I. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates can

- Apply their technical competence in computer science to solve real world problems, with technical and people leadership.
- Conduct cutting edge research and develop solutions on problems of social relevance.
- Work in a business environment, exhibiting team skills, work ethics, adaptability and lifelong learning.

II. PROGRAM OUTCOMES (POs)

1 **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2 **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3 **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4 **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5 **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6 **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7 **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8 **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9 **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10 **Communication**: Communicate effectively on complex engineering activities with the
engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11 **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12 **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

III. **PROGRAM SPECIFIC OUTCOMES (PSOs)**

The Students will be able to

- Exhibit design and programming skills to build and automate business solutions using cutting edge technologies.
- Strong theoretical foundation leading to excellence and excitement towards research, to provide elegant solutions to complex problems.
- Ability to work effectively with various engineering fields as a team to design, build and develop system applications.
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PTMA3151 MATRICES AND CALCULUS

COURSE OBJECTIVES:
- To develop the use of matrix algebra techniques that are needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I MATRICES 9 + 3

UNIT II DIFFERENTIAL CALCULUS 9 + 3

UNIT III FUNCTIONS OF SEVERAL VARIABLES 9 + 3

UNIT IV INTEGRAL CALCULUS 9 + 3
Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals - Applications: Hydrostatic force and pressure, moments and centres of mass.

UNIT V MULTIPLE INTEGRALS 9 + 3

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course the students will be able to
CO1: Use the matrix algebra methods for solving practical problems.
CO2: Apply differential calculus tools in solving various application problems.
CO3: Able to use differential calculus ideas on several variable functions.
CO4: Apply different methods of integration in solving practical problems.
CO5: Apply multiple integral ideas in solving areas, volumes and other practical problems.
TEXT BOOKS:
3. James Stewart, "Calculus: Early Transcendentals”, Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8 ].

REFERENCES:

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PTPH3151 ENGINEERING PHYSICS L T P C
3 0 0 3

COURSE OBJECTIVES:
- To make the students effectively achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of oscillations, optics and lasers.
- Equipping the students to successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

UNIT I MECHANICS
Multi-particle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of the system of particles. Rotation of rigid bodies: Rotational kinematics – rotational

UNIT II ELECTROMAGNETIC WAVES
The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

UNIT III OSCILLATIONS, OPTICS AND LASERS

UNIT IV BASIC QUANTUM MECHANICS
Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS
The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch’s theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.

TOTAL : 45 PERIODS

COURSE OUTCOMES:
After completion of this course, the students should be able to
CO1:Understand the importance of mechanics.
CO2:Express their knowledge in electromagnetic waves.
CO3:Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
CO4:Understand the importance of quantum physics.
CO5:Comprehend and apply quantum mechanical principles towards the formation of energy bands.

TEXT BOOKS:
2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.
REFERENCES:

CO’s-PO’s & PSO’s MAPPING

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PTCY3151 ENGINEERING CHEMISTRY L T P C
3 0 0 3

COURSE OBJECTIVES:
- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To introduce the basic concepts and applications of phase rule and composites.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

UNIT I WATER AND ITS TREATMENT

UNIT II NANO CHEMISTRY
Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.
UNIT III PHASE RULE AND COMPOSITES
Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process. Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

UNIT IV FUELS AND COMBUSTION
Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; Power alcohol and biodiesel. Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. CO\textsubscript{2} emission and carbon footprint.

UNIT V ENERGY SOURCES AND STORAGE DEVICES
Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion-battery; Electric vehicles - working principles; Fuel cells: H\textsubscript{2}-O\textsubscript{2} fuel cell, microbial fuel cell; Supercapacitors: Storage principle, types and examples.

COURSE OUTCOMES:
At the end of the course, the students will be able:
CO1: To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
CO2: To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
CO3: To apply the knowledge of phase rule and composites for material selection requirements.
CO4: To recommend suitable fuels for engineering processes and applications.
CO5: To recognize different forms of energy resources and apply them for suitable applications in energy sectors.

TEXT BOOKS:
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PTGE3151

PROBLEM SOLVING AND PYTHON PROGRAMMING

L T P C

3 0 0 3

COURSE OBJECTIVES:
- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT I

COMPUTATIONAL THINKING AND PROBLEM SOLVING


UNIT II

DATA TYPES, EXPRESSIONS, STATEMENTS

Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.
UNIT III CONTROL FLOW, FUNCTIONS, STRINGS

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

UNIT V FILES, MODULES, PACKAGES

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

TOTAL : 45 PERIODS

COURSE OUTCOMES:
Upon completion of the course, students will be able to

CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs using conditionals and loops for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries etc.
CO6: Read and write data from/to files in Python programs.

TEXT BOOKS:

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5. https://www.python.org/
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PTGE3171  PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY  L  T  P  C

0 0 2 1

COURSE OBJECTIVES:

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

EXPERIMENTS:

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter’s age validity, student mark range validation)
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 30 PERIODS

COURSE OUTCOMES:
On completion of the course, students will be able to:
CO1: Develop algorithmic solutions to simple computational problems
CO2: Develop and execute simple Python programs.
CO3: Implement programs in Python using conditionals and loops for solving problems.
CO4: Deploy functions to decompose a Python program.
CO5: Process compound data using Python data structures.
CO6: Utilize Python packages in developing software applications.

TEXT BOOKS:

REFERENCES:
5. https://www.python.org/

CO’s-PO’s & PSO’s MAPPING

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COURSE OBJECTIVES:

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS 9 + 3
Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

UNIT II DESIGN OF EXPERIMENTS 9 + 3
One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - $2^2$ factorial design.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9 + 3

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9 +3
Lagrange’s and Newton’s divided difference interpolations – Newton’s forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson’s 1/3 rules.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9 +3

TOTAL: 60 PERIODS

COURSE OUTCOMES:
Upon successful completion of the course, students will be able to:

CO1: Apply the concept of testing of hypothesis for small and large samples in real life problems.

CO2: Apply the basic concepts of classifications of design of experiments in the field of agriculture.

CO3: Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
CO4: Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.

CO5: Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXT BOOKS:

REFERENCES:

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COURSE OBJECTIVES:

- To make the students understand the importance in studying electrical properties of materials.
- To enable the students to gain knowledge in semiconductor physics
- To instill knowledge on magnetic properties of materials.
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications
- To inculcate an idea of significance of nano structures, quantum confinement, ensuing nano device applications and quantum computing.
UNIT I  ELECTRICAL PROPERTIES OF MATERIALS  

UNIT II  SEMICONDUCTOR PHYSICS  

UNIT III  MAGNETIC PROPERTIES OF MATERIALS  

UNIT IV  OPTICAL PROPERTIES OF MATERIALS  
Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - photo current in a P-N diode – solar cell - LED – Organic LED – Laser diodes – Optical data storage techniques.

UNIT V  NANODEVICES AND QUANTUM COMPUTING  

TOTAL :45 PERIODS

COURSE OUTCOMES:  
At the end of the course, the students should be able to  
CO1:gain knowledge on classical and quantum electron theories, and energy band structures  
CO2:acquire knowledge on basics of semiconductor physics and its applications in various devices  
CO3:get knowledge on magnetic properties of materials and their applications in data storage,  
CO4:have the necessary understanding on the functioning of optical materials for optoelectronics  
CO5:understand the basics of quantum structures and their applications and basics of quantum computing

TEXT BOOKS:  

REFERENCES:

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Note: the average value of this course to be used for program articulation matrix.

PTBE3251 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING  L  T  P  C
3  0  0  3

COURSE OBJECTIVES:
- To introduce the basics of electric circuits and analysis
- To impart knowledge in the basics of working principles and application of electrical machines
- To introduce analog devices and their characteristics
- To educate on the fundamental concepts of digital electronics
- To introduce the functional elements and working of measuring instruments

UNIT I ELECTRICAL CIRCUITS
DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm’s Law - Kirchhoff’s Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state) Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only)
UNIT II ELECTRICAL MACHINES

UNIT III ANALOG ELECTRONICS

UNIT IV DIGITAL ELECTRONICS
Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps (Simple Problems only).

UNIT V MEASUREMENTS AND INSTRUMENTATION

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completing this course, the students will be able to
CO1: Compute the electric circuit parameters for simple problems
CO2: Explain the working principle and applications of electrical machines
CO3: Analyze the characteristics of analog electronic devices
CO4: Explain the basic concepts of digital electronics
CO5: Explain the operating principles of measuring instruments

TEXT BOOKS:

REFERENCES:
CO’s-PO’s & PSO’s MAPPING

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PTCS3251
PROGRAMMING IN C

COURSE OBJECTIVES:
- To understand the constructs of C Language.
- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop modular applications in C using functions
- To develop applications in C using pointers and structures
- To do input/output and file handling in C

UNIT I BASICS OF C PROGRAMMING
Introduction to programming paradigms – Applications of C Language - Structure of C program - C programming: Data Types - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Preprocessor directives - Compilation process

UNIT II ARRAYS AND STRINGS
Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional arrays - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.

UNIT III FUNCTIONS AND POINTERS

UNIT IV STRUCTURES AND UNION
UNIT V  FILE PROCESSING

Files – Types of file processing: Sequential access, Random access – Sequential access file - Random access file - Command line arguments.

COURSE OUTCOMES:
Upon completion of the course, the students will be able to
CO1: Demonstrate knowledge on C Programming constructs
CO2: Develop simple applications in C using basic constructs
CO3: Design and implement applications using arrays and strings
CO4: Develop and implement modular applications in C using functions.
CO5: Develop applications in C using structures and pointers.
CO6: Design applications using sequential and random access file processing.

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:

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COURSE OBJECTIVES:

- To familiarise with C programming constructs.
- To develop programs in C using basic constructs.
- To develop programs in C using arrays.
- To develop applications in C using strings, pointers, functions.
- To develop applications in C using structures.
- To develop applications in C using file processing.

LIST OF EXPERIMENTS:

Note: The lab instructor is expected to design problems based on the topics listed. The Examination shall not be restricted to the sample experiments designed.

1. I/O statements, operators, expressions
2. decision-making constructs: if-else, goto, switch-case, break-continue
3. Loops: for, while, do-while
4. Arrays: 1D and 2D, Multi-dimensional arrays, traversal
5. Strings: operations
6. Functions: call, return, passing parameters by (value, reference), passing arrays to function.
7. Recursion
8. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers
10. Files: reading and writing, File pointers, file operations, random access, processor directives.

COURSE OUTCOMES:

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

CO1: Demonstrate knowledge on C programming constructs.
CO2: Develop programs in C using basic constructs.
CO3: Develop programs in C using arrays.
CO4: Develop applications in C using strings, pointers, functions.
CO5: Develop applications in C using structures.
CO6: Develop applications in C using file processing.

TOTAL: 30 PERIODS

TEXT BOOKS:


REFERENCES:


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**PTMA3354**

**DISCRETE MATHEMATICS**

**L T P C**

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**COURSE OBJECTIVES:**

- To extend student’s logical and mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
- To understand the basic concepts of combinatorics and graph theory.
- To familiarize the applications of algebraic structures.
- To understand the concepts and significance of lattices and boolean algebra which are widely used in computer science and engineering.

**UNIT I**

**LOGIC AND PROOFS**

9+3


**UNIT II**

**COMBINATORICS**

9+3


**UNIT III**

**GRAPHS**

9+3

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

**UNIT IV**

**ALGEBRAIC STRUCTURES**

9+3


**UNIT V**

**LATTICES AND BOOLEAN ALGEBRA**

9+3


**TOTAL: 60 PERIODS**
COURSE OUTCOMES:
At the end of the course, students would:
CO1: Have knowledge of the concepts needed to test the logic of a program.
CO2: Have an understanding in identifying structures on many levels.
CO3: Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
CO4: Be aware of the counting principles.
CO5: Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

TEXT BOOKS:

REFERENCES:

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PTCS3351 DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION L T P C
3 0 0 3

COURSE OBJECTIVES:
- To analyze and design combinational circuits.
- To analyze and design sequential circuits
- To understand the basic structure and operation of a digital computer.
- To study the design of data path unit, control unit for processor and to familiarize with the hazards.
- To understand the concept of various memories and I/O interfacing.

UNIT I COMBINATIONAL LOGIC
UNIT II  SYNCHRONOUS SEQUENTIAL LOGIC  9
Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation - Registers – Counters.

UNIT III  COMPUTER FUNDAMENTALS  9

UNIT IV  PROCESSOR  9
Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Microprogrammed Control – Pipelining – Data Hazard – Control Hazards.

UNIT V  MEMORY AND I/O  9

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1 : Design various combinational digital circuits using logic gates
CO2 : Design sequential circuits and analyze the design procedures
CO3 : State the fundamentals of computer systems and analyze the execution of an instruction
CO4 : Analyze different types of control design and identify hazards
CO5 : Identify the characteristics of various memory systems and I/O communication

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

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PTCS3301  DATA STRUCTURES  L T P C
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COURSE OBJECTIVES:
- To understand the concepts of ADTs.
- To Learn linear data structures – lists, stacks, and queues.
- To understand non-linear data structures – trees and graphs.
- To understand sorting, searching and hashing algorithms.
- To apply Tree and Graph structures.

UNIT I  LISTS  9
Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation
– Singly linked lists – Circularly linked lists – Doubly-linked lists – Applications of lists – Polynomial
ADT – Radix Sort – Multilists.

UNIT II  STACKS AND QUEUES  9
– Applications of Queues.

UNIT III  TREES  9
Tree ADT – Tree Traversals - Binary Tree ADT – Expression trees – Binary Search Tree ADT – AVL
Trees – Priority Queue (Heaps) – Binary Heap.

UNIT IV  MULTIWAY SEARCH TREES AND GRAPHS  9
B-Tree – B+ Tree – Graph Definition – Representation of Graphs – Types of Graph - Breadth-first
traversal – Depth-first traversal — Bi-connectivity – Euler circuits – Topological Sort – Dijkstra's
algorithm – Minimum Spanning Tree – Prim's algorithm – Kruskal's algorithm

UNIT V  SEARCHING, SORTING AND HASHING TECHNIQUES  9
Searching – Linear Search – Binary Search. Sorting – Bubble sort – Selection sort – Insertion
sort – Shell sort – Merge Sort – Hashing – Hash Functions – Separate Chaining – Open

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Define linear and non-linear data structures.
CO2: Implement linear and non–linear data structure operations.
CO3: Use appropriate linear/non–linear data structure operations for solving a given problem.
CO4: Apply appropriate graph algorithms for graph applications.
CO5: Analyze the various searching and sorting algorithms.

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES

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PTCCS356 OBJECT ORIENTED SOFTWARE ENGINEERING L T P C 3 0 0 3

COURSE OBJECTIVES:
- To understand Software Engineering Lifecycle Models
- To Perform software requirements analysis
- To gain knowledge of the System Analysis and Design concepts using UML.
- To understand software testing and maintenance approaches
- To work on project management scheduling using DevOps

UNIT I SOFTWARE PROCESS AND AGILE DEVELOPMENT

UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION
UNIT III SOFTWARE DESIGN

UNIT IV SOFTWARE TESTING AND MAINTENANCE
Testing – Unit testing – Black box testing– White box testing – Integration and System testing– Regression testing – Debugging - Program analysis – Symbolic execution – Model Checking-Case Study

UNIT V PROJECT MANAGEMENT

COURSE OUTCOMES:
CO1: Compare various Software Development Lifecycle Models
CO2: Evaluate project management approaches as well as cost and schedule estimation strategies.
CO3: Perform formal analysis on specifications.
CO4: Use UML diagrams for analysis and design.
CO5: Architect and design using architectural styles and design patterns, and test the system

TOTAL:45 PERIODS

TEXT BOOKS

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TOTAL:45 PERIODS
COURSE OBJECTIVES:
- To demonstrate array implementation of linear data structure algorithms.
- To implement the applications using Stack.
- To implement the applications using Linked list.
- To implement Binary search tree and AVL tree algorithms.
- To implement the Heap algorithm.
- To implement Dijkstra’s algorithm.
- To implement Prim’s algorithm.
- To implement Sorting, Searching and Hashing algorithms.

LIST OF EXERCISES:
1. Array implementation of Stack, Queue and Circular Queue ADTs
2. Implementation of Singly Linked List
3. Linked list implementation of Stack and Linear Queue ADTs
4. Implementation of Polynomial Manipulation using Linked list
5. Implementation of Evaluating Postfix Expressions, Infix to Postfix conversion
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues
9. Implementation of Dijkstra’s Algorithm
10. Implementation of Prim’s Algorithm
11. Implementation of Linear Search and Binary Search
12. Implementation of Insertion Sort and Selection Sort
13. Implementation of Merge Sort
14. Implementation of Open Addressing (Linear Probing and Quadratic Probing)

COURSE OUTCOMES:
At the end of this course, the students will be able to:
- **CO1**: Implement Linear data structure algorithms.
- **CO2**: Implement applications using Stacks and Linked lists
- **CO3**: Implement Binary Search tree and AVL tree operations.
- **CO4**: Implement graph algorithms.
- **CO5**: Analyze the various searching and sorting algorithms.

**CO’s-PO’s & PSO’s MAPPING**

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COURSE OBJECTIVES:
- To understand Object Oriented Programming concepts and basics of Java programming language
- To know the principles of packages, inheritance and interfaces
- To develop a java application with threads and generics classes
- To define exceptions and use I/O streams
- To design and build Graphical User Interface Application using JAVAFX

UNIT I  INTRODUCTION TO OOP AND JAVA  9

UNIT II  INHERITANCE, PACKAGES AND INTERFACES  9

UNIT III  EXCEPTION HANDLING AND MULTITHREADING  9

UNIT IV  I/O, GENERICS, STRING HANDLING  9

UNIT V  JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS  9

COURSE OUTCOMES:
On completion of this course, the students will be able to
CO1: Apply the concepts of classes and objects to solve simple problems
CO2: Develop programs using inheritance, packages and interfaces
CO3: Make use of exception handling mechanisms and multithreaded model to solve real world problems
CO4: Build Java applications with I/O packages, string classes, Collections and generics concepts
CO5: Integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications

TOTAL: 45 PERIODS

TEXT BOOKS:

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PTCS3452 THEOLOGY OF COMPUTATION L T P C
3 0 0 3

COURSE OBJECTIVES:
- To understand foundations of computation including automata theory
- To construct models of regular expressions and languages.
- To design context free grammar and push down automata
- To understand Turing machines and their capability
- To understand Undecidability and NP class problems

UNIT I AUTOMATA AND REGULAR EXPRESSIONS 9

UNIT II REGULAR EXPRESSIONS AND LANGUAGES 9
Regular expression – Regular Languages- Equivalence of Finite Automata and regular expressions – Proving languages to be not regular (Pumping Lemma) – Closure properties of regular languages.
UNIT III  CONTEXT FREE GRAMMAR AND PUSH DOWN AUTOMATA  9

UNIT IV  NORMAL FORMS AND TURING MACHINES  9

UNIT V  UNDECIDABILITY  9

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Construct automata theory using Finite Automata
CO2: Write regular expressions for any pattern
CO3: Design context free grammar and Pushdown Automata
CO4: Design Turing machine for computational functions
CO5: Differentiate between decidable and undecidable problems

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

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PTCS3492 DATABASE MANAGEMENT SYSTEMS  

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COURSE OBJECTIVES:

- To learn the fundamentals of data models, relational algebra and SQL
- To represent a database system using ER diagrams and to learn normalization techniques
- To understand the fundamental concepts of transaction, concurrency and recovery processing
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design
- To have an introductory knowledge about the Distributed databases, NOSQL and database security

UNIT I RELATIONAL DATABASES  
10

UNIT II DATABASE DESIGN  
8

UNIT III TRANSACTIONS  
9

UNIT IV IMPLEMENTATION TECHNIQUES  
9

UNIT V ADVANCED TOPICS  
9
COURSE OUTCOMES:
Upon completion of this course, the students will be able to
CO1: Construct SQL Queries using relational algebra
CO2: Design database using ER model and normalize the database
CO3: Construct queries to handle transaction processing and maintain consistency of the database
CO4: Compare and contrast various indexing strategies and apply the knowledge to tune the performance of the database
CO5: Appraise how advanced databases differ from Relational Databases and find a suitable database for the given requirement.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

CO’s-PO’s & PSO’s MAPPING

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PTCS3381 OBJECT ORIENTED PROGRAMMING LABORATORY L T P C 0 0 3 1.5

COURSE OBJECTIVES:
- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages, interfaces, inheritance, exception handling and file processing.
- To develop applications using generic programming and event handling

LIST OF EXPERIMENTS:
1. Solve problems by using sequential search, binary search, and quadratic sorting algorithms (selection, insertion)
2. Develop stack and queue data structures using classes and objects.
3. Develop a java application with an Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor,
Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10% of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club funds. Generate pay slips for the employees with their gross and net salary.

4. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named printArea(). 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 printArea() that prints the area of the given shape.

5. Solve the above problem using an interface.

6. Implement exception handling and creation of user defined exceptions.

7. Write a java program that implements a multi-threaded 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.

8. Write a program to perform file operations.

9. Develop applications to demonstrate the features of generics classes.

10. Develop applications using JavaFX controls, layouts and menus.

11. Develop a mini project for any application using Java concepts.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of this course, the students will be able to

CO1: Design and develop java programs using object oriented programming concepts

CO2: Develop simple applications using object oriented concepts such as package, exceptions

CO3: Implement multithreading, and generics concepts

CO4: Create GUIs and event driven programming applications for real world problems

CO5: Implement and deploy web applications using Java

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PTCS3481 DATABASE MANAGEMENT SYSTEMS LABORATORY L T P C 0 0 3 1.5

COURSE OBJECTIVES:

- To learn and implement important commands in SQL.
- To learn the usage of nested and joint queries.
- To understand functions, procedures and procedural extensions of databases.
- To understand design and implementation of typical database applications.
- To be familiar with the use of a front end tool for GUI based application development.
LIST OF EXPERIMENTS:
1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Create a set of tables, add foreign key constraints and incorporate referential integrity.
3. Query the database tables using different 'where' clause conditions and also implement aggregate functions.
4. Query the database tables and explore sub queries and simple join operations.
5. Query the database tables and explore natural, equi and outer joins.
6. Write user defined functions and stored procedures in SQL.
7. Execute complex transactions and realize DCL and TCL commands.
8. Write SQL Triggers for insert, delete, and update operations in a database table.
9. Create View and index for database tables with a large number of records.
12. Develop a simple GUI based database application and incorporate all the above-mentioned features
13. Case Study using any of the real life database applications from the following list
   a) Inventory Management for a EMart Grocery Shop
   b) Society Financial Management
   c) Cop Friendly App – Eseva
   d) Property Management – eMall
   e) Star Small and Medium Banking and Finance
      • Build Entity Model diagram. The diagram should align with the business and functional goals stated in the application.
      • Apply Normalization rules in designing the tables in scope.
      • Prepared applicable views, triggers (for auditing purposes), functions for enabling enterprise grade features.
      • Build PL SQL / Stored Procedures for Complex Functionalities, ex EOD Batch Processing for calculating the EMI for Gold Loan for each eligible Customer.
      • Ability to showcase ACID Properties with sample queries with appropriate settings

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Create databases with different types of key constraints.
CO2: Construct simple and complex SQL queries using DML and DCL commands.
CO3: Use advanced features such as stored procedures and triggers and incorporate in GUI based application development.
CO4: Create an XML database and validate with meta-data (XML schema).
CO5: Create and manipulate data using NOSQL database.

CO’s-PO’s & PSO’s MAPPING

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PTCS3401

ALGORITHMS

L T P C
3 0 0 3

COURSE OBJECTIVES:
- To understand and apply the algorithm analysis techniques on searching and sorting algorithms
- To critically analyze the efficiency of graph algorithms
- To understand different algorithm design techniques
- To solve programming problems using state space tree
- To understand the concepts behind NP Completeness, Approximation algorithms and randomized algorithms.

UNIT I

INTRODUCTION

9

UNIT II

GRAPH ALGORITHMS

9

UNIT III

ALGORITHM DESIGN TECHNIQUES

9

UNIT IV

STATE SPACE SEARCH ALGORITHMS

9
Backtracking: n-Queens problem - Hamiltonian Circuit Problem - Subset Sum Problem – Graph colouring problem Branch and Bound: Solving 15-Puzzle problem - Assignment problem - Knapsack Problem - Travelling Salesman Problem

UNIT V

NP-COMPLETE AND APPROXIMATION ALGORITHM

9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Analyze the efficiency of algorithms using various frameworks
CO2: Apply graph algorithms to solve problems and analyze their efficiency.
CO3: Make use of algorithm design techniques like divide and conquer, dynamic programming and greedy techniques to solve problems
CO4: Use the state space tree method for solving problems.
CO5: Solve problems using approximation algorithms and randomized algorithms

TEXT BOOKS:

REFERENCES:

CO’s-PO’s & PSO’s MAPPING

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PTCS3451 INTRODUCTION TO OPERATING SYSTEMS L T P C 3 0 0 3

COURSE OBJECTIVES:
- To understand the basics and functions of operating systems.
- To understand processes and threads.
- To analyze scheduling algorithms and process synchronization.
- To understand the concept of deadlocks.
- To analyze various memory management schemes.
- To be familiar with I/O management and file systems.
- To be familiar with the basics of virtual machines and Mobile OS like iOS and Android.

UNIT I INTRODUCTION
### UNIT II  PROCESS MANAGEMENT
11

### UNIT III  MEMORY MANAGEMENT
10
Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write - Page Replacement - Allocation of Frames –Thrashing.

### UNIT IV  STORAGE MANAGEMENT
10

### UNIT V  VIRTUAL MACHINES AND MOBILE OS
7
Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.

### COURSE OUTCOMES:
At the end of this course, the students will be able to:
- CO1 : Analyze various scheduling algorithms and process synchronization.
- CO2 : Explain deadlock prevention and avoidance algorithms.
- CO3 : Compare and contrast various memory management schemes.
- CO4 : Explain the functionality of file systems, I/O systems, and Virtualization
- CO5 : Compare iOS and Android Operating Systems.

### TEXT BOOKS:

### REFERENCES:
COURSE OBJECTIVES:

- To understand the concept of layering in networks.
- To know the functions of protocols of each layer of TCP/IP protocol suite.
- To visualize the end-to-end flow of information.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer.

UNIT I  INTRODUCTION AND APPLICATION LAYER  10

UNIT II  TRANSPORT LAYER  9

UNIT III  NETWORK LAYER  7
Switching : Packet Switching - Internet protocol - IPV4 – IP Addressing – Subnetting - IPV6, ARP, RARP, ICMP, DHCP

UNIT IV  ROUTING  7

UNIT V  DATA LINK AND PHYSICAL LAYERS  12

COURSE OUTCOMES:

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

CO 1: Explain the basic layers and its functions in computer networks.

CO 2: Understand the basics of how data flows from one node to another.
CO 3: Analyze routing algorithms.
CO 4: Describe protocols for various functions in the network.
CO 5: Analyze the working of various application layer protocols.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

CO’s-PO’s & PSO’s MAPPING

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PTCS3501 COMPILER DESIGN L T P C
3 0 0 3

COURSE OBJECTIVES:
- To learn the various phases of compiler.
- To learn the various parsing techniques.
- To understand intermediate code generation and run-time environment.
- To learn to implement the front-end of the compiler.
- To learn to implement code generator.
- To learn to implement code optimization.

UNIT I  INTRODUCTION TO COMPILERS & LEXICAL ANALYSIS

UNIT II SYNTAX ANALYSIS

Role of Parser – Grammars – Context-free grammars – Writing a grammar Top Down Parsing - General Strategies - Recursive Descent Parser Predictive Parser-LL(1) - Parser-Shift Reduce Parser-LR Parser- LR (0)Item Construction of SLR Parsing Table - Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC tool - Design of a syntax Analyzer for a Sample Language

UNIT III SYNTAX DIRECTED TRANSLATION & INTERMEDIATE CODE GENERATION 9


UNIT IV RUN-TIME ENVIRONMENT AND CODE GENERATION 9


UNIT V CODE OPTIMIZATION 8


TOTAL: 45 PERIODS

COURSE OUTCOMES:
On Completion of the course, the students should be able to:

CO1: Understand the techniques in different phases of a compiler.
CO2: Design a lexical analyser for a sample language and learn to use the LEX tool.
CO3: Apply different parsing algorithms to develop a parser and learn to use YACC tool
CO4: Understand semantics rules (SDT), intermediate code generation and run-time environment.
CO5: Implement code generation and apply code optimization techniques.

TEXT BOOK:


REFERENCES

CO’s-PO’s & PSO’s MAPPING

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PTCS3461 OPERATING SYSTEMS LABORATORY

COURSE OBJECTIVES:
- To install windows operating systems.
- To understand the basics of Unix command and shell programming.
- To implement various CPU scheduling algorithms.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms
- To implement Page Replacement Algorithms
- To implement various memory allocation methods.
- To be familiar with File Organization and Allocation Strategies.

LIST OF EXPERIMENTS:
1. Installation of windows operating system
2. Illustrate UNIX commands and Shell Programming
4. Write C programs to implement the various CPU Scheduling Algorithms
5. Illustrate the inter process communication strategy
6. Implement mutual exclusion by Semaphore
7. Write C programs to avoid Deadlock using Banker’s Algorithm
8. Write a C program to Implement Deadlock Detection Algorithm
9. Write C program to implement Threading
10. Implement the paging Technique using C program
11. Write C programs to implement the following Memory Allocation Methods
   a. First Fit    b. Worst Fit    c. Best Fit
12. Write C programs to implement the various Page Replacement Algorithms
13. Write C programs to Implement the various File Organization Techniques
14. Implement the following File Allocation Strategies using C programs
   a. Sequential  
   b. Indexed  
   c. Linked
15. Write C programs for the implementation of various disk scheduling algorithms
16. Install any guest operating system like Linux using VMware.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1 : Define and implement UNIX Commands.
CO2 : Compare the performance of various CPU Scheduling Algorithms.
CO3 : Compare and contrast various Memory Allocation Methods.
CO5 : Implement various Disk Scheduling Algorithms.

CO’s-PO’s & PSO’s MAPPING

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PTCB3491 CRYPTOGRAPHY AND CYBER SECURITY

COURSE OBJECTIVES:
- Learn to analyze the security of in-built cryptosystems.
- Know the fundamental mathematical concepts related to security.
- Develop cryptographic algorithms for information security.
- Comprehend the various types of data integrity and authentication schemes
- Understand cyber crimes and cyber security.

UNIT I INTRODUCTION TO SECURITY

UNIT II SYMMETRIC CIPHERS
Number theory – Algebraic Structures – Modular Arithmetic - Euclid’s algorithm – Congruence and matrices – Group, Rings, Fields, Finite Fields

UNIT III ASYMMETRIC CRYPTOGRAPHY
MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing – Factorization – Euler's totient function, Fermat's and Euler’s Theorem – Chinese Remainder Theorem – Exponentiation and logarithm
ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange — Elliptic curve arithmetic – Elliptic curve cryptography.

UNIT IV INTEGRITY AND AUTHENTICATION ALGORITHMS
MUTUAL TRUST: Key management and distribution – Symmetric key distribution using symmetric and asymmetric encryption – Distribution of public keys – X.509 Certificates.

UNIT V CYBER CRIMES AND CYBER SECURITY

COURSE OUTCOMES:
CO1: Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
CO2: Apply the different cryptographic operations of symmetric cryptographic algorithms
CO3: Apply the different cryptographic operations of public key cryptography
CO4: Apply the various Authentication schemes to simulate different applications.
CO5: Understand various cyber crimes and cyber security.

TEXT BOOKS

REFERENCES
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PTCS3691 EMBEDDED SYSTEMS AND IOT L T P C

3 0 0 3

COURSE OBJECTIVES:

- To learn the internal architecture and programming of an embedded processor.
- To introduce interfacing I/O devices to the processor.
- To introduce the evolution of the Internet of Things (IoT).
- To build a small low-cost embedded and IoT system using Arduino/Raspberry Pi/ open platform.
- To apply the concept of Internet of Things in real world scenario.

UNIT I 8-BIT EMBEDDED PROCESSOR 9

UNIT II EMBEDDED C PROGRAMMING 9

UNIT III IOT AND ARDUINO PROGRAMMING 9

UNIT IV IOT COMMUNICATION AND OPEN PLATFORMS 9

UNIT V APPLICATIONS DEVELOPMENT 9

COURSE OUTCOMES:

CO1: Explain the architecture of embedded processors.
CO2: Write embedded C programs.
CO3: Design simple embedded applications.
CO4: Compare the communication models in IOT
CO5: Design IoT applications using Arduino/Raspberry Pi /open platform.

TOTAL : 45 PERIODS

TEXTBOOKS

REFERENCES

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PTCS3491 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

COURSE OBJECTIVES:
The main objectives of this course are to:
- Study about uninformed and Heuristic search techniques.
- Learn techniques for reasoning under uncertainty
- Introduce Machine Learning and supervised learning algorithms
- Study about ensembling and unsupervised learning algorithms
- Learn the basics of deep learning using neural networks

UNIT I PROBLEM SOLVING
UNIT II PROBABILISTIC REASONING

UNIT III SUPERVISED LEARNING

UNIT IV ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING
Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization

UNIT V NEURAL NETWORKS
Perceptron - Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks – Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.

PRACTICAL EXERCISES:
1. Implementation of Uninformed search algorithms (BFS, DFS)
2. Implementation of Informed search algorithms (A*, memory-bounded A*)
3. Implement naïve Bayes models
4. Implement Bayesian Networks
5. Build Regression models
6. Build decision trees and random forests
7. Build SVM models
8. Implement ensembling techniques
9. Implement clustering algorithms
10. Implement EM for Bayesian networks
11. Build simple NN models
12. Build deep learning NN models

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Use appropriate search algorithms for problem solving
CO2: Apply reasoning under uncertainty
CO3: Build supervised learning models
CO4: Build ensembling and unsupervised models
CO5: Build deep learning neural network models

TEXT BOOKS:

TOTAL: 75 PERIODS
REFERENCES:

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PTCS3352 FOUNDATIONS OF DATA SCIENCE L T P C
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COURSE OBJECTIVES:
- To understand the data science fundamentals and process.
- To learn to describe the data for the data science process.
- To learn to describe the relationship between data.
- To utilize the Python libraries for Data Wrangling.
- To present and interpret data using visualization libraries in Python

UNIT I INTRODUCTION
Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model– presenting findings and building applications - Data Mining - Data Warehousing – Basic Statistical descriptions of Data

UNIT II DESCRIBING DATA
Types of Data - Types of Variables - Describing Data with Tables and Graphs – Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores

54
UNIT III    DESCRIBING RELATIONSHIPS

UNIT IV    PYTHON LIBRARIES FOR DATA WRANGLING

UNIT V    DATA VISUALIZATION

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Define the data science process
CO2: Understand different types of data description for data science process
CO3: Gain knowledge on relationships between data
CO4: Use the Python Libraries for Data Wrangling
CO5: Apply visualization Libraries in Python to interpret and explore data

TOTAL: 45 PERIODS

TEXT BOOKS

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COURSE OBJECTIVES:
- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

UNIT I  ENVIRONMENT AND BIODIVERSITY  6

UNIT II  ENVIRONMENTAL POLLUTION  9

UNIT III  RENEWABLE SOURCES OF ENERGY  6
Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

UNIT IV  SUSTAINABILITY AND MANAGEMENT  6
Development , GDP ,Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols-Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

UNIT V  SUSTAINABILITY PRACTICES  6

TOTAL: 30 PERIODS
COURSE OUTCOMES:
CO1: To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
CO2: To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
CO3: To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
CO4: To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
CO5: To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.

TEXT BOOKS:
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.

REFERENCES :

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COURSE DESCRIPTION
This course aims to provide a broad understanding about the modern values and ethical principles that have evolved and are enshrined in the Constitution of India with regard to the democratic, secular and scientific aspects. The course is designed for undergraduate students so that they could study, understand and apply these values in their day to day life.

COURSE OBJECTIVES:
- To create awareness about values and ethics enshrined in the Constitution of India
- To sensitize students about the democratic values to be upheld in the modern society.
- To inculcate respect for all people irrespective of their religion or other affiliations.
- To instill the scientific temper in the students’ minds and develop their critical thinking.
- To promote sense of responsibility and understanding of the duties of citizen.

UNIT I  DEMOCRATIC VALUES  6
Reading Text: Excerpts from John Stuart Mills’ On Liberty

UNIT II  SECULAR VALUES  6
Understanding Secular values – Interpretation of secularism in Indian context - Disassociation of state from religion – Acceptance of all faiths – Encouraging non-discriminatory practices.
Reading Text: Excerpt from Secularism in India: Concept and Practice by Ram Puniyani

UNIT III  SCIENTIFIC VALUES  6
Reading Text: Excerpt from The Scientific Temper by Antony Michaelis

UNIT IV  SOCIAL ETHICS  6
Application of ethical reasoning to social problems – Gender bias and issues – Gender violence – Social discrimination – Constitutional protection and policies – Inclusive practices.
Reading Text: Excerpt from 21 Lessons for the 21st Century by Yuval Noah Harari

UNIT V  SCIENTIFIC ETHICS  6
Transparency and Fairness in scientific pursuits – Scientific inventions for the betterment of society - Unfair application of scientific inventions – Role and Responsibility of Scientist in the modern society.

TOTAL:30 PERIODS
REFERENCES:
5. Research Methodology for Natural Sciences by Soumitro Banerjee, IISc Press, January 2022

COURSE OUTCOMES
Students will be able to
CO1: Identify the importance of democratic, secular and scientific values in harmonious functioning of social life
CO2: Practice democratic and scientific values in both their personal and professional life.
CO3: Find rational solutions to social problems.
CO4: Behave in an ethical manner in society
CO5: Practice critical thinking and the pursuit of truth.

PTCS3361 DATA SCIENCE LABORATORY  L T P C
0 0 3 1.5

COURSE OBJECTIVES:
• To understand the python libraries for data science
• To understand the basic Statistical and Probability measures for data science.
• To learn descriptive analytics on the benchmark data sets.
• To apply correlation and regression analytics on standard data sets.
• To present and interpret data using visualization packages in Python.

LIST OF EXPERIMENTS:
1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.
2. Working with Numpy arrays
3. Working with Pandas data frames
4. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.
5. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
   a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
   b. Bivariate analysis: Linear and logistic regression modeling
   c. Multiple Regression analysis
   d. Also compare the results of the above analysis for the two data sets.
6. Apply and explore various plotting functions on UCI data sets.
   a. Normal curves
   b. Density and contour plots
   c. Correlation and scatter plots
   d. Histograms
e. Three dimensional plotting

7. Visualizing Geographic Data with Basemap

TOTAL: 45 PERIODS

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

CO1: Make use of the python libraries for data science
CO2: Make use of the basic Statistical and Probability measures for data science.
CO3: Perform descriptive analytics on the benchmark data sets.
CO4: Perform correlation and regression analytics on standard data sets
CO5: Present and interpret data using visualization packages in Python.

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PTCS3811 PROJECT WORK

COURSE OBJECTIVES:
To train the students
- For gaining domain knowledge, and technical skills to solve potential business / research problems
- Gather requirements and Design suitable software solutions and evaluate alternatives
- To work in small teams and understand the processes and practices in the ‘industry.
- Implement, Test and deploy solutions for target platforms
- Preparing project reports and presentation

The students shall individually / or as group work on business/research domains and related problems approved by the Department / organization that offered the internship / project.

The student can select any topic which is relevant to his/her specialization of the programme. The student should continue the work on the selected topic as per the formulated methodology. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work, results and discussion, conclusion and references should be prepared as per the format prescribed by the University and submitted to the Head of the department. The students will be evaluated based on the report and viva-voce examination by a panel of examiners as per the Regulations.

TOTAL: 90 PERIODS
COURSE OUTCOMES:
At the end of the project, the student will be able to
CO1: Gain Domain knowledge and technical skill set required for solving industry / research problems
CO2: Provide solution architecture, module level designs, algorithms
CO3: Implement, test and deploy the solution for the target platform
CO4: Prepare detailed technical report, demonstrate and present the work

PTCCS346   EXPLORATORY DATA ANALYSIS   L T P C
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COURSE OBJECTIVES:
- To outline an overview of exploratory data analysis.
- To implement data visualization using Matplotlib.
- To perform univariate data exploration and analysis.
- To apply bivariate data exploration and analysis.
- To use Data exploration and visualization techniques for multivariate and time series data.

UNIT I  EXPLORATORY DATA ANALYSIS  6
EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques.

UNIT II  EDA USING PYTHON  6

UNIT III  UNIVARIATE ANALYSIS  6
Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality.

UNIT IV  BIVARIATE ANALYSIS  6
Relationships between Two Variables - Percentage Tables - Analysing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines.

UNIT V  MULTIVARIATE AND TIME SERIES ANALYSIS  6

PRACTICAL EXERCISES:
1. Install the data Analysis and Visualization tool: R/ Python /Tableau Public/ Power BI.
2. Perform exploratory data analysis (EDA) with datasets like email data set. Export all your emails as a dataset, import them inside a pandas data frame, visualize them and get different insights from the data.
3. Working with Numpy arrays, Pandas data frames, Basic plots using Matplotlib.
4. Explore various variable and row filters in R for cleaning data. Apply various plot features in R on sample data sets and visualize.
5. Perform Time Series Analysis and apply the various visualization techniques.
6. Perform Data Analysis and representation on a Map using various Map data sets with Mouse Rollover effect, user interaction, etc..
7. Build cartographic visualization for multiple datasets involving various countries of the world; states and districts in India etc.
8. Perform EDA on Wine Quality Data Set.
9. Use a case study on a data set and apply the various EDA and visualization techniques and present an analysis report.

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Understand the fundamentals of exploratory data analysis.
CO2: Implement the data visualization using Matplotlib.
CO3: Perform univariate data exploration and analysis.
CO4: Apply bivariate data exploration and analysis.
CO5: Use Data exploration and visualization techniques for multivariate and time series data.

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:

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COURSE OBJECTIVES:

- To understand the foundations of the recommender system.
- To learn the significance of machine learning and data mining algorithms for Recommender systems
- To learn about collaborative filtering
- To make students design and implement a recommender system.
- To learn collaborative filtering.

UNIT I  INTRODUCTION  6
Introduction and basic taxonomy of recommender systems - Traditional and non-personalized Recommender Systems - Overview of data mining methods for recommender systems- similarity measures- Dimensionality reduction – Singular Value Decomposition (SVD)

Suggested Activities:

- Practical learning – Implement Data similarity measures.
- External Learning – Singular Value Decomposition (SVD) applications

Suggested Evaluation Methods:

- Quiz on Recommender systems.
- Quiz of python tools available for implementing Recommender systems

UNIT II  CONTENT-BASED RECOMMENDATION SYSTEMS  6
High-level architecture of content-based systems - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms.

Suggested Activities:

- Assignment on content-based recommendation systems
- Assignment of learning user profiles

Suggested Evaluation Methods:

- Quiz on similarity-based retrieval.
- Quiz of content-based filtering

UNIT III  COLLABORATIVE FILTERING  6
A systematic approach, Nearest-neighbor collaborative filtering (CF), user-based and item-based CF, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection

Suggested Activities:

- Practical learning – Implement collaborative filtering concepts
- Assignment of security aspects of recommender systems

Suggested Evaluation Methods:

- Quiz on collaborative filtering
Seminar on security measures of recommender systems

UNIT IV  ATTACK-RESISTANT RECOMMENDER SYSTEMS  6

Suggested Activities:
- Group Discussion on attacks and their mitigation
- Study of the impact of group attacks
- External Learning – Use of CAPTCHAs

Suggested Evaluation Methods:
- Quiz on attacks on recommender systems
- Seminar on preventing attacks using the CAPTCHAs

UNIT V  EVALUATING RECOMMENDER SYSTEMS  6

Suggested Activities:
- Group Discussion on goals of evaluation design
- Study of accuracy metrics

Suggested Evaluation Methods:
- Quiz on evaluation design
- Problems on accuracy measures 30 PERIODS

PRACTICAL EXERCISES  30 PERIODS
1. Implement Data similarity measures using Python
2. Implement dimension reduction techniques for recommender systems
3. Implement user profile learning
4. Implement content-based recommendation systems
5. Implement collaborative filter techniques
6. Create an attack for tampering with recommender systems
7. Implement accuracy metrics like Receiver Operated Characteristic curves

TOTAL: 60 PERIODS

COURSE OUTCOMES:
On completion of the course, the students will be able to:
CO1: Understand the basic concepts of recommender systems.
CO2: Implement machine-learning and data-mining algorithms in recommender systems data sets.
CO3: Implementation of Collaborative Filtering in carrying out performance evaluation of recommender systems based on various metrics.
CO4: Design and implement a simple recommender system.
CO5: Learn about advanced topics of recommender systems.
CO6: Learn about advanced topics of recommender systems applications

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PTCCS355 NEURAL NETWORKS AND DEEP LEARNING

COURSE OBJECTIVES:
- To understand the basics in deep neural networks
- To understand the basics of associative memory and unsupervised learning networks
- To apply CNN architectures of deep neural networks
- To analyze the key computations underlying deep learning, then use them to build and train deep neural networks for various tasks.
- To apply autoencoders and generative models for suitable applications.

UNIT I INTRODUCTION
Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction-Evolution of Neural Networks-Basic Models of Artificial Neural Network- Important Terminologies of ANNs-Supervised Learning Network.

UNIT II ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS

UNIT III THIRD-GENERATION NEURAL NETWORKS
UNIT IV    DEEP FEEDFORWARD NETWORKS  6

UNIT V    RECURRENT NEURAL NETWORKS  6

LAB EXPERIMENTS:  
1. Implement simple vector addition in TensorFlow.
2. Implement a regression model in Keras.
4. Implement a Feed-Forward Network in TensorFlow/Keras.
5. Implement an Image Classifier using CNN in TensorFlow/Keras.
6. Improve the Deep learning model by fine tuning hyper parameters.
7. Implement a Transfer Learning concept in Image Classification.
8. Using a pre trained model on Keras for Transfer Learning
9. Perform Sentiment Analysis using RNN
10. Implement an LSTM based Autoencoder in TensorFlow/Keras.
11. Image generation using GAN

Additional Experiments: 
12. Train a Deep learning model to classify a given image using pre trained model
13. Recommendation system from sales data using Deep Learning
14. Implement Object Detection using CNN
15. Implement any simple Reinforcement Algorithm for an NLP problem

TOTAL: 60 PERIODS

COURSE OUTCOMES:  
At the end of this course, the students will be able to:
CO1: Apply Convolution Neural Network for image processing.
CO2: Understand the basics of associative memory and unsupervised learning networks.
CO3: Apply CNN and its variants for suitable applications.
CO4: Analyze the key computations underlying deep learning and use them to build and train deep neural networks for various tasks.
CO5: Apply autoencoders and generative models for suitable applications.

TEXT BOOKS:  
REFERENCES:
4. Learn Keras for Deep Neural Networks, Jojo Moolayil, Apress, 2018

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PTCCS369 TEXT AND SPEECH ANALYSIS L T P C 2 0 2 3

COURSE OBJECTIVES:
- Understand natural language processing basics
- Apply classification algorithms to text documents
- Build question-answering and dialogue systems
- Develop a speech recognition system
- Develop a speech synthesizer

UNIT I NATURAL LANGUAGE BASICS 6


Suggested Activities
- Flipped classroom on NLP
- Implementation of Text Preprocessing using NLTK
- Implementation of TF-IDF models
Suggested Evaluation Methods
- Quiz on NLP Basics
- Demonstration of Programs

UNIT II  TEXT CLASSIFICATION

Suggested Activities
- Flipped classroom on Feature extraction of documents
- Implementation of SVM models for text classification
- External learning: Text summarization and Topic models

Suggested Evaluation Methods
- Assignment on above topics
- Quiz on RNN, Transformers
- Implementing NLP with RNN and Transformers

UNIT III  QUESTION ANSWERING AND DIALOGUE SYSTEMS

Suggested Activities:
- Flipped classroom on language models for QA
- Developing a knowledge-based question-answering system
- Classic QA model development

Suggested Evaluation Methods
- Assignment on the above topics
- Quiz on knowledge-based question answering system
- Development of simple chatbots

UNIT IV  TEXT-TO-SPEECH SYNTHESIS

Suggested Activities:
- Flipped classroom on Speech signal processing
- Exploring Text normalization
- Data collection
- Implementation of TTS systems

Suggested Evaluation Methods
- Assignment on the above topics
- Quiz on wavenet, deep learning-based TTS systems
- Finding accuracy with different TTS systems
UNIT V  AUTOMATIC SPEECH RECOGNITION

Speech recognition: Acoustic modelling – Feature Extraction - HMM, HMM-DNN systems

Suggested Activities:
- Flipped classroom on Speech recognition.
- Exploring Feature extraction

Suggested Evaluation Methods
- Assignment on the above topics
- Quiz on acoustic modelling

PRACTICAL EXERCISES

1. Create Regular expressions in Python for detecting word patterns and tokenizing text
2. Getting started with Python and NLTK - Searching Text, Counting Vocabulary, Frequency Distribution, Collocations, Bigrams
3. Accessing Text Corpora using NLTK in Python
4. Write a function that finds the 50 most frequently occurring words of a text that are not stop words.
5. Implement the Word2Vec model
6. Use a transformer for implementing classification
7. Design a chatbot with a simple dialog system
8. Convert text to speech and find accuracy
9. Design a speech recognition system and find the error rate

TOTAL: 60 PERIODS

COURSE OUTCOMES:
On completion of the course, the students will be able to

CO1: Explain existing and emerging deep learning architectures for text and speech processing
CO2: Apply deep learning techniques for NLP tasks, language modelling and machine translation
CO3: Explain coreference and coherence for text processing
CO4: Build question-answering systems, chatbots and dialogue systems
CO5: Apply deep learning models for building speech recognition and text-to-speech systems

TEXTBOOK

REFERENCES:
4. Steven Bird, Ewan Klein, and Edward Loper, “Natural language processing with Python”, O’REILLY.
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PTCCW331 BUSINESS ANALYTICS

COURSE OBJECTIVES:
- To understand the Analytics Life Cycle.
- To comprehend the process of acquiring Business Intelligence
- To understand various types of analytics for Business Forecasting
- To model the supply chain management for Analytics.
- To apply analytics for different functions of a business

UNIT I INTRODUCTION TO BUSINESS ANALYTICS

UNIT II BUSINESS INTELLIGENCE
Data Warehouses and Data Mart - Knowledge Management –Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence –OLAP – Analytic functions

UNIT III BUSINESS FORECASTING
Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models –Data Mining and Predictive Analysis Modelling –Machine Learning for Predictive analytics.

UNIT IV HR & SUPPLY CHAIN ANALYTICS
Human Resources – Planning and Recruitment – Training and Development - Supply chain network - Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR & Supply Chain - Applying HR Analytics to make a prediction of the demand for hourly employees for a year.

UNIT V MARKETING & SALES ANALYTICS
Marketing Strategy, Marketing Mix, Customer Behaviour –selling Process – Sales Planning – Analytics applications in Marketing and Sales - predictive analytics for customers’ behaviour in marketing and sales.

LIST OF EXPERIMENTS:
Use MS-Excel and Power-BI to perform the following experiments using a Business data set, and make presentations.
Students may be encouraged to bring their own real-time socially relevant data set.

30 PERIODS
I Cycle – MS Excel
1. Explore the features of Ms-Excel.
2. (i) Get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND)
   ii) Perform data import/export operations for different file formats.
3. Perform statistical operations - Mean, Median, Mode and Standard deviation, Variance, Skewness, Kurtosis
4. Perform Z-test, T-test & ANOVA
5. Perform data pre-processing operations i) Handling Missing data ii) Normalization
6. Perform dimensionality reduction operation using PCA, KPCA & SVD
7. Perform bivariate and multivariate analysis on the dataset.
8. Apply and explore various plotting functions on the data set.

II Cycle – Power BI Desktop
9. Explore the features of Power BI Desktop
10. Prepare & Load data
11. Develop the data model
12. Perform DAX calculations
13. Design a report
14. Create a dashboard and perform data analysis
15. Presentation of a case study

COURSE OUTCOMES:
CO1: Explain the real world business problems and model with analytical solutions.
CO2: Identify the business processes for extracting Business Intelligence
CO3 : Apply predictive analytics for business fore-casting
CO4: Apply analytics for supply chain and logistics management
CO5: Use analytics for marketing and sales.

TOTAL :60 PERIODS

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COURSE OBJECTIVES:

- To understand the basics of image processing techniques for computer vision.
- To learn the techniques used for image pre-processing.
- To discuss the various object detection techniques.
- To understand the various Object recognition mechanisms.
- To elaborate on the video analytics techniques.

UNIT I
INTRODUCTION

UNIT II
IMAGE PRE-PROCESSING
Local pre-processing - Image smoothing - Edge detectors - Zero-crossings of the second derivative - Scale in image processing - Canny edge detection - Parametric edge models - Edges in multispectral images - Local pre-processing in the frequency domain - Line detection by local pre-processing operators - Image restoration.

UNIT III
OBJECT DETECTION USING MACHINE LEARNING

UNIT IV
FACE RECOGNITION AND GESTURE RECOGNITION

UNIT V
VIDEO ANALYTICS

LIST OF EXERCISES

1. Write a program that computes the T-pyramid of an image.
2. Write a program that derives the quad tree representation of an image using the homogeneity criterion of equal intensity
3. Develop programs for the following geometric transforms: (a) Rotation (b) Change of scale (c) Skewing (d) Affine transform calculated from three pairs of corresponding points (e) Bilinear transform calculated from four pairs of corresponding points.
4. Develop a program to implement Object Detection and Recognition
5. Develop a program for motion analysis using moving edges, and apply it to your image sequences.
6. Develop a program for Facial Detection and Recognition
7. Write a program for event detection in video surveillance system
COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Understand the basics of image processing techniques for computer vision and video analysis.
CO2: Explain the techniques used for image pre-processing.
CO3: Develop various object detection techniques.
CO4: Understand the various face recognition mechanisms.
CO5: Elaborate on deep learning-based video analytics.

TEXT BOOK:

REFERENCES

CO’s-PO’s & PSO’s MAPPING

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PTCCS338    COMPUTER VISION
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COURSE OBJECTIVES:
- To understand the fundamental concepts related to Image formation and processing.
- To learn feature detection, matching and detection
- To become familiar with feature based alignment and motion estimation
- To develop skills on 3D reconstruction
- To understand image based rendering and recognition
UNIT I INTRODUCTION TO IMAGE FORMATION AND PROCESSING


UNIT II FEATURE DETECTION, MATCHING AND SEGMENTATION

Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge - Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods.

UNIT III FEATURE-BASED ALIGNMENT & MOTION ESTIMATION


UNIT IV 3D RECONSTRUCTION

Shape from X - Active rangefinding - Surface representations - Point-based representations - Volumetric representations - Model-based reconstruction - Recovering texture maps and albedos.

UNIT V IMAGE-BASED RENDERING AND RECOGNITION


PRACTICAL EXERCISES:

Software needed:
OpenCV computer vision Library for OpenCV in Python / PyCharm or C++ / Visual Studio or or equivalent

- OpenCV Installation and working with Python
- Basic Image Processing - loading images, Cropping, Resizing, Thresholding, Contour analysis, Blob detection
- Image Annotation – Drawing lines, text circle, rectangle, ellipse on images
- Image Enhancement - Understanding Color spaces, color space conversion, Histogram equalization, Convolution, Image smoothing, Gradients, Edge Detection
- Image Features and Image Alignment – Image transforms – Fourier, Hough, Extract ORB Image features, Feature matching, cloning, Feature matching based image alignment
- Image segmentation using Graphcut / Grabcut
- Camera Calibration with circular grid
- Pose Estimation
- 3D Reconstruction – Creating Depth map from stereo images
- Object Detection and Tracking using Kalman Filter, Camshift
COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: To understand basic knowledge, theories and methods in image processing and computer vision.
CO2: To implement basic and some advanced image processing techniques in OpenCV.
CO3: To apply 2D a feature-based based image alignment, segmentation and motion estimations.
CO4: To apply 3D image reconstruction techniques
CO5: To design and develop innovative image processing and computer vision applications.

TEXT BOOKS:

REFERENCES:
2. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006

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PTCCS334 BIG DATA ANALYTICS

COURSE OBJECTIVES:
- To understand big data.
- To learn and use NoSQL big data management.
- To learn mapreduce analytics using Hadoop and related tools.
- To work with mapreduce applications
- To understand the usage of Hadoop related tools for Big Data Analytics
UNIT I UNDERSTANDING BIG DATA

UNIT II NOSQL DATA MANAGEMENT

UNIT III MAP REDUCE APPLICATIONS

UNIT IV BASICS OF HADOOP

UNIT V HADOOP RELATED TOOLS

COURSE OUTCOMES:
After the completion of this course, students will be able to:
CO1: Describe big data and use cases from selected business domains.
CO2: Explain NoSQL big data management.
CO3: Install, configure, and run Hadoop and HDFS.
CO4: Perform map-reduce analytics using Hadoop.
CO5: Use Hadoop-related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.

LIST OF EXPERIMENTS:
1. Downloading and installing Hadoop; Understanding different Hadoop modes. Startup scripts, Configuration files.
2. Hadoop Implementation of file management tasks, such as Adding files and directories, retrieving files and Deleting files
3. Implement of Matrix Multiplication with Hadoop Map Reduce
4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
5. Installation of Hive along with practice examples.
7. Installation of HBase, Installing thrift along with Practice examples
8. Practice importing and exporting data from various databases.
Software Requirements:
  Cassandra, Hadoop, Java, Pig, Hive and HBase.

TOTAL: 60 PERIODS

TEXT BOOKS:
  3. Sadalage, Pramod J. "NoSQL distilled", 2013

REFERENCES:

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PTCCS375 WEB TECHNOLOGIES
COURSE OBJECTIVES:
  - To understand different Internet Technologies
  - To learn java-specific web services architecture
  - To Develop web applications using frameworks

UNIT I  WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0

UNIT II  CLIENT SIDE PROGRAMMING
UNIT III SERVER SIDE PROGRAMMING
Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- DATABASE CONNECTIVITY: JDBC.

UNIT IV PHP and XML
An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions- Form Validation. XML: Basic XML- Document Type Definition- XML Schema, XML Parsers and Validation, XSL ,

UNIT V INTRODUCTION TO ANGULAR and WEB APPLICATIONS FRAMEWORKS
Introduction to AngularJS, MVC Architecture, Understanding ng attributes, Expressions and data binding, Conditional Directives, Style Directives, Controllers, Filters, Forms, Routers, Modules, Services; Web Applications Frameworks and Tools – Firebase- Docker- Node JS- React- Django- UI & UX.

COURSE OUTCOMES:
CO1: Construct a basic website using HTML and Cascading Style Sheets
CO2: Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
CO3: Develop server side programs using Servlets and JSP.
CO4: Construct simple web pages in PHP and to represent data in XML format.
CO5: Develop interactive web applications.

PRACTICAL EXERCISES:
List Of Experiments:
1. Create a web page with the following using HTML.
   • To embed an image map in a web page.
   • To fix the hot spots.
   • Show all the related information when the hot spots are clicked.
2. Create a web page with all types of Cascading style sheets.
3. Client Side Scripts for Validating Web Form Controls using DHTML.
4. Installation of Apache Tomcat web server.
5. Write programs in Java using Servlets:
   • To invoke servlets from HTML forms.
   • Session Tracking.
6. Write programs in Java to create three-tier applications using JSP and Databases
   • For conducting on-line examination.
   • For displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
7. Programs using XML- Schema – XSLT/XSL.

TEXTBOOKS
REFERENCES:

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PTCCS332  APP DEVELOPMENT  L T P C
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COURSE OBJECTIVES:
- To learn development of native applications with basic GUI Components
- To develop cross-platform applications with event handling
- To develop applications with location and data storage capabilities
- To develop web applications with database access

UNIT I  FUNDAMENTALS OF MOBILE & WEB APPLICATION DEVELOPMENT  6
Basics of Web and Mobile application development, Native App, Hybrid App, Cross-platform App, What is Progressive Web App, Responsive Web design,

UNIT II  NATIVE APP DEVELOPMENT USING JAVA  6
Native Web App, Benefits of Native App, Scenarios to create Native App, Tools for creating Native App, Cons of Native App, Popular Native App Development Frameworks, Java & Kotlin for Android, Swift & Objective-C for iOS, Basics of React Native, Native Components, JSX, State, Props

UNIT III  HYBRID APP DEVELOPMENT  6

UNIT IV  CROSS-PLATFORM APP DEVELOPMENT USING REACT-NATIVE  6
UNIT V  NON-FUNCTIONAL CHARACTERISTICS OF APP FRAMEWORKS

Comparison of different App frameworks, Build Performance, App Performance, Debugging capabilities, Time to Market, Maintainability, Ease of Development, UI/UX, Reusability

COURSE OUTCOMES:
CO1: Develop Native applications with GUI Components.
CO2: Develop hybrid applications with basic event handling.
CO3: Implement cross-platform applications with location and data storage capabilities.
CO4: Implement cross platform applications with basic GUI and event handling.
CO5: Develop web applications with cloud database access.

PRACTICAL EXERCISES:
1. Using react native, build a cross platform application for a BMI calculator.
2. Build a cross platform application for a simple expense manager which allows entering expenses and income on each day and displays category wise weekly income and expense.
3. Develop a cross platform application to convert units from imperial system to metric system (km to miles, kg to pounds etc.)
4. Design and develop a cross platform application for day to day task (to-do) management.
5. Design an android application using Cordova for a user login screen with username, password, reset button and a submit button. Also, include header image and a label. Use layout managers.
6. Design and develop an android application using Apache Cordova to find and display the current location of the user.
7. Write programs using Java to create Android application having Databases
   • For a simple library application.
   • For displaying books available, books lend, book reservation. Assume that student information is available in a database which has been stored in a database server.

TOTAL: 60 PERIODS

TEXT BOOKS
1. Head First Android Development, Dawn Griffiths, O'Reilly, 1st edition
2. Apache Cordova in Action, Raymond K. Camden, Manning. 2015
3. Full Stack React Native: Create beautiful mobile apps with JavaScript and React Native, Anthony Accomazzo, Houssein Djirdeh, Sophia Shoemaker, Devin Abbott, FullStack publishing

REFERENCES
2. Native Mobile Development by Shaun Lewis, Mike Dunn
3. Building Cross-Platform Mobile and Web Apps for Engineers and Scientists: An Active Learning Approach, Pawan Lingras, Matt Triff, Rucha Lingras

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COURSE OBJECTIVES:

- Introduce Cloud Service Management terminology, definition & concepts
- Compare and contrast cloud service management with traditional IT service management
- Identify strategies to reduce risk and eliminate issues associated with adoption of cloud services
- Select appropriate structures for designing, deploying and running cloud-based services in a business environment
- Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems

UNIT I CLOUD SERVICE MANAGEMENT FUNDAMENTALS 6

UNIT II CLOUD SERVICES STRATEGY 6
Cloud Strategy Fundamentals, Cloud Strategy Management Framework, Cloud Policy, Key Driver for Adoption, Risk Management, IT Capacity and Utilization, Demand and Capacity matching, Demand Queueing, Change Management, Cloud Service Architecture

UNIT III CLOUD SERVICE MANAGEMENT 6

UNIT IV CLOUD SERVICE ECONOMICS 6
Pricing models for Cloud Services, Freemium, Pay Per Reservation, Pay per User, Subscription based Charging, Procurement of Cloud-based Services, Capex vs Opex Shift, Cloud service Charging, Cloud Cost Models

UNIT V CLOUD SERVICE GOVERNANCE & VALUE 6
IT Governance Definition, Cloud Governance Definition, Cloud Governance Framework, Cloud Governance Structure, Cloud Governance Considerations, Cloud Service Model Risk Matrix, Understanding Value of Cloud Services, Measuring the value of Cloud Services, Balanced Scorecard, Total Cost of Ownership
COURSE OUTCOMES:
CO1: Exhibit cloud-design skills to build and automate business solutions using cloud technologies.
CO2: Possess Strong theoretical foundation leading to excellence and excitement towards adoption of cloud-based services
CO3: Solve the real world problems using Cloud services and technologies

30 PERIODS

PRACTICAL EXERCISES:
1. Create a Cloud Organization in AWS/Google Cloud/or any equivalent Open Source cloud softwares like Openstack, Eucalyptus, OpenNebula with Role-based access control
2. Create a Cost-model for a web application using various services and do Cost-benefit analysis
3. Create alerts for usage of Cloud resources
4. Create Billing alerts for your Cloud Organization
5. Compare Cloud cost for a simple web application across AWS, Azure and GCP and suggest the best one

TOTAL:60 PERIODS

TEXT BOOKS
1. Cloud Service Management and Governance: Smart Service Management in Cloud Era by Enamul Haque, Enel Publications
3. Cloud Computing Design Patterns by Thomas Erl, Robert Cope, Amin Naserpour

REFERENCES
1. Economics of Cloud Computing by Praveen Ayyappa, LAP Lambert Academic Publishing

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PTCCS370 UI AND UX DESIGN

COURSE OBJECTIVES:
- To provide a sound knowledge in UI & UX
- To understand the need for UI and UX
- To understand the various Research Methods used in Design
- To explore the various Tools used in UI & UX
- Creating a wireframe and prototype
UNIT I FOUNDATIONS OF DESIGN 6
UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy

UNIT II FOUNDATIONS OF UI DESIGN 6
Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides

UNIT III FOUNDATIONS OF UX DESIGN 6

UNIT IV WIREFRAMING, PROTOTYPING AND TESTING 6

UNIT V RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE 6

30 PERIODS

LIST OF EXPERIMENTS 30 PERIODS
1. Designing a Responsive layout for an societal application
2. Exploring various UI Interaction Patterns
3. Developing an interface with proper UI Style Guides
4. Developing Wireflow diagram for application using open source software
5. Exploring various open source collaborative interface Platform
6. Hands on Design Thinking Process for a new product
7. Brainstorming feature for proposed product
8. Defining the Look and Feel of the new Project
9. Create a Sample Pattern Library for that product (Mood board, Fonts, Colors based on UI principles)
10. Identify a customer problem to solve
11. Conduct end-to-end user research - User research, creating personas, Ideation process (User stories, Scenarios), Flow diagrams, Flow Mapping
12. Sketch, design with popular tool and build a prototype and perform usability testing and identify improvements

TOTAL: 60 PERIODS

COURSE OUTCOMES:
On completion of the course, the students will be able to:
CO1: Build UI for user Applications
CO2: Evaluate UX design of any product or application
CO3: Demonstrate UX Skills in product development
CO4: Implement Sketching principles
CO5: Create Wireframe and Prototype

TEXT BOOKS
1. Joel Marsh, “UX for Beginners”, O’Reilly, 2022

REFERENCES
2. Steve Schoger, Adam Wathan “Refactoring UI”, 2018
5. https://www.interaction-design.org/literature

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PTCCS366 SOFTWARE TESTING AND AUTOMATION

COURSE OBJECTIVES:
- To understand the basics of software testing
- To learn how to do the testing and planning effectively
- To build test cases and execute them
- To focus on wide aspects of testing and understanding multiple facets of testing
- To get an insight about test automation and the tools used for test automation

UNIT I FOUNDATIONS OF SOFTWARE TESTING

UNIT II TEST PLANNING
UNIT III TEST DESIGN AND EXECUTION
6

UNIT IV ADVANCED TESTING CONCEPTS
6

UNIT V TEST AUTOMATION AND TOOLS
6

PRACTICAL EXERCISES:
30 PERIODS
1. Develop the test plan for testing an e-commerce web/mobile application (www.amazon.in).
2. Design the test cases for testing the e-commerce application.
3. Test the e-commerce application and report the defects in it.
4. Develop the test plan and design the test cases for an inventory control system.
5. Execute the test cases against a client server or desktop application and identify the defects.
6. Test the performance of the e-commerce application.
7. Automate the testing of e-commerce applications using Selenium.
8. Integrate TestNG with the above test automation.
9. Mini Project:
   a) Build a data-driven framework using Selenium and TestNG
   b) Build Page object Model using Selenium and TestNG
   c) Build BDD framework with Selenium, TestNG and Cucumber

COURSE OUTCOMES:
CO1: Understand the basic concepts of software testing and the need for software testing
CO2: Design Test planning and different activities involved in test planning
CO3: Design effective test cases that can uncover critical defects in the application
CO4: Carry out advanced types of testing
CO5: Automate the software testing using Selenium and TestNG

TOTAL:60 PERIODS

TEXTBOOKS

REFERENCES

**CO’s-PO’s & PSO’s MAPPING**

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**PTCCS374 WEB APPLICATION SECURITY**

**COURSE OBJECTIVES:**
- To understand the fundamentals of web application security
- To focus on wide aspects of secure development and deployment of web applications
- To learn how to build secure APIs
- To learn the basics of vulnerability assessment and penetration testing
- To get an insight about Hacking techniques and Tools

**UNIT I FUNDAMENTALS OF WEB APPLICATION SECURITY**


**UNIT II SECURE DEVELOPMENT AND DEPLOYMENT**


**UNIT III SECURE API DEVELOPMENT**

UNIT IV  VULNERABILITY ASSESSMENT AND PENETRATION TESTING


UNIT V  HACKING TECHNIQUES AND TOOLS

Social Engineering, Injection, Cross-Site Scripting (XSS), Broken Authentication and Session Management, Cross-Site Request Forgery, Security Misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Tools: Comodo, OpenVAS, Nexpose, Nikto, Burp Suite, etc.

PRACTICAL EXERCISES:

1. Install wireshark and explore the various protocols
   a. Analyze the difference between HTTP vs HTTPS
   b. Analyze the various security mechanisms embedded with different protocols.
      Identify the vulnerabilities using OWASP ZAP tool
      Create simple REST API using python for following operation
      . GET
      a. PUSH
      b. POST
      c. DELETE
      Install Burp Suite to do following vulnerabilities:
      . SQL injection
      a. cross-site scripting (XSS)
      Attack the website using Social Engineering method

COURSE OUTCOMES:

CO1: Understanding the basic concepts of web application security and the need for it
CO2: Be acquainted with the process for secure development and deployment of web applications
CO3: Acquire the skill to design and develop Secure Web Applications that use Secure APIs
CO4: Be able to get the importance of carrying out vulnerability assessment and penetration testing
CO5: Acquire the skill to think like a hacker and to use hackers tool sets

TOTAL :60 PERIODS

TEXT BOOKS


REFERENCES

5. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams
Companies.

CO’s-PO’s & PSO’s MAPPING

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PTCCS342

DEVOPS

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COURSE OBJECTIVES:

- To introduce DevOps terminology, definition & concepts
- To understand the different Version control tools like Git, Mercurial
- To understand the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment
- To understand Configuration management using Ansible
- Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real
  world problems

UNIT I

INTRODUCTION TO DEVOPS

6
Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github.

UNIT II

COMPILE AND BUILD USING MAVEN & GRADLE

6
Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases(compile build,
test, package) Maven Profiles, Maven repositories(local, central, global),Maven plugins, Maven
create and build Artificats, Dependency management, Installation of Gradle, Understand build using
Gradle

UNIT III

CONTINUOUS INTEGRATION USING JENKINS

6
Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a
Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin,
Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring
Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.

UNIT IV

CONFIGURATION MANAGEMENT USING ANSIBLE

6
Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible
modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible
UNIT V BUILDING DEVOPS PIPELINES USING AZURE

Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines.yml file

COURSE OUTCOMES:

CO1: Understand different actions performed through Version control tools like Git.
CO2: Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.
CO3: Ability to Perform Automated Continuous Deployment
CO4: Ability to do configuration management using Ansible
CO5: Understand to leverage Cloud-based DevOps tools using Azure DevOps

PRACTICAL EXERCISES:

1. Create Maven Build pipeline in Azure
2. Run regression tests using Maven Build pipeline in Azure
3. Install Jenkins in Cloud
4. Create CI pipeline using Jenkins
5. Create a CD pipeline in Jenkins and deploy in Cloud
6. Create an Ansible playbook for a simple web application infrastructure
7. Build a simple application using Gradle
8. Install Ansible and configure ansible roles and to write playbooks

TOTAL:60 PERIODS

TEXT BOOKS


REFERENCES

2. by Mitesh Soni

CO’s-PO’s & PSO’s MAPPING

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PTCCS358  PRINCIPLES OF PROGRAMMING LANGUAGES  L T P C
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COURSE OBJECTIVES:

- To understand and describe syntax and semantics of programming languages
- To understand data, data types, and basic statements
- To understand call-return architecture and ways of implementing them
- To understand object-orientation, concurrency, and event handling in programming languages
- To develop programs in non-procedural programming paradigms

UNIT I  SYNTAX AND SEMANTICS  9

UNIT II  DATA, DATA TYPES, AND BASIC STATEMENTS  9

UNIT III  SUBPROGRAMS AND IMPLEMENTATIONS  9

UNIT IV  OBJECT-ORIENTATION, CONCURRENCY, AND EVENT HANDLING  9

UNIT V  FUNCTIONAL AND LOGIC PROGRAMMING LANGUAGES  9
Introduction to lambda calculus – fundamentals of functional programming languages – Programming with Scheme – Programming with ML – Introduction to logic and logic programming – Programming with Prolog – multi-paradigm languages

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: Describe syntax and semantics of programming languages
CO2: Explain data, data types, and basic statements of programming languages
CO3: Design and implement subprogram constructs
CO4: Apply object-oriented, concurrency, and event handling programming constructs
   and Develop programs in Scheme, ML, and Prolog
CO5: Understand and adopt new programming languages

TEXT BOOKS

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PTCCS335 CLOUD COMPUTING

COURSE OBJECTIVES:
- To understand the principles of cloud architecture, models and infrastructure.
- To understand the concepts of virtualization and virtual machines.
- To gain knowledge about virtualization infrastructure.
- To explore and experiment with various Cloud deployment environments.
- To learn about the security issues in the cloud environment.

UNIT I  CLOUD ARCHITECTURE MODELS AND INFRASTRUCTURE


UNIT II  VIRTUALIZATION BASICS

UNIT III VIRTUALIZATION INFRASTRUCTURE AND DOCKER

UNIT IV CLOUD DEPLOYMENT ENVIRONMENT
Google App Engine – Amazon AWS – Microsoft Azure; Cloud Software Environments – Eucalyptus – OpenStack.

UNIT V CLOUD SECURITY

PRACTICAL EXERCISES:

1. Install Virtualbox/VMware/ Equivalent open source cloud Workstation with different flavours of Linux or Windows OS on top of windows 8 and above.
2. Install a C compiler in the virtual machine created using a virtual box and execute Simple Programs
3. Install Google App Engine. Create a hello world app and other simple web applications using python/java.
4. Use the GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Install Hadoop single node cluster and run simple applications like wordcount.
9. Run a Container from Docker Hub

COURSE OUTCOMES:
CO1: Understand the design challenges in the cloud.
CO2: Apply the concept of virtualization and its types.
CO3: Experiment with virtualization of hardware resources and Docker.
CO4: Develop and deploy services on the cloud and set up a cloud environment.
CO5: Explain security challenges in the cloud environment.

TEXT BOOKS

REFERENCES
COURSE OBJECTIVES:
- To Learn the basics and types of Virtualization
- To understand the Hypervisors and its types
- To Explore the Virtualization Solutions
- To Experiment the virtualization platforms

UNIT I  INTRODUCTION TO VIRTUALIZATION  7
Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations- Types of hardware virtualization: Full virtualization - partial virtualization - Paravirtualization-Types of Hypervisors

UNIT II SERVER AND DESKTOP VIRTUALIZATION  6

UNIT III NETWORK VIRTUALIZATION  6
Introduction to Network Virtualization-Advantages- Functions-Tools for Network Virtualization-VLAN-WAN Architecture-WAN Virtualization

UNIT IV STORAGE VIRTUALIZATION  5
Memory Virtualization-Types of Storage Virtualization-Block, File-Address space Remapping-Risks of Storage Virtualization-SAN-NAS-RAID

UNIT V VIRTUALIZATION TOOLS  6
VMWare-AWS-Microsoft HyperV- Oracle VM Virtual Box - IBM PowerVM- Google Virtualization- Case study.

PRACTICAL EXERCISES:  30 PERIODS
1. Create type 2 virtualization in VMWARE or any equivalent Open Source Tool. Allocate memory and storage space as per requirement. Install Guest OS on that VMWARE.

2. a. Shrink and extend virtual disk
b. Create, Manage, Configure and schedule snapshots

c. Create Spanned, Mirrored and Striped volume

d. Create RAID 5 volume

3.

a. Desktop Virtualization using VNC

b. Desktop Virtualization using Chrome Remote Desktop

4. Create type 2 virtualization on ESXI 6.5 server

5. Create a VLAN in CISCO packet tracer

6. Install KVM in Linux

7. Create Nested Virtual Machine (VM under another VM)

COURSE OUTCOMES:

CO1: Analyse the virtualization concepts and Hypervisor

CO2: Apply the Virtualization for real-world applications

CO3: Install & Configure the different VM platforms

CO4: Experiment with the VM with various software

TOTAL: 60 PERIODS

TEXT BOOKS


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COURSE OBJECTIVES:
- To know the details of data warehouse Architecture
- To understand the OLAP Technology
- To understand the partitioning strategy
- To differentiate various schema
- To understand the roles of process manager & system manager

UNIT I  INTRODUCTION TO DATA WAREHOUSE  5
Data warehouse Introduction - Data warehouse components- operational database Vs data warehouse – Data warehouse Architecture – Three-tier Data Warehouse Architecture - Autonomous Data Warehouse- Autonomous Data Warehouse Vs Snowflake - Modern Data Warehouse

UNIT II  ETL AND OLAP TECHNOLOGY  6
What is ETL – ETL Vs ELT – Types of Data warehouses - Data warehouse Design and Modeling - Delivery Process - Online Analytical Processing (OLAP) - Characteristics of OLAP - Online Transaction Processing (OLTP) Vs OLAP - OLAP operations- Types of OLAP- ROLAP Vs MOLAP Vs HOLAP.

UNIT III  META DATA, DATA MART AND PARTITION STRATEGY  7

UNIT IV  DIMENSIONAL MODELING AND SCHEMA  6

UNIT V  SYSTEM & PROCESS MANAGERS  6
Data Warehousing System Managers: System Configuration Manager- System Scheduling Manager - System Event Manager - System Database Manager - System Backup Recovery Manager - Data Warehousing Process Managers: Load Manager – Warehouse Manager- Query Manager – Tuning – Testing

PRACTICAL EXERCISES:  30 PERIODS
1. Data exploration and integration with WEKA
2. Apply weka tool for data validation
3. Plan the architecture for real time application
4. Write the query for schema definition
5. Design data warehouse for real time applications
6. Analyse the dimensional Modeling
7. Case study using OLAP
8. Case study using OTLP
9. Implementation of warehouse testing.
COURSE OUTCOMES:
At the end of the course the students should be able to
CO1: Design data warehouse architecture for various Problems
CO2: Apply the OLAP Technology
CO3: Analyse the partitioning strategy
CO4: Critically analyze the differentiation of various schema for given problem
CO5: Frame roles of process manager & system manager

TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES

CO’s-PO’s & PSO's MAPPING

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PTCCS367
STORAGE TECHNOLOGIES
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COURSE OBJECTIVES:
- Characterize the functionalities of logical and physical components of storage
- Describe various storage networking technologies
- Identify different storage virtualization technologies
- Discuss the different backup and recovery strategies
- Understand common storage management activities and solutions

UNIT I
STORAGE SYSTEMS
9
Introduction to Information Storage: Digital data and its types, Information storage, Key characteristics of data center and Evolution of computing platforms. Information Lifecycle Management. Third Platform Technologies: Cloud computing and its essential characteristics, Cloud services and cloud deployment models, Big data analytics, Social networking and mobile computing, Characteristics of third platform infrastructure and Imperatives for third platform transformation. Data
Center Environment: Building blocks of a data center, Compute systems and compute virtualization and Software-defined data center.

UNIT II INTELLIGENT STORAGE SYSTEMS AND RAID 5
Components of an intelligent storage system, Components, addressing, and performance of hard disk drives and solid-state drives, RAID, Types of intelligent storage systems, Scale-up and scale-out storage Architecture.

UNIT III STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION 13
Block-Based Storage System, File-Based Storage System, Object-Based and Unified Storage. Fibre Channel SAN: Software-defined networking, FC SAN components and architecture, FC SAN topologies, link aggregation, and zoning, Virtualization in FC SAN environment. Internet Protocol SAN: iSCSI protocol, network components, and connectivity, Link aggregation, switch aggregation, and VLAN, FCIP protocol, connectivity, and configuration. Fibre Channel over Ethernet SAN: Components of FCoE SAN, FCoE SAN connectivity, Converged Enhanced Ethernet, FCoE architecture.

UNIT IV BACKUP, ARCHIVE AND REPLIATION 12
Introduction to Business Continuity, Backup architecture, Backup targets and methods, Data deduplication, Cloud-based and mobile device backup, Data archive, Uses of replication and its characteristics, Compute based, storage-based, and network-based replication, Data migration, Disaster Recovery as a Service (DRaaS).

UNIT V SECURING STORAGE INFRASTRUCTURE 6
Information security goals, Storage security domains, Threats to a storage infrastructure, Security controls to protect a storage infrastructure, Governance, risk, and compliance, Storage infrastructure management functions, Storage infrastructure management processes.

COURSE OUTCOMES:
CO1: Demonstrate the fundamentals of information storage management and various models of Cloud infrastructure services and deployment
CO2: Illustrate the usage of advanced intelligent storage systems and RAID
CO3: Interpret various storage networking architectures - SAN, including storage subsystems and virtualization
CO4: Examine the different role in providing disaster recovery and remote replication technologies
CO5: Infer the security needs and security measures to be employed in information storage management

TOTAL:45 PERIODS

TEXTBOOKS
1. EMC Corporation, Information Storage and Management, Wiley, India
### CO's-PO's & PSO's MAPPING

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### PTCCS365

#### SOFTWARE DEFINED NETWORKS

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### COURSE OBJECTIVES:

- To understand the need for SDN and its data plane operations
- To understand the functions of control plane
- To comprehend the migration of networking functions to SDN environment
- To explore various techniques of network function virtualization
- To comprehend the concepts behind network virtualization

#### UNIT I SDN: INTRODUCTION

Evolving Network Requirements – The SDN Approach – SDN architecture - SDN Data Plane, Control plane and Application Plane

#### UNIT II SDN DATA PLANE AND CONTROL PLANE

Data Plane functions and protocols - OpenFlow Protocol - Flow Table - Control Plane Functions - Southbound Interface, Northbound Interface – SDN Controllers - Ryu, OpenDaylight, ONOS - Distributed Controllers

#### UNIT III SDN APPLICATIONS


#### UNIT IV NETWORK FUNCTION VIRTUALIZATION


#### UNIT V NFV FUNCTIONALITY

NFV Infrastructure – Virtualized Network Functions – NFV Management and Orchestration – NFV Use cases – SDN and NFV

30 PERIODS

### PRACTICAL EXERCISES:

1) Setup your own virtual SDN lab
   a) Virtualbox/Mininet Environment for SDN - [http://mininet.org](http://mininet.org)
   b) [https://www.kathara.org](https://www.kathara.org)
iii) GNS3

2) Create a simple mininet topology with SDN controller and use Wireshark to capture and visualize the OpenFlow messages such as OpenFlow FLOW MOD, PACKET IN, PACKET OUT etc.

3) Create a SDN application that uses the Northbound API to program flow table rules on the switch for various use cases like L2 learning switch, Traffic Engineering, Firewall etc.

4) Create a simple end-to-end network service with two VNFs using vim-emu https://github.com/containernet/vim-emu

5) Install OSM and onboard and orchestrate network service.

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

CO1: Describe the motivation behind SDN

CO2: Identify the functions of the data plane and control plane

CO3: Design and develop network applications using SDN

CO4: Orchestrate network services using NFV

CO5: Explain various use cases of SDN and NFV

TOTAL :60 PERIODS

TEXTBOOKS:


REFERENCES:


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PTCCS368 STREAM PROCESSING L T P C 2 0 2 3

COURSE OBJECTIVES:

- Introduce Data Processing terminology, definition & concepts
- Define different types of Data Processing
• Explain the concepts of Real-time Data processing
• Select appropriate structures for designing and running real-time data services in a business environment
• Illustrate the benefits and drive the adoption of real-time data services to solve real world problems

UNIT I  FOUNDATIONS OF DATA SYSTEMS  6
Introduction to Data Processing, Stages of Data processing, Data Analytics, Batch Processing, Stream processing, Data Migration, Transactional Data processing, Data Mining, Data Management Strategy, Storage, Processing, Integration, Analytics, Benefits of Data as a Service, Challenges

UNIT II  REAL-TIME DATA PROCESSING  6
Introduction to Big data, Big data infrastructure, Real-time Analytics, Near real-time solution, Lambda architecture, Kappa Architecture, Stream Processing, Understanding Data Streams, Message Broker, Stream Processor, Batch & Real-time ETL tools, Streaming Data Storage

UNIT III  DATA MODELS AND QUERY LANGUAGES  6
Relational Model, Document Model, Key-Value Pairs, NoSQL, Object-Relational Mismatch, Many-to-One and Many-to-Many Relationships, Network data models, Schema Flexibility, Structured Query Language, Data Locality for Queries, Declarative Queries, Graph Data models, Cypher Query Language, Graph Queries in SQL, The Semantic Web, CODASYL, SPARQL

UNIT IV  EVENT PROCESSING WITH APACHE KAFKA  6
Apache Kafka, Kafka as Event Streaming platform, Events, Producers, Consumers, Topics, Partitions, Brokers, Kafka APIs, Admin API, Producer API, Consumer API, Kafka Streams API, Kafka Connect API

UNIT V  REAL-TIME PROCESSING USING SPARK STREAMING  6

PRACTICAL EXERCISES:  30 PERIODS
1. Install MongoDB
2. Design and Implement Simple application using MongoDB
3. Query the designed system using MongoDB
4. Create a Event Stream with Apache Kafka
5. Create a Real-time Stream processing application using Spark Streaming
6. Build a Micro-batch application
7. Real-time Fraud and Anomaly Detection,
8. Real-time personalization, Marketing, Advertising

COURSE OUTCOMES:
CO1: Understand the applicability and utility of different streaming algorithms.
CO2: Describe and apply current research trends in data-stream processing.
CO3: Analyze the suitability of stream mining algorithms for data stream systems.
CO4: Program and build stream processing systems, services and applications.
CO5: Solve problems in real-world applications that process data streams.

TOTAL: 60 PERIODS

TEXT BOOKS
1. Streaming Systems: The What, Where, When and How of Large-Scale Data Processing by Tyler Akidau, Slava Chemyak, Reuven Lax, O'Reilly publication
2. Designing Data-Intensive Applications by Martin Kleppmann, O'Reilly Media

REFERENCES
2. Kafka.apache.org

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PTCCS362 SECURITY AND PRIVACY IN CLOUD

COURSE OBJECTIVES:
- To Introduce Cloud Computing terminology, definition & concepts
- To understand the security design and architectural considerations for Cloud
- To understand the Identity, Access control in Cloud
- To follow best practices for Cloud security using various design patterns
- To be able to monitor and audit cloud applications for security

UNIT I FUNDAMENTALS OF CLOUD SECURITY CONCEPTS
Overview of cloud security - Security Services - Confidentiality, Integrity, Authentication, Non-repudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures.

UNIT II SECURITY DESIGN AND ARCHITECTURE FOR CLOUD
Security design principles for Cloud Computing - Comprehensive data protection - End-to-end access control - Common attack vectors and threats - Network and Storage - Secure Isolation Strategies - Virtualization strategies - Inter-tenant network segmentation strategies - Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key
UNIT III  ACCESS CONTROL AND IDENTITY MANAGEMENT  

UNIT IV  CLOUD SECURITY DESIGN PATTERNS  
Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud

UNIT V  MONITORING, AUDITING AND MANAGEMENT  
Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts - Auditing – Record generation, Reporting and Management, Tamper-proofing audit logs, Quality of Services, Secure Management, User management, Identity management, Security Information and Event Management

PRACTICAL EXERCISES:  
1. Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm not present in Cloud Sim
2. Simulate resource management using cloud sim
3. Simulate log forensics using cloud sim
4. Simulate a secure file sharing using a cloud sim
5. Implement data anonymization techniques over the simple dataset (masking, k-anonymization, etc)
6. Implement any encryption algorithm to protect the images
7. Implement any image obfuscation mechanism
8. Implement a role-based access control mechanism in a specific scenario
9. Implement an attribute-based access control mechanism based on a particular scenario
10. Develop a log monitoring system with incident management in the cloud

COURSE OUTCOMES:  
CO1: Understand the cloud concepts and fundamentals.  
CO2: Explain the security challenges in the cloud.  
CO3: Define cloud policy and Identity and Access Management.  
CO4: Understand various risks and audit and monitoring mechanisms in the cloud.  
CO5: Define the various architectural and design considerations for security in the cloud.

TEXTBOOKS  

REFERENCES  
PTCCS344 ETHICAL HACKING L T P C 2 0 2 3

COURSE OBJECTIVES:
- To understand the basics of computer based vulnerabilities.
- To explore different footprinting, reconnaissance and scanning methods.
- To expose the enumeration and vulnerability analysis methods.
- To understand hacking options available in Web and wireless applications.
- To explore the options for network protection.
- To practice tools to perform ethical hacking to expose the vulnerabilities.

UNIT I INTRODUCTION 6

UNIT II FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS 6

UNIT III ENUMERATION AND VULNERABILITY ANALYSIS 6

UNIT IV SYSTEM HACKING 6
UNIT V NETWORK PROTECTION SYSTEMS


PRACTICAL EXERCISES:

1. Install Kali or Backtrack Linux / Metasploitable/ Windows XP
2. Practice the basics of reconnaissance.
3. Using FOCA / SearchDiggity tools, extract metadata and expanding the target list.
4. Aggregates information from public databases using online free tools like Paterva’s Maltego.
5. Information gathering using tools like Robtex.
6. Scan the target using tools like Nessus.
7. View and capture network traffic using Wireshark.
8. Automate dig for vulnerabilities and match exploits using Armitage

Kali or Backtrack Linux, Metasploitable, Windows XP

COURSE OUTCOMES:

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

CO1: To express knowledge on basics of computer based vulnerabilities
CO2: To gain understanding on different footprinting, reconnaissance and scanning methods.
CO3: To demonstrate the enumeration and vulnerability analysis methods
CO4: To gain knowledge on hacking options available in Web and wireless applications.
CO5: To acquire knowledge on the options for network protection.
CO6: To use tools to perform ethical hacking to expose the vulnerabilities.

TOTAL:60 PERIODS

TEXTBOOKS


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PTCCS343 DIGITAL AND MOBILE FORENSICS  L T P C  
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COURSE OBJECTIVES:
- To understand basic digital forensics and techniques.
- To understand digital crime and investigation.
- To understand how to be prepared for digital forensic readiness.
- To understand and use forensics tools for iOS devices.
- To understand and use forensics tools for Android devices.

UNIT I INTRODUCTION TO DIGITAL FORENSICS

UNIT II DIGITAL CRIME AND INVESTIGATION

UNIT III DIGITAL FORENSIC READINESS

UNIT IV iOS FORENSICS

UNIT V ANDROID FORENSICS

COURSE OUTCOMES: On completion of the course, the students will be able to:
CO1: Have knowledge on digital forensics.
CO2: Know about digital crime and investigations.
CO3: Be forensic ready.
CO4: Investigate, identify and extract digital evidence from iOS devices.
CO5: Investigate, identify and extract digital evidence from Android devices.

30 PERIODS
LAB EXPERIMENTS:
1. Installation of Sleuth Kit on Linux. List all data blocks. Analyze allocated as well as unallocated blocks of a disk image.
2. Data extraction from call logs using Sleuth Kit.
3. Data extraction from SMS and contacts using Sleuth Kit.
4. Install Mobile Verification Toolkit or MVT and decrypt encrypted iOS backups.
5. Process and parse records from the iOS system.
7. Extract diagnostic information from Android devices through the adb protocol.
8. Generate a unified chronological timeline of extracted records.

30 PERIODS
TOTAL : 60 PERIODS

TEXT BOOK:

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PTCCS363 SOCIAL NETWORK SECURITY

COURSE OBJECTIVES:
- To develop semantic web related simple applications
- To explain Privacy and Security issues in Social Networking
- To explain the data extraction and mining of social networks
- To discuss the prediction of human behavior in social communities
- To describe the Access Control, Privacy and Security management of social networks

UNIT I  FUNDAMENTALS OF SOCIAL NETWORKING
Introduction to Semantic Web, Limitations of current Web, Development of Semantic Web, Emergence of the Social Web, Social Network analysis, Development of Social Network Analysis, Key concepts and measures in network analysis, Historical overview of privacy and security, Major paradigms, for understanding privacy and security
UNIT II SECURITY ISSUES IN SOCIAL NETWORKS
The evolution of privacy and security concerns with networked technologies, Contextual influences on privacy attitudes and behaviors, Anonymity in a networked world

UNIT III EXTRACTION AND MINING IN SOCIAL NETWORKING DATA
Extracting evolution of Web Community from a Series of Web Archive, Detecting communities in social networks, Definition of community, Evaluating communities, Methods for community detection and mining, Applications of community mining algorithms, Tools for detecting communities social network infrastructures and communities, Big data and Privacy

UNIT IV PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES

UNIT V ACCESS CONTROL, PRIVACY AND IDENTITY MANAGEMENT

COURSE OUTCOMES:
CO1: Develop semantic web related simple applications
CO2: Address Privacy and Security issues in Social Networking
CO3: Explain the data extraction and mining of social networks
CO4: Discuss the prediction of human behavior in social communities
CO5: Describe the applications of social networks

PRACTICAL EXERCISES:
1. Design own social media application
2. Create a Network model using Neo4j
3. Read and write Data from Graph Database
4. Find “Friend of Friends” using Neo4j
5. Implement secure search in social media
6. Create a simple Security & Privacy detector

TEXT BOOKS
3. Learning Neo4j 3.x Second Edition By Jérôme Baton, Rik Van Bruggen, Packt publishing
REFERENCES

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PTCCS351 MODERN CRYPTOGRAPHY

COURSE OBJECTIVES:
- To learn about Modern Cryptography.
- To focus on how cryptographic algorithms and protocols work and how to use them.
- To build a Pseudorandom permutation.
- To construct Basic cryptanalytic techniques.
- To provide instruction on how to use the concepts of block ciphers and message authentication codes.

UNIT I INTRODUCTION

UNIT II FORMAL NOTIONS OF ATTACKS
Attacks under Message Indistinguishability: Chosen Plaintext Attack (IND-CPA), Chosen Ciphertext Attacks (IND-CCA1 and IND-CCA2), Attacks under Message Non-malleability: NM-CPA and NM-CCA2, Inter-relations among the attack model.
UNIT III RANDOM ORACLES

UNIT IV BUILDING A PSEUDORANDOM PERMUTATION
The LubyRackoff Construction: Formal Definition, Application of the LubyRackoff Construction to the construction of Block Ciphers, The DES in the light of LubyRackoff Construction.

UNIT V MESSAGE AUTHENTICATION CODES

PRACTICAL EXERCISES:
1. Implement Feige-Fiat-Shamir identification protocol.  
2. Implement GQ identification protocol.  
3. Implement Schnorr identification protocol.  
4. Implement Rabin one-time signature scheme.  
5. Implement Merkle one-time signature scheme.  
6. Implement Authentication trees and one-time signatures.  
7. Implement GMR one-time signature scheme.

COURSE OUTCOMES:
CO1: Interpret the basic principles of cryptography and general cryptanalysis.  
CO2: Determine the concepts of symmetric encryption and authentication.  
CO3: Identify the use of public key encryption, digital signatures, and key establishment.  
CO4: Articulate the cryptographic algorithms to compose, build and analyze simple cryptographic solutions.  
CO5: Express the use of Message Authentication Codes.  

TOTAL: 60 PERIODS

TEXT BOOKS:
2. Wenbo Mao, Modern Cryptography, Theory and Practice, Pearson Education (Low Priced Edition)

REFERENCES:
PTCB3591 ENGINEERING SECURE SOFTWARE SYSTEMS

COURSE OBJECTIVES:
- Know the importance and need for software security.
- Know about various attacks.
- Learn about secure software design.
- Understand risk management in secure software development.
- Know the working of tools related to software security.

UNIT I NEED OF SOFTWARE SECURITY AND LOW-LEVEL ATTACKS
Software Assurance and Software Security - Threats to software security - Sources of software insecurity - Benefits of Detecting Software Security - Properties of Secure Software – Memory-Based Attacks: Low-Level Attacks Against Heap and Stack - Defense Against Memory-Based Attacks

UNIT II SECURE SOFTWARE DESIGN

UNIT III SECURITY RISK MANAGEMENT

UNIT IV SECURITY TESTING
UNIT V  SECURE PROJECT MANAGEMENT

Governance and security - Adopting an enterprise software security framework - Security and project management - Maturity of Practice

PRACTICAL EXERCISES
1. Implement the SQL injection attack.
2. Implement the Buffer Overflow attack.
3. Implement Cross Site Scripting and Prevent XSS.
4. Perform Penetration testing on a web application to gather information about the system, then initiate XSS and SQL injection attacks using tools like Kali Linux.
5. Develop and test the secure test cases
6. Penetration test using kali Linux

30 PERIODS

COURSE OUTCOMES:
Upon completion of the course, the student will be able to

CO1: Identify various vulnerabilities related to memory attacks.
CO2: Apply security principles in software development.
CO3: Evaluate the extent of risks.
CO4: Involve selection of testing techniques related to software security in the testing phase of software development.
CO5: Use tools for securing software.

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:

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PTCCS339 CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES 2023

UNIT I INTRODUCTION TO BLOCKCHAIN
Blockchain- Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, Transactions-The Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree

UNIT II BITCOIN AND CRYPTOCURRENCY
A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay

UNIT III BITCOIN CONSENSUS
Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW ,monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

UNIT IV HYPERLEDGER FABRIC & ETHEREUM

UNIT V BLOCKCHAIN APPLICATIONS
Smart contracts, Truffle Design and issue- DAApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance,etc- Case Study.

COURSE OUTCOMES:
CO1: Understand emerging abstract models for Blockchain Technology
CO2: Identify major research challenges and technical gaps existing between theory and practice in the crypto currency domain.
CO3: It provides conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.
CO4: Apply hyperledger Fabric and Ethereum platform to implement the Block chain Application.
PRACTICAL

1. Install and understand Docker container, Node.js, Java and Hyperledger Fabric, Ethereum and perform necessary software installation on local machine/create instance on cloud to run.

2. Create and deploy a blockchain network using Hyperledger Fabric SDK for Java Set up and initialize the channel, install and instantiate chain code, and perform invoke and query on your blockchain network.

3. Interact with a blockchain network. Execute transactions and requests against a blockchain network by creating an app to test the network and its rules.

4. Deploy an asset-transfer app using blockchain. Learn app development within a Hyperledger Fabric network.

5. Use blockchain to track fitness club rewards. Build a web app that uses Hyperledger Fabric to track and trace member rewards.

6. Car auction network: A Hello World example with Hyperledger Fabric Node SDK and IBM Blockchain Starter Plan. Use Hyperledger Fabric to invoke chain code while storing results and data in the starter plan

TOTAL: 60 PERIODS

TEXT BOOKS


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COURSE OBJECTIVES:

- To learn the fundamentals of cryptography.
- To learn the key management techniques and authentication approaches.
- To explore the network and transport layer security techniques.
- To understand the application layer security standards.
- To learn the real time security practices.

UNIT I 
INTRODUCTION
Basics of cryptography, conventional and public-key cryptography, hash functions, authentication, and digital signatures.

UNIT II
KEY MANAGEMENT AND AUTHENTICATION

UNIT III
ACCESS CONTROL AND SECURITY

UNIT IV
APPLICATION LAYER SECURITY

UNIT V
SECURITY PRACTICES

PRACTICAL EXERCISES:

1. Implement symmetric key algorithms
2. Implement asymmetric key algorithms and key exchange algorithms
3. Implement digital signature schemes
4. Installation of Wire shark, tcpdump and observe data transferred in client-server communication using UDP/TCP and identify the UDP/TCP datagram.
5. Check message integrity and confidentiality using SSL
6. Experiment Eavesdropping, Dictionary attacks, MITM attacks
7. Experiment with Sniff Traffic using ARP Poisoning
8. Demonstrate intrusion detection system using any tool.
9. Explore network monitoring tools
10. Study to configure Firewall, VPN

30 PERIODS
COURSE OUTCOMES:
At the end of this course, the students will be able:
CO1: Classify the encryption techniques
CO2: Illustrate the key management technique and authentication.
CO3: Evaluate the security techniques applied to network and transport layer
CO4: Discuss the application layer security standards.
CO5: Apply security practices for real time applications.

TOTAL:60 PERIODS

TEXT BOOKS:

REFERENCES:

CO's-PO's & PSO's MAPPING

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PTCCS333 AUGMENTED REALITY/VIRTUAL REALITY L T P C
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COURSE OBJECTIVES:
- To impart the fundamental aspects and principles of AR/VR technologies.
- To know the internals of the hardware and software components involved in the development of AR/VR enabled applications.
- To learn about the graphical processing units and their architectures.
- To gain knowledge about AR/VR application development.
- To know the technologies involved in the development of AR/VR based applications.
UNIT I
INTRODUCTION

UNIT II
VR MODELING

UNIT III
VR PROGRAMMING
VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World ToolKit and Java 3D

UNIT IV
APPLICATIONS

UNIT V
AUGMENTED REALITY
Introduction to Augmented Reality–Computer vision for AR–Interaction–Modelling and Annotation–Navigation–Wearable devices

PRACTICAL EXERCISES:
1. Study of tools like Unity, Maya, 3DS MAX, AR toolkit, Vuforia and Blender.
2. Use the primitive objects and apply various projection types by handling camera.
3. Download objects from asset store and apply various lighting and shading effects.
4. Model three dimensional objects using various modelling techniques and apply textures over them.
5. Create three dimensional realistic scenes and develop simple virtual reality enabled mobile applications which have limited interactivity.
6. Add audio and text special effects to the developed application.
7. Develop VR enabled applications using motion trackers and sensors incorporating full haptic interactivity.
8. Develop AR enabled applications with interactivity like E learning environment, Virtual walkthroughs and visualization of historic places.
10. Develop simple MR enabled gaming applications.
COURSE OUTCOMES:
On completion of the course, the students will be able to:
CO1: Understand the basic concepts of AR and VR
CO2: Understand the tools and technologies related to AR/VR
CO3: Know the working principle of AR/VR related Sensor devices
CO4: Design of various models using modeling techniques
CO5: Develop AR/VR applications in different domains

TOTAL: 60 PERIODS

TEXTBOOKS:
1. Charles Palmer, John Williamson, “Virtual Reality Blueprints: Create compelling VR experiences for mobile”, Packt Publisher, 2018

CO’s-PO’s & PSO’s MAPPING

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PTCCS361 ROBOTIC PROCESS AUTOMATION

COURSE OBJECTIVES:
- To understand the basic concepts of Robotic Process Automation.
- To expose to the key RPA design and development strategies and methodologies.
- To learn the fundamental RPA logic and structure.
- To explore the Exception Handling, Debugging and Logging operations in RPA.
- To learn to deploy and Maintain the software bot.

UNIT I INTRODUCTION TO ROBOTIC PROCESS AUTOMATION

UNIT II AUTOMATION PROCESS ACTIVITIES
Sequence, Flowchart & Control Flow: Sequencing the Workflow, Activities, Flowchart, Control Flow for Decision making. Data Manipulation: Variables, Collection, Arguments, Data Table, Clipboard
management, File operations Controls: Finding the control, waiting for a control, Act on a control, UiExplorer, Handling Events

UNIT III  APP INTEGRATION, RECORDING AND SCRAPING  6
App Integration, Recording, Scraping, Selector, Workflow Activities. Recording mouse and keyboard actions to perform operation, Scraping data from website and writing to CSV. Process Mining.

UNIT IV  EXCEPTION HANDLING AND CODE MANAGEMENT  6

UNIT V  DEPLOYMENT AND MAINTENANCE  6
Publishing using publish utility, Orchestration Server, Control bots, Orchestration Server to deploy bots, License management, Publishing and managing updates. RPA Vendors - Open Source RPA, Future of RPA

PRACTICAL EXERCISES:  30 PERIODS
Setup and Configure a RPA tool and understand the user interface of the tool:
1. Create a Sequence to obtain user inputs display them using a message box;
2. Create a Flowchart to navigate to a desired page based on a condition;
3. Create a State Machine workflow to compare user input with a random number.
4. Build a process in the RPA platform using UI Automation Activities.
5. Create an automation process using key System Activities, Variables and Arguments
6. Also implement Automation using System Trigger
7. Automate login to (web)Email account
8. Recording mouse and keyboard actions.
9. Scarping data from website and writing to CSV
10. Implement Error Handling in RPA platform
11. Web Scraping
12. Email Query Processing

TOTAL:60 PERIODS

COURSE OUTCOMES:
By the end of this course, the students will be able to:
- Enunciate the key distinctions between RPA and existing automation techniques and platforms.
- Use UiPath to design control flows and work flows for the target process
- Implement recording, web scraping and process mining by automation
- Use UiPath Studio to detect, and handle exceptions in automation processes
- Implement and use Orchestrator for creation, monitoring, scheduling, and controlling of automated bots and processes.

TEXT BOOKS:
REFERENCES:
1. Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author), Introduction to Robotic Process Automation: a Primer, Institute of Robotic Process Automation, Amazon Asia-Pacific Holdings Private Limited, 2018

CO’s-PO’s & PSO’s MAPPING

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CO’s-PO’s & PSO’s MAPPING

PTCCS340  CYBER SECURITY  L T P C 2 0 2 3

COURSE OBJECTIVES:
- To learn cybercrime and cyberlaw.
- To understand the cyber attacks and tools for mitigating them.
- To understand information gathering.
- To learn how to detect a cyber attack.
- To learn how to prevent a cyber attack.

UNIT I  INTRODUCTION  6

UNIT II  ATTACKS AND COUNTERMEASURES  6

UNIT III  RECONNAISSANCE  5
UNIT IV  INTRUSION DETECTION

UNIT V  INTRUSION PREVENTION

30 PERIODS

PRACTICAL EXERCISES:
1. Install Kali Linux on Virtual box
2. Explore Kali Linux and bash scripting
3. Perform open source intelligence gathering using Netcraft, Whois Lookups, DNS Reconnaissance, Harvester and Maltego
4. Understand the nmap command d and scan a target using nmap
5. Install metasloitable2 on the virtual box and search for unpatched vulnerabilities
6. Use Metasplot to exploit an unpatched vulnerability
7. Install Linus server on the virtual box and install ssh
8. Use Fail2banto scan log files and ban ips that show the malicious signs
10. Perform real-time network traffic analysis and data pocket logging using Snort

30 PERIODS

COURSE OUTCOMES:
On successful completion of this course, the student will be able to
CO1: Explain the basics of cyber security, cyber crime and cyber law (K2)
CO2: Classify various types of attacks and learn the tools to launch the attacks (K2)
CO3: Apply various tools to perform information gathering (K3)
CO4: Apply intrusion techniques to detect intrusion (K3)
CO5: Apply intrusion prevention techniques to prevent intrusion (K3)

TOTAL:60 PERIODS

TEXTBOOKS

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PTCCS359 QUANTUM COMPUTING L T P C 2 0 2 3

COURSE OBJECTIVES:
- To know the background of classical computing and quantum computing.
- To learn the fundamental concepts behind quantum computation.
- To study the details of quantum mechanics and its relation to Computer Science.
- To gain knowledge about the basic hardware and mathematical models of quantum computation.
- To learn the basics of quantum information and the theory behind it.

UNIT I QUANTUM COMPUTING BASIC CONCEPTS 6
Complex Numbers - Linear Algebra - Matrices and Operators - Global Perspectives Postulates of Quantum Mechanics – Quantum Bits - Representations of Qubits - Superpositions

UNIT II QUANTUM GATES AND CIRCUITS 5
Universal logic gates - Basic single qubit gates - Multiple qubit gates - Circuit development - Quantum error correction

UNIT III QUANTUM ALGORITHMS 7
Quantum parallelism - Deutsch’s algorithm - The Deutsch–Jozsa algorithm - Quantum Fourier transform and its applications - Quantum Search Algorithms: Grover’s Algorithm

UNIT IV QUANTUM INFORMATION THEORY 6
Data compression - Shannon’s noiseless channel coding theorem - Schumacher’s quantum noiseless channel coding theorem - Classical information over noisy quantum channels

UNIT V QUANTUM CRYPTOGRAPHY 6
Classical cryptography basic concepts - Private key cryptography - Shor’s Factoring Algorithm - Quantum Key Distribution - BB84 - Ekart 91

PRACTICAL EXERCISES
1. Single qubit gate simulation - Quantum Composer
2. Multiple qubit gate simulation - Quantum Composer
3. Composing simple quantum circuits with q-gates and measuring the output into classical bits.
4. IBM Qiskit Platform Introduction

30 PERIODS
5. Implementation of Shor’s Algorithms
6. Implementation of Grover’s Algorithm
7. Implementation of Deutsch’s Algorithm
8. Implementation of Deutsch-Jozsa’s Algorithm
9. Integer factorization using Shor’s Algorithm
10. QKD Simulation
11. Mini Project such as implementing an API for efficient search using Grover’s Algorithms or

COURSE OUTCOMES:
On completion of the course, the students will be able to:
CO1: Understand the basics of quantum computing.
CO2: Understand the background of Quantum Mechanics.
CO3: Analyze the computation models.
CO4: Model the circuits using quantum computation.
     environments and frameworks.
CO5: Understand the quantum operations such as noise and error–correction.

TOTAL: 60 PERIODS

TEXTBOOKS:
   First edition (1 November 2020).
   for Everyone”.

REFERENCES
1. Scott Aaronson, “Quantum Computing Since Democritus”, Cambridge University Press,
   2013.
2. N. David Mermin, “Quantum Computer Science: An Introduction”, Cambridge University

CO’s-PO’s & PSO’s MAPPING

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COURSE OBJECTIVES:
- To discuss on basics of 3D printing
  To explain the principles of 3D printing technique
- To explain and illustrate inkjet technology
- To explain and illustrate laser technology
- To discuss the applications of 3D printing

UNIT I  INTRODUCTION  6
Introduction; Design considerations – Material, Size, Resolution, Process; Modelling and viewing - 3D; Scanning; Model preparation – Digital; Slicing; Software; File formats

UNIT II  PRINCIPLE  6

UNIT III  INKJET TECHNOLOGY  6
Printer - Working Principle, Positioning System, Print head, Print bed, Frames, Motion control; Print head Considerations – Continuous Inkjet, Thermal Inkjet, Piezoelectric Drop-On-Demand; Material Formulation for jetting; Liquid based fabrication – Continuous jet, Multijet; Powder based fabrication – Colourjet.

UNIT IV  LASER TECHNOLOGY  6
Light Sources – Types, Characteristics; Optics – Deflection, Modulation; Material feeding and flow – Liquid, powder; Printing machines – Types, Working Principle, Build Platform, Print bed Movement, Support structures;

UNIT V  INDUSTRIAL APPLICATIONS  6
Product Models, manufacturing – Printed electronics, Biopolymers, Packaging, Healthcare, Food, Medical, Biotechnology, Displays; Future trends;

PRACTICAL EXERCISES:  30 PERIODS
1. Study the interface and basic tools in the CAD software.
2. Study 3D printer(s) including print heads, build envelope, materials used and related support removal system(s).
3. Review of geometry terms of a 3D mesh.
4. Commands for moving from 2D to 3D.
5. Advanced CAD commands to navigate models in 3D space
6. Design any four everyday objects
   Refer to web sites like Thingiverse, Shapeways and GitFab to design four everyday objects that utilize the advantages of 3D printing
   Choose four models from a sharing site like Thingiverse, Shapeways or Gitfab.
a. Improve upon a file and make it your own. Some ideas include:
• Redesign it with a specific user in mind
• Redesign it for a slightly different purpose
• Improve the look of the product

7. Use the CAM software to prepare files for 3D printing.
8. Manipulate machine movement and material layering.
9. Repair a 3D mesh using

a) Freeware utilities: Autodesk MeshMixer (http://goo.gl/x5nhYc), MeshLab (http://goo.gl/lgztLl) or Netfabb Basic or Cloud Service (http://goo.gl/Q1P47a)
b) Freeware tool tutorials: Netfabb Basic or Cloud Service (http://goo.gl/Q1P47a), Netfabb and MeshLab (http://goo.gl/WPOVec)
c) Professional tools: Magics or Netfabb
   Equipment: one 3D printer for every 10-15 students

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Outline and examine the basic concepts of 3D printing technology
CO2: Outline 3D printing workflow
CO3: Explain and categorise the concepts and working principles of 3D printing using inkjet technique
CO4: Explain and categorise the working principles of 3D printing using laser technique
CO5: Explain various method for designing and modeling for industrial applications

TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES:

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COURSE OBJECTIVES:
- To understand the basics of Knowledge Engineering.
- To discuss methodologies and modeling for Agent Design and Development.
- To design and develop ontologies.
- To apply reasoning with ontologies and rules.
- To understand learning and rule learning.

UNIT I REASONING UNDER UNCERTAINTY

UNIT II METHODOLOGY AND MODELING

UNIT III ONTOLOGIES – DESIGN AND DEVELOPMENT

UNIT IV REASONING WITH ONTOLOGIES AND RULES

UNIT V LEARNING AND RULE LEARNING

PRACTICAL EXERCISES:
1. Perform operations with Evidence Based Reasoning.
2. Perform Evidence based Analysis.
3. Perform operations on Probability Based Reasoning.
4. Perform Believability Analysis.
5. Implement Rule Learning and refinement.
6. Perform analysis based on learned patterns.
7. Construction of Ontology for a given domain.
COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Understand the basics of Knowledge Engineering.
CO2: Apply methodologies and modelling for Agent Design and Development.
CO3: Design and develop ontologies.
CO4: Apply reasoning with ontologies and rules.
CO5: Understand learning and rule learning.

TOTAL : 60 PERIODS

TEXT BOOKS:
1. Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum, Knowledge Engineering Building Cognitive Assistants for Evidence-based Reasoning, Cambridge University Press, First Edition, 2016. (Unit 1 – Chapter 1 / Unit 2 – Chapter 3,4 / Unit 3 – Chapter 5, 6 / Unit 4 - 7 , Unit 5 – Chapter 8, 9 )

REFERENCES:
2. Ela Kumar, Knowledge Engineering, I K International Publisher House, 2018.

CO’s-PO’s & PSO’s MAPPING

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PTCCS364  SOFT COMPUTING  L T P C 2 0 2 3

COURSE OBJECTIVES:
- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.
- To provide the mathematical background for carrying out the optimization associated with neural network learning.
- To learn various evolutionary Algorithms.
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems.
- To introduce case studies utilizing the above and illustrate the Intelligent behavior of programs based on soft computing.
# UNIT I INTRODUCTION TO SOFT COMPUTING AND FUZZY LOGIC


# UNIT II NEURAL NETWORKS

Supervised Learning Neural Networks – Perceptrons - Backpropagation - Multilayer Perceptrons – Unsupervised Learning Neural Networks – Kohonen Self-Organizing Networks

# UNIT III GENETIC ALGORITHMS

Chromosome Encoding Schemes - Population initialization and selection methods - Evaluation function - Genetic operators - Cross over – Mutation - Fitness Function – Maximizing function

# UNIT IV NEURO FUZZY MODELING


# UNIT V APPLICATIONS


## COURSE OUTCOMES:

**CO1:** Understand the fundamentals of fuzzy logic operators and inference mechanisms

**CO2:** Understand neural network architecture for AI applications such as classification and clustering

**CO3:** Learn the functionality of Genetic Algorithms in Optimization problems

**CO4:** Use hybrid techniques involving Neural networks and Fuzzy logic

**CO5:** Apply soft computing techniques in real world applications

## PRACTICAL EXERCISES

1. Implementation of fuzzy control/ inference system
2. Programming exercise on classification with a discrete perceptron
3. Implementation of XOR with backpropagation algorithm
4. Implementation of self organizing maps for a specific application
5. Programming exercises on maximizing a function using Genetic algorithm
6. Implementation of two input sine function
7. Implementation of three input non linear function

## TEXT BOOKS:

2. Himanshu Singh, Yunis Ahmad Lone, Deep Neuro-Fuzzy Systems with Python
REFERENCES


CO’s-PO’s & PSO’s MAPPING

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PTCCS357

OPTIMIZATION TECHNIQUES

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COURSE OBJECTIVES:
The objective of this course is to enable the student to
- Formulate and solve linear programming problems (LPP)
- Evaluate Integer Programming Problems, Transportation and Assignment Problems.
- Obtain a solution to network problems using CPM and PERT techniques.
- Able to optimize the function subject to the constraints.
- Identify and solve problems under Markovian queuing models.

UNIT I  LINEAR MODELS
Introduction of Operations Research - mathematical formulation of LPP- Graphical Methods to solve LPP- Simplex Method- Two-Phase method

UNIT II  INTEGER PROGRAMMING AND TRANSPORTATION PROBLEMS
Integer programming: Branch and bound method- Transportation and Assignment problems - Traveling salesman problem.

UNIT III  PROJECT SCHEDULING
Project network - Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM.

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UNIT IV  CLASSICAL OPTIMIZATION THEORY  6

UNIT V  QUEUING MODELS  6
Introduction, Queuing Theory, Operating characteristics of a Queuing system, Constituents of a Queuing system, Service facility, Queue discipline, Single channel models, multiple service channels.

30 PERIODS

PRACTICALS
1. Solving simplex maximization problems using R programming.
2. Solving simplex minimization problems using R programming.
3. Solving mixed constraints problems – Big M & Two phase method using TORA.
4. Solving transportation problems using R.
5. Solving assignment problems using R.
6. Solving optimization problems using LINGO.
7. Studying Primal-Dual relationships in LP using TORA.
8. Solving LP problems using dual simplex method using TORA.
9. Sensitivity & post optimality analysis using LINGO.
10. Solving shortest route problems using optimization software
11. Solving Project Management problems using optimization software
12. Testing random numbers and random variates for their uniformity.
13. Testing random numbers and random variates for their independence
15. Solve multi server queuing model using simulation software package.

30 PERIODS

TOTAL:  60 PERIODS

COURSE OUTCOMES:
On successful completion of this course, the student will able to
CO1: Formulate and solve linear programming problems (LPP)
CO2: Evaluate Integer Programming Problems, Transportation and Assignment Problems.
CO3: Obtain a solution to network problems using CPM and PERT techniques.
CO4: Able to optimize the function subject to the constraints.
CO5: Identify and solve problems under Markovian queuing models

TEXT BOOK:

REFERENCES:
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PTCCS348 GAME THEORY L T P C

2 0 2 3

COURSE OBJECTIVES:

- To introduce the student to the notion of a game, its solutions concepts, and other basic notions and tools of game theory, and the main applications for which they are appropriate, including electronic trading markets.
- To formalize the notion of strategic thinking and rational choice by using the tools of game theory, and to provide insights into using game theory in modelling applications.
- To draw the connections between game theory, computer science, and economics, especially emphasizing the computational issues.
- To introduce contemporary topics in the intersection of game theory, computer science, and economics.
- To apply game theory in searching, auctioning and trading.

UNIT I INTRODUCTION

Introduction — Making rational choices: basics of Games — strategy — preferences — payoffs — Mathematical basics — Game theory — Rational Choice — Basic solution concepts-non-cooperative versus cooperative games — Basic computational issues — finding equilibria and learning in games- Typical application areas for game theory (e.g. Google’s sponsored search, eBay auctions, electricity trading markets).

UNIT II GAMES WITH PERFECT INFORMATION

Games with Perfect Information — Strategic games — prisoner’s dilemma, matching pennies - Nash equilibria —mixed strategy equilibrium — zero-sum games

UNIT III GAMES WITH IMPERFECT INFORMATION

Games with Imperfect Information — Bayesian Games — Motivational Examples — General Definitions — Information aspects — Illustrations — Extensive Games with Imperfect — Information — Strategies — Nash Equilibrium —Repeated Games — The Prisoner’s Dilemma — Bargaining

UNIT IV NON-COOPERATIVE GAME THEORY

UNIT V       MECHANISM DESIGN


30 PERIODS

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to
CO1: Discuss the notion of a strategic game and equilibria and identify the characteristics of main applications of these concepts.
CO2: Discuss the use of Nash Equilibrium for other problems.
CO3: Identify key strategic aspects and based on these be able to connect them to appropriate game theoretic concepts given a real world situation.
CO4: Identify some applications that need aspects of Bayesian Games.
CO5: Implement a typical Virtual Business scenario using Game theory.

LABORATORY EXERCISES:
1. Prisoner’s dilemma
2. Pure Strategy Nash Equilibrium
3. Extensive Form – Graphs and Trees, Game Trees
4. Strategic Form – Elimination of dominant strategy
5. Minimax theorem, minimax strategies
6. Perfect information games: trees, players assigned to nodes, payoffs, backward Induction, subgame perfect equilibrium,
8. Repeated Games
9. Bayesian Nash equilibrium

30 PERIODS
TOTAL: 60 PERIODS

TEXT BOOKS:
CO's-PO's & PSO's MAPPING

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PTCCS337 COGNITIVE SCIENCE

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COURSE OBJECTIVES:
- To know the theoretical background of cognition.
- To understand the link between cognition and computational intelligence.
- To explore probabilistic programming language.
- To study the computational inference models of cognition.
- To study the computational learning models of cognition.

UNIT I PHILOSOPHY, PSYCHOLOGY AND NEUROSCIENCE 6

UNIT II COMPUTATIONAL INTELLIGENCE 6

UNIT III PROBABILISTIC PROGRAMMING LANGUAGE 6

UNIT IV INFERENCE MODELS OF COGNITION 6

UNIT V LEARNING MODELS OF COGNITION 6

30 PERIODS

PRACTICAL EXERCISES
1. Demonstration of Mathematical functions using WebPPL.
2. Implementation of reasoning algorithms.
3. Developing an Application system using generative model.
4. Developing an Application using conditional inference learning model.
5. Application development using hierarchical model.
6. Application development using Mixture model.

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Understand the underlying theory behind cognition.
CO2: Connect to the cognition elements computationally.
CO3: Implement mathematical functions through WebPPL.
CO4: Develop applications using cognitive inference model.
CO5: Develop applications using cognitive learning model.

30 PERIODS

TEXT BOOK:

REFERENCES:

CO’s-PO’s & PSO’s MAPPING

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PTCCS345 ETHICS AND AI

COURSE OBJECTIVES:
- Study the morality and ethics in AI
- Learn about the Ethical initiatives in the field of artificial intelligence
• Study about AI standards and Regulations
• Study about social and ethical issues of Robot Ethics
• Study about AI and Ethics- challenges and opportunities

UNIT I INTRODUCTION
Definition of morality and ethics in AI-Impact on society-Impact on human psychology-Impact on the legal system-Impact on the environment and the planet-Impact on trust

UNIT II ETHICAL INITIATIVES IN AI
International ethical initiatives-Ethical harms and concerns-Case study: healthcare robots, Autonomous Vehicles, Warfare and weaponization.

UNIT III AI STANDARDS AND REGULATION

UNIT IV ROBOETHICS: SOCIAL AND ETHICAL IMPLICATION OF ROBOTICS

UNIT V AI AND ETHICS- CHALLENGES AND OPPORTUNITIES
Challenges - Opportunities- ethical issues in artificial intelligence- Societal Issues Concerning the Application of Artificial Intelligence in Medicine- decision-making role in industries-National and International Strategies on AI.

COURSE OUTCOMES:
On completion of the course, the students will be able to
CO1: Learn about morality and ethics in AI
CO2: Acquire the knowledge of real time application ethics, issues and its challenges.
CO3: Understand the ethical harms and ethical initiatives in AI
CO4: Learn about AI standards and Regulations like AI Agent, Safe Design of Autonomous and Semi-Autonomous Systems
CO5: Understand the concepts of Roboethics and Morality with professional responsibilities.
CO6: Learn about the societal issues in AI with National and International Strategies on AI

PRACTICAL EXERCISES
1. Recent case study of ethical initiatives in healthcare, autonomous vehicles and defense
2. Exploratory data analysis on a 2 variable linear regression model
3. Experiment the regression model without a bias and with bias
4. Classification of a dataset from UCI repository using a perceptron with and without bias
5. Case study on ontology where ethics is at stake
6. Identification on optimization in AI affecting ethics

TOTAL: 60 PERIODS
TEXT BOOKS:

REFERENCES:
2. Mark Coeckelbergh, "AI Ethics", The MIT Press Essential Knowledge series, April 2020
3. Web link:

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