.**

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**Prerequisites:**
1. A course on "Computer Programming and Data Structures".
2. A course on "Computer Organization and Architecture".

**Course Objectives:**
- Introduce operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
- Introduce the issues to be considered in the design and development of operating system
- Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

**Course Outcomes:**
1. Understand the concepts of OS, the basic principles used in the design of modern operating system and process.
2. Understand the concepts related to deadlock and memory management.
3. Understand the concepts of threads and mechanisms for synchronization.
4. Understand the concepts of virtual memory management.
5. Understand the concepts of secondary storage structure, protection and case study of Linux operating system.

**UNIT - I**

**Operating System - Introduction**, Structures - Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls
**Process -** Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

**UNIT - II**

**CPU Scheduling** - Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec
**Deadlocks -** System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

**UNIT - III**

**Process Management and Synchronization -** The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors
**Interprocess Communication Mechanisms:** IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

**UNIT - IV**

**Memory Management and Virtual Memory -** Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

**UNIT - V**

**File System Interface and Operations** -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl system calls.

**TEXT BOOKS:**

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.

**REFERENCE BOOKS:**

1. Operating Systems- Internals and Design Principles, William Stallings, Fifth Edition-2005, Pearson Education/PHI
2. Operating System A Design Approach- Crowley, TMH.
3. Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI
4. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education
5. UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.

## PCY404PC: COMPUTER NETWORKS

**B.Tech. II Year II Sem.**

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**Pre-requisites:**
1. A course on "Programming for problem solving".
2. A course on "Data Structures".

**Course Objectives**
- The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
- Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

**Course Outcomes:**
1. Gain the knowledge of the basic computer network technology.
2. Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
3. Obtain the skills of subnetting and routing mechanisms.
4. Familiarity with the essential protocols of computer networks, and how they can be applied innetwork design and implementation.
5. understand and implement the different types of protocols.

### UNIT - I
Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.
Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless Transmission.
Data link layer: Design issues, framing, Error detection and correction.

### UNIT - II
Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channels.
Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols.
Medium Access sublayer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

### UNIT - III
Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

### UNIT - IV
Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

### UNIT - V
Application Layer -Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.

**TEXT BOOK:**
1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

**REFERENCE BOOKS:**
1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking - Behrouz A. Forouzan. Third Edition TMH.

## PCY405PC: SOFTWARE ENGINEERING

**B.Tech. II Year II Sem.**

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**Course Objectives**

- The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
- Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

**Course Outcomes:**

1. Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).

2. Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.

3. Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

4. Understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.

5. ⋅ Identify and apply appropriate software architectures and patterns

**UNIT - I**
**Introduction to Software Engineering**: The evolving role of software, changing nature of software, software myths. **A Generic view of process**: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI). **Process models**: The waterfall model, Spiral model and Agile methodology

**UNIT - II**
**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.

**UNIT - III**
**Design Engineering**: Design process and design quality, design concepts, the design model.
Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

**UNIT - IV**
**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.
**Metrics for Process and Products:** Software measurement, metrics for software quality.

**UNIT - V**
**Risk management:** Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM. **Quality Management:** Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

**TEXT BOOKS:**

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.

**REFERENCE BOOKS:**

1. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
3. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.
4. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

## PCY406PC: OPERATING SYSTEMS LAB

**B.Tech. II Year II Sem.**

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**Prerequisites:** A course on "Programming for Problem Solving", A course on "Computer Organization and Architecture".

**Co-requisite:** A course on "Operating Systems".

**Course Objectives:**
- To provide an understanding of the design aspects of operating system concepts through simulation
- Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

**Course Outcomes:**
1. Implement the basic command of OS and will execute the various system calls.
2. Implement the process synchronization problem using semaphore.
3. Implement CPU scheduling algorithm for process scheduling and deadlock management techniques.
4. Implement memory management techniques.
5. Implement file storage allocation techniques.

**List of Experiments:**

1. Write C programs to simulate the following CPU Scheduling algorithms a) FCFS b) SJF c) Round Robin d) priority

2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close, fcntl, seek, stat, opendir, readdir)

3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.

4. Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls.

5. Write C programs to illustrate the following IPC mechanisms a) Pipes b) FIFOs c) Message Queues d) Shared Memory

6. Write C programs to simulate the following memory management techniques a) Paging b) Segmentation

7. Write C programs to simulate Page replacement policies a) FCFS b) LRU c) Optimal

**TEXT BOOKS:**
1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the Unix environment, W.R.Stevens, Pearson education.

**REFERENCE BOOKS:**
1. Operating Systems - Internals and Design Principles, William Stallings, Fifth Edition-2005, Pearson Education/PHI
2. Operating System - A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum, 2nd edition, Pearson/PHI
4. UNIX Programming Environment, Kernighan and Pike, PHI/Pearson Education
5. UNIX Internals: The New Frontiers, U. Vahalia, Pearson Education

## PCY407PC: COMPUTER NETWORKS LAB

**B.Tech. II Year II Sem.**

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**Course Objectives:**
1. To understand the working principle of various communication protocols.
2. To understand the network simulator environment and visualize a network topology and observe its performance
3. To analyze the traffic flow and the contents of protocol frames

**Course Outcomes:**
1. Implement data link layer farming methods
2. Analyze error detection and error correction codes.
3. Implement and analyze routing and congestion issues in network design.
4. Implement Encoding and Decoding techniques used in presentation layer
5. To be able to work with different network tools

**List of Experiments:**
1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijsktra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting techniques used in buffers.
10. **Wireshark**
    i. Packet Capture Using Wire shark
    ii. Starting Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics & Filters.
11. How to run Nmap scan
12. Operating System Detection using Nmap
13. Do the following using NS2 Simulator
    i. NS2 Simulator-Introduction
    ii. Simulate to Find the Number of Packets Dropped
    iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    iv. Simulate to Find the Number of Packets Dropped due to Congestion
    v. Simulate to Compare Data Rate & Throughput.
    vi. Simulate to Plot Congestion for Different Source/Destination
    vii. Simulate to Determine the Performance with respect to Transmission of Packets

**TEXT BOOKS:**
1. Computer Networks, Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

**REFERENCE BOOKS:**
- An Engineering Approach to Computer Networks, S.Keshav, 2nd Edition, Pearson Education
- Data Communications and Networking - Behrouz A. Forouzan. 3rd Edition, TMH.

## PCY409PC: NODE JS/ REACT JS/ DJANGO

**B.Tech. II Year II Sem.**

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**Prerequisites:** Object Oriented Programming through Java, HTML Basics

**Course Objectives:**
- To implement the static web pages using HTML and do client side validation using JavaScript.
- To design and work with databases using Java
- To develop an end to end application using java full stack.
- To introduce Node JS implementation for server side programming.
- To experiment with single page application development using React.

**Course Outcomes:** At the end of the course, the student will be able to,
1. Build a custom website with HTML, CSS, and Bootstrap and little JavaScript.
2. Demonstrate Advanced features of JavaScript and learn about JDBC
3. Develop Server – side implementation using Java technologies like
4. Develop the server – side implementation using Node JS.
5. Design a Single Page Application using React.

**Exercises:**
1. Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3 features, flex and grid.
2. Make the above web application responsive web application using Bootstrap framework.
3. Use JavaScript for doing client – side validation of the pages implemented in experiment 1 and experiment 2.
4. Explore the features of ES6 like arrow functions, callbacks, promises, async/await. Implement an application for reading the weather information from openweathermap.org and display the information in the form of a graph on the web page.
5. Develop a java stand alone application that connects with the database (Oracle / mySql) and perform the CRUD operation on the database tables.
6. Create an xml for the bookstore. Validate the same using both DTD and XSD.
7. Design a controller with servlet that provides the interaction with application developed in experiment 1 and the database created in experiment 5.
8. Maintaining the transactional history of any user is very important. Explore the various session tracking mechanism (Cookies, HTTP Session)
9. Create a custom server using http module and explore the other modules of Node JS like OS, path, event.
10. Develop an express web application that can interact with REST API to perform CRUD operations on student data. (Use Postman)
11. For the above application create authorized end points using JWT (JSON Web Token).
12. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.
13. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation using chart.js
14. Create a TODO application in react with necessary components and deploy it into github.

**REFERENCE BOOKS:**
1. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2nd Edition, 2008.
3. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, 2nd Edition, A Press.

## *PMC410: CONSTITUTION OF INDIA

**B.Tech. II Year II Sem.**

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**Course Objectives:** Students will be able to:
- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

**Course Outcomes:** Students will be able to:
- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
- Discuss the passage of the Hindu Code Bill of 1956.

**Unit - 1** History of Making of the Indian Constitution- History of Drafting Committee.
**Unit - 2** Philosophy of the Indian Constitution- Preamble Salient Features
**Unit - 3** Contours of Constitutional Rights & Duties - Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

**Unit - 4** Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

**Unit - 5** Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO ZilaPanchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

**Unit - 6** Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

**Suggested Reading:**
1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

# PALLAVI ENGINEERING COLLEGE HYDERABAD
## Kuntloor, Abdullapurmet (M), RR Dist., Telangana-505505
## CSE-CYBER SECURITY
## COURSE STRUCTURE –PR24

### III YEAR – I SEMESTER

| S. No | Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | PCY501PC | Network Security and Cryptography | 3 | 1 | 0 | 4 |
| 2 | PCY502PC | Database Management Systems | 3 | 0 | 0 | 3 |
| 3 | PCY503PC | Formal Languages and Automata Theory | 3 | 0 | 0 | 3 |
| 4 | | Professional Elective – I | 3 | 0 | 0 | 3 |
| 5 | | Professional Elective – II | 3 | 0 | 0 | 3 |
| 6 | PCY504PC | Network Security and Cryptography Lab | 0 | 0 | 2 | 1 |
| 7 | PCY505PC | Database Management Systems Lab | 0 | 0 | 2 | 1 |
| 8 | PEN508HS | Advanced English Communication Skills Lab | 0 | 0 | 2 | 1 |
| 9 | PCY506PC | UI design-Flutter | 0 | 0 | 2 | 1 |
| 10 | *PMC510 | Intellectual Property Rights | 3 | 0 | 0 | 0 |
| | | **Total** | 18 | 1 | 8 | 20 |

### III YEAR – II SEMESTER

| S. No | Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | PCY601PC | Cyber Security Essentials | 3 | 0 | 0 | 3 |
| 2 | PCY602PC | Cyber Crime Investigation & Digital Forensics | 3 | 0 | 0 | 3 |
| 3 | PCY603PC | Algorithms Design and Analysis | 3 | 0 | 0 | 3 |
| 4 | | Professional Elective – III | 3 | 0 | 0 | 3 |
| 5 | | Open Elective – I | 3 | 0 | 0 | 3 |
| 6 | PCY604PC | Cyber Security Essentials Lab | 0 | 0 | 2 | 1 |
| 7 | PCY605PC | Cyber Crime Investigation & Digital Forensics Lab | 0 | 0 | 2 | 1 |
| 8 | | Professional Elective – III Lab | 0 | 0 | 2 | 1 |
| 9 | PCY606PC | Industrial Oriented Mini Project / Summer Internship/ Skill Development Course (Big data Spark) | 0 | 0 | 4 | 2 |
| 10 | *PMC609 | Environmental Science | 3 | 0 | 0 | 0 |
| | | **Total** | 18 | 0 | 10 | 20 |

**Environmental Science in III Yr II Sem Should be Registered by Lateral Entry Students Only.**

# PALLAVI ENGINEERING COLLEGE HYDERABAD
## Kuntloor, Abdullapurmet (M), RR Dist., Telangana-505505
### CSE-CYBER SECURITY
### COURSE STRUCTURE –PR24

### IV YEAR – I SEMESTER

| S. No | Code | Course Title | L | T | P | Credits |
|-------|------|-------------|---|---|---|---------|
| 1 | PCY701PC | Vulncrability Assessment & Penetration Testing | 3 | 0 | 0 | 3 |
| 2 | PCY702PC | Network Management Systems and Operations | 3 | 0 | 0 | 3 |
| 3 | | Professional Elective – IV | 3 | 0 | 0 | 3 |
| 4 | | Professional Elective – V | 3 | 0 | 0 | 3 |
| 5 | | Open Elective – II | 3 | 0 | 0 | 3 |
| 6 | PCY703PC | Vulnerability Assessment & Penetration Testing Lab | 0 | 0 | 2 | 1 |
| 7 | PCY704PC | Network Management Systems and Operations Lab | 0 | 0 | 2 | 1 |
| 8 | PCY705PC | Project Stage – I | 0 | 0 | 6 | 3 |
| | | **Total** | **15** | **0** | **10** | **20** |

### IV YEAR – II SEMESTER

| S. No | Code | Course Title | L | T | P | Credits |
|-------|------|-------------|---|---|---|---------|
| 1 | PCY80iPC | Organizational Behavior | 3 | 0 | 0 | 3 |
| 2 | | Professional Elective – VI | 3 | 0 | 0 | 3 |
| 3 | | Open Elective – III | 3 | 0 | 0 | 3 |
| 4 | PCY802PC | Project Stage – II including Seminar | 0 | 0 | 22 | 11 |
| | | **Total** | **6** | **0** | **16** | **20** |

### *PMC – Satisfactory/Unsatisfactory

#### Professional Elective – I

| | |
|--|--|
| PCY511PE | Compiler Design |
| PCY512PE | Artificial Intelligence |
| PCY513PE | Data warehousing and Data Mining |
| PCY514PE | Ad-hoc & Sensor Networks |
| PCY515PE | Cloud Computing |

#### Professional Elective - II

| | |
|--|--|
| PCY521PE | Ethical Hacking |
| PCY522PE | Data Science |
| PCY523PE | Distributed Systems |
| PCY524PE | Cyber Laws |
| PCY525PE | IoT Security |

# PALLAVI ENGINEERING COLLEGE HYDERABAD
## Kuntloor, Abdullapurmet (M), RR Dist., Telangana-505505
## CSE-CYBER SECURITY
## COURSE STRUCTURE –PR24

### Professional Elective - III

| PCY631PE | Mobile Application Security |
|---|---|
| PCY632PE | Machine Learning |
| PCY633PE | DevOps |
| PCY634PE | Blockchain Technology |
| PCY635PE | Mobile Application Development |

# Courses in PE - III and PE - III Lab must be in 1-1 correspondence.

### Professional Elective -IV

| PCY741PE | Edge Analytics |
|---|---|
| PCY742PE | Web & Database Security |
| PCY743PE | Information System Audit & Assurance |
| PCY744PE | Social Media Security |
| PCY745PE | Deep Learning |

### Professional Elective -V

| PCY751PE | Quantum Computing |
|---|---|
| PCY752PE | Data Analytics for Fraud Detection |
| PCY753PE | 5G Technologies |
| PCY754PE | Security Incident & Response Management (SOC) |
| PCY755PE | Authentication Techniques |

### Professional Elective – VI

| PCY861PE | Quantum Cryptography |
|---|---|
| PCY862PE | IoT Cloud Processing and Analytics |
| PCY863PE | Cloud Security |
| PCY864PE | Digital Watermarking and Steganography |
| PCY865PE | Data Privacy |

**Open Elective I:**
1. PCY611OE: Cyber Laws
2. PCY612OE: Ethical Hacking

**Open Elective II:**
1. PCY721OE: Information System Audit & Assurance
2. PCY722OE: Social Media Security

**Open Elective III:**
1. PCY861OE: Data Privacy
2. PCY862OE: 5G Technologies

**PALLAVI ENGINEERING COLLEGE HYDERABAD**
**B.Tech. in COMPUTER SCIENCE AND ENGINEERING (CYBER SECURITY)**
**COURSE STRUCTURE & SYLLABUS (PR24 Regulations)**
**Applicable from AY 2024-25 Batch**

## PCY501PC: NETWORK SECURITY AND CRYPTOGRAPHY

**B.Tech. III Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Course Objectives:**
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection

**Course Outcomes:**
- Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.
- Ability to identify information system requirements for both of them such as client and server.
- Ability to understand the current legal issues towards information security.

**UNIT - I**
**Security Concepts:** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security
**Cryptography Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

**UNIT - II**
**Symmetric key Ciphers:** Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.
**Asymmetric key Ciphers:** Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

**UNIT - III**
**Cryptographic Hash Functions:** Message Authentication, Secure Hash Algorithm (SHA-512),
**Message authentication codes:** Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.
**Key Management and Distribution:** Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

**UNIT - IV**
**Transport-level Security:** Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)
**Wireless Network Security:** Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

**UNIT - V**
**E-Mail Security:** Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security

## PCY502PC: DATABASE MANAGEMENT SYSTEMS

**B.Tech. III Year I Sem.**

L  T  P  C
3  0  0  3

**Prerequisites**: A course on "Data Structures".

**Course Objectives:**
- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

**Course Outcomes:**
- Gain knowledge of fundamentals of DBMS, database design and normal forms
- Master the basics of SQL for retrieval and management of data.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques

### UNIT - I

**Database System Applications**: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS
**Introduction to Database Design:** Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

### UNIT - II

**Introduction to the Relational Model:** Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views.
Relational Algebra, Tuple relational Calculus, Domain relational calculus.

### UNIT - III

**SQL:** QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases.
**Schema Refinement:** Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, First, Second, Third normal forms, BCNF, lossless join decomposition, multivalued dependencies, Fourth normal form, Fifth normal form.

### UNIT - IV

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions.

### UNIT - V

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes- Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

### TEXT BOOKS:
1. Database System Concepts, Silberschatz, Korth, McGraw hill, V edition.3rd Edition

architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange

**Case Studies on Cryptography and security:** Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

### TEXT BOOKS:
1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

### REFERENCE BOOKS:
1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

## PCY503PC: FORMAL LANGUAGES AND AUTOMATA THEORY

**B.Tech. III Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

### Course Objectives
- To provide introduction to some of the central ideas of theoretical computer science from the perspective of formal languages.
- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- Classify machines by their power to recognize languages.
- Employ finite state machines to solve problems in computing.
- To understand deterministic and non-deterministic machines.
- To understand the differences between decidability and undecidability.

### Course Outcomes
- Understand the concept of abstract machines and their power to recognize the languages.
- Employ finite state machines for modeling and solving computing problems.
- Design context free grammars for formal languages.
- Distinguish between decidability and undecidability.

### UNIT - I
**Introduction to Finite Automata:** Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.
**Nondeterministic Finite Automata:** Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.
**Deterministic Finite Automata:** Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA, Moore and Melay machines

### UNIT - II
**Regular Expressions:** Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.
**Pumping Lemma for Regular Languages**, Statement of the pumping lemma, Applications of the Pumping Lemma.
**Closure Properties of Regular Languages:** Closure properties of Regular languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.

### UNIT - III
**Context-Free Grammars:** Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.
**Push Down Automata:** Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state, Acceptance by empty stack, Deterministic Pushdown Automata. From CFG to PDA, From PDA to CFG.

### UNIT - IV
**Normal Forms for Context- Free Grammars:** Eliminating useless symbols, Eliminating €-Productions. Chomsky Normal form Greibach Normal form.
**Pumping Lemma for Context-Free Languages:** Statement of pumping lemma, Applications
**Closure Properties of Context-Free Languages:** Closure properties of CFL's, Decision Properties of CFL's Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill

## REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

## PCY511PE: COMPILER DESIGN (Professional Elective –I)

**B.Tech. III Year I Sem.**

    **L  T  P  C**
    **3  0  0  3**

**Prerequisites**
1. A course on "Formal Languages and Automata Theory".
2. A course on "Computer Organization and architecture".
3. A course on "Data Structures".

**Course Objectives:**
- Introduce the major concepts of language translation and compiler design and impart the
- knowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, code optimization techniques, intermediate code generation, code generation and data flow analysis.

**Course Outcomes:**
- Demonstrate the ability to design a compiler given a set of language features.
- Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
- Acquire skills in using lex tool & yacc tool for developing a scanner and parser.
- Design and implement LL and LR parsers
- Design algorithms to do code optimization in order to improve the performance of a program in terms of space and time complexity.
- Design algorithms to generate machine code.

**UNIT - I**
**Introduction:** The structure of a compiler, the science of building a compiler, programming language basics
**Lexical Analysis:** The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers.

**UNIT - II**
**Syntax Analysis:** Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars and Parser Generators.

**UNIT - III**
**Syntax-Directed Translation:** Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.
**Intermediate-Code Generation:** Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Switch-Statements, Intermediate Code for Procedures.

**UNIT - IV**
**Run-Time Environments:** Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection.
**Code Generation:** Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation

**UNIT - V**

**Types of Turing machine:** Turing machines and halting

**Undecidability:** Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem, Modified Post Correspondence problem, Other Undecidable Problems, Counter machines.

**TEXT BOOKS:**
1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2nd edition, PHI.

**REFERENCE BOOKS:**
1. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Textbook on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.
5. Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan, Rama R, Pearson.

**PCY512PE: ARTIFICIAL INTELLIGENCE (Professional Elective –I)**

**B.Tech. III Year I Sem.**

```
L  T  P  C
3  0  0  3
```

**Prerequisites:**
1. Programming for problem solving, Data Structures.

**Course Objectives:**
- To learn the distinction between optimal reasoning Vs. human like reasoning
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

**Course Outcomes:**
- Understand search strategies and intelligent agents
- Understand different adversarial search techniques
- Apply propositional logic, predicate logic for knowledge representation
- Apply AI techniques to solve problems of game playing, and machine learning.

**UNIT - I**

Introduction to AI, Intelligent Agents, problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces

**UNIT - II**
**Problem Solving by Search-II and Propositional Logic**
**Adversarial Search:** Games, Optimal Decisions in Games, Alpha-Beta Pruning, Imperfect Real-Time Decisions. Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems. Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

**UNIT - III**
**Logic and Knowledge Representation**
**First-Order Logic:** Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.
**Inference in First-Order Logic:** Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

**UNIT - IV**
**Knowledge Representation:** Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.
**Classical Planning:** Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

**UNIT - V**

**Machine-Independent Optimization:** The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops In Flow Graphs.

**TEXT BOOK:**

1.  Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman.

**REFERENCE BOOKS:**

1.  Lex & Yacc - John R. Levine, Tony Mason, Doug Brown, O'reilly
2.  Compiler Construction, Louden, Thomson.

**PCY513PE: DATA WAREHOUSING AND DATA MINING (Professional Elective – I)**

**B.Tech. III Year I Sem.**                                                  L  T  P  C
                                                                             3  0  0  3

**Pre-Requisites:**
1. Database Management System
2. Probability and Statistics

**Course Objectives:**
- Students will become acquainted with both the strengths and limitations of various data mining techniques like Association, Classification, Cluster and Outlier analysis. Understand Data warehouse and OLAP tools and architectures.

**Course Outcomes:**
- Understand the need of data mining and pre-processing techniques.
- Identify data warehouse models, architectures and schemas for enterprise applications.
- Perform market basket analysis using association rule mining.
- Understanding various classification models.
- Identify appropriate clustering and outlier detection techniques to handle complex data.

**UNIT - I**
**Introduction to Data Mining:**
Data mining, Kinds of Data, Knowledge Discovery process, Data Mining Functionalities-Kinds of Patterns mined, Major Issues in Data Mining. Data Pre-processing: Descriptive Data summarization, Data Cleaning, Data Integration & Transformation, Data Reduction, Data Discretization.

**UNIT- II**
**Data Warehouse and OLAP:**
Data Warehouse basic concepts, Differences between Operational Database Systems and Data Warehouses, multidimensional Data model, data warehouse architecture.

**UNIT- III**
**Mining frequent patterns, associations and correlations:** Basic Concepts, Market Basket Analysis, Apriori Algorithm, FP-growth, mining various kinds of association rules, From Association Analysis to Correlation Analysis.

**UNIT- IV**
**Classification and prediction:** Basic Concepts, issues regarding classification and prediction, Decision Tree Induction, Bayesian Classification, Rule-Based Classification, classification by backpropagation, lazy learners, prediction: linear regression, nonlinear regression, evaluating accuracy of a classifier or predictor

**UNIT- V**
**Cluster Analysis:** Requirements for Cluster Analysis, Overview of Basic Clustering Methods, Partitioning Methods-k-Means, k-Medoids, Hierarchical Methods-AGENES, DIANA, BIRCH, Density-Based Method-DBSCAN, Outlier Analysis.

**TEXT BOOKS:**
1. Jiawei Han, Micheline Kamber, Jian Pei., Data Mining: Concepts and Techniques, 2nd/3rd Edition, Morgan Kaufmann/Elsevier, 2012.
2. Margaret H Dunham., Data Mining Introductory and Advanced Topics, 2nd Edition, Pearson Education India, 2006.

**REFERENCE BOOKS:**
1. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
2. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne and Vipin Kumar., Introduction to Data Mining, 2nd Edition, Pearson Education India, 2021.
3. Amitesh Sinha., Data Warehousing, Thomson Learning, India, 2007.

**UNIT - V**

**Uncertain knowledge and Learning Uncertainty:** Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use

**Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

**TEXT BOOK:**

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

**REFERENCE BOOKS:**

1. Artificial Intelligence, 3rd Edn, E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henry Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education

**PCY514PE: AD HOC & SENSOR NETWORKS (Professional Elective – I)**

**B.Tech. III Year I Sem.**

```
L  T  P  C
3  0  0  3
```

**Prerequisites**
- Computer Networks
- Distributed Systems
- Mobile Computing

**Course Objectives**
- To understand the challenges of routing in ad-hoc and sensor networks
- To understand various broadcast, mutlicast and geocasting protocols in ad hoc and sensor networks
- To understand basics of Wireless sensors, and Lower Layer Issues and Upper Layer Issues of WSN

**Course Outcomes**
- Understand the concepts of sensor networks and applications
- Understand and compare the MAC and routing protocols for adhoc networks
- Understand the transport protocols of sensor networks

**UNIT - I**
**Introduction to Ad Hoc Networks**
Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.
**Routing in MANETs**
Criteria for classification, Taxonomy of MANET routing algorithms, *Topology-based* routing algorithms-Proactive: DSDV, WRP; Reactive: DSR, AODV, TORA; Hybrid: ZRP; *Position- based* routing algorithms-Location Services-DREAM, Quorum-based, GLS; Forwarding Strategies, Greedy Packet, Restricted Directional Flooding-DREAM, LAR; Other routing algorithms-QoS Routing, CEDAR.

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

**UNIT - III**
**Geocasting**
Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR.
TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

**UNIT - IV**
**Basics of Wireless Sensors and Lower Layer Issues**-Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

**UNIT - V**
**Upper Layer Issues of WSN**
Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

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

**REFERENCE BOOKS:**
1. C. Siva Ram Murthy, B.S. Manoj Ad Hoc Wireless Networks: Architectures and Protocols.
2. Taieb Znati Kazem Sohraby, Daniel Minoli, Wireless Sensor Networks: Technology, Protocols and Applications, Wiley.

## PCY515PE: CLOUD COMPUTING (Professional Elective – I)

**B.Tech. III Year I Sem.**

L  T  P  C
3  0  0  3

**Pre-requisites:**
1. A course on "Computer Networks".
2. A course on "Operating System".

**Course Objectives:**
- This course provides an insight into cloud computing
- Topics covered include- Cloud Computing Architecture, Deployment Models, Service Models, Technological Drivers for Cloud Computing, Networking for Cloud Computing and Security in Cloud Computing

**Course Outcomes:**
- Understand different computing paradigms and potential of the paradigms and specifically cloud computing
- Understand cloud service types, cloud deployment models and technologies supporting and driving the cloud
- Acquire the knowledge of programming models for cloud and development of software application that runs the cloud and various services available from major cloud providers
- Understand the security concerns and issues in cloud computing
- Acquire the knowledge of advances in cloud computing.

### UNIT - I
Computing Paradigms, Cloud Computing Fundamentals, Cloud Computing Architecture and Management

### UNIT - II
**Cloud Deployment Models, Cloud Service Models, Technological Drivers for Cloud Computing:** SOA and Cloud, Multicore Technology, Web 2.0 and Web 3.0, Pervasive Computing, Operating System, Application Environment

### UNIT - III
**Virtualization, Programming Models for Cloud Computing:** MapReduce, Cloud Haskell, Software Development in Cloud

### UNIT - IV
**Networking for Cloud Computing:** Introduction, Overview of Data Center Environment, Networking Issues in Data Centers, Transport Layer Issues in DCNs, Cloud Service Providers

### UNIT - V
Security in Cloud Computing, and Advanced Concepts in Cloud Computing

**TEXT BOOK:**
1. Chandrasekaran, K. *Essentials of cloud computing*. CRC Press, 2014

**REFERENCE BOOKS:**
1. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011
2. Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

## PCY521PE: ETHICAL HACKING (Professional Elective – II)

**B.Tech. III Year I Sem.**                                             L  T  P  C
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**Prerequisites:**
1. A course on "Operating Systems"
2. A course on "Computer Networks"
3. A course on "Network Security and Cryptography"

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

**Course Outcomes:**
- Gain the knowledge of the use and availability of tools to support an ethical hack
- Gain the knowledge of interpreting the results of a controlled attack
- Understand the role of politics, inherent and imposed limitations and metrics for planning of a test
- Comprehend the dangers associated with penetration testing

## UNIT- I
**Introduction:** Hacking Impacts, The Hacker Framework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration
**Information Security Models:** Computer Security, Network Security, Service Security, Application Security, Security Architecture
**Information Security Program:** The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking

## UNIT - II
**The Business Perspective:** Business Objectives, Security Policy, Previous Test Results, Business Challenges Planning for a Controlled Attack: Inherent Limitations, Imposed Limitations, timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement

## UNIT - III
**Preparing for a Hack:** Technical Preparation, Managing the Engagement Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance

## UNIT - IV
**Enumeration:** Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase
**Exploitation:** Intuitive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern

## UNIT - V
**Deliverable:** The Deliverable, The Document, Overall Structure, Aligning Findings, Presentation

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

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

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

**PCY522PE: DATA SCIENCE (Professional Elective – II)**

**B.Tech. III Year I Sem.**

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**Course Objectives:**
- Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
- Understand the basic types of data and basic statistics
- Identify the importance of data reduction and data visualization techniques

**Course Outcomes:**
- Understand basic terms of statistical modeling and data science
- Implementation of R programming concepts
- utilize R elements for data visualization and prediction

## UNIT- I
### Introduction
Definition of Data Science- Big Data and Data Science hype - and getting past the hype - Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting.
**Basics of R:** Introduction, R-Environment Setup, Programming with R, Basic Data Types.

## UNIT- II
### Data Types & Statistical Description
**Types of Data:** Attributes and Measurement, Attribute, The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes.
Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

## UNIT- III
**Vectors:** Creating and Naming Vectors, Vector Arithmetic, Vector sub setting,
**Matrices:** Creating and Naming Matrices, Matrix Sub setting, Arrays, Class.
**Factors and Data Frames:** Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.
**Lists:** Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors

## UNIT- IV
**Conditionals and Control Flow:** Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.
**Iterative Programming in R:** Introduction, While Loop, For Loop, Looping Over List.
**Functions in R:** Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

## UNIT- V
**Charts and Graphs:** Introduction, Pie Chart: Chart Legend, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot.
**Regression:** Linear Regression Analysis, Multiple Linear regression

**TEXT BOOKS:**
1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014.
2. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

**REFERENCE BOOKS:**
1. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
3. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
4. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
5. Paul Teetor, "R Cookbook", O'Reilly, 2011.

**PCY523PE: DISTRIBUTED SYSTEMS (Professional Elective – II)**

**B.Tech. III Year I Sem.**                                                                                          L  T  P  C
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**Prerequisites:**
1. A course on "Operating Systems"
2. A course on "Computer Organization & Architecture"

**Course Objectives:**
- To provide an insight into Distributed systems.
- To introduce concepts related to Peer to Peer Systems, Transactions and Concurrency control, Security and Distributed shared memory

**Course Outcomes:**
- Understand Transactions and Concurrency control.
- Understand distributed shared memory.
- Design a protocol for a given distributed application.

**UNIT - I**
**Characterization of Distributed Systems:** Examples of Distributed systems, Resource sharing and web, challenges
**System models:** Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication
**Distributed objects and Remote Invocation:** Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

**UNIT - II**
**Operating System Support-** OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture.
**Distributed File Systems-**Introduction, File Service architecture.

**UNIT - III**
**Peer to Peer Systems-** Napster and its legacy, Peer to Peer middleware
**Time and Global States-**Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.
**Coordination and Agreement-** Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

**UNIT - IV**
**Transactions and Concurrency Control-** Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering.
**Distributed Transactions-**Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions
**Distributed deadlocks:** Transaction recovery.

**UNIT - V**
**Replication:** Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data.
**Distributed shared memory:** Design and Implementation issues, Consistency models.

**TEXT BOOKS:**
1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S. Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.

**REFERENCE BOOKS:**
1. Distributed Systems - Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani and Mukesh Singhal, Cambridge, rp 2010.

## PCY524PE: CYBER LAWS (Professional Elective – II)

**B.Tech. III Year I Sem.**                                                    **L  T  P  C**
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**Course Objectives:**
- Gain an understanding of the evolution and jurisprudence of cyber law in India, including the IT Act 2000.
- Learn about digital signatures, e-governance, and their legal implications under the IT Act.
- Understand the legal framework for electronic contracts, their formation, and international perspectives.
- Explore taxation issues in cyberspace, cybercrimes, electronic evidence, and their adjudication under the IT Act.

**Course Outcomes**
- Learn evolution and key aspects of Indian cyber law, including recent amendments.
- Gain knowledge about the legalities of digital signatures and the role of e-governance in the IT Act.
- Develop an understanding of the legalities involved in electronic contracts and international conventions.
- Adapt in understanding and analyzing cybercrime, electronic evidence, and intellectual property rights in the context of IT.

### UNIT - I
**Introduction:** History of Internet and World Wide Web, Need for cyber law, Cybercrime on the rise, Important terms related to cyber law.
**Cyber law in India:** Need for cyber law in India, History of cyber law in India.
information Technology Act, 2000: Overview of other laws amended by the IT Act, 2000, National Policy on Information Technology 2012.

### UNIT - II
**Overview of the Information Technology Act, 2000:** Applicability of the Act, Important provisions of the Act: Digital signature and Electronic signature, Digital Signature under the IT Act, 2000, E-Governance Attribution, Acknowledgement and Dispatch of Electronic Records, Certifying Authorities, Electronic Signature Certificates, Duties of Subscribers, Penalties and Offences, Intermediaries.

### UNIT - III
Overview of rules issued under The IT Act, 2000, Electronic Commerce, Electronic Contracts, Cyber Crimes, Cyber Frauds.

### UNIT - IV
**Regulatory Authorities:** Department of Electronics and Information Technology, Controller of Certifying Authorities (CCA), Cyber Appellate Tribunal, Indian Computer Emergency Response Team (ICERT), Cloud Computing, Case Laws.

### UNIT - V
**Introduction to Cybercrime and procedure to report Cybercrime:** procedure to report cybercrime, some basic rules for safe operations of the computer and internet, the criminal law (amendment) act, 2013: legislative remedies for online harassment and cyberstalking in India.

**TEXT BOOKS:**
1. Textbook on "Cyber Law", second edition, Pavan Duggal, Universal Law Publishing.
2. Textbook on "Indian Cyber law on Cybercrimes", Pavan Duggal,

## PCY525PE: IOT SECURITY (Professional Elective – II)

**B.Tech. III Year I Sem.**                                                                L  T  P  C
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### Course Objectives:
- Understand the various attacks and importance of Security aspects in IoT
- Understand the techniques, protocols and security towards Gaming models
- Understand security and privacy challenges of IoT
- Understand the application of block chain technology for IoT Security

### Course Outcomes:
- Incorporate the best practices learnt to identify the attacks and mitigate the same
- Adopt the right security techniques and protocols during the design of IoT products
- Assimilate and apply the skills learnt on ciphers and block chains when appropriate
- Describe the essential components of IoT
- Find appropriate security/privacy solutions for IoT

### UNIT- I
Fundamentals of IoT and Security and its need, Prevent Unauthorized Access to Sensor Data, Block ciphers, Introduction to Blockchain, Introduction of IoT devices, IoT Security Requirements, M2M Security, Message integrity Modeling faults and adversaries Difference among IoT devices, computers, and embedded devices.

### UNIT- II
IoT and cyber-physical systems RFID Security, Authenticated encryption Byzantine Generals problem sensors and actuators in IoT, IoT security (vulnerabilities, attacks, and countermeasures), Cyber Physical Object Security, Hash functions Consensus algorithms and their scalability problems Accelerometer, photoresistor, buttons

### UNIT- III
Security engineering for IoT development Hardware Security, Merkle trees and Elliptic curves digital signatures, verifiable random functions, Zero-knowledge systems motor, LED, vibrator, IoT security lifecycle, Front-end System Privacy Protection, Management, Secure IoT Databases, Public-key crypto (PKI), blockchain, the challenges, and solutions, analog signal vs. digital signal

### UNIT- IV
Data Privacy Networking Function Security Trees signature algorithms proof of work, Proof of stake, Networking in IoT Device/User Authentication in IoT IoT Networking Protocols, Crypto-currencies, alternatives to Bitcoin consensus, Bitcoin scripting language and their use Real-time communication

### UNIT- V
Introduction to Authentication Techniques, Secure IoT Lower Layers, Bitcoin P2P network, Ethereum and Smart Contracts, Bandwidth efficiency, Data Trustworthiness in IoT, Secure IoT Higher Layers, Distributed consensus, Smart Contract Languages and verification challenges, Data analytics in IoT - simple data analyzing methods

### TEXT BOOKS:
1. B. Russell and D. Van Duren, "Practical Internet of Things Security," Packt Publishing, 2016.
2. FeiHU,"Security and Privacy Internet of Things (IoTs):Models, Algorithms and Implementations", CRC Press, 2016
3. Narayanan et al., "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction," Princeton University Press, 2016.

D. Sai Kiran

**REFERENCE BOOKS:**

1. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2nd Edition, O' Reilly Media, 2006.
2. Thomas R. Peltier, "Information Security policies and procedures: A Practitioner's Reference", 2nd Edition Prentice Hall, 2004.
3. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.
4. Thomas R Peltier, Justin Peltier and John Blackley," Information Security Fundamentals", 2nd Edition, Prentice Hall, 1996.

## PCY504PC: NETWORK SECURITY AND CRYPTOGRAPHY LAB

**B.Tech. III Year I Sem.**

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### Course Objectives:

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.

### Course Outcomes:

- Understand basic cryptographic algorithms, message and web authentication and security issues.
- Identify information system requirements for both of them such as client and server.
- Understand the current legal issues towards information security.

### List of Experiments:

1. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and display the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms
   a. Ceaser cipher b. Substitution cipher c. Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement the RSA algorithm.
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
11. Calculate the message digest of a text using the MD5 algorithm in JAVA

### TEXT BOOKS:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, McGraw Hill, 3rd Edition

### REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, McGraw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

**REFERENCE BOOKS:**

1. A. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Crypto currencies," O'Reilly, 2014.
2. T. Alpcan and T. Basar, "Network Security: A Decision and Game-theoretic Approach," Cambridge University Press, 2011.
3. Security and the IoT ecosystem, KPMG International, 2015.
4. Internet of Things: IoT Governance, Privacy and Security Issues" European Research Cluster.
5. Ollie Whitehouse, "Security of Things: An Implementers' Guide to Cyber-Security for Internet of Things Devices and Beyond", NCC Group, 2014.
6. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guide to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.

D.saikiray

**PCY506PC: UI DESIGN-FLUTTER**

**B.Tech. III Year I Sem.**                                          L  T  P  C
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**Course Objectives:**
- Learns to Implement Flutter Widgets and Layouts
- Understands Responsive UI Design and with Navigation in Flutter
- Knowledge on Widges and customize widgets for specific UI elements, Themes
- Understand to include animation apart from fetching data

**Course Outcomes:**
- Implements Flutter Widgets and Layouts
- Responsive UI Design and with Navigation in Flutter
- Create custom widgets for specific UI elements and also Apply styling using themes and custom styles.
- Design a form with various input fields, along with validation and error handling
- Fetches data and write code for unit Test for UI components and also animation

**List of Experiments:** Students need to implement the following experiments
1.  a) Install Flutter and Dart SDK.
    b) Write a simple Dart program to understand the language basics.

2.  a) Explore various Flutter widgets (Text, Image, Container, etc.).
    b) Implement different layout structures using Row, Column, and Stack widgets.

3.  a) Design a responsive UI that adapts to different screen sizes.
    b) Implement media queries and breakpoints for responsiveness.

4.  a) Set up navigation between different screens using Navigator.
    b) Implement navigation with named routes.

5.  a) Learn about stateful and stateless widgets.
    b) Implement state management using set State and Provider.

6.  a) Create custom widgets for specific UI elements.
    b) Apply styling using themes and custom styles.

7.  a) Design a form with various input fields.
    b) Implement form validation and error handling.

8.  a) Add animations to UI elements using Flutter's animation framework.
    b) Experiment with different types of animations (fade, slide, etc.).

9.  a) Fetch data from a REST API.
    b) Display the fetched data in a meaningful way in the UI.

10. a) Write unit tests for UI components.
    b) Use Flutter's debugging tools to identify and fix issues.

**TEXT BOOK:**
1.  Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.

## PCY5058PC: DATABASE MANAGEMENT SYSTEMS LAB

**B.Tech. III Year I Sem.**

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### Co-requisites:
- Co-requisite of course "Database Management Systems"

### Course Objectives:
- Introduce ER data model, database design and normalization
- Learn SQL basics for data definition and data manipulation

### Course Outcomes:
- Design database schema for a given application and apply normalization
- Acquire skills in using SQL commands for data definition and data manipulation.
- Develop solutions for database applications using procedures, cursors and triggers

### List of Experiments:
1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. A. Querying (using ANY, ALL, UNION, INTERSECT, JOIN, Constraints etc.)
   B. Nested, Correlated subqueries
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers (Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursors

### TEXT BOOKS:
1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 3rd Edition
2. Database System Concepts, Silberschatz, Korth, McGraw Hill, V edition.

### REFERENCES BOOKS:
1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel . 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C.J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

## PCY601PC: CYBER SECURITY ESSENTIALS

**B.Tech. III Year II Sem.**
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**Course Objectives:**
- Understand fundamental concepts of cyber security, including information assurance, cryptography, network security, and Windows security principles.
- Explore attacker techniques, motivations, and exploitation methods, gaining insights into cyber threats and vulnerabilities.

**Course Outcomes:**
- Understand basic cryptographic techniques for securing information and analyze cyber threats using concepts such as proxies, tunneling, and fraud techniques.
- Develop skills in identifying and exploiting vulnerabilities, including shellcode, buffer overflows, SQL injection, and web exploit tools.
- Demonstrate knowledge of malicious code, its types (worms, viruses), and countermeasures against evasion, privilege escalation, and information theft.
- Analyze defense and analysis techniques, including memory forensics, honeypots, and intrusion detection systems, for proactive cybersecurity measures.

### UNIT-I
**Cyber Security Fundamentals:** Network and Security Concepts- Information Assurance Fundamentals, Basic Cryptography, Symmetric Encryption, Public Key Encryption, The Domain Name System (DNS), Firewalls, Virtualization, Radio-Frequency Identification
**Microsoft Windows Security Principles:** Windows Tokens, Window Messaging, Windows Program, The Windows firewalls

### UNIT-II
**Attacker Techniques and Motivations:** How Hackers Cover Their Tracks (Antiforensics) How and Why Attackers Use Proxies, Tunneling Techniques, Fraud Techniques, Threat Infrastructure

### UNIT-III
**Exploitation:** Techniques to Gain a Foothold, Misdirection- Shellcode, Integer Overflow Vulnerabilities, Stack-Based Buffer Overflows, Format String Vulnerabilities, SQL Injection, Malicious PDF Files, Race Conditions, Web Exploit Tools, DoS Conditions, Brute Force and Dictionary Attacks, Reconnaissance, and Disruption Methods- Cross-Site Scripting (XSS), Social Engineering, WarXing, DNS Amplification Attacks

### UNIT-IV
**Malicious Code:** Self-Replicating Malicious Code- Worms, Viruses. Evading Detection and Elevating Privileges- Obfuscation, Virtual Machine Obfuscation, Persistent Software Techniques, Rootkits, Spyware, Attacks against Privileged User Accounts and Escalation of Privileges, Token Kidnapping, Virtual Machine Detection. Stealing Information and Exploitation- Form Grabbing, Man-in-the-Middle Attacks, DLL Injection, Browser Helper Objects

### UNIT-V
**Defense and Analysis Techniques:** Memory Forensics, Honeypots, Malicious Code Naming, Automated Malicious Code Analysis Systems, Intrusion Detection Systems.

**TEXT BOOK:**
1. James Graham, Richard Howard, Ryan Olson, "Cyber Security Essentials", CRC Press, Taylor & Francis Group, 2011.

**REFERENCE BOOK:**
1. Mayank Bhusan, Rajkumar Singh Rathore, Aatif Jamshed, "Fundamental of Cyber Security (Principles, Theory and Practices) BPB Publications 2018.

## PCY602PC: CYBER CRIME INVESTIGATION & DIGITAL FORENSICS

**B.Tech. III Year II Sem.**

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### Prerequisites
1. Knowledge of computer hardware, operating systems, applications and networking is required.

### Course Objectives:
- Know about role of digital devices in cyber crime investigation
- Learn about cyber crime investigation process and methodologies
- An introduction to the methodology and procedures associated with digital forensic analysis in a network environment.

### Course Outcomes:
- To obtain and analyze digital information for possible use as evidence in civil, criminal or administrative cases.
- To learn about the importance of digital forensic principles and procedures
- To know legal considerations and digital evidence controls
- To learn about digital forensic tools

### UNIT – I
**Foundations of Digital Forensics:** Digital Evidence, Principles of Digital Forensics, Challenging aspects of Digital Evidence, The Role of computers In crime, Cyber Crime Law.

### UNIT – II
**Digital Investigations:** Digital Investigation process models, Applying Scientific method in Digital Investigations, Handling a digital Crime scene: Fundamental Principles, Surveying and Preserving Digital Investigation.

### UNIT - III
**Violent Crime and Digital Investigation:** The role of Computers in violent crime, Processing Digital crime scene, Investigative Reconstruction, Digital Evidence as Alibi.

### UNIT - IV
Cyber stalking, Computer basics for Digital Forensics, Applying Forensics science to computers, Digital Evidence on windows systems, Digital Evidence on Unix systems.

### UNIT - V
**Network Forensics:** Networks basics for Digital Investigators, Applying Forensics science to networks, Digital Evidence on physical and data link layers, Digital Evidence on Network and Transport layers.

## PCY603PC: ALGORITHMS DESIGN AND ANALYSIS

**B.Tech. III Year II Sem.**

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**Prerequisites:** Programming for problem solving and Data Structures

**Course Objectives:**
- Introduces the notations for analysis of the performance of algorithms.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
- Describes how to evaluate and compare different algorithms using worst, average, and best-case analysis.
- Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

**Course Outcomes:**
- Analyze the performance of algorithms
- Choose appropriate data structures and algorithm design methods for a specified application
- Understand the choice of data structures and the algorithm design methods

### UNIT - I

**Introduction:** Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.

**Divide and conquer:** General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

### UNIT - II

**Disjoint Sets:** Disjoint set operations, union and find algorithms, Priority Queue- Heaps, Heapsort

**Backtracking:** General method, applications, n-queen's problem, sum of subsets problem, graph Coloring, Hamiltonian cycles.

### UNIT - III

**Dynamic Programming:** General method, applications- Optimal binary search tree, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

### UNIT - IV

**Greedy method:** General method, applications- Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

**Basic Traversal and Search Techniques:** Techniques for Binary Trees, Techniques for Graphs, Connected components, Biconnected components.

### UNIT - V

**Branch and Bound:** General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

**NP-Hard and NP-Complete problems:** Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

**TEXT BOOK:**

1. Digital Evidence and computer Crime  by Eoghan Casey Academic Press Third Edition.

**REFERENCE BOOKS:**

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

### PCY631PE: MOBILE APPLICATION SECURITY (Professional Elective – III)

**B.Tech. III Year II Sem.**                                    L  T  P  C
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**Course Objectives:**
- This course provides a thorough understanding of mobile platforms, including attack surfaces, risk landscape & more.

**Course Outcomes:**
- Understand common mobile application security vulnerabilities
- Define the security controls of multiple mobile operating systems
- Understand and analyze Bluetooth technology
- understand and analyze overview of SMS security and Enterprise security

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

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

### UNIT- III ·
Bluetooth Security Overview of the Technology, History and Standards, Common Uses, Alternatives, Future, Bluetooth Technical Architecture, Radio Operation and Frequency, Bluetooth Network Topology, Device Identification, Modes of Operation, Bluetooth Stack, Bluetooth Profiles, Bluetooth Security Features, Pairing, Traditional Security Services in Bluetooth, Security "Non-Features", Threats to Bluetooth Devices and Networks, Bluetooth Vulnerabilities, Bluetooth Versions Prior to v1.2, Bluetooth Versions Prior to v2.1. Security for 1g Wi-Fi Applications, Security for 2g Wi-Fi Applications, Recent Security Schemes for Wi-Fi Applications

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

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

**TEXT BOOKS:**
1. Mobile Application Security, Himanshu Dwivedi, Chris Clark, David Thiel, First edition, Tata McGraw Hill.

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

**TEXT BOOK:**
1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan, University Press.

**REFERENCE BOOKS:**
1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R.Tamassia, John Wiley and sons.

## PCY632PE: MACHINE LEARNING (Professional Elective – III)

**B.Tech. III Year II Sem.**                                                       L  T  P  C
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### Course Objectives:
- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability-based learning techniques

### Course Outcomes:
- Distinguish between, supervised, unsupervised and semi-supervised learning
- Understand algorithms for building classifiers applied on datasets of non-linearly separable classes
- Understand the principles of evolutionary computing algorithms
- Design an ensembler to increase the classification accuracy

### UNIT - I
Learning - Types of Machine Learning - Supervised Learning - The Brain and the Neuron - Design a Learning System - Perspectives and Issues in Machine Learning - Concept Learning Task - Concept Learning as Search - Finding a Maximally Specific Hypothesis - Version Spaces and the Candidate Elimination Algorithm - Linear Discriminants: - Perceptron - Linear Separability - Linear Regression.

### UNIT - II
Multi-layer Perceptron- Going Forwards - Going Backwards: Back Propagation Error - Multi-layer Perceptron in Practice - Examples of using the MLP - Overview - Deriving Back-Propagation - Radial Basis Functions and Splines - Concepts - RBF Network - Curse of Dimensionality - Interpolations and Basis Functions - Support Vector Machines

### UNIT - III
Learning with Trees - Decision Trees - Constructing Decision Trees - Classification and Regression Trees - Ensemble Learning - Boosting - Bagging - Different ways to Combine Classifiers - Basic Statistics - Gaussian Mixture Models - Nearest Neighbor Methods - Unsupervised Learning - K means Algorithms

### UNIT - IV
Dimensionality Reduction - Linear Discriminant Analysis - Principal Component Analysis - Factor Analysis - Independent Component Analysis - Locally Linear Embedding - Isomap - Least Squares Optimization
Evolutionary Learning - Genetic algorithms - Genetic Offspring: - Genetic Operators - Using Genetic Algorithms

### UNIT - V
Reinforcement Learning - Overview - Getting Lost Example
Markov Chain Monte Carlo Methods - Sampling - Proposal Distribution - Markov Chain Monte Carlo - Graphical Models - Bayesian Networks - Markov Random Fields - Hidden Markov Models - Tracking Methods

**TEXT BOOKS:**
1. Stephen Marsland, ¯Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

**REFERENCE BOOKS:**
1. Tom M Mitchell, ¯Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, ¯Machine Learning: The Art and Science of Algorithms that Make Sense of Data‖, First Edition, Cambridge University Press, 2012.
3. Jason Bell, ¯Machine learning - Hands on for Developers and Technical Professionals‖, First Edition, Wiley, 2014
4. Ethem Alpaydin, ¯Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014

**PCY633PE: DEVOPS (Professional Elective – III)**

**B.Tech. III Year II Sem.**                                              **L  T  P  C**
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**Pre-Requisites:**
1. Software Engineering
2. Software Project Management

**Course Objectives:**
- Understand the skill sets and high-functioning teams involved in Agile , DevOps and related methods to reach a continuous delivery capability.
- Implement automated system update and DevOps lifecycle.

**Course Outcomes:**
- Understand the various components of Devops environment.
- Identify Software development models and architectures of DevOps
- Use different project management and integration tools.
- Select an appropriate testing tool and deployment model for project.

**UNIT- I**
**Introduction to DevOps:**
Introduction, Agile development model, DevOps and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, identifying bottlenecks.

**UNIT- II**
**Software development models and DevOps:**
DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing. DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Micro services and the data tier, DevOps, architecture, and resilience.

**UNIT- III**
**Introduction to project management:**
The need for source code control, the history of source code management, Roles and code, source code management system and migrations, shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

**UNIT- IV**
**Integrating the system:**
Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

**UNIT- V**
**Testing Tools and Deployment:**
Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development. Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, SaltStack and Docker.

**TEXT BOOKS:**
1. Joakim Verona., Practical DevOps, Packt Publishing, 2016.
**REFERENCE BOOKS:**
1. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications.
2. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley.

## PCY634PE: MOBILE APPLICATION DEVELOPMENT (Professional Elective – III)

**B.Tech. III Year II Sem.**                                         **L  T  P  C**
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### Prerequisites
1. Acquaintance with JAVA programming.
2. A Course on DBMS.

### Course Objectives
- To demonstrate their understanding of the fundamentals of Android operating systems
- To improves their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

### Course Outcomes
- Understand the working of Android OS Practically.
- Develop Android user interfaces
- Develop, deploy and maintain the Android Applications.

### UNIT - I
Introduction to Android Operating System: Android OS design and Features - Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components - Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes
Android Application Lifecycle - Activities, Activity lifecycle, activity states, monitoring state changes

### UNIT - II
Android User Interface: Measurements - Device and pixel density independent measuring unit - s Layouts - Linear, Relative, Grid and Table Layouts
User Interface (UI) Components -Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers
Event Handling - Handling clicks or changes of various UI components
Fragments - Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

### UNIT - III
Intents and Broadcasts: Intent – Using intents to launch Activities, explicitly starting new Activity, Implicit Intents, passing data to Intents, getting results from Activities, Native Actions, using Intent to dial a number or to send SMS
Broadcast Receivers - Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity
Notifications - Creating and Displaying notifications, Displaying Toasts

### UNIT - IV
Persistent Storage: Files - Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

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**UNIT - V**

Database - Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

**TEXT BOOK:**

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012

**REFERENCE BOOKS:**

1. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013
2. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

## PCY635PE: BLOCKCHAIN TECHNOLOGY (Professional Elective – III)

| B.Tech. III Year II Sem. | L | T | P | C |
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**Prerequisites:**
1. Knowledge in information security and applied cryptography.
2. Knowledge in Computer Networks

**Course Objectives:**
- To learn the fundamentals of Blockchain and various types of block chain and consensus mechanisms.
- To understand the public block chain system, Private block chain system and consortium blockchain.
- Able to know the security issues of blockchain technology.

**Course Outcomes:**
- Understanding concepts behind crypto currency
- Applications of smart contracts in decentralized application development
- Understand frameworks related to public, private and hybrid blockchain
- Create blockchain for different application case studies

### UNIT-I
**Fundamentals of Blockchain:** Introduction, Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future.
Blockchain Types and Consensus Mechanism: Introduction, Decentralization and Distribution, Types of Blockchain, Consensus Protocol.
Cryptocurrency – Bitcoin, Altcoin and Token: Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

### UNIT-II
**Public Blockchain System:** Introduction, Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain.
**Smart Contracts:** Introduction, Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

### UNIT-III
**Private Blockchain System:** Introduction, Key Characteristics of Private Blockchain, Need of Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E- commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, ByzantineFault, Multichain.
**Consortium Blockchain:** Introduction, Key Characteristics of Consortium Blockchain, Need of Consortium Blockchain, Hyperledger Platform, Overview of Ripple, Overview of Corda.
Initial Coin Offering: Introduction, Blockchain Fundraising Methods, Launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO, ICO Platforms.

### UNIT-IV
**Security in Blockchain:** Introduction, Security Aspects in Bitcoin, Security and Privacy Challenges of Blockchain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Blockchain Smart Contract (DApp), Security Aspects in Hyperledger Fabric.

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**Applications of Blockchain:** Introduction, Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain In Supply Chain, The Blockchain and IoT. Limitations and Challenges of Blockchain.

### UNIT-V

**Blockchain Case Studies:** Case Study 1 - Retail, Case Study 2 - Banking and Financial Services, Case Study 3 - Healthcare, Case Study 4 - Energy and Utilities.
**Blockchain Platform using Python:** Introduction, Learn How to Use Python Online Editor, Basic Programming Using Python, Python Packages for Blockchain.
**Blockchain platform using Hyperledger Fabric:** Introduction, Components of Hyper ledger Fabric Network, Chain codes from Developer.ibm.com, Blockchain Application Using Fabric Java SDK.

### TEXT BOOK:

1. "Blockchain Technology", Chandramouli Subramanian, Asha A. George, Abhilasj K A and Meena Karthikeyan, Universities Press.

### REFERENCE BOOKS:

1. Michael Juntao Yuan, Building Blockchain Apps, Pearson, India.
2. Blockchain Blueprint for Economy, Melanie Swan, SPD O'reilly.
3. Blockchain for Business, Jai Singh Arun, Jerry Cuomo, Nitin Gaur, Pearson.

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## PCY611OE: CYBER LAWS (Open Elective – I)

**B.Tech. III Year II Sem.**

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### Course Objectives:

- Gain an understanding of the evolution and jurisprudence of cyber law in India, including the IT Act 2000.
- Learn about digital signatures, e-governance, and their legal implications under the IT Act.
- Understand the legal framework for electronic contracts, their formation, and international perspectives.
- Explore taxation issues in cyberspace, cybercrimes, electronic evidence, and their adjudication under the IT Act.

### Course Outcomes

- Learn evolution and key aspects of Indian cyber law, including recent amendments.
- Gain knowledge about the legalities of digital signatures and the role of e-governance in the IT Act.
- Develop an understanding of the legalities involved in electronic contracts and international conventions.
- Adapt in understanding and analyzing cybercrime, electronic evidence, and intellectual property rights in the context of IT.

### UNIT - I

**Introduction:** History of Internet and World Wide Web, Need for cyber law, Cybercrime on the rise, Important terms related to cyber law.

**Cyber law in India:** Need for cyber law in India, History of cyber law in India.

**Information Technology Act, 2000:** Overview of other laws amended by the IT Act, 2000, National Policy on Information Technology 2012.

### UNIT - II

**Overview of the Information Technology Act, 2000:** Applicability of the Act, Important provisions of the Act: Digital signature and electronic signature, Digital Signature under the IT Act, 2000, E-Governance Attribution, Acknowledgement and Dispatch of Electronic Records, Certifying Authorities, Electronic Signature Certificates, Duties of Subscribers, Penalties and Offences, Intermediaries.

### UNIT - III

Overview of rules issued under The IT Act, 2000, Electronic Commerce, Electronic Contracts, Cyber Crimes, Cyber Frauds.

### UNIT - IV

**Regulatory Authorities:** Department of Electronics and Information Technology, Controller of Certifying Authorities (CCA), Cyber Appellate Tribunal, Indian Computer Emergency Response Team (ICERT), Cloud Computing, Case Laws.

### UNIT - V

**Introduction to Cybercrime and procedure to report Cybercrime:** procedure to report cybercrime, some basic rules for safe operations of the computer and internet, the criminal law (amendment) act, 2013: legislative remedies for online harassment and cyberstalking in India.

### TEXT BOOK:

1. Textbook on "Cyber Law", second edition, Pavan Duggal, Universal Law Publishing.
2. Textbook on "Indian Cyber law on Cybercrimes", Pavan Duggal,

**REFERENCE BOOKS:**

1. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2nd Edition, O' Reilly Media, 2006.
2. Thomas R. Peltier, "Information Security policies and procedures: A Practitioner's Reference", 2nd Edition Prentice Hall, 2004.
3. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.
4. Thomas R Peltier, Justin Peltier and John Blackley," Information Security Fundamentals", 2nd Edition, Prentice Hall, 1996.

## PCY612OE: ETHICAL HACKING (Open Elective – I)

**B.Tech. III Year II Sem.**                                            L  T  P  C
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### Prerequisites:
1. A course on "Operating Systems".
2. A course on "Computer Networks".
3. A course on "Network Security and Cryptography".

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

### Course Outcomes:
- Gain the knowledge of the use and availability of tools to support an ethical hack
- Gain the knowledge of interpreting the results of a controlled attack
- Understand the role of politics, inherent and imposed limitations and metrics for planning of a test
- Comprehend the dangers associated with penetration testing

### UNIT- I
**Introduction:** Hacking Impacts, The Hacker Framework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration
**Information Security Models:** Computer Security, Network Security, Service Security, Application Security, Security Architecture
**Information Security Program:** The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking

### UNIT - II
**The Business Perspective**: Business Objectives, Security Policy, Previous Test Results, Business Challenges Planning for a Controlled Attack: Inherent Limitations, Imposed Limitations, timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement

### UNIT - III
**Preparing for a Hack:** Technical Preparation, Managing the Engagement Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance

### UNIT - IV
**Enumeration:** Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase
**Exploitation:** Intuitive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern

### UNIT - V
**Deliverable:** The Deliverable, The Document, Overall Structure, Aligning Findings, Presentation

## PCY605PC: CYBER CRIME INVESTIGATION & DIGITAL FORENSICS LAB

**B.Tech. III Year II Sem.**                                                L T P C
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### Course Objectives

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

### Course Outcomes

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

### List of Experiments

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

### TEXT BOOKS:

1. Real Digital Forensics for Handheld Devices, E. P. Dorothy, Auerback Publications, 2013.
2. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics, J. Sammons, Syngress Publishing, 2012.

### REFERENCE BOOKS:

1. Handbook of Digital Forensics and Investigation, E. Casey, Academic Press, 2010
2. Malware Forensics Field Guide for Windows Systems: Digital Forensics Field Guides, C. H. Malin, E. Casey and J. M. Aquilina, Syngress, 2012
3. Brett shabers, Eric Zimerman, X-ways forensics practitioners guide

**PCY611PE: MOBILE APPLICATION SECURITY LAB (Professional Elective – III)**

**B.Tech. III Year II Sem.**                                              **L  T  P  C**
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**Course Objectives:**
- This course provides a thorough understanding of mobile platforms, including attack surfaces, risk landscape & more.

**Course Outcomes:**
- Understand common mobile application security vulnerabilities
- Understand and analyze the apks using different tools
- Understand and implement authentication services.

**List of Experiments**
1. Use the following tools to analyze an apk to detect for any existence of vulnerabilities
   a.   QARK
   b.   DEVKNOX
   c.   OWASP
   d.   DROZER
2. Implement Authentication: Single Sign-on
3. Implement Authentication: Two Factor Authentication
4. Demonstrate how to Detect and Remove Malware From Android Phone
5. Demonstrate Remote Lock or Wipe

**TEXT BOOK:**
1. Mobile Application Security, Himanshu Dwivedi, Chris Clark, David Thiel, First edition, TATA McGraw Hill.

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

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

**TEXT BOOK:**

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

**REFERENCE BOOKS:**

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

## PCY604PC: CYBER SECURITY ESSENTIALS LAB

**B.Tech. III Year II Sem.**

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### Prerequisites
- A course on "Network Security and Cryptography"

### Course Objectives:
- Understanding Cybersecurity Principles and Techniques
- Application of Security Tools and Methods

### Course Outcomes:
1. Practical Skills in Cybersecurity Tools and Techniques
2. Analytical and Problem-Solving Abilities

### Lab Experiments
1. Implement and test simple symmetric encryption algorithms like AES and DES.
2. Implement RSA encryption to demonstrate the concept of public and private keys.
3. Set up and configure a basic firewall using tools like iptables on Linux.
4. Demonstrate DNS spoofing and DNS cache poisoning attacks.
5. Set up a proxy server and demonstrate how attackers can use proxies to hide their tracks.
6. Demonstrate basic antiforensics techniques like
   i.     Deleting logs       ii. Using steganography tools.
7. Perform SQL injection on a test website and then implement measures to prevent it.
8. Create a simple application vulnerable to buffer overflow and demonstrate how to exploit it.
9. Implement an XSS attack on a test web application and demonstrate ways to mitigate such attacks.
10. Analyze a simple computer virus in a controlled environment and discuss detection and prevention strategies.
11. Investigate the functioning of a rootkit and demonstrate techniques to detect it.
12. Set up a basic IDS like Snort and test its effectiveness in detecting different types of attacks.

### TEXT BOOK:
1. James Graham, Richard Howard, Ryan Olson, "Cyber Security Essentials", CRC Press, Taylor & Francis Group, 2011.

### REFERENCE BOOKS:
1. Mayank Bhusan, Rajkumar Singh Rathore, Aatif Jamshed, "Fundamental of Cyber Security (Principles, Theory and Practices) BPB Publications 2018

**PCY612PE: MACHINE LEARNING LAB (Professional Elective – III)**

**B.Tech. III Year II Sem.**                                                            **L T P C**
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**Course Objective:**
- The objective of this lab is to get an overview of the various machine learning techniques and can demonstrate them using python.

**Course Outcomes:**
- Understand modern notions in predictive data analysis
- Select data, model selection, model complexity and identify the trends
- Understand a range of machine learning algorithms along with their strengths and weaknesses
- Build predictive models from data and analyze their performance

**List of Experiments**
1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. implementation of K-Means Clustering
10. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

**TEXT BOOK:**
1. Machine Learning - Tom M. Mitchell, - MGH

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

## PCY613PE: DEVOPS LAB (Professional Elective – III)

**B.Tech. III Year II Sem.**                                          **L  T  P  C**
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### Course Objectives:
- Develop a sustainable infrastructure for applications and ensure high scalability. DevOps aims to shorten the software development lifecycle to provide continuous delivery with high-quality.

### Course Outcomes:
- Understand the need of DevOps tools.
- Understand the environment for a software application development.
- Apply different project management, integration and development tools.
- Use Selenium tool for automated testing of application.

### List of Experiments:
1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.
8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application for exercise 7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in JavaScript and perform testing using Selenium.
12. Develop test cases for the above containerized application using selenium.

### TEXT BOOK:
1. Joakim Verona., Practical DevOps, Packt Publishing, 2016.

### REFERENCE BOOKS:
1. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications.
2. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley.

### PCY614PE: BLOCKCHAIN TECHNOLOGY LAB (Professional Elective – III)

**B.Tech. III Year II Sem.**                                         L  T  P  C
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**Prerequisites:**
- Knowledge in Basics of JavaScript /Java for Hyperledger Fabric.
- Basics of Solidity for ETH.

**Course Objectives:**
- To learn the basic blockchain applications.
- To be familiar with the blockchain lab setup.

**Course Outcomes:**
- Able to work in the field of block chain technologies.

**List of Experiments**
1. Setup Metamask in the System and Create a wallet in the Metamask with Test Network.
2. Create multiple accounts in Metamask and perform the balance transfer between the accounts and describe the transaction specifications.
3. Setup the Ganache Tool in the system.
4. Create a custom RPC network in Metamask and connect it with Ganache tool and transfer the ether between ganache accounts.
5. Write a smart contract using a solidity program to perform the balance transfer from contract to other accounts.
6. Write a solidity program to perform the exception handling.
7. Setup the Hyperledger Fabric Network with 2 Organizations 1 Peer Each in the system.
8. Create a channel called mychannel, carchannel in the deployed network.
9. Take the existing Fabcar smart contract and add a new function to query the car on the basis of person name and deploy the smart contract on the Hyperledger Fabric Network.
10. Write an SDK program to query the person details from the deployed smart.

**TEXT BOOK:**
1. Michael Juntao Yuan, Building Blockchain Apps, Pearson.

**REFERENCE BOOKS:**
1. Blockchain Technology, Chandramouli Subramanian, Asha A. George, Abhilasj K A and Meena Karthikeyan, Universities Press.
2. Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st ed. Edition, by Daniel Drescher

### PCY635PE: MOBILE APPLICATION DEVELOPMENT LAB (Professional Elective – III)

**B.Tech. III Year II Sem.**

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**Course Objectives:**
- To learn how to develop Applications in an android environment.
- To learn how to develop user interface applications.
- To learn how to develop URL related applications.

**Course Outcomes:**
- Understand the working of Android OS Practically.
- Develop user interfaces.
- Develop, deploy and maintain the Android Applications.

**LIST OF EXPERIMENTS:**
1. Create an Android application that shows Hello + name of the user and run it on an emulator.
(b) Create an application that takes the name from a text box and shows hello message along with the name entered in the text box, when the user clicks the OK button.
2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Datepicker), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on the right fragment instead of the second screen with the back button. Use Fragment transactions and Rotation event listeners.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store usernames and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with a Login Failed message.
7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.
9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.
10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.
11. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.
12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.

**TEXT BOOKS:**
1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012.
2. Android Application Development for Java Programmers, James C Sheusi, Cengage, 2013.

**REFERENCE BOOK:**
1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

## PCY606PC: BIG DATA-SPARK

**B.Tech. III Year II Sem.**

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**Course Objectives:**

- The main objective of the course is to process Big Data with advance architecture like spark and streaming data in Spark

**Course Outcomes:**

- Develop MapReduce Programs to analyze large dataset Using Hadoop and Spark
- Write Hive queries to analyze large dataset Outline the Spark Ecosystem and its components
- Perform the filter, count, distinct, map, flatMap RDD Operations in Spark.
- Build Queries using Spark SQL
- Apply Spark joins on Sample Data Sets
- Make use of sqoop to import and export data from hadoop to database and vice-versa

**List of Experiments:**

1. To Study of Big Data Analytics and Hadoop Architecture
   (i) know the concept of big data architecture
   (ii) know the concept of Hadoop architecture

2. Loading DataSet in to HDFS for Spark Analysis
   Installation of Hadoop and cluster management
   (i) Installing Hadoop single node cluster in ubuntu environment
   (ii) Knowing the differencing between single node clusters and multi-node clusters
   (iii) Accessing WEB-UI and the port number
   (iv) Installing and accessing the environments such as hive and sqoop

3. File management tasks & Basic linux commands
   (i) Creating a directory in HDFS
   (ii) Moving forth and back to directories
   (iii) Listing directory contents
   (iv) Uploading and downloading a file in HDFS
   (v) Checking the contents of the file
   (vi) Copying and moving files
   (vii) Copying and moving files between local to HDFS environment
   (viii) Removing files and paths
   (ix) Displaying few lines of a file
   (x) Display the aggregate length of a file
   (xi) Checking the permissions of a file
   (xii) Zipping and unzipping the files with & without permission pasting it to a location
   (xiii) Copy, Paste commands

4. Map-reducing
   (i) Definition of Map-reduce
   (ii) Its stages and terminologies
   (iii) Word-count program to understand map-reduce (Mapper phase, Reducer phase, Driver code)

5. Implementing Matrix-Multiplication with Hadoop Map-reduce

6. Compute Average Salary and Total Salary by Gender for an Enterprise.

7. (i) Creating hive tables (External and internal)

(ii) Loading data to external hive tables from sql tables(or)Structured c.s.v using scoop

(iii) Performing operations like filterations and updations

(iv) Performing Join (inner, outer etc)

(v) Writing User defined function on hive tables

8. Create a sql table of employees Employee table with id,designation Salary table (salary ,dept id) Create external table in hive with similar schema of above tables,Move data to hive using scoop and load the contents into tables,filter a new table and write a UDF to encrypt the table with AES-algorithm, Decrypt it with key to show contents

9. (i) Pyspark Definition(Apache Pyspark) and difference between Pyspark, Scala, pandas
   (ii) Pyspark files and class methods
   (iii) get(file name)
   (iv) get root directory()

10. Pyspark -RDD'S
    (i) what is RDD's?
    (ii) ways to Create RDD
    (iii) parallelized collections
    (iv) external dataset
    (v) existing RDD's
    (vi) Spark RDD's operations (Count, foreach(), Collect, join,Cache()

11. Perform pyspark transformations
    (i) map and flatMap
    (ii) to remove the words, which are not necessary to analyze this text.
    (iii) groupBy
    (iv) What if we want to calculate how many times each word is coming in corpus ?
    (v) How do I perform a task (say count the words 'spark' and 'apache' in rdd3) separatly on each partition and get the output of the task performed in these partition ?
    (vi) unions of RDD
    (vii) join two pairs of RDD Based upon their key

12. Pyspark sparkconf-Attributes and applications
    (i) What is Pyspark spark conf ()
    (ii) Using spark conf create a spark session to write a dataframe to read details in a c.s.v and later move that c.s.v to another location

**TEXT BOOKS:**
1. Spark in Action, Marko Bonaci and Petar Zecevic, Manning.
2. PySpark SQL Recipes: With HiveQL, Dataframe and Graphframes, Raju Kumar Mishra and Sundar Rajan Raman, Apress Media.

**WEB LINKS:**
1. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01330150584451891225182_shared/overview
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01258388119638835242_shared/overview
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012605268423008256169 2_shared/overview

D. Sai kiran

Sanjaya

### PCY701PC: VULNERABILITY ASSESSMENT AND PENETRATION TESTING

**B.Tech. IV Year I Sem.**                                            L  T  P  C
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**Prerequisites**
1. Knowledge in information security.
2. Knowledge on Web Application.

**Course Objectives**
- Give an introduction to Vulnerability Assessment and Penetration Testing.
- To be familiar with the Penetration Testing and Tools.
- To get an exposure to Metasploit exploitation tool, Linux exploit and Windows exploit.
- To gain knowledge on Web Application Security Vulnerabilities, Vulnerability analysis and Malware analysis.

**Course Outcomes**
1. Learn to handle the vulnerabilities of a Web application
2. Able to learn various penetration testing tools.
3. Knowledge on Metasploit, Linux exploit and windows exploit tools
4. Analyze various vulnerabilities

**UNIT- I**
**Introduction**
Ethics of Ethical Hacking: Why you need to understand your enemy's tactics, recognizing the gray areas in security, Vulnerability Assessment and Penetration Testing.
**Penetration Testing and Tools:**
Social Engineering Attacks: How a social engineering attack works, conducting a social engineering attack, common attacks used in penetration testing, preparing yourself for face-to-face attacks, defending against social engineering attacks.

**UNIT- II**
**Physical Penetration Attacks:** Why a physical penetration is important? conducting a physical penetration, Common ways into a building, defending against physical penetrations.
**Insider Attacks:** Conducting an insider attack, defending against insider attacks.
**Metasploit:** The Big Picture, Getting Metasploit, Using the Metasploit Console to Launch Exploits, Exploiting Client-Side Vulnerabilities with Metasploit, Penetration Testing with Metasploit's Meterpreter, Automating and Scripting Metasploit, Going Further with Metasploit.

**UNIT- III**
**Managing a Penetration Test:** planning a penetration test, structuring a penetration test, execution of a penetration test, information sharing during a penetration test, reporting the results of a Penetration Test.
**Basic Linux Exploits:** Stack Operations, Buffer Overflows, Local Buffer Overflow Exploits, Exploit Development Process.
**Windows Exploits:** Compiling and Debugging Windows Programs, Writing Windows Exploits, Understanding Structured Exception Handling (SEH), Understanding Windows Memory Protections (XPSP3, Vista, 7 and Server 2008), Bypassing Windows Memory Protections.

## UNIT- IV
### Web Application Security Vulnerabilities:

Overview of top web application security vulnerabilities, Injection vulnerabilities, cross-Site scripting vulnerabilities, the rest of the OWASP Top Ten SQL Injection vulnerabilities, Cross-site scripting vulnerabilities.

### Vulnerability Analysis:
Passive Analysis, Source Code Analysis, Binary Analysis.

## UNIT- V
### Client-Side Browser Exploits:
Why client-side vulnerabilities are interesting, Internet explorer security concepts, history of client-side exploits and latest trends, finding new browser-based vulnerabilities heap spray to exploit, protecting yourself from client-side exploit.

**Malware Analysis:** Collecting Malware and Initial Analysis: Malware, Latest Trends in Honeynet Technology, Catching Malware: Setting the Trap, Initial Analysis of Malware.

### TEXT BOOKS:
1. Gray Hat Hacking-The Ethical Hackers Handbook", Allen Harper, Stephen Sims, Michael Baucom, 3rd Edition, Tata Mc Graw-Hill.
2. The Web Application Hacker's Handbook-Discovering and Exploiting Security flaws", Dafydd Suttard, Marcus pinto, 1st Edition, Wiley Publishing.

### REFERENCE BOOKS:
1. "Penetration Testing: Hands-on Introduction to Hacking", Georgia Weidman, 1st Edition, No Starch Press.
2. The Pen Tester Blueprint-Starting a Career as an Ethical Hacker ", L. Wylie, Kim Crawly, 1st Edition, Wiley Publications.

D. Saj Kiray

## PCY702PC: NETWORK MANAGEMENT SYSTEMS AND OPERATIONS

**B.Tech. IV Year I Sem.**                                          L  T  P  C
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**Course Objectives:**
- Comprehensive understanding of network management.
- Learn about network configurations, security policies, and risk assessments.
- Learn about diagnosing and troubleshooting network faults, performance assessment, and optimization.

**Course Outcomes:**
- Understanding the challenges and structure of network management in the context of the Internet.
- Defining network management and comprehending its scope, challenges, and variety in multi-vendor environments.
- Identifying and diagnosing network faults, understanding trouble reports, and learning troubleshooting techniques.
- Exploring the various network management tools.

### UNIT - I

**The Network Management Challenge:** Introduction, The Internet and Network Management, Internet Structure, Managing an Entity, Internal and External policies, The state of Network Management, Network Management in the Gartner Model, Benefits of Automation, The Lack of Industry Response, Distributed Systems and new abstractions.

**A Review of Network Elements and Services:** Introduction, Network Devices and Network Services, Network Elements and Element Management, Effect of physical organization on Management, Examples of Network Elements and Services, Basic Ethernet Switch, VLAN Switch, Access Point for a Wireless LAN, Cable Modem System, DSL Modem System and DSLAM, CSU/DSU used in Wide Area Digital Circuits, Channel Bank, IP Router, Firewall, DNS Server, DHCP Server, Web Server, HTTP Load Balancer.

### UNIT - II

**The Network Management Problem:** Introduction, What is Network Management? The scope of Network Management, variety and multi-vendor environments, element and network management systems, scale and complexity, types of networks, classification of devices.

**Configuration and Operation:** Introduction, Intuition for configuration, configuration and protocol layering, dependencies among configuration parameters, seeking a more precise definition of configuration, configuration and temporal consequences, configuration and global consistency, global state and practical systems, configuration and default values, partial state, automatic update and recovery, Interface paradigm and incremental configuration, commit and rollback during configuration, automated rollback and timeout, snapshot, configuration, and partial state, separation of setup and activation.

### UNIT - III

**Fault Detection and Correction:** Introduction, Network Faults, Trouble Reports, Symptoms, and causes, Troubleshooting and Diagnostics, Monitoring, Baselines, Items that can be Monitored, Alarms, Logs, and Polling, Identifying the cause of a Fault, Human Failure and Network Faults, Protocol Layering and Faults, Hidden Faults and Automatic Correction, Anomaly Detection and Event Correlation, Fault Prevention.

**Performance Assessment and Optimization:** Introduction, aspects of performance, Items that can be measured, measures of network performance, application and endpoint sensitivity, degraded service, variance in traffic and congestion, congestion, delay and utilization, local and end-to-end

measurements, passive observation Vs. active probing, bottlenecks and future planning, capacity Planning, planning the capacity of a switch, planning the capacity of a router, planning the capacity of an Internet connection, measuring peak and average traffic on a link, estimated peak utilization and 95th percentile, the relationship between average and peak utilization.

## UNIT - IV
**Security:** Introduction, The illusion of a secure network, security as a process, security terminology and concepts, management goals related to security, Risk Assessment, Security policies, acceptable use policy, basic technologies used for security, management issues and security, Security architecture: Perimeter Vs. Resources, element coordination and firewall unification, resource limits and denial of service, management of authentication, access control and user authentication, management of wireless networks, security of the network, role-based access control, audit trails and security logging, key management.

## UNIT - V
**Management Tools and Technologies:** Introduction, the principle of most recent change, the evolution of Management tools, management tools as applications, using a separate network for management, types of management tools, physical layer testing tools, reachability and connectivity tools (ping), packet analysis tools, discovery tools, device interrogation interfaces and tools, event monitoring tools, triggers, Urgency Levels, and Granularity, events, Urgency Levels and traffic, performance monitoring tools, flow analysis tools, routing and traffic engineering tools, Configuration tools, Security Enforcement tools, Network Planning tools, Integration of Management tools, NOCs and Remote Monitoring, Remote CLI Access, Remote Aggregation Of Management Traffic.

## TEXT BOOK:
1. Automated Network Management Systems, D. Comer, Prentice Hall, 2006, ISBN No. 0132393085.

## REFERENCE BOOKS:
1. Nagios Core Administration Cookbook - Second Edition, Tom Ryder, 2016, Packt Publishing, ISBN: 781785889332.
2. Terraform: Up and Running, Yevgeniy Brikman, 2017, O'Reilly Media, Inc., ISBN: 9781491977088
3. Applied Network Security Monitoring, Chris Sanders, Jason Smith, Syngress publications.

## PCY741PE: EDGE ANALYTICS (Professional Elective – IV)

**B.Tech. IV Year I Sem.**

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### Prerequisites

- A basic knowledge of "Python Programming".

### Course Objectives

- The aim of the course is to introduce the fundamentals of Edge Analytics
- The course gives an overview of – Architectures, Components, Communication Protocols and tools used for Edge Analytics

### Course Outcomes

- Understand the concepts of Edge Analytics, both in theory and in practical application
- Demonstrate a comprehensive understanding of different tools used at edge analytics
- Formulate, Design and Implement the solutions for real world edge analytics

### UNIT- I

Introduction to Edge Analytics
What is edge analytics, Applying and comparing architectures, Key benefits of edge analytics, Edge analytics architectures, Using edge analytics in the real world.

### UNIT- II

Basic edge analytics components, Connecting a sensor to the ESP-12F microcontroller, KOM-MICS smart factory platform, Communications protocols used in edge analytics, Wi-Fi communication for edge analytics, Bluetooth for edge analytics communication, Cellular technologies for edge analytics communication, Long-distance communication using LoRa and Signfox for edge analytics.

### UNIT- III

Working with Microsoft Azure IoT Hub, Cloud Service providers, Microsoft Azure, Exploring the Azure portal, Azure ioT Hub, Using the Raspberry Pi with Azure IoT edge, Connecting our Raspberry Pi edge device, adding a simulated temperature sensor to our edge device.

### UNIT- IV

Using Micropython for Edge Analytics, Understanding Micropython, Exploring the hardware that runs MicroPython, Using MicroPython for an edge analytics application, Using edge intelligence with microcontrollers, Azure Machine Learning designer, Azure IoT edge custom vision.

### UNIT- V

Designing a Smart Doorbell with Visual Recognition setting up the environment, Writing the edge code, creating the Node-RED dashboard, Types of attacks against our edge analytics applications, Protecting our edge analytics applications

**Text Book:**

1. Hands-On Edge Analytics with Azure IoT: Design and develop IoT applications with edge analytical solutions including Azure IoT Edge by Colin Dow

**Reference Books:**

1. Learn Edge Analytics - Fundamentals of Edge Analytics: Automated analytics at source using Microsoft Azure by Ashish Mahajan

### PCY742PE: WEB & DATABASE SECURITY (Professional Elective – IV)

**B.Tech. IV Year I Sem.**

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#### Course Objectives
- Give an Overview of information security
- Give an overview of Access control of relational databases

#### Course Outcomes:
- Understand the Web architecture and applications
- Understand client side and server-side programming
- Understand how common mistakes can be bypassed and exploit the application
- Identify common application vulnerabilities

#### UNIT - I
The Web Security, The Web Security Problem, Risk Analysis and Best Practices Cryptography and the Web: Cryptography and Web Security, Working Cryptographic Systems and Protocols, Legal Restrictions on Cryptography, Digital Identification

#### UNIT - II
The Web's War on Your Privacy, Privacy-Protecting Techniques, Backups and Anti Theft, Web Server Security, Physical Security for Servers, Host Security for Servers, Securing Web Applications

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

#### UNIT - IV
Security Re-engineering for Databases: Concepts and Techniques, Database Watermarking for Copyright Protection, Trustworthy Records Retention, Damage Quarantine and Recovery in Data Processing Systems, Hippocratic Databases: Current Capabilities and

#### UNIT - V
Future Trends Privacy in Database Publishing: A Bayesian Perspective, Privacy-enhanced Location-based Access Control, Efficiently Enforcing the Security and Privacy Policies in a Mobile Environment

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

#### REFERENCE BOOKS:
1. Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for Modern Web Applications, O'reilly
2. Jonathan LeBlanc Tim Messerschmidt, Identity and Data Security for Web Development - Best Practices, O'reilly
3. McDonald Malcolm, Web Security For Developers, No Starch Press, US

**PCY743PE: INFORMATION SYSTEM AUDIT AND ASSURANCE (Professional Elective – IV)**

**B.Tech. IV Year I Sem.**

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**Course Objectives:**
- Develop Expertise in System Auditing and Control.
- Master Business Continuity and Disaster Recovery Planning.

**Course Outcomes:**
- Acquire knowledge of the COBIT framework and its application in auditing and assurance services.
- Develop expertise in Internal Control and Information System Audit.
- Learn standard practices, policies, audit planning, and risk assessment to be able to do thorough audits of computer systems.
- Learn to evaluate and manage risks effectively.
- Learn to conduct business impact analyses and develop appropriate disaster recovery strategies.

**UNIT - I**
**System Audit and Assurance:** Characteristics of Assurance services, Types of Assurance services, Certified Information system auditor, Benefits of Audits for Organization, COBIT.

**UNIT - II**
**Internal Control and Information System Audit:** Internal Control, Detective control, Corrective Control, Computer-Assisted Audit Tools and Techniques.

**UNIT - III**
**Conducting Information System Audit:** Standard practices, policies, Audit planning, Risk Assessment, Information gathering techniques, Vulnerabilities, System security testing, Conducting audits for Banks.

**UNIT - IV**
**Audit Control:** Network Security and Control, Internet Banking Risks and Control, Operating System Risks and Control, Operational Control Overview

**UNIT - V**
**Business Continuity and Disaster Recovery Planning:** Data backup/storage, Developing appropriate Disaster recovery strategy, Business Impact analysis.

**TEXT BOOK:**
1. Information System Audit and Assurance; D. P. Dube, Ved Prakash Gulati; Tata McGraw- Hill Education, 01-Jan2005

**REFERENCE BOOKS:**
1. William Stallings and Lawrie Brown, Computer Security: Principles and Practice, Pearson Education.
2. Martin Weiss and Michael G. Solomon, Auditing IT Infrastructures For Compliance (Information Systems Security & Assurance), Jones and Bartlett Publishers, Inc.

## PCY744PE: SOCIAL MEDIA SECURITY (Professional Elective – IV)

**B.Tech. IV Year I Sem.**

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### Course Objectives
- Give introduction about the social networks, its use, the need of security in social data

### Course Outcomes
- Learn about browser's risks
- Learn about Social Networking,
- Understand the risks while using social media.
- Understand security of different web browsers.
- Understand threats and safety measures involved using an email communication

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

### UNIT - II
Dark side Cyber crime, Social Engineering, Hacked accounts, cyber stalking, cyber bullying, predators, phishing, hackers

### UNIT – III
Being bold versus being overlooked Good social media campaigns, Bad social media campaigns, sometimes it's better to be overlooked, social media hoaxes, The human factor, Content management, Promotion of social media

### UNIT - IV
Risks of Social media Introduction Public embarrassment, Once it's out there, it's out there False information, Information leakage, Retention and archiving, Loss of data and equipment

### UNIT – V
Policies and Privacy Blocking users controlling app privacy, Location awareness, Security Fake accounts passwords, privacy and information sharing

### TEXT BOOKS:
1. Interdisciplinary Impact Analysis of Privacy in Social Networks,Recognizing Your Digital Friends, Encryption for Peer-to-Peer Social NetworksCrowdsourcing and Ethics, Authors: Altshuler Y, EloviciY, Cremers A.B, Aharony N, Pentland A. (Eds.)
2. Social media security https://www.sciencedirect.com/science/article/pii/B9781597499866000000

### REFERENCE BOOKS:
1. Michael Cross, Social Media Security Leveraging Social Networking While Mitigating Risk.
2. Online Social Networks Security, Brij B. Gupta, Somya Ranjan Sahoo, Principles, Algorithm, Applications, and Perspectives, CRC press.

D. saj kiray

## PCY745PE: DEEP LEARNING (Professional Elective – IV)

**B.Tech. IV Year I Sem.**
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### Course Objectives:
- To understand deep Learning algorithms and their applications in real-world data

### Course Outcomes:
- Understand machine learning basics and neural networks
- Understand optimal usage of data for training deep models
- Apply CNN and RNN models for real-world data
- Evaluate deep models
- Develop deep models for real-world problems

### UNIT - I
**Machine Learning Basics**
Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning
**Deep Feedforward Networks** Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

### UNIT - II
**Regularization for Deep Learning**
Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop, and Manifold Tangent Classifier, Optimization for Training Deep Models, Learning vs Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates

### UNIT - III
**Convolutional Networks**
The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features

### UNIT - IV
**Recurrent and Recursive Nets**
Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for Multiple Time Scales, The Long Short-Term Memory and Other Gated RNNs, Optimization for Long-Term Dependencies, Explicit Memory

### UNIT - V
**Practical Methodology:** Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyperparameters, Debugging Strategies, Example: Multi-Digit Number Recognition

**Applications:** Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Other Applications.

**TEXT BOOK:**
1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.

**REFERENCE BOOKS:**
1. The Elements of Statistical Learning. Hastie, R. Tibshirani, and J. Friedman, Springer.
2. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.
3. Bishop. C.M., Pattern Recognition and Machine Learning, Springer, 2006.
4. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
5. Golub, G.,H., and Van Loan, C.,F., Matrix Computations, JHU Press, 2013.
6. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

**PCY751PE: QUANTUM COMPUTING (Professional Elective – V)**

**B.Tech. IV Year I Sem.**                                                    L  T  P  C
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**Course Objectives**
- To introduce the fundamentals of quantum computing
- The problem-solving approach using finite dimensional mathematics

**Course Outcomes**
- Understand basics of quantum computing
- Understand physical implementation of Qubit
- Understand Quantum algorithms and their implementation
- Understand The Impact of Quantum Computing on Cryptography

**UNIT - I**
**History of Quantum Computing:** Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations

**UNIT - II**
**Background Mathematics:** Basics of Linear Algebra, Hilbert space, Probabilities and measurements. Background Physics: Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. Background Biology: Basic concepts of Genomics and Proteomics (Central Dogma)

**UNIT - III**
**Qubit:** Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.

**UNIT - IV**
**Quantum Algorithms:** Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

**UNIT - V**
**Noise and error correction:** Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation

**TEXT BOOK:**
1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge.

**REFERENCE BOOKS:**
1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II.
3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms.

### PCY752PE: DATA ANALYTICS FOR FRAUD DETECTION (Professional Elective – V)

**B.Tech. IV Year I Sem.**

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#### Course Objectives
- Discuss the overall process of how data analytics is applied
- Discuss how data analytics can be used to better address and identify risks
- Help mitigate risks from fraud and waste for our clients and organizations

#### Course Outcomes
- Formulate reasons for using data analysis to detect fraud.
- Explain characteristics and components of the data and assess its completeness.
- Identify known fraud symptoms and use digital analysis to identify unknown fraud symptoms.
- Automate the detection process.
- Verify results and understand how to prosecute fraud

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

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

#### UNIT - III
**Data Analytical Tests:** Benford's Law, Number Duplication Test, Z-Score, Relative Size Factor Test, Same-Same-Same Test, Same-Same-Different Test

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

#### UNIT - V
Payroll Fraud, Expense Reimbursement Schemes, Register disbursement schemes

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

#### REFERENCE BOOKS:
1. Blokdyk Gerardus, Data analysis techniques for fraud detection, Create space Independent Publishing Platform
2. Leonard W. Vona, Fraud Data Analytics Methodology: The Fraud Scenario Approach to Uncovering Fraud in Core Business Systems, Wiley

## PCY753PE: 5G TECHNOLOGIES (Professional Elective – V)

**B.Tech. IV Year I Sem.**

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**Course Objectives:**
- Knowledge on the concepts of 5G and 5G technology and drivers, understand 5G network architecture, components, features and their benefits.

**Course Outcomes:**
- Understand 5G and 5G Broadband Wireless Communications
- Understand 5G wireless Propagation Channels
- Understand the significance of radio access technologies for 5G
- Analyze Device-to-device (D2D) communications
- Learn Massive MIMO propagation channel models

### UNIT - I
Overview of 5G Broadband Wireless Communications: Mobile communications generations: from 1G to 4G, Rationale of 5G - requirements, Standardization activities.

### UNIT - II
The 5G wireless Propagation Channels: Channel model requirements, Propagation scenarios and challenges in the 5G modeling, Channel Models for mmWave, MIMO Systems.

### UNIT - III
The 5G radio-access technologies: Access design principles for multi-user communications – Orthogonal Frequency Division Multiplexing (OFDM), Filter Bank Multi-Carriers (FBMC) and Universal Filtered Multi-Carrier (UFMC), Multiple Access Techniques - Orthogonal Frequency Division Multiple Accesses (OFDMA), Non-Orthogonal Multiple Accesses (NOMA).

### UNIT - IV
Device-to-Device (D2D) Communications- Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multi-hop and multi-operator D2D communications.

### UNIT - V
Millimeter-wave Communications - Spectrum and Regulations, Deployment scenarios, Beam-forming, physical layer techniques.
Massive MIMO propagation channel models, Pilot design for Massive MIMO, Resource allocation and transceiver algorithms for massive MIMO, Fundamentals of baseband and RF implementations in massive MIMO.

**TEXT BOOKS:**
1. Afif Osseiran, Jose.F. Monserrat, Patrick Marsch, "Fundamentals of 5G Mobile Networks", Cambridge University Press.

**REFERENCE BOOKS:**
1. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", John Wiley & Sons.
2. Amitabha Ghosh and Rapeepat Ratasuk "Essentials of LTE and LTE-A", Cambridge University Press
3. Athanasios G.Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, "New Directions in Wireless Communication Systems from Mobile to 5G", CRC Press.
4. Theodore S. Rappaport, Robert W. Heath, Robert C. Danials, James N. Murdock "Millimeter Wave Wireless Communications", Prentice Hall Communications.
5. Martin Sauter "From GSM From GSM to LTE-Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband", Wiley-Blackwell.

**PCY754PE: SECURITY INCIDENT AND RESPONSE MANAGEMENT (Professional Elective – V)**

**B.Tech. IV Year I Sem.**                                                              L  T  P  C
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**Prerequisites:**
- Knowledge of information security and applied cryptography.
- Knowledge of Operating Systems.

**Course Objectives:**
- Give an introduction to the preparation of inevitable incidents, incident detection and characterization.
- To get exposure to live data collection and forensic duplication.
- To gain knowledge on data collection in Windows, Unix and Mac OS Systems.

**Course Outcomes:**
- Learn how to handle the incident response management.
- Perform live data collection and forensic duplication.
- Identify network evidence.
- Analyze data to carry out an investigation.
- Knowledge on investigation on Mac and Windows OS systems

**UNIT- I**
**Introduction**: Preparing for the inevitable incident: Real-world incident, IR management incident handbook, Pre-incident preparation, preparing the Organization for Incident Response, Preparing the IR team, preparing the Infrastructure for Incident Response.
**Incident Detection and Characterization:** Getting the investigation started on the right foot, collecting initial facts, Maintenance of Case Notes, Understanding Investigative Priorities.
**Discovering the scope of Incident:** Examining initial data, Gathering and reviewing preliminary evidence, determining a course of action, Customer data loss scenario, automated clearing fraud scenario.

**UNIT- II**
**Data Collection:** Live Data Collection: When to perform live response, Selecting a live response tool, what to collect, collection best practices, Live data collection on Microsoft Windows Systems, Live Data Collection on Unix-based Systems.
**Forensic Duplication:** Forensic Image Formats, Traditional duplication, live system duplication, Duplication of Enterprise Assets.

**UNIT- III**
**Network Evidence:** The case for network monitoring, Types for network monitoring, Setting up a Network Monitoring System, Network Data, Analysis, Collect Logs Generated from Network Events.
**Enterprise Services**: Network Infrastructure Services, Enterprise Management Applications, Web servers, Database Servers.

**UNIT- IV**
**Data Analysis:** Analysis Methodology: Define Objectives Know your data, Access your data, Analyze your data, Evaluate Results.
**Investigating Windows Systems**: NTFS and File System analysis, prefetch, Event logs, Scheduled Tasks, The Windows Registry, Other Artifacts of Interactive Sessions, Memory Forensics, Alternative Persistence Mechanisms.

**UNIT- V**

**Investigating Mac OS X Systems**: HFS and File System Analysis, Core Operating Systems data.
**Investigating Applications**: What is Application Data? Where is application data stored? General Investigation methods, Web Browser, Email Clients, Instant Message Clients.

**TEXT BOOK:**
1. "Incident Response and Computer Forensics", Jason T. Luttgens, Mathew Pepe and Kevin Mandia, 3rd Edition, Tata McGraw-Hill Education.

**REFERENCE BOOKS:**
1. "Cyber Security Incident Response-How to Contain, Eradicate, and Recover from Incidents", Eric. C. Thompson, Apress.
2. "The Computer Incident Response Planning Handbook: Executable Plans for Protecting Information at Risk", N.K. McCarthy, Tata McGraw-Hill.

## PCY755PE: AUTHENTICATION TECHNIQUES (Professional Elective – V)

**B.Tech. IV Year I Sem.**

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### Course Objectives:
- Knowledge on concept of authentication types, protocols, physical identification and various authentication algorithms

### Course Outcomes:
- Understand different types of authentication techniques
- Understand authentication and Key Transport using Key Cryptography
- Understand different biometric techniques used in authentication.
- Understand the procedure of local authentication and Authentication by Addresses.
- Apply various authentication protocols in different environments and their representation

### UNIT - I
**Introduction to Authentication:** Protocol Architectures, Cryptographic tools, Adversary capabilities, Goals for authentication and key establishment, Tools for verification of Protocols
**Authentication Tokens:** Tokens, Network Password Sniffing, One-Time Passwords, Man in the middle Attack, IP Hijacking, Incorporating a PIN, Enrolling Users

### UNIT- II
**Authentication and Key Transport Using Public Key Cryptography:** Entity Authentication Protocols: Protocols in ISO/IEC 9798-3, Protocols in ISO/IEC 9798-5, SPLICE/AS, Key Transport Protocols.
**Key Agreement Protocols:** Introduction, Diffie-Hellman Key Agreement, MTI Protocols, Diffie-Hellman based protocols with Basic Message Format, Diffie-Hellman based protocols with explicit authentication.

### UNIT- III
**Biometrics:** Biometrics, Uses of Biometrics, Biometric Techniques, How Biometrics Work, taking a Biometric Reading, Feedback During Biometric Input, forging a Physical Trait, Building and Matching Patterns, A Trivial Hand Geometry Biometric, Enrolling a User, Biometric Accuracy, Biometric Encryption, Authenticity of Biometric Data, The Problem of Biometric Exploitation

### UNIT- IV
**Local Authentication:** Laptops and Workstations, Workstation Encryption, File Encryption, Volume Encryption, Encryption for Data Protection, Shortcut Attacks on Encryption, Trial-and-Error Attacks on Encryption, Theoretical Guess-Rate Limitations, Key-Handling Issues, Key-Handling Policies, Key Escrow and Crypto Politics
**Authentication by Address:** Telephone Numbers as Addresses, Identification via Dial-Back, Dial-Up Identification: Caller ID, Network Addresses, Denial of Service Attacks, Effective Source Authentication, Unix Local Network Authentication, Remote Procedure Calls, NFS, and NIS, Authenticating a Geographical Location.

### UNIT- V
**Indirect Authentication:** Indirect Authentication, Network Boundary Control, One-Time Password Products, LAN Resource Control, RADIUS Protocol, Protecting RADIUS Messages, RADIUS Challenge Response, Encrypted Connections and Windows NT, Encrypted Connections, Integrity Protection, Politics, Encryption, and Technical Choices, Windows NT Secure Channels, Secure Channel Keying, Attacks on Secure Channels, Computers' Authentication Secrets

**TEXT BOOKS:**
1. "Protocols for Authentication and Key Establishment", Colin Boyd and Anish Mathuria, springer, 202.
2. "Authentication: From Passwords to Public Keys", Smith, R. E. (2002), United Kingdom: Addison-Wesley.

**REFERENCE BOOKS:**
1. Biometrics Authentication: A Practical Guide to Fingerprint, Face, Iris, and Speech Recognition by Anil Jain, Arun Ross, and Karthik Nandakumar
2. Kerberos: The Protocol and Its Applications by William Stallings
3. Biometrics Technologies and verification Systems, John Vacca, , Elsevier Inc. , 2007.
4. Pattern Classification, Richard O. Duda, David G.Stork, Peter E. Hart, Wiley 2007.

### PCY721OE: INFORMATION SYSTEM AUDIT AND ASSURANCE (Open Elective – II)

**B.Tech. IV Year I Sem.**

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**Course Objectives:**
- Develop Expertise in System Auditing and Control.
- Master Business Continuity and Disaster Recovery Planning.

**Course Outcomes:**
- Acquire knowledge of the COBIT framework and its application in auditing and assurance services.
- Develop expertise in Internal Control and Information System Audit.
- Learn standard practices, policies, audit planning, and risk assessment to be able to do thorough audits of computer systems.
- Learn to evaluate and manage risks effectively.
- Learn to conduct business impact analyses and develop appropriate disaster recovery strategies

### UNIT - I
**System Audit and Assurance:** Characteristics of Assurance services, Types of Assurance services, Certified Information system auditor, Benefits of Audits for Organization, COBIT.

### UNIT - II
**Internal Control and Information System Audit:** Internal Control, Detective control, Corrective Control, Computer-Assisted Audit Tools and Techniques.

### UNIT - III
**Conducting Information System Audit:** Standard practices, policies, Audit planning, Risk Assessment, Information gathering techniques, Vulnerabilities, System security testing, Conducting audits for Banks.

### UNIT - IV
**Audit Control:** Network Security and Control, Internet Banking Risks and Control, Operating System Risks and Control, Operational Control Overview

### UNIT - V
**Business Continuity and Disaster Recovery Planning:** Data backup/storage, Developing appropriate Disaster recovery strategy, Business Impact analysis.

**TEXT BOOKS:**
1. Information System Audit and Assurance; D. P. Dube, Ved Prakash Gulati; Tata McGraw- Hill Education, 01-Jan2005

**REFERENCE BOOKS:**
1. William Stallings and Lawrie Brown, Computer Security: Principles and Practice, Pearson Education
2. Martin Weiss and Michael G. Solomon, Auditing IT Infrastructures For Compliance (Information Systems Security & Assurance), Jones and Bartlett Publishers, Inc

## PCY722OE: SOCIAL MEDIA SECURITY (Open Elective – II)

**B.Tech. IV Year I Sem.**

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### Course Objectives
- Give introduction about the social networks, its use, the need of security in social data

### Course Outcomes
- Learn about browser's risks
- Learn about Social Networking,
- Understand the risks while using social media.
- Understand security of different web browsers.
- Understand threats and safety measures involved using an email communication

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

### UNIT - II
Dark side Cyber crime, Social Engineering, Hacked accounts, cyber stalking, cyber bullying, predators, phishing, hackers

### UNIT - III
Being bold versus being overlooked Good social media campaigns, Bad social media campaigns, Sometimes it's better to be overlooked, Social media hoaxes, The human factor, Content management, Promotion of social media

### UNIT - IV
Risks of Social media Introduction Public embarrassment, Once it's out there, it's out there False information, Information leakage, Retention and archiving, Loss of data and equipment

### UNIT - V
Policies and Privacy Blocking users controlling app privacy, Location awareness, Security Fake accounts passwords, privacy and information sharing

### TEXT BOOKS:
1. Interdisciplinary Impact Analysis of Privacy in Social Networks, Recognizing Your Digital Friends, Encryption for Peer-to-Peer Social Networks Crowd sourcing and Ethics, Authors: Altshuler Y, EloviciY, Cremers A.B, Aharony N, Pentland A. (Eds.)
2. Social media security https://www.sciencedirect.com/science/article/pii/B97815974998660000

### REFERENCE BOOKS:
1. Michael Cross, Social Media Security Leveraging Social Networking While Mitigating Risk
2. Online Social Networks Security, Brij B. Gupta, Somya Ranjan Sahoo, Principles, Algorithm, Applications, and Perspectives, CRC press

### PCY703PC: VULNERABILITY ASSESSMENT & PENETRATION TESTING LAB

**B.Tech. IV Year I Sem.**

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**Course Objectives:**
- Learning Penetration Testing methodologies
- Monitoring the network traffic
- To understand the host and services discovery

**Course Outcomes:**
- Design for monitoring network traffic.
- Perform different penetration testing methods.
- Design different types of vulnerabilities scanning.
- Understand web application assessment.

**List of Experiments:**
1. Implement Monitoring of Network Traffic using
   a. wireshark
   b. tcpdump
   c. Nagios
   d. solarwinds
2. Implement Host & Services Discovery using Nmap, massscan.
3. Implement Vulnerability Scanning using OpenVAS, Zapproxy, SQLmap.
4. Implement Internal Penetration Testing.
   a. Mapping
   b. Scanning
   c. Gaining access through CVE's
   d. Sniffing POP3/FTP/Telnet Passwords
   o. ARP Poisoning
   f. DNS Poisoning
5. Implement External Penetration Testing.
   a. Evaluating external Infrastructure.
   b. Creating topological map & identifying IP address of target.
   c. Lookup domain registry for IP information.
   d. Examining use of IPV6 at remote location.
6. Implement Vulnerability scanning with Nessus.
7. Implement Vulnerability scanning with openvas.
8. Implement Web application assessment with nikto.
9. Implement Web application assessment with burp suite.
10. Implement Web application assessment with owaspzap,

**TEXT BOOKS:**
1. " Gray Hat Hacking-The Ethical Hackers Handbook", Allen Harper, Stephen Sims, Michael Baucom, 3rd Edition, Tata Mc Graw-Hill.
2. " The Web Application Hacker's Handbook-Discovering and Exploiting Security flaws", Dafydd Suttard, Marcus pinto, 1st Edition, Wiley Publishing.

**REFERENCE BOOKS:**
1. "Penetration Testing: Hands-on Introduction to Hacking", Georgia Weidman, 1st Edition, No Starch Press.
2. " The Pen Tester Blueprint-Starting a Career as an Ethical Hacker ", L. Wylie, Kim Crawly, 1st Edition, Wiley Publications.

## PCY704PC: NETWORK MANAGEMENT SYSTEMS AND OPERATIONS LAB

**B.Tech. IV Year I Sem.**                                        **L T P C**
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### Course Objectives:
- Comprehensive understanding of network management.
- Learn about network configurations, security policies, and risk assessments.
- Learn about diagnosing and troubleshooting network faults, performance assessment, and optimization.

### Course Outcomes:
- Understanding the challenges and structure of network management in the context of the Internet.
- Defining network management and comprehending its scope, challenges, and variety in multi-vendor environments.
- Identifying and diagnosing network faults, understanding trouble reports, and learning troubleshooting techniques.
- Exploring the various network management tools.

### List of Experiments:
1. Network Discovery and Mapping
   A. Utilize tools like Nmap and Wireshark to perform network discovery.
   B. Create a visual map of the network infrastructure.
   C. Analyze the implications of the network structure on management strategies.

2. Policy Implementation and Compliance
   A. Use tools like Snort or Suricata for intrusion detection.
   B. Implement firewall rules with tools such as iptables or pfSense.
   C. Assess compliance with security policies and regulatory requirements.

3. Automation with Ansible
   A. Set up Ansible for network configuration management.
   B. Automate routine tasks such as software updates and configuration changes.
   C. Evaluate the impact of automation on efficiency and responsiveness.
4. Fault Detection with Wireshark and Nagios
5. Protocol Analysis with Tcpdump
6. Traffic Analysis with Wireshark and Bandwidthd
7. Traffic Measurement with Ntopng
8. Threat Modeling with OWASP Cornucopia
9. Risk Assessment with OpenVAS
10. Firewall Configuration with pfSense
11. Network Discovery with Nmap
12. Security Enforcement with Snort

### TEXT BOOK:
1. Automated Network Management Systems, D. Comer, Prentice Hall, 2006, ISBN No. 0132393085.

### REFERENCE BOOKS:
1. Nagios Core Administration Cookbook - Second Edition, Tom Ryder, 2016, Packt Publishing, ISBN: 781785889332.
2. Terraform: Up and Running, Yevgeniy Brikman, 2017, O'Reilly Media, Inc., ISBN: 9781491977088
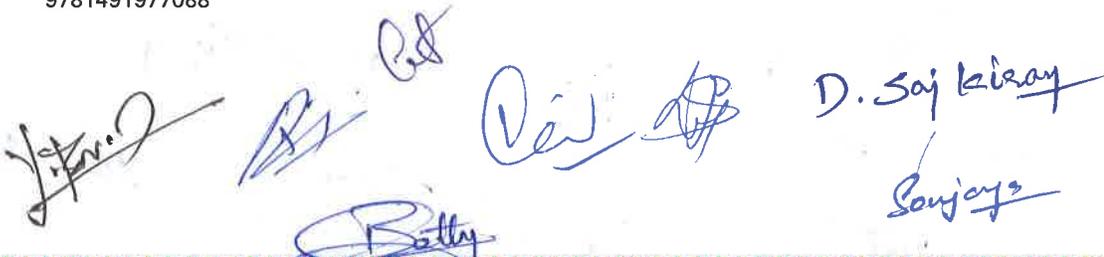
## PCY801PC: ORGANIZATIONAL BEHAVIOUR

**B.Tech. IV Year II Sem.**

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### Course Objectives:
- This course demonstrates individual, group behavior aspects: The dynamics of organizational climate, structure and its impact on Organizations.

### Course Outcomes:
- Students understand their personality, perception and attitudes for overall development and further learn the importance of group behavior in the organizations.

### UNIT - I Organizational Behaviour
Definition, need and importance of organizational behaviour – Nature and scope – Frame work – Organizational behaviour models.

### UNIT - II Individual Behaviour
Personality - types - Factors influencing personality - Theories - Learning - Types of learners - The learning process - Learning theories - Organizational behaviour modification, Misbehaviour - Types - Management Intervention. Emotions - Emotional Labour - Emotional Intelligence - Theories. Attitudes – Characteristics - Components - Formation - Measurement- Values. Perceptions - Importance - Factors influencing perception - Interpersonal perception- Impression Management. Motivation - importance - Types - Effects on work behavior.

### UNIT - III Group Behaviour
Organization structure – Formation – Groups in organizations – Influence – Group dynamics – Emergence of informal leaders and working norms - Group decision making techniques - Team building - Interpersonal relations - Communication - Control.

### UNIT - IV Leadership and Power
Meaning - Importance - Leadership styles - Theories of leadership - Leaders Vs Managers - Sources of power - Power centers - Power and Politics.

### UNIT - V Dynamics of Organizational Behaviour
Organizational culture and climate – Factors affecting organizational climate – Importance. Job satisfaction – Determinants – Measurements – Influence on behavior. Organizational change – Importance - Stability Vs Change - Proactive Vs Reaction change - the change process - Resistance to change - Managing change. Stress - Work Stressors - Prevention and Management of stress - Balancing work and Life. Organizational development - Characteristics - objectives -. Organizational effectiveness

### TEXT BOOKS:
1. Stephen P. Robins, Organisational Behavior, PHI Learning / Pearson Education, 11th edition, 2008.
2. Fred Luthans, Organisational Behavior, McGraw Hill, 11th Edition, 2001.

### REFERENCE BOOKS:
1. Schermerhorn, Hunt and Osborn, Organisational behavior, John Wiley, 9th Edition, 2008.
2. Udai Pareek, Understanding Organisational Behaviour, 2nd Edition, Oxford Higher Education, 2004.

## PCY861PE: QUANTUM CRYPTOGRAPHY (Professional Elective – VI)

**B.Tech. IV Year II Sem.**                                              **L  T  P  C**
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**Prerequisites:**
1. Quantum computing

**Course Objectives**
- Objective of the course is to build quantum-preparedness for the post quantum era.

**Course Outcomes**
- Basic understanding about quantum information and computation.
- Understand attack Strategies on QKD Protocols
- Analyze and understand statistical analysis of QKD Networks in Real-Life Environment
- Apply Quantum-cryptographic networks

**UNIT - I**
Quantum Information Theory, Unconditional Secure Authentication, Entropy, Quantum Key Distribution, Quantum Channel, Public Channel, QKD Gain, Finite Resources

**UNIT - II**
Adaptive Cascade Introduction, Error Correction and the Cascade Protocol, Adaptive Initial Block-Size Selection, Fixed Initial Block-Size, Dynamic Initial Block-Size, Examples

**UNIT - III**
Attack Strategies on QKD Protocols: Introduction, Attack Strategies in an Ideal Environment, Individual Attacks in an Realistic Environment QKD Systems: Introduction, QKD Systems

**UNIT - IV**
Statistical Analysis of QKD Networks in Real-Life Environment: Statistical Methods, Statistical Analysis QKD Networks Based on Q3P: QKD Networks, PPP, Q3P, Routing, Transport

**UNIT - V**
Quantum-Cryptographic Networks from a Prototype to the Citizen: The SECOQC Project, How to Bring QKD into the "Real" Life The Ring of Trust Model: Introduction, Model of the Point of Trust, Communication in the Point of Trust Model, Exemplified Communications, A Medical Information System Based on the Ring of Trust

**TEXT BOOK:**
1. Kollmitzer C., Pivk M. (Eds.), Applied Quantum Cryptography, Lect. Notes Phys. 797 (Springer, Berlin Heidelberg 2010).

**REFERENCE BOOKS:**
1. Gerald B. Gilbert, Michael Hamrick, and Yaakov S. Weinstein, Quantum Cryptography, World Scientific Publishing.
2. Gilles Van Assche, Quantum Cryptography and Secret-Key Distillation, Cambridge University Press.

### PCY862PE: IOT CLOUD PROCESSING AND ANALYTICS (Professional Elective – VI)

**B.Tech. IV Year II Sem.**

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#### Course Objectives

- To analyze the data generated from IoT device, store in cloud, to be able to manage IoT data stored in cloud

#### Course Outcomes

- Learn IoT Big data challenges
- Integrate Cloud and Big Data for IOT analytics
- Analyze sensor data streams for events
- Know open source framework for IoT analytics
- Review tools for semantic and data stream analytics

#### UNIT - I

**Introducing IoT Analytics**

IoT Data and BigData, Challenges of IoT Analytics, Applications, IoT Analytics Lifecycle and Techniques IoT

**Cloud and Big Data Integration for IoT Analytics**

Introduction, IaaS, PaaS and SaaS Paradigms, Requirements of IoT Big Data Analytics, Platform 3, Functional Architecture, Data Analytics for the IoT, Data Collection Using Low-power, Long-range Radios, WAZIUP Software Platform, iKaaS Software Platform

#### UNIT - II

**Searching the Internet of Things**

Introduction, A Search Architecture for Social and Physical Sensors, Local Event Retrieval, Using Sensor Metadata Streams to Identify Topics of Local, Events in the City, Venue Recommendation

#### UNIT - III

**Development Tools for IoT Analytics Applications**

Introduction, Related Work, The VITAL Architecture for IoT Analytics Applications, VITAL Development Environment, Development Examples

#### UNIT - IV

**An Open Source Framework for IoT Analytics as a Service**

Introduction, Architecture for IoT Analytics-as-a-Service, Sensing-as-a-Service Infrastructure Anatomy, Scheduling, Metering and Service Delivery, Sensing-as-a-Service Example, From Sensing-as-a-Service to IoT-Analytics- as-a-Service

#### UNIT - V

**A Review of Tools for IoT Semantics and Data Streaming Analytics**

Introduction, Related Work, Semantic Analysis, Tools and Platforms

**Data Analytics for Smart Cities**

Introduction, Cloud-based IoT Analytics, Cloud-based City Platform, Solutions, Edge, State of the Art, Edge-based City Platform, Workflow, Task and Topology, IoT-friendly Interfaces, Use Case of Edge-based Data Analytics

#### TEXT BOOKS:

1. Building Blocks for IoT Analytics by John Soldatos, River Publisher

#### REFERENCE BOOKS:

1. Analytics for the Internet of Things (IoT)by Andrew miller, Packt Publishing.
2. Big Data Analytics for Internet of Things by Tausifa Jan Saleem, Mohammad Ahsan Chishti, Wiley Publishing.

**PCY863PE: CLOUD SECURITY (Professional Elective – VI)**

**B.Tech. IV Year II Sem.**                                    L  T  P  C
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**Pre-requisites:**
- Computer Networks, Cryptography and Network Security, Cloud Computing.

**Course Objectives:**
- To understand the fundamentals concepts of cloud computing.
- To understand the cloud security and privacy issues.
- To understand the Threat Model and Cloud Attacks
- To understand the Data Security and Storage

**Course Outcomes:**
- Acquire the knowledge on fundamentals concepts of cloud computing.
- Distinguish the various cloud security and privacy issues.
- Analyze the various threats and Attack tools
- Understand the Data Security and Storage concepts.

**UNIT - I**
**Overview of Cloud Computing:** Introduction, Definitions and Characteristics, Cloud Service Models, Cloud Deployment Models, Cloud Service Platforms, Challenges Ahead.
**Introduction to Cloud Security:** Introduction, Cloud Security Concepts, CSA Cloud Reference Model, NIST Cloud Reference Model, NIST Cloud Reference Model.

**UNIT - II**
**Cloud Security and Privacy Issues:** Introduction, Cloud Security Goals/Concepts, Cloud Security Issues, Security Requirements for Privacy, Privacy Issues in Cloud.
**Infrastructure Security:** The Network Level, the Host Level, The Application Level, SaaS Application Security, PaaS Application Security, IaaS Application Security.

**UNIT – III**
**Threat Model and Cloud Attacks:** Introduction, Threat Model- Type of attack entities, Attack surfaces with attack scenarios, A Taxonomy of Attacks.
**Attack Tools**: Network-level attack tools, VM-level attack tools, VMM attack tools, Security Tools, VMM security tools.

**UNIT - IV**
**Information Security Basic Concepts**: an Example of a Security Attack, Cloud Software Security Requirements, Rising Security Threats.
**Data Security and Storage:** Aspects of Data Security, Data Security Mitigation, Provider Data and Its Security.

**UNIT - V**
**Evolution of Security Considerations**: Security Concerns of Cloud Operating Models, Identity Authentication, Secure Transmissions, Secure Storage and Computation, Security Using Encryption Keys, Challenges of Using Standard Security Algorithms, Variations and Special Cases for Security Issues with Cloud Computing, Side Channel Security Attacks in the Cloud.
**Security Management in the Cloud**: Security Management Standards, Availability Management, Access Control, Security Vulnerability, Patch, and Configuration Management.

**TEXT BOOKS:**

1. Cloud Security Attacks, Techniques, Tools, and Challenges by Preeti Mishra, Emmanuel S Pilli, Jaipur R C Joshi Graphic Era, 1st Edition published 2022 by CRC press.
2. Cloud Security and Privacy by Tim Mather, Subra Kumaraswamy, and Shahed Lati First Edition, September 2019.
3. Cloud Computing with Security and Scalability, Concepts and Practices by Naresh Kumar Sehgal, Pramod Chandra P. Bhatt, John M. Acken · Springer International Publishing 2022.

**REFERENCE BOOKS:**

1. Essentials of Cloud Computing by K. Chandrasekaran Special Indian Edition CRC press.
2. Cloud Computing Principles and Paradigms by Rajkumar Buyya, John Wiley.

**PCY864PE: DIGITAL WATERMARKING AND STEGANOGRAPHY (Professional Elective – VI)**

**B.Tech. IV Year II Sem.**                                                                    L  T  P  C
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**Course Objectives:**
- To learn about the watermarking models and message coding
- To learn about watermark security and authentication.
- To learn about steganography Perceptual models

**Course Outcomes:**
- Know the History and importance of watermarking and steganography.
- Analyze Applications and properties of watermarking and steganography.
- Demonstrate Models and algorithms of watermarking.
- Possess the passion for acquiring knowledge and skill in preserving authentication of Information.
- Identify the theoretic foundations of steganography and steganalysis.

**UNIT - I**
**Introduction:** Information Hiding, Steganography and Watermarking, History of watermarking, Importance of digital watermarking, Applications and Properties, Evaluating watermarking systems. Watermarking models & message coding, Notation, Communications, Communication-based models, Geometric models, Mapping messages into message vectors, Error correction coding, Detecting multi-symbol watermarks.

**UNIT - II**
**Watermarking with side information &analyzing errors:** Informed Embedding, Informed Coding - Structured dirty-paper codes, Message errors, False positive errors, False negative errors, ROC curves – Effect of whitening on error rates.

**UNIT - III**
**Perceptual models:** Evaluating perceptual impact, General form of a perceptual model, Examples of perceptual models, Robust watermarking approaches, Redundant Embedding, Spread Spectrum Coding, Embedding in Perceptually significant coefficients.

**UNIT - IV**
**Watermark security & authentication:** Security requirements, Watermark security and cryptography, Attacks, Exact authentication, Selective authentication, Localization, Restoration.

**UNIT - V**
**Steganography:** Steganography communication, Notation and terminology, Information, theoretic foundations of steganography, Practical steganographic methods, Minimizing the embedding impact, Steganalysis.

**TEXT BOOKS:**
1. Digital Watermarking and Steganography, Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker, Morgan Kaufmann Publishers, New York, 2008.

**REFERENCE BOOKS:**
1. Techniques and Applications of Digital Watermarking and Contest Protection, Michael Arnold, Martin Schmucker, Stephen D. Wolthusen, Artech House, London, 2003.
2. Digital Watermarking for Digital Media, Juergen Seits, IDEA Group Publisher, New York, 2005.
3. Disappearing Cryptography – Information Hiding: Steganography & Watermarking, PeterWayner, Morgan Kaufmann Publishers, New York, 2002.

## PCY865PE: DATA PRIVACY (Professional Elective – VI)

**B.Tech. IV Year II Sem.**

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**Course Objectives:**
- Instill an understanding of the essential importance of data privacy.
- Classify the necessary statistical and computational techniques essential for data sharing, particularly emphasizing applications in social and health sciences.
- Develop the foundational principles in architecture, algorithms, and technology for the preservation and maintenance of data privacy.

**Course Outcomes:**
- Outline essential rules and principles for safeguarding privacy and personally identifiable information.
- Develop data that facilitates meaningful statistical inference while minimizing the exposure of sensitive information.
- Identify potential threats related to different types of anonymized data.
- Classify and evaluate methods for generating test data with a focus on both privacy and utility considerations.

### UNIT - I
**Introduction to Data Privacy**: Overview of Data Privacy, Importance of Data Privacy, Protecting Sensitive Data, Use Cases for Data Sharing, Methods of Protecting Data, Balancing Data Privacy and Utility, Introduction to Anonymization Design Principles.
**Nature of Data in the Enterprise:** Multidimensional Data, Transaction Data, Longitudinal Data, Graph Data, Time Series Data.

### UNIT - II
**Static Data Anonymization I:** Multidimensional Data: -Introduction, Classification of Privacy-Preserving Methods, Classification of Data in a Multidimensional Data: Protecting explicit identifiers protecting Quasi-identifiers, Group Based Anonymization: k-Anonymization, l-Diversity, t-Closeness, Algorithm Comparison.

### UNIT - III
**Static Data Anonymization II**: Complex Data Structures- Introduction, Privacy Preserving Graph Data, Privacy-Preserving Time Series Data, Privacy Preservation of Longitudinal Data, Privacy Preservation of Transaction Data.

### UNIT - IV
**Threats to Anonymized Data**: Threats to Anonymized Data, Threats to Data Structures, Multidimensional Data, Longitudinal Data, Graph Data, Time Series Data, Transaction Data, Threats by Anonymization Techniques: Randomization, k-Anonymization, l-diversity, t-closeness.

### UNIT - V
**Privacy-Preserving Data Mining:** Introduction, Data Mining: Key Functional Areas of Multidimensional Data, Privacy-Preserving Test Data Manufacturing, Test Data Fundamentals, Privacy Preservation of Test Data.
**Synthetic Data Generation:** Introduction, Synthetic Data and Their Use, Privacy and Utility in Synthetic Data, Dynamic Data Protection: Tokenization Introduction, Understanding Tokenization, Use Cases for Dynamic Data Protection, Benefits of Tokenization Compared to Other Methods, Components for Tokenization.

**TEXT BOOKS:**

1. Nataraj Venkataramanan, Ashwin Sriram, *Data Privacy: Principles and Practice*, 2016, 1st Edition, Taylor & Francis. (ISBN No.: 978-1-49-872104-2), United Kingdom.

**REFERENCE BOOKS:**

1. B. Raghunathan, the Complete Book of Data Anonymization: From Planning to Implementation, 1st Edition, CRC press.
2. L. Sweeney, Computational Disclosure Control: A Primer on Data Privacy Protection, MIT Computer Science, 2002.
3. Nishant Bhajaria, Data Privacy: A runbook for engineers, Manning Publications.

**PCY861OE: 5G TECHNOLOGIES (Open Elective – III)**

**B.Tech. IV Year II Sem.**

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**Course Objectives:**
- Knowledge on the concepts of 5G and 5G technology and drivers, understand 5G network architecture, components, features and their benefits.

**Course Outcomes:**
- Understand 5G and 5G Broadband Wireless Communications
- Understand 5G wireless Propagation Channels
- Understand the significance of radio access technologies for 5G
- Analyze Device-to-device (D2D) communications
- Learn Massive MIMO propagation channel models

**UNIT - I**
Overview of 5G Broadband Wireless Communications: Mobile communications generations: from 1G to 4G, Rationale of 5G - requirements, Standardization activities.

**UNIT - II**
The 5G wireless Propagation Channels: Channel model requirements, Propagation scenarios and challenges in the 5G modeling, Channel Models for mmWave, MIMO Systems.

**UNIT - III**
The 5G radio-access technologies: Access design principles for multi-user communications – Orthogonal Frequency Division Multiplexing (OFDM), Filter Bank Multi-Carriers (FBMC) and Universal Filtered Multi-Carrier (UFMC), Multiple Access Techniques - Orthogonal Frequency Division Multiple Accesses (OFDMA), Non-Orthogonal Multiple Accesses (NOMA).

**UNIT - IV**
Device-to-Device (D2D) Communications- Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multi-hop and multi-operator D2D communications.

**UNIT - V**
Millimeter-wave Communications - Spectrum and Regulations, Deployment scenarios, Beam-forming, physical layer techniques.
Massive MIMO propagation channel models, Pilot design for Massive MIMO, Resource allocation and transceiver algorithms for massive MIMO, Fundamentals of baseband and RF implementations in massive MIMO.

**TEXT BOOK:**
1. Afif Osseiran, Jose.F. Monserrat, Patrick Marsch, "Fundamentals of 5G Mobile Networks", Cambridge University Press.

**REFERENCE BOOKS:**
1. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", John Wiley & Sons.
2. Amitabha Ghosh and Rapeepat Ratasuk "Essentials of LTE and LTE-A", Cambridge University Press
3. Athanasios G. Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, "New Directions in Wireless Communication Systems from Mobile to 5G", CRC Press.
4. Theodore S. Rappaport, Robert W. Heath, Robert C. Danials, James N. Murdock "Millimeter Wave Wireless Communications", Prentice Hall Communications.
5. Martin Sauter "From GSM From GSM to LTE-Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband", Wiley-Blackwell.

## PCY862OE: DATA PRIVACY (Open Elective – III)

**B.Tech. IV Year II Sem.**                                   L T P C
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**Course Objectives:**
- Instill an understanding of the essential importance of data privacy.
- Classify the necessary statistical and computational techniques essential for data sharing, particularly emphasizing applications in social and health sciences.
- Develop the foundational principles in architecture, algorithms, and technology for the preservation and maintenance of data privacy.

**Course Outcomes:**
- Outline essential rules and principles for safeguarding privacy and personally identifiable information.
- Develop data that facilitates meaningful statistical inference while minimizing the exposure of sensitive information.
- Identify potential threats related to different types of anonymized data.
- Classify and evaluate methods for generating test data with a focus on both privacy and utility considerations.

### UNIT - I
**Introduction to Data Privacy**: Overview of Data Privacy, Importance of Data Privacy, Protecting Sensitive Data, Use Cases for Data Sharing, Methods of Protecting Data, Balancing Data Privacy and Utility, Introduction to Anonymization Design Principles.
**Nature of Data in the Enterprise:** Multidimensional Data, Transaction Data, Longitudinal Data, Graph Data, Time Series Data.

### UNIT - II
**Static Data Anonymization I**: Multidimensional Data: Introduction, Classification of Privacy-Preserving Methods, Classification of Data in a Multidimensional Data: Protecting explicit identifiers protecting Quasi-identifiers, Group Based Anonymization: k-Anonymization, l-Diversity, t-Closeness, Algorithm Comparison.

### UNIT- III
**Static Data Anonymization II**: Complex Data Structures- Introduction, Privacy Preserving Graph Data, Privacy-Preserving Time Series Data, Privacy Preservation of Longitudinal Data, Privacy Preservation of Transaction Data.

### UNIT- IV
**Threats to Anonymized Data**: Threats to Anonymized Data, Threats to Data Structures, Multidimensional Data, Longitudinal Data, Graph Data, Time Series Data, Transaction Data, Threats by Anonymization Techniques: Randomization, k-Anonymization, l-diversity,t-closeness.

### UNIT-V
**Privacy-Preserving Data Mining:** Introduction, Data Mining: Key Functional Areas of Multidimensional Data, Privacy-Preserving Test Data Manufacturing, Test Data Fundamentals, Privacy Preservation of Test Data.
**Synthetic Data Generation:** Introduction, Synthetic Data and Their Use, Privacy and Utility in Synthetic Data, Dynamic Data Protection: Tokenization Introduction, Understanding Tokenization, Use Cases for Dynamic Data Protection, Benefits of Tokenization Compared to Other Methods, Components for Tokenization.

**TEXT BOOK:**

1. Nataraj Venkataramanan, Ashwin Sriram, *Data Privacy: Principles and Practice*, 2016, 1st Edition, Taylor & Francis. (ISBN No.: 978-1-49-872104-2), United Kingdom.

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1. B. Raghunathan, the Complete Book of Data Anonymization: From Planning to Implementation, 1st Edition, CRC press.
2. L. Sweeney, Computational Disclosure Control: A Primer on Data Privacy Protection, MIT Computer Science, 2002.
3. Nishant Bhajaria, Data Privacy: A runbook for engineers, Manning Publications.