**ANNAMALAI UNIVERSITY**

**(Affiliated Colleges)**

**413 - M.Sc. Information Technology**

Programme Structure and Scheme of Examination (under CBCS)

(Applicable to the candidates admitted from the academic year 2023 -2024 onwards)

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| **Part** | **Course Code** | **Study Components & Course Title** | **Credit** | **Hours/ Week** | **Maximum Marks** |
| **CIA** | **ESE** | **Total** |
| **SEMESTER – I** |
| Part A | 23PINTC11 | Core – I: Python Programming | 5 | 7 | 25 | 75 | 100 |
| 23PINTC12 | Core – II: Web Development using Word Press  | 5 | 7 | 25 | 75 | 100 |
| 23PINTP13 | Core – III: Python Programming - Practical | 4 | 6 | 25 | 75 | 100 |
| 23PINTE14-1/ 23PINTE14-2/23PINTE14-3 | Elective – I: (Generic / Discipline Specific) (One from Group A)Data Structures / Compiler Design/Natural Language Processing | 3 | 5 | 25 | 75 | 100 |
| 23PINTE15-1/ 23PINTE15-2/23PINTE15-3 | Elective – II: (Generic / Discipline Specific) (One from Group B)Operating Systems/Digital Computer Architecture/Human Computer Interaction | 3 | 5 | 25 | 75 | 100 |
|  | **Total** | **20** | **30** |  |  | **500** |
| **SEMESTER – II** |
| Part A | 23PINTC21 | Core – IV: Database Systems | 5 | 6 | 25 | 75 | 100 |
| 23PINTC22 | Core – V: Open Source Technologies - | 5 | 6 | 25 | 75 | 100 |
| 23PINTP23 | Core – VI: RDBMS LAB  | 4 | 6 | 25 | 75 | 100 |
| 23PINTE24-1/23PINTE24-2/23PINTE24-3 | Elective – III: (Generic / Discipline Specific)(One from Group C)Networks and Security/Biometric Techniques/Blockchain Technology | 3 | 4 | 25 | 75 | 100 |
| 23PINTE25-1/23PINTE25-2/23PINTE25-3 | Elective – IV: (Computer / IT related) (One from Group D)Software Engineering/Object oriented analysis and design/ Software Project Management | 3 | 4 | 25 | 75 | 100 |
| 23PINTS26 | Skill Enhancement Course [SEC] – I: Object Oriented Programming through Java, HTML Basics | 2 | 4 | 25 | 75 | 100 |
|  |  | **22** | **30** |  |  | **600** |

**List of** Discipline Centric Electives / Generic Electives

 **(Choose 1 out of 3 in each Group)**

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| **Electives** | **Group** | **Course Code** | **Course Title**  |
| Discipline Centric | A | 23PINTE14-1 | Data Structures |
| 23PINTE14-2 | Compiler Design |
| 23PINTE14-3 | Natural Language Processing |
| Generic | B | 23PINTE15-1 | Operating Systems |
| 23PINTE15-2 | Digital Computer Architecture |
| 23PINTE15-3 | Human Computer Interaction |
| Discipline Centric | C | 23PINTE24-1 | Networks and Security |
| 23PINTE24-2 | Biometric Techniques |
| 23PINTE24-3 | Blockchain Technology |
| Generic | D | 23PINTE25-1 | Software Engineering  |
| 23PINTE25-2 | Object oriented analysis and design  |
| 23PINTE25-3 | Software Project Management |

**Syllabus of M.Sc. Information Technology**

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| **SEMESTER: I****PART: A****CORE COURSE – I** | **23PINTC11: PYTHON PROGRAMMING** | **Credit:5****Hours:7** |

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| **Objectives of the Course** | To acquire programming skills in core Python and to develop database applications in Python |
| **UNIT-I :**  **Core Python:** Introduction - Python Basics: Comments - Statements and syntax - variable Assignment - Identifiers - **Python objects :** Built-in-types - Internal types - Standard Type operators - Standard type Built-in-functions. **Numbers :** Introduction to Numbers - Integers - Floating point numbers - Complex numbers - Operators - Built-in and factory functions – Conditionals and Loops -**Sequences :** Strings, Lists and Tuples |
| **UNIT-II :**  Mapping and set types.- **Functions and functional programming**: Introduction - Calling functions - Creating functions - passing functions - Formal arguments - Variable - Length Arguments - Functional Programming - Variable Scope – Recursion |
| **UNIT-III :**  **Modules:** Modules and Files – namespaces - Importing Modules - Features - Built-in functions. **Object Oriented Programming**: Introduction - Object Oriented Programming – Encapsulation Inheritance – Polymorphism - **Errors and Exceptions**: Introduction – Exceptions in Python. |
| **UNIT-IV :**  **GUI Programming**: Introduction – **Using Widgets**: Core widgets- Generic widget properties – Labels – Buttons – Radio Buttons – Check Buttons – Text – Entry – List Boxes – Menus – Frame – Scroll Bars – Scale |
| **UNIT-V:**  **Database Programming**: Connecting to a database using MongoDB - Creating Tables - INSERT-UPDATE - DELETE - READ operations. |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text**1. Wesley J. Chun, (2007), “Core Python Programming”, Pearson Education, Second Edition – (Unit I,II,III).
2. Charles Dierbach, (2015), “Introduction to Computer Science Using Python A Computational Problem-Solving Focus”, Wiley India Edition- (Unit III- Object Oriented Programming)
3. Martin C Brown, (2018), “The Complete Reference Python”, McGraw Hill Education (India) Private Limited – (Unit IV)
 |
| **Reference Books**1. Mark Lutz, (2013), “Learning Python Powerful Object Oriented Programming”, O‟reilly Media, 5 th Edition.
2. Timothy A. Budd, (2011), “Exploring Python”, Tata MCGraw Hill Education Private Limited, First Edition.
3. Allen Downey, Jeffrey Elkner, Chris Meyers, (2012), “How to think like a computer scientist: learning with Python”
 |
| **Website and e-Learning Source**1. <http://interactivepython.org/courselib/static/pythonds>
2. <http://www.ibiblio.org/g2swap/byteofpython/read/>
3. <http://www.diveintopython3.net/>
4. <http://docs.python.org/3/tutorial/index.html>
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes**  |
| **CLO1** | Explain the basic concepts in python language. |
| **CLO2** | Apply the various data types and identify the usage of control statements, loops, functions and modules in python for processing the data |
| **CLO3** | Analyze and solve problems using basic constructs and techniques of python. |
| **CLO4** | Assess the approaches used in the development of interactive application. |
| **CLO5** | To build real time programs using python |

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| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CLO2** | **3** | **3** | **3** | **3** | **3** | **2** |
| **CLO3** | **3** | **2** | **3** | **3** | **3** | **3** |
| **CLO4** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CLO5** | **3** | **3** | **3** | **3** | **3** | **3** |

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| **SEMESTER: I****PART: A****CORE COURSE – II** | **23PINTC12: WEB DEVELOPMENT USING WORD PRESS**  | **Credit:5****Hours:7** |

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| **Objectives of the Course** | The primary course objective of this paper is to learn the fundamentals of basic web concepts, HTML, DHTML, JavaScript and Word Press |
| **UNIT-I :** **Introduction to HTML** - Lists - Adding Graphics to HTML Documents - Tables -Linking Documents - Frames- Developing HTML Forms |
| **UNIT-II :**  **Dynamic HTML** - Cascading Style Sheets - Use of SPAN Tag - External Style Sheets - Use of DIV Tag - Developing Websites |
| **UNIT-III :** **Introduction to JavaScript** - JavaScript in Web Pages - Advantages - Writing JavaScript into HTML - Basic Programming Techniques - Operators and Expressions- JavaScript Programming Construct: Conditional Checking, Controlled Loops, Functions: Built-in Functions, User-Defined Functions - Placing Text in a Browser - Dialog Boxes. |
| **UNIT-IV :** **JavaScript Document Object Model:** Introduction - Understanding Objects in HTML - Handling Events using JavaScript. Forms used by a Website: Form Object - Built-in Objects. |
| **UNIT-V:**  **Word Press:** Installation - Stetting and administration- Word press: Theming basics - Our First Word Press Website - Theme Foundation - Menu and navigation - Home page - Dynamic Sidebars and Widgets - Page - archive Page results - Testing and Launching |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text**1. Ivan N. Bayross, (2005), Web Enabled Commercial Applications Development Using HTML, DHTML, JavaScript, perlCGI, 3rd Edition, BPB Publications. (Unit I, II, III and IV)
2. Jesse Friedman,( 2012), Web Designer's Guide to WordPress: Plan, Theme, Build, Launch (Voices That Matter), 1st Edition , New Riders. (Unit V)
 |
| **Reference Books**1. N.P. Gopalan, J. Akilandeswari, (2009), Web Technology: A Developer‟s Perspective, Eastern Economy Edition, PHI Learning Private Limited.
2. Deitel&Deitel, (2000), Internet and World Wide Web How to program, Prentice Hall.
3. Jon Duckett, (2004), Beginning Web Programming with HTML, XHTML, and CSS, Wiley Publishing, Inc.
 |
| **Website and e-Learning Source**1. <http://www.sergey.com/web_course/content.html>
2. <http://www.pageresource.com/jscript/index.html>
3. <http://www.peachpit.com/guides/content.aspx>
4. <https://www.tutorialspoint.com/wordpress/index.htm>
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**Course Learning Outcome (for Mapping with POs and PSOs)**

**Students will be able to**

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| **CO’s** | **Course Outcomes**  |
| **CLO1** | Identify the tools which will be suitable for the requirement of the webpage. |
| **CLO2** | Implement Java script and Style Sheets effectively in the Web Pages |
| **CLO3** | Analyze the different tools and built-in functions available to be applied in the webpage |
| **CLO4** | Rate the design and effectiveness of the Web Pages created. |
| **CLO5** | Design and publish a website using Word press |

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| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **3** | **3** | **3** | **2** | **2** | **3** |
| **CLO2** | **3** | **3** | **3** | **2** | **2** | **3** |
| **CLO3** | **3** | **3** | **3** | **2** | **2** | **3** |
| **CLO4** | **3** | **3** | **3** | **2** | **2** | **3** |
| **CLO5** | **3** | **3** | **3** | **3** | **3** | **3** |

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| **SEMESTER: I****PART: A****PRACTICAL- I** | 23PINTP13: PYTHON PROGRAMMING - PRACTICAL | **Credit:4****Hours:6** |

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| **Objectives of the Course** | This course gives practical experience in Python basics, Object Oriented programming like Classes, Inheritance, and Polymorphism, GUI Applications and Database connection. |
| **Course Outline** | 1. Python Basic programs
2. Control Structures
3. Lists
4. Functions and Recursions
5. Modules
6. String Processing
7. Dictionaries and Sets
8. Classes and Objects
9. Polymorphism
10. Inheritance
11. GUI Application
12. Working with Database
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| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** Wesley J. Chun, (2007), “Core Python Programming”, Pearson Education, Second Edition – |
| **Reference Books**1. Mark Lutz, (2013), “Learning Python Powerful Object Oriented Programming”, O‟reilly Media, 5 th Edition.
2. Timothy A. Budd, (2011), “Exploring Python”, Tata MCGraw Hill Education Private Limited, First Edition.
3. Allen Downey, Jeffrey Elkner, Chris Meyers, (2012), “How to think like a computer scientist: learning with Python”
 |
| **Website and e-Learning Source**1. <http://interactivepython.org/courselib/static/pythonds>
2. <http://www.ibiblio.org/g2swap/byteofpython/read/>
3. <http://www.diveintopython3.net/>
4. <http://docs.python.org/3/tutorial/index.html>
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes**  |
| **CLO1** |  Understand the significance of control statements, loops and functions in creating simple programs. |
| **CLO2** |  Apply the core data structures available in python to store, process and sort the data  |
| **CLO3** | Analyze the real time problem using suitable python concepts |
| **CLO4** | Assess the complex problems using appropriate concepts in python |
| **CLO5** | Develop the real time applications using python programming language. |

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| **CO/ PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CLO2** | **3** | **3** | **3** | **3** | **3** | **2** |
| **CLO3** | **3** | **2** | **3** | **3** | **3** | **3** |
| **CLO4** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CLO5** | **3** | **3** | **3** | **3** | **3** | **3** |

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| **SEMESTER: I****PART: A****ELECTIVE – I**  | 23PINTE14-1: DATA STRUCTURES | **Credit:3****Hours:5** |

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| **Objectives of the Course** | To become familiar with the various data structures and their applications and to increase the understanding of basic concepts of the design and use of algorithms  |
| **UNIT-I :**  **Introduction and Overview:** Definitions – Concept of Data Structures – Overview of Data Structures – Implementation of Data Structures – Arrays: Definition – One Dimensional Array – Multidimensional Arrays: Two Dimensional Array – Sparse Matrices – Three dimensional and n-dimensional Arrays – Stacks : Introduction – Definition – Representation of Stack – Operations on Stack – Applications of Stacks: Evaluation of Arithmetic Expressions – Implementation of Recursion - Tower of Hanoi Problem |
|  **UNIT-II :**  **Queues:** Introduction – Definition – Representation of Queues – **Various Queue Structures :** Circular Queue – Deque – Priority Queue – **Applications of Queues :** Simulation – CPU Scheduling in a Multiprogramming Environment – Round Robin Algorithm – **Linked Lists:** Single Linked List – Circular Linked List – Double Linked List – Circular Double Linked List – **Applications of Linked List:** Polynomial Representation |
| **UNIT-III :**  **Trees:** Basic Terminologies – Representation of Binary Tree: Linear Representation – Linked Representation – **Operations:** Traversals – **Types of Binary Trees**: Expression Tree – Binary Search Tree – Splay tree |
| **UNIT-IV :** **Sorting:** Bubble Sort, Insertion Sort, Selection Sort, Shell Sort – Quick Sort - Merge Sort - Radix Sort - Heap Sort – **Searching:** Linear Search - Binary Search |
| **UNIT-V:**  **Graphs:** Introduction – Graph representation and its operations – Path Matrix – Graph Traversal - Application of DFS – Shortest Path Algorithm - **Minimum Spanning Tree :** Prim‟s Algorithm – Kruskal‟s Algorthim - Greedy – Knapsack – Back Tracking – 8 Queens |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text**1. Debasis Samantha (2013), Classic Data Structures, Second Edition, PHI Learning Private Limited.
2. P. Sudharsan, J. John Manoj Kumar, C & Data Structures, Third Edition, RBA Publications. Unit 4: Chapter 14, Unit 5: Chapter 13
3. Ellis Horowitz, SartajSahni, Sanguthevar Rajeshakaran, (2007), Fundamentals of Computer Algorithms, Second Edition, Universities Press (P) Limited
 |
| **Reference Books**1. Sara Baase, (1991), Computer Algorithms – Introduction to Design and Analysis, Addison- Wesley Publishing Company
2. Robert Kruse, C.L.Tondo, Bruce Leung, Data Structures and Program Design in C ,2nd Edition, PHI Publications.
 |
| **Website and e-Learning Source**1. <http://www.cs.sunysb.edu/~skiena/214/lectures/>
2. <http://datastructures.itgo.com/graphs/dfsbfs.htm>
3. <http://oopweb.com/Algorithms/Documents/PLDS210/VolumeFrames.html>
4. <http://discuss.codechef.com/questions/48877/data-structures-and-algorithms>
5. <http://code.tutsplus.com/tutorials/algorithms-and-data-structures--cms-20437>
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes**  |
| **CLO1** | Outline the basic data structures |
| **CLO2** | Identify the different operations and memory representations |
| **CLO3** | Interpret different techniques with their complexities |
| **CLO4** | Compare the applications of various data structures |
| **CLO5** | Choose an algorithm to solve simple problems suited for appropriate situations |

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| **CO/ PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **3** | **1** | **2** | **2** | **1** | **2** |
| **CLO2** | **3** | **2** | **2** | **2** | **2** | **3** |
| **CLO3** | **3** | **2** | **3** | **3** | **3** | **2** |
| **CLO4** | **3** | **3** | **2** | **3** | **3** | **3** |
| **CLO5** | **3** | **3** | **3** | **3** | **3** | **2** |

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| **SEMESTER: I****PART: A****ELECTIVE – I**  | **23PINTE14-2: COMPILER DESIGN** | **Credit:3****Hours:5** |

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| **Objectives of the Course** | To acquire the knowledge about the compiler design and to understand the different phases of Compiler |
| **UNIT-I :**  Compilers & Translators, Need of Translators, Structure of a Compiler, Phases, Lexical Analysis, Syntax Analysis, Intermediate Code Generation, Code Optimization, Code Generation, Book Keeping, A Symbol Table in brief, Semantic Analysis, L-value, r-values, Error Handling |
| **UNIT-II :**  Rules of Lexical Analyser, Need for Lexical Analysis, Input Buffering, Preliminary Scanning, A simple Approach to the Design of Lexical Analysers, Transition Diagrams, Regular Expression, String & Languages, Finite Automata, Non-deterministic Automata, Deterministic Automata, From regular Expression to Finite Automata, Context free Grammars, Derivations & Parse Trees, Parsers, Shift Reduce Parsing, Operator-Precedence Parsing |
| **UNIT-III :**  Symbol Table Management, Contents of a Symbol Table, Names & Symbol table records, reusing of symbol table spaces, array names, Indirection in Symbol Table entries, Data Structures for Symbol Tables, List, Self Organizing Lists, Search Trees, Hash Tables, Errors, Reporting Errors, Sources of Errors Syntactic Errors, Semantic Errors, Dynamic Errors, Lexical Phase Errors, Minimum Distance Matching, Syntactic Phase Error, Time of Detection, Ponic mode, Case study on Lex and Yacc |
| **UNIT-IV :** Principal Sources of Optimization, Inner Loops, Language Implementation Details Inaccessible to the User. Further Optimization, Algorithm Optimization, Loop Optimization , Code Motion, Induction Variables, Reduction in Strength, Basic Blocks, Flow Graphs, DAG Representation of Basic Blocks, Value Numbers & Algebraic Laws, Global Data Flow Analysis, Memory Management Strategies , Fetch Strategy, Placement Strategies, Replacement Strategies, Address Binding, Compile Time, Load Time, Execution Time, Static Loading, Dynamic Loading, Dynamic Linking |
| **UNIT-V:**  Problems in Code Generation, a Simple Code Generator, Next-Use Information, Register Descriptors, Address Descriptors, Code Generation Algorithm, Register Allocation & Assignment, Global Register Allocation, Usage Counts, Register Assignment for Outer Loops, Register Allocation by Graph Coloring, Code Generation from DAG's, Peep-Hole Optimization, Redundant Loads & Stores, Un-Reachable Code, Multiple Jumps, Algebraic Simplifications, Use of Machine Idioms |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** Compilers: Principles, Techniques & Tools, Second Edition by A. V. Aho, Monicas. Lam, Ravi Sethi, J. D. Ullman |
| **Reference Books**1. Dhamdhere D.M., “Compiler Construction: Theory and Practice”, McMillan India Ltd., 1983
2. Holub Allen, “Compiler Design in C”, Prentice Hall of India, 1990
 |
| **Website and e-Learning Source**1. htt[ps://www.g](http://www.geeksforgeeks.org/compiler-design-tutorials/)e[eksforgeeks.org/compiler-design-tutorials/](http://www.geeksforgeeks.org/compiler-design-tutorials/)
2. htt[ps://www.tutorialspoint.com/compil](http://www.tutorialspoint.com/compiler_design/)e[r\_design/](http://www.tutorialspoint.com/compiler_design/)
3. htt[ps://www.javatpoint.com/compil](http://www.javatpoint.com/compiler-tutorial)e[r-tutorial](http://www.javatpoint.com/compiler-tutorial)
4. https://onlinecourses.nptel.ac.in/noc19\_cs01/preview
5. <http://ecomputernotes.com/compiler-design>
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes**  |
| **CLO1** | Identify the major phases of compilation and the functionality of LEX andYACC |
| **CLO2** | Describe the functionality of compilation process and symbol table management |
| **CLO3** | Apply the various parsing, optimization techniques and error recovery routines to have a better code for code generation |
| **CLO4** | Analyze the techniques and tools needed to design and implement compilers. |
| **CLO5** | Test a compiler and experiment the knowledge of different phases in compilation |

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| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **3** | **2** | **2** | **2** | **3** | **2** |
| **CLO2** | **3** | **2** | **2** | **2** | **3** | **3** |
| **CLO3** | **3** | **2** | **3** | **3** | **2** | **3** |
| **CLO4** | **3** | **3** | **3** | **3** | **2** | **3** |
| **CLO5** | **3** | **3** | **3** | **3** | **3** | **3** |

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| **SEMESTER: I****PART: A****ELECTIVE – I**  | **23PINTE14-3: NATURAL LANGUAGE PROCESSING** | **Credit:3****Hours:5** |

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| **Objectives of the Course** | To learn the fundamentals of natural language processing and to understand the role of CFG, semantics of sentences and pragmatics  |
| **UNIT-I :**  Introduction: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance |
| **UNIT-II :**  Word Level Analysis: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Back off – Word Classes, Part-of-Speech Tagging, Rule based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models |
| **UNIT-III :**  Syntactic Analysis: Context-Free Grammars, Grammar rules for English, Tree banks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures |
| **UNIT-IV :** Semantics and Pragmatics: Requirements for representation, FirstOrder Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selection restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods |
| **UNIT-V:**  Discourse Analysis and Lexical Resources: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC) |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text**1. Daniel Jurafsky, James H. Martin;Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech; Pearson Publication; 2014.
2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python , First Edition, OReilly Media, 2009.
 |
| **Reference Books**1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, ―Natural Language Processing with Java , O‗Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval, Oxford University Press, 2008.
 |
| **Website and e-Learning Source**1. <http://www.cse.iitb.ac.in/~pb/papers/nlp-iitb.pdf>
2. <https://www.nitk.ac.in/faculty/dr-sarika-jain>
3. <https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/what-is-natural-language-processing-nlp>
4. <https://www.sas.com/en_us/insights/analytics/what-is-natural-language-processing-nlp.html>
5. https://towardsdatascience.com/your-guide-to-natural-language-processing-nlp-48ea2511f6e1
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes**  |
| **CLO1** | Describe the concepts of morphology, syntax, semantics, discourse & pragmatics of natural language |
| **CLO2** | Identify various linguistic and statistical features relevant to the basic NLP task, namely, spelling correction, morphological analysis, parsing and semantic analysis |
| **CLO3** | Classify the text into an organized group using a set of handicraft linguistic rules with appropriate NLP processes and algorithms  |
| **CLO4** | Analyze the system with various language analysis methods and interpret the results |
| **CLO5** | Assess NLP systems, identify and suggest solutions for the shortcomings |

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| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **3** | **2** | **2** | **2** | **2** | **2** |
| **CLO2** | **3** | **2** | **2** | **2** | **2** | **2** |
| **CLO3** | **3** | **2** | **2** | **3** | **2** | **3** |
| **CLO4** | **3** | **2** | **2** | **3** | **2** | **3** |
| **CLO5** | **3** | **2** | **2** | **3** | **3** | **3** |

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| **SEMESTER: I****PART: A****ELECTIVE – II** | **23PINTE15-1: OPERATING SYSTEMS** | **Credit:3****Hours:5** |

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| **Objectives of the Course** | To develop fundamental knowledge of Operating systems, to become familiar with CPU Scheduling, memory and file management concepts, to learn concepts and programming techniques of Linux |
| **UNIT-I :**  **Introduction :** Evolution of Operating System - Structure - Processes - The Process Concepts - Inter Process Communication - IPC Problems - Scheduling Levels - Preemptive Vs Non- Preemptive Scheduling - **Scheduling Algorithms:** First Come First Served - Shortest Job First - Shortest Remaining Time Next - Three Level Scheduling - Round Robin Scheduling - Priority Scheduling -Multiple Queues - Shortest Process Next - Guaranteed Scheduling - Lottery Scheduling - Fair-Share Scheduling - Thread Scheduling |
| **UNIT-II :**  Swapping - Virtual Memory - Page Replacement Algorithm - Segmentation |
| **UNIT-III :**  **Deadlock** - Examples of Deadlock - Detection - Recovery - Avoidance - Prevention – Semaphore -Shared Memory |
| **UNIT-IV :** **File System** - Files - Directories - I/O Management - Disks - Disk Arm Scheduling Algorithm |
| **UNIT-V:**  **Introduction to Linux:** Introducing Shell Programming - Linux File Systems - Linux File system calls - Implementation of Linux File systems - Linux Commands - Directory Oriented Commands - File Oriented Commands - Communication Oriented Commands- General Purpose Commands |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text**1. Andrew S. Tanenbaum, (2001), Modern Operating Systems, 2nd Edition, Prentice Hall of India.
2. B.Mohamed Ibrahim, (2005) Linux Practical Approach, Firewall Media.
 |
| **Reference Books**1. Silberchatz, Galvin, Gagne, (2003), Operating Systems Concepts, 6th Edition Wiley India Edition.
2. JhonGoerzen, (2002), Linux Programming Bible, 4th Edition, Wiley- dreamtech India (P) Ltd.
 |
| **Website and e-Learning Source**1. htt[ps://www.webopedia.com/TERM/O/operating](http://www.webopedia.com/TERM/O/operating_system.html)\_[system.html](http://www.webopedia.com/TERM/O/operating_system.html)
2. htt[ps://www.tutorialspoint.com/oper](http://www.tutorialspoint.com/operating_system/operating_system_tutorial.pdf)a[ting\_system/operating\_system\_tutorial.pdf](http://www.tutorialspoint.com/operating_system/operating_system_tutorial.pdf)
3. <http://iips.icci.edu.iq/images/exam/Abraham-Silberschatz-Operating-System-Concepts---> 9th2012.12.pdf
4. htt[ps://www.informatics.indi](http://www.informatics.indiana.edu/rocha/academics/i101/pdfs/os_intro.pdf)a[na.edu/rocha/academics/i101/pdfs/os\_intro.pdf](http://www.informatics.indiana.edu/rocha/academics/i101/pdfs/os_intro.pdf)
5. htt[ps://www](http://www.youtube.com/watch?v=oJMYYMIGVMU).[youtube.com/watch?v=oJMYYMIGVMU](http://www.youtube.com/watch?v=oJMYYMIGVMU)
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes**  |
| **CLO1** | Outline the fundamental concepts of an OS and their respective functionality |
| **CLO2** | Demonstrate the importance of open-source operating system commands |
| **CLO3** | Identify and stimulate management activities of operating system |
| **CLO4** | Analyze the various services provided by the operating system |
| **CLO5** | Interpret different problems related to process, scheduling, deadlock, memory and files |

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| **CO/ PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **3** | **1** | **1** | **2** | **2** | **2** |
| **CLO2** | **3** | **2** | **2** | **3** | **3** | **2** |
| **CLO3** | **3** | **3** | **2** | **2** | **2** | **2** |
| **CLO4** | **3** | **3** | **3** | **3** | **2** | **3** |
| **CLO5** | **3** | **3** | **3** | **3** | **3** | **3** |

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| **SEMESTER: I****PART: A****ELECTIVE – II** | **23PINTE15-2: DIGITAL COMPUTER ARCHITECTURE** | **Credit:3****Hours:5** |

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| **Objectives of the Course** | To provide a comprehensive introduction of the basic design of a computer and the interdependence and interoperation between the various components inside a computer |
| **UNIT-I :**  Data Representation - Data Types - Number Systems - Decimal and Alphanumeric Representation - Complements - (r-1)‟s complement - (r‟s) complement - Fixed- point Representation - Floating-point Representation - Binary Codes - Gray Codes - Decimal Codes - Alphanumeric Codes – Error Detection Codes |
| **UNIT-II :**  Digital Computers - Logic Gates - Boolean Algebra - K-Map Simplification - Combinational Circuits - Half Adder - Full Adder - SR, D, JK and T Flip Flops - Sequential Circuits - State Table - State Diagram - Digital Components: Integrated Circuits - Decoders - NAND Gate Decoder - Encoders - Multiplexers - Registers - Shift Registers - Binary Counters - Memory Unit |
| **UNIT-III :**  Register Transfer and Micro-operations: Register Transfer Language - Register Transfer - Bus and Memory Transfers - Arithmetic Micro-operations - Logic Micro-operations - Shift Micro- operations - Arithmetic Logic Shift Unit. Computer Organization and Programming: Instruction Codes - Computer Registers - Computer Instructions - Timing and Control - Instruction Cycle - Memory Reference Instructions - Input-Output and Interrupt |
| **UNIT-IV :** Central Processing Unit: General Register Organization - Instruction Formats - Addressing Modes - Data Transfer and Manipulation - Program Control. I/O Organization: Peripheral Devices - I/O Interface - Asynchronous Data Transfer - Modes of Transfer - Priority Interrupt - DMA |
| **UNIT-V:**  Memory Organization and CPU: Memory Hierarchy - Main Memory - Auxiliary Memory - Associative Memory - Cache Memory - Virtual Memory - Memory Management Hardware |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text**M. Morris Mano, “Computer System Architecture”, Prentice Hall of India, 2001 |
| **Reference Books**1. John P. Hayes, “Computer Architecture and Organization”, Tata McGraw Hill, 1996.
2. V C Hamatcher et al, “Computer Organization”, Tata McGraw Hill, 1996.
 |
| **Website and e-Learning Source** 1. http://www.labri.fr/perso/strandh/Teaching/AMP/Common/Strandh-Tutorial/Dir.html
2. <http://www.computer-pdf.com/architecture/>
3. <http://www.uotechnology.edu.iq/depcse/lectures/3/>
4. <http://www.csie.nuk.edu.tw/~kcf/course/ComputerArchitecture/>
5. <http://www.ecs.csun.edu/~cputnam/Comp546/Putnam/Cache%20Memory.pdf>(UnitV: Cache Memory)
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes**  |
| **CLO1** | Demonstrate the fundamental concept of binary representation and codes,combinational circuits, Instruction formats, register operations and memory organization |
| **CLO2** | Explain the various types of flip flops, different types of micro operations, as well as the addressing modes in the instruction set |
| **CLO3** | Apply the various number conversion systems and simplification of equations using K-map |
| **CLO4** | Analyze the various design of combinational circuits and flip flops to design a computer |
| **CLO5** | Distinguish the major components of a computer including CPU, memory, I/O and storage |

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| **CO/ PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **3** | **2** | **1** | **2** | **2** | **2** |
| **CLO2** | **3** | **2** | **2** | **2** | **2** | **2** |
| **CLO3** | **2** | **2** | **2** | **2** | **2** | **2** |
| **CLO4** | **3** | **2** | **2** | **2** | **3** | **2** |
| **CLO5** | **3** | **2** | **3** | **2** | **3** | **3** |

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| **SEMESTER: I****PART: A****ELECTIVE – II** | **23PINTE15-3: HUMAN COMPUTER INTERACTION** | **Credit:3****Hours:5** |

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| **Objectives of the Course** | To think constructively and analytically in designing and evaluating interactive technologies |
| **UNIT-I :**  Foundations: The Human: Introduction-Input-Output Channels- Memory. The Computer: Introduction- Text Entry Devices- Display Devices- Memory. The Interaction: Introduction – Models of Interaction-Frameworks and HCI Ergonomics-Interaction Styles-Elements of the WIMP Interface-Interactivity - The Context of the Interactions |
| **UNIT-II :**  Design Process: Design Basics- Introduction - Process- User Focus-Scenarios- Navigation Design- Screen Design and Layout-Interaction and Prototyping. Design Rules-Introduction- Principles to Support Usability-Guidelines-Golden Rules and Heuristics-HCI Patterns |
| **UNIT-III :**  Implementation Support: Introduction - Elements of Windowing Systems - Programming the Application- Using Toolkits-User Interface Management Systems. Evaluation Techniques: What is an Evaluation- Goal of Evaluation-Evaluation Through Expert Analysis-Choosing an Evaluation Method |
| **UNIT-IV :** Universal Design: Introduction - Universal Design Principles-Designing for Diversity. User Support: Introduction-Requirements of User Support-Approaches to User Support-Adaptive Help Systems-Designing User Support Systems |
| **UNIT-V:**  Models: Cognitive Models: Introduction-Goals and Task-Linguistic Models- Challenge of Display Based System-Physical and Device Models - Cognitive Architectures |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** Alan dix, Janet finlay, Gregory D. Abowd and Russell Beale,(2004),Human Computer Interaction, 3rd edition, Pearson Education |
| **Reference Books**1. John C. Caroll, (2002), Human Computer Interaction in the new millennium, Pearson Education
2. [Jenny Preece](https://www.amazon.in/Jenny-Preece/e/B001IGHLL6/ref%3Ddp_byline_cont_book_1), [Yvonne Rogers](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_2?ie=UTF8&field-author=Yvonne+Rogers&search-alias=stripbooks), [Helen Sharp](https://www.amazon.in/Helen-Sharp/e/B00JOOIOUQ/ref%3Ddp_byline_cont_book_3) (2019), Interaction Design: Beyond Human–Computer Interaction,fifth edition, John Wiley & Sons Inc.
 |
| **Website and e-Learning Source**1. <http://courses.iicm.tugraz.at/hci/>
2. <http://www.hcibook.com/hcibook/downloads/pdf/exercises.pdf>
3. <http://www.idemployee.id.tue.nl/g.w.m.rauterberg/lectures.html>
4. [http://user.medunigraz.at/andreas.holzinger/holzinger/papersen/HCI/Workshop/forISSEP%2](http://user.medunigraz.at/andreas.holzinger/holzinger/papersen/HCI/Workshop/forISSEP%252) 02005.pdf
5. <http://universaldesign.ie/What-is-Universal-Design/The-7-Principles/> (Unit IV**:** Universal Design Principles)
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes**  |
| **CLO1** | Describe typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms |
| **CLO2** | Identify the usability and the beneficiary factors of User support systems |
| **CLO3** | Analyze the core theories, models and methodologies in the field of HCI |
| **CLO4** | Evaluate interactive systems based on the human factor theories |
| **CLO5** | Elaborate an interactive system based on the design principles, standards and guidelines |

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| **CO/ PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **3** | **2** | **1** | **2** | **2** | **2** |
| **CLO2** | **3** | **2** | **1** | **2** | **2** | **2** |
| **CLO3** | **3** | **2** | **2** | **3** | **3** | **3** |
| **CLO4** | **3** | **3** | **2** | **3** | **3** | **3** |
| **CLO5** | **3** | **2** | **2** | **3** | **3** | **3** |

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| **SEMESTER: II****PART: A****CORE COURSE – IV** | 23PINTC21: DATABASE SYSTEMS | **Credit:5****Hours:6** |

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| **Objectives of the Course** | To understand the basic DBMS models, architecture, query and to normalize the database. To Learn Transaction Processing, Recovery and Distributed Database. |
| **UNIT-I :**  **Introduction**: Database System Applications-Purpose of Database Systems-View of Data- Database Users and Administrators. **Relational Database**: Structure of Relational Databases- Databases Schema- Keys-Schema Diagrams-**Formal Relational Query Languages**: Relational Algebra-Tuple Relational Calculus |
| **UNIT-II :**  **Database Design:** Overview of Design Process-The Entity Relationship Model-Constraints- Removing Redundant Attributes in Entity Sets-Entity-Relationship Diagrams-Reduction to Relational Schemas-Extended E-R features -Alternative Notations for Modeling Data**. Relational Database Design:** Features of Good Relational Design-Functional Dependency- **Normalization**: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF- Functional Dependency Theory |
| **UNIT-III :**  **Transaction Management:** Transaction Concept-Simple Transaction Model-Storage Structure- Transaction Atomicity and Durability-Transaction Isolation-Serializability. **Concurrency Control:** Lock Based Protocols-Locks-Granting of Locks-Two Phase Locking Protocol-Time Stamp Based Protocol - **Recovery System:** Failure Classification-**Recovery and Atomicity**: Log Records-Database Modification-Concurrency Control and Recovery-Recovery Algorithm |
| **UNIT-IV :**  **Distributed Database:** Homogeneous and Heterogeneous Databases-Distributed Data storage- Distributed Transactions-Commit Protocols-Concurrency Control in Distributed Databases- Distributed Query Processing. Case study: MongoDB |
| **UNIT-V:**  **SQL** - Table Fundamentals - Viewing Data - Inserting - Deleting - Updating - Modifying - Constraints - Functions - Grouping - Subqueries - Joins - Views.**PL/SQL**: Introduction - PL/SQL Block - Data Types And Variables - Control Structure - Cursors - PL/SQL Security - Locks. PL/SQL Database Objects: Exception Handling- Packages - Procedures and Functions - Database Triggers |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text**1. Abraham Silberchatz, Henry F.Korth, S.Sudarshan, Database Systems Concepts, Sixth Edition, Tata Mcgraw Hill.
2. Ivan Bayross, SQL, PL/SQL The Programming Language of ORACLE, Fourth edition, BPB Publications. Unit IV & V
 |
| **Reference Books**1. AtulKahate, Introduction to Database Management systems, Pearson education.
2. Carlo Zaniolo, Stefano Ceri, Christos Faloustsos, R.T.Snodgrass, V.S.Subrahmanian, (1997), Advanced Database Systems, Morgan Kaufman.
3. George Koch, Kelvin Loney, (2002), Oracle 9i : The Complete Reference, Oracle Press, Tata McGrawHill Publication.
4. RamezElmasri, Shamkant B. Navathe (2014), “Database Systems”, Sixth edition, Pearson Education, New Delhi
 |
| **Website and e-Learning Source**1. <http://awtrey.com/tutorials/dbeweb/database.php>
2. <http://www.slideshare.net/SalamaAlbusaidi/emerging-database-technology-multimedia-> database.
3. <http://www.tutorialspoint.com/dbms/index.htm>
4. <http://www.tutorialspoint.com/plsql/index.htm>
5. https://opentextbc.ca/dbdesign/chapter/chapter-11-functional-dependencies/(Functional Dependencies)
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes**  |
| **CLO1** | Explain the relational databases and uses of PL/SQL |
| **CLO2** | Apply Schema, ER- Model, normalization, transaction, concurrency, and recovery on tables using SQL and PL/SQL. |
| **CLO3** | Analyze and manage relational & distributed, database, transaction,concurrency control and query languages |
| **CLO4** | Assess databases based on models and Normal Forms. |
| **CLO5** | Design and construct tables and manipulate it effectively using PL/SQL database objects |

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| **CO/ PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CLO2** | **3** | **3** | **3** | **3** | **3** | **2** |
| **CLO3** | **3** | **2** | **3** | **3** | **3** | **2** |
| **CLO4** | **3** | **3** | **3** | **3** | **3** | **2** |
| **CLO5** | **3** | **3** | **3** | **3** | **3** | **3** |

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| **SEMESTER: II****PART: A****CORE COURSE – V** | **23PINTC22:OPEN SOURCE TECHNOLOGIES -**  | **Credit:5****Hours:6** |

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| **Objectives of the Course** | To learn the efficiency of Open Source Technology and to train to have a good practical knowledge of how to write successful PHP and Ruby code and utilizing a database using PHP. |
| **UNIT-I :** **PHP:** Introduction – Creating a PHP page – Running PHP page –HTML and PHP – Printing Text – Comment Statements – Working with variables – Storing data in variables - Interpolating strings – Constants - Understanding Internal Datatypes – Operators – Flow Control – Strings: String Functions - Converting to and from strings - Formatting text strings - Working with numbers. |
| **UNIT-II :**  Date and Time - Create an Array - Use an Associative Array - Functions to Work with Arrays - Work with Arrays of Arrays - Create and Use Functions |
| **UNIT-III :** Reading Data in web pages: Handling various controls - PHP Browser-Handling power: Data Validation - File Handling : Opening a file – Reading Text from a file – Closing a file- Working with Databases: Creating , Inserting , Accessing , Updating , Deleting and Sorting Database - Work with Cookies and Sessions |
| **UNIT-IV :** **Ruby:** Getting Started with Ruby – Working with Numbers and Strings – Variables – Constants – Operators – Conditionals and Loops |
| **UNIT-V:**  Arrays - Hashes - Methods - Blocks : Classes and Objects : Creating a Class and an Object- Exception Handling – File Handling |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text**1. Steven Holzner, (2016), “PHP: The Complete Reference”, McGraw Hill Education Private Limited, Indian Edition. (Unit I, II)
2. RachnaKapur, Mario Briggs, Tapas Saha, Ulisses Costa, Pedro Carvalho, Raul F. Chong, Peter Kohlmann (2010), “Getting Started with Open Source Development”, DB2 on Campus Book Series. (Unit III)
3. <http://indexof.es/Ruby/Beginning%20Ruby%20On%20Rails.pdf> (Unit IV)
4. http://www.cs.uni.edu/~wallingf/teaching/agile-may2010/ruby/programming-ruby.pdf(Unit V)
 |
| **Reference Books**1. W. Jason Gilmore (2010), “Beginning PHP &MySql”, Apress.
2. Joel Murach, Ray Harris (2010), “PHP and MySQL”,Shroff Publishers & Distributors
3. Larry Ullman (2008), “PHP 6 and MySQL 5”, Pearson Education.
4. John Coggeshall (2006), “PHP 5”, Pearson Education.
5. Michale C. Glass (2004), “Beginning PHP, Apache, MySQL Web Development”, Wiley DreamTech Press.
 |
| **Website and e-Learning Source**1. <http://www.w3schools.com/php/>
2. <http://howtostartprogramming.com/PHP/>
3. <http://www.massey.ac.nz/~nhreyes/MASSEY/159339/Lectures/Lecture%2011%20->

%20PHP%20-%20Part%205%20-%20CookiesSessions.pdf1. <http://www.tutorialspoint.com/mysql/>
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes**  |
| **CLO1** | Demonstrate the setup and configuration of development environment to write PHP and Ruby Scripts |
| **CLO2** | Select the appropriate language fundamentals and techniques to write and compile PHP and Ruby programs |
| **CLO3** | Examine the bugs and analyze how to prevent and remove the bugs |
| **CLO4** | Test and debug the application with sample inputs to check the correctness and consistency of the scripts |
| **CLO5** | Create simple programs that make use of various PHP and Ruby features andfunctions and solve web application and database tasks using PHP |

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| **CO/ PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **3** | **3** | **3** | **1** | **2** | **3** |
| **CLO2** | **3** | **3** | **3** | **2** | **2** | **2** |
| **CLO3** | **3** | **2** | **3** | **3** | **2** | **2** |
| **CLO4** | **3** | **2** | **3** | **2** | **3** | **3** |
| **CLO5** | **3** | **3** | **3** | **3** | **2** | **3** |

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| **SEMESTER: II****PART: A****PRACTICAL-II** | 23PINTP23: RDBMS LAB | **Credit:4****Hours:6** |

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| **Objectives of the Course** | The primary Course Objective of this paper is to learn and implement SQL & PL/SQL. |
| **Course Outline** | 1. DDL Commands
2. DML Commands
3. DCL Commands
4. Usage of Sub Queries in DML and Create-SQL
5. Solving queries using built-in functions
6. Simple programs in PL/SQL block
7. Exception Handling in PL/SQL
8. Programs using Implicit Cursors
9. Programs using Explicit Cursors
10. Procedures & User-defined functions
11. Creation of Triggers
 |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text**Ivan Bayross, SQL, PL/SQL The Programming Language of ORACLE, Fourth edition, BPB Publications |
| **Reference Books**Ramez Elmasri, Shamkant B. Navathe (2014), “Database Systems”, Sixth edition, Pearson Education, New Delhi |
| **Website and e-Learning Source**1. <http://awtrey.com/tutorials/dbeweb/database.php>
2. <http://www.slideshare.net/SalamaAlbusaidi/emerging-database-technology-multimedia-> database.
3. <http://www.tutorialspoint.com/dbms/index.htm>
4. <http://www.tutorialspoint.com/plsql/index.htm>
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes**  |
| **CLO1** | Choose appropriate SQL queries and PL/SQL blocks for the database. |
| **CLO2** | Implement SQL and PL/SQL blocks for the given problem effectively. |
| **CLO3** | Analyze the problem and Exceptions using queries and PL/SQL blocks. |
| **CLO4** | Validate the database for normalization using SQL and Pl/SQL blocks. |
| **CLO5** | Design Database tables, create Procedures, user-defined functions and Triggers. |

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| **CO/ PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **3** | **3** | **2** | **3** | **3** | **3** |
| **CLO2** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CLO3** | **3** | **3** | **2** | **3** | **3** | **3** |
| **CLO4** | **3** | **3** | **2** | **3** | **3** | **2** |
| **CLO5** | **3** | **3** | **3** | **3** | **3** | **3** |

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| **SEMESTER: II****PART: A****ELECTIVE – III** | **23PINTE24-1: NETWORKS AND SECURITY** | **Credit:3****Hours:4** |

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| **Objectives of the Course** | To understand the importance of networking and the basic model followed in network design and to understand necessary approaches and techniques to build protection mechanisms in order to secure computer networks |
| **UNIT-I :**  Uses of Computer Networks – Network Hardware – Line Configuration – Topology – Transmission Modes – **Reference Models:** OSI Reference Model – TCP/IP Reference Model – **Physical Layer:** Guided Transmission Media – Wireless Transmission – Communication Satellites – **Public Switched Telephone Network**: Local Loop – Multiplexing – Switching |
| **UNIT-II :**  **Data Link Layer:** Design Issues - Error Detection and Correction - **Network Layer :** Design Issues – **Routing Algorithms** : Shortest Path Routing – Distance Vector Routing – Link State Routing – Broadcast Routing – Multicast Routing – Congestion Control |
| **UNIT-III :**  **Network Layer in the Internet:** IP Addresses –**Transport Layer:** Elements of Transport Protocols: Addressing – Connection Establishment – Connection Release – **Application Layer:** Domain Name System – **Email:** Architecture and Services |
| **UNIT-IV :** **Network Security:** Introduction to Cryptography - Symmetric - Key Cryptography - Asymmetric- key Cryptography – Security Services: Message Confidentiality - Message Integrity - Message Authentication - Digital Signature - Entity Authentication – **Security in the Internet:** IPSecurity - SSL/TLS: SSL services - SSL Protocols - Firewalls |
| **UNIT-V:**  **Security for Wireless Networks:** Introduction – Protecting the wireless networks – Physical Security – Authentication and access control- **Smartphone Security:** Security Threats - Steps to smartphone security –**Websites and Web application Security:** Definition – Available Technologies - Threats - Strategies.**Case Study: To study recent Wi -Fi and Smartphone technologies** |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text**1. Andrew S.Tanenbaum, David J. Wetherall (2010), Computer Networks, Prentice Hall of India, V Edition. (Unit I - Unit - III) Unit I – Chapter 1,2

 Unit II – Chapter 3,5 Unit III – Chapter 5,6,71. Behrouz A. Forouzan, (2016), Data Communications and Networking, Tata McGraw-Hill Publishing Company Limited, IV Edition. (Unit IV) Unit IV - Chapter 30, 31, 32
 |
| **Reference Books**1. Charles P. Pfleeger, Shari Lawrence Pfleeger( 2002), Security in Computing, 3rd Edition, Pearson Education.
2. James F. Kurose, Keith W. Ross (2005 ),Computer Networking, 3rd Edition, Addison Wesley,.
3. William Stallings(2006), Cryptography and Network Security: Principles and Practice, 3rd Edition, PHI.
 |
| **Website and e-Learning Source**1. <http://wndw.net/pdf/wndw3-en/ch09-security-for-wireless-networks.pdf> (Unit V- Wireless Networks Security)
2. <https://www.fcc.gov/sites/default/files/smartphone_master_document.pdf> (Unit V- Steps to smartphone security)
3. [https://www.csoonline.com/article/3241727/mobile-security/6-mobile-security-threats-you- should-take-seriously-in-2019.html](https://www.csoonline.com/article/3241727/mobile-security/6-mobile-security-threats-you-should-take-seriously-in-2019.html) (Unit V – Smart Phone Security Threats)
4. <https://kgk.uni-obuda.hu/sites/default/files/12_Kadena.pdf> (Unit V – Smart Phone Security Threats)
5. <https://www.goodfirms.co/glossary/web-security/>(Unit V – Web Security)
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes**  |
| **CLO1** | Outline the concepts and fundamentals of data communication and computer networks |
| **CLO2** | Identify the usage and importance of layered model, network security and web security |
| **CLO3** | Classify the techniques based on required application |
| **CLO4** | Analyze the significant applications of protocols and layers used in data communication and networking |
| **CLO5** | Explain the functionality of various techniques and algorithms that works atdifferent layers |

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| **CO/ PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **3** | **2** | **3** | **3** | **2** | **3** |
| **CLO2** | **3** | **2** | **2** | **2** | **2** | **2** |
| **CLO3** | **3** | **2** | **3** | **2** | **2** | **3** |
| **CLO4** | **3** | **2** | **2** | **2** | **3** | **2** |
| **CLO5** | **3** | **3** | **3** | **3** | **3** | **3** |

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| **SEMESTER: II****PART: A****ELECTIVE – III** | **23PINTE24- 2 : BIOMETRIC TECHNIQUES** | **Credit:3****Hours:4** |

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| **Objectives of the Course** | To understand various physiological and behavioural biometrics and its applications |
| **UNIT-I :**  Introduction: Biometric Fundamentals - Biometrics Vs Traditional Techniques - Benefits of Biometrics in Identification Systems - Key Biometric Terms and Processes: Verification, Identification and Biometric Matching - Accuracy in Biometric Systems: False Match Rate, False Non-Match Rate, Failure to Enroll Rate, Derived Metrics |
| **UNIT-II** :  Physiological Biometrics: Finger Scan: Components-How it works-Competing Technologies- Deployments-Strengths and Weaknesses. Facial Scan: Components- How it Works-Competing Technologies-Deployments-Strengths and Weaknesses |
| **UNIT-III** :  Other Physiological Biometrics: Iris Scan: Components- How it Works-Competing Technologies-Deployments-Strengths and Weaknesses. Voice Scan: How it Works-Competing Technologies-Deployments-Strengths and Weaknesses. Other Physiological Biometrics: Hand Scan and Retina Scan |
| **UNIT-IV** : Behavioural Biometrics: Signature Scan and Keystroke Scan: How it Works-Competing Technologies-Deployments-Strengths and Weaknesses. Esoteric Biometrics: Vein Pattern- Facial Thermography-DNA- Sweat Pores- Hand Grip- Finger Nail Bed- Body Odor- Ear-Gait- Skin Luminescence- Brain Wave Pattern- Foot Print and Foot Dynamics |
| **UNIT-V:**  Biometric Applications: Categorizing Biometric Applications - Application Areas: Criminal and Citizen Identification, Surveillance, PC/Network Access, E-Commerce/Telephony and Retail/ATM - Costs to Deploy -Issues in Deployment- Biometric Standards |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text**1. Samir Nanavati, Michael Thieme, Raj Nanavati,(2003),Biometrics - Identity Verification in a Networked World, Wiley-dreamtech India Pvt Ltd, New Delhi
2. John D. Woodward, Nicholas M. Orlans, Peter T. Higgins, Biometrics: the ultimate reference, Dreamtech Press
 |
| **Reference Books**Anil K Jain, Patrick Flynn, Arun A Ross, (2008), Handbook of Biometrics, Springer  |
| **Website and e-Learning Source**1. <http://www.sans.org/reading-room/whitepapers/authentication/biometric-scanning/>
2. <http://www.biometrics.gov/documents/biointro.pdf>
3. <http://www.cse.unr.edu/~bebis/CS790Q/Lect/IntroBiometrics.pdf>
4. <http://www.planetbiometrics.com/creo_files/upload/article-files/btamvol1> update.pdf
5. <http://www.biometrics.gov/documents/biointro.pdf>(Unit V: Biometric Applications)
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes**  |
| **CLO1** | Outline the existing theories, methods and interpretations in the field ofbiometrics |
| **CLO2** | Identify the deployment areas, competing technologies, strength and weakness of various Physiological and Behavioral Biometrics |
| **CLO3** | Analyze various Application areas, Biometric security issues and Biometricstandards |
| **CLO4** | Assess the methods relevant for design, development and operation of biometric access control systems |
| **CLO5** | Determine identification /verification systems to validate the user identity and technological uplifts in biometrics compared to traditional securing mechanisms |

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| **CO/ PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **2** | **1** | **1** | **1** | **1** | **1** |
| **CLO2** | **2** | **2** | **1** | **1** | **2** | **2** |
| **CLO3** | **3** | **2** | **1** | **2** | **2** | **3** |
| **CLO4** | **3** | **2** | **2** | **3** | **3** | **2** |
| **CLO5** | **3** | **3** | **2** | **3** | **3** | **3** |

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| **SEMESTER: II****PART: A****ELECTIVE – III** | **23PINTE24- 3 : BLOCKCHAIN TECHNOLOGY** | **Credit:3****Hours:4** |

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| **Objectives of the Course** | To study the basics of Blockchain technology, private and public Blockchain, and smart contract. This paper familiarizes the students to explore various aspects of Blockchain technology like application in various domains |
| **UNIT-I :**  **Introduction of Cryptography and Blockchain :** Definition of Blockchain - Blockchain Technology Mechanisms & Networks - Blockchain Origins - Objective of Blockchain - Blockchain Challenges - Transactions and Blocks - P2P Systems - Keys as Identity - Digital Signatures, Hashing, and public key cryptosystems - private vs. public Blockchain |
| **UNIT-II :**  **Bitcoin and Cryptocurrency :** Bitcoin Terminology- The Bitcoin Network - The Bitcoin Mining Process - Mining Developments - Bitcoin Wallets - Decentralization and Hard Forks - Ethereum Virtual Machine (EVM) - Merkle Tree- Double- Spend Problem - Blockchain and Digital Currency- Transactional Blocks - Impact of Blockchain Technology on Cryptocurrency |
| **UNIT-III :**  **Introduction to Ethereum**: Introduction to Ethereum - Consensus Mechanisms- Metamask Setup - Ethereum Accounts -Transactions -Receiving Ethers- Smart Contracts |
| **UNIT-IV :** **Introduction to Hyperledger and Solidity Programming**: Definition of Hyperledger - Distributed Ledger Technology & its Challenges - Hyperledger & Distributed Ledger Technology -Hyperledger Fabric -Hyperledger Composer - Solidity - Language of Smart Contracts - Installing Solidity & Ethereum Wallet - Basics of Solidity - Layout of a Solidity Source File & Structure of Smart Contracts - General Value Types |
| **UNIT-V:**  **Blockchain Applications**: Internet of Things -Medical Record Management System - Domain Name Service and Future of Blockchain -Alt Coins |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text**1. Imran Bashir, “Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained”, Second Edition, Packt Publishing, 20182. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction” Princeton University Press, 2016 3. Antonopoulos and G. Wood, “Mastering Ethereum: Building Smart Contracts and Dapps”, O’Reilly Publishing, 2018  |
| **Reference Books**1. Antonopoulos, Mastering Bitcoin, O’Reilly Publishing, 20142. D. Drescher, Blockchain Basics. Apress, 2017 |
| **Website and e-Learning Source**1. https://nptel.ac.in/courses/106/104/106104220/#
2. https://www.udemy.com/course/build-your-blockchain-az/
3. https://eduxlabs.com/courses/blockchain-technology- training/?tab=tab-curriculum
4. <https://www.geeksforgeeks.org/consensus-algorithms-in-blockchain/>
5. <https://ec.europa.eu/programmes/erasmus-plus/project-result-content/eb79d492-327b-43d8-b479-dd0fd9fd4490/BLISS%2003> T3%20Unit%201%20slides%20v3.0%20final%20controled.pptx
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes**  |
| **CLO1** | Understand and explore the working of Blockchain technology |
| **CLO2** | Identify the security and privacy implications of blockchain technology  |
| **CLO3** | Apply the learning of solidity to build de-centralized apps on Ethereum  |
| **CLO4** | Analyze the working of Smart Contracts and the working of Hyperledger |
| **CLO5** | Assess the methods relevant for design, development and operation of blockchain based applications |

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| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **2** | **2** | **3** | **3** | **2** | **3** |
| **CLO2** | **2** | **2** | **2** | **2** | **2** | **2** |
| **CLO3** | **3** | **2** | **3** | **2** | **2** | **2** |
| **CLO4** | **3** | **2** | **2** | **2** | **3** | **2** |
| **CLO5** | **3** | **3** | **3** | **3** | **3** | **3** |

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| **SEMESTER: II****PART: A****ELECTIVE – IV** | **23PINTE25- 1 : SOFTWARE ENGINEERING** | **Credit:3****Hours:4** |

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| **Objectives of the Course** | This paper familiarizes the students with the knowledge of basic Software engineering methods and practices and gives hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development. |
| **UNIT-I :**  Introduction: A Generic View of Process - Process Models: The Waterfall Model-Incremental Model-Evolutionary Model-Specialized Model-The Unified Process-Agile Process - Agile process Models**Exercises:**Choose any one project and do the following exercises for the chosen project a. Student Result Management System b. Library management system c. Online course reservation system d. Railway reservation systeme. Recruitment systemf. Stock Maintenance Systemg. Write the Problem Statement for a suggested system of relevance |
| **UNIT-II :**  System Engineering: System Engineering Hierarchy - System Modeling - Requirements Engineering: Tasks- Initiating The Process-Eliciting Requirements-Developing Use Cases- Negotiating Requirements-Validating Requirements - Building the Analysis Models: Data modeling concepts - Scenario based - Flow oriented - Class based Modeling**Exercise**: Preparation of Software Requirement Specification Document |
| **UNIT-III :**  Design Engineering: Design Concepts - Design Models - Pattern Based Design - Architectural Design - Component Level Design: Component - Class Based and Conventional Components Design - User Interface Design: Analysis and Design**Exercise**: Draw DFD and Use Case diagram for the chosen project using any CASE tools |
| **UNIT-IV :** Testing Strategies: Software Testing - Strategies: Conventional - Object Oriented - Validation Testing - System Testing: Recovery - Security - Stress - Performance - Testing Tactics: Testing Fundamentals- Black Box - White Box - Basis Path-Control Structure**Exercise**: Develop test cases and perform various testing using any one of the testing tools |
| **UNIT-V:**  Estimation : Software project Estimation - Empirical Estimation models - Risk management : Software Risks - Risk Identification - Risk Projection - Risk Mitigation, Monitoring and Management - Quality Management: Quality Concepts - Quality Assurance -Software Reliability-Quality Standards.Case Study :Devops Tools **Exercise**: Perform Estimation of effort using FP Estimation for chosen system and prepare Gantt Chart/PERT Chart for the same. |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** Roger Pressman.S., "Software Engineering: A Practitioner's Approach", 6th Edition, Mcgraw Hill, 2005 |
| **Reference Books**1. Richard Failey, “Software Engineering Concepts”, Tata McGraw-Hill, 2004.
2. P. Fleeger, "Software Engineering", Prentice Hall, 1999.
3. Carlo Ghezzi, Mehdi Jazayari, Dino Mandrioli, "Fundamentals ofSoftware Engineering", Prentice Hall Of India 1991.
4. Sommerville, "Software Engineering” 5th Edition: Addison Wesley, 1996.
 |
| **Website and e-Learning Source**1. <http://productdevelop.blogspot.in/2011/03/what-are-formal-technical-reviews-ftr.html>
2. <http://basicqafundamentals.blogspot.in/2011/03/difference-between-alpha-testing-beta.html>
3. <https://www.wiziq.com/tutorials/software-engineering>
4. <http://www.jkinfoline.com/software-engineering.html>
5. <http://www.freetutes.com/systemanalysis/>
6. <http://www.softwaretestingstuff.com/2007/09/white-box-testing.html>(Unit IV : White Box Testing)
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes** |
| **CLO1** | Recognize the software process models including the specification, design,implementation, and testing for a software project |
| **CLO2** | Use recent and advanced tools necessary for software project development,testing, management and reuse |
| **CLO3** | Compare and contrast various design, testing and quality issues |
| **CLO4** | Prioritize the requirements and risk accordingly that meet user expected performance, maintenance and quality |
| **CLO5** | Design software projects with well-defined architecture, modules, components and interfaces |

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| **CO/ PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **3** | **2** | **2** | **3** | **3** | **2** |
| **CLO2** | **3** | **2** | **2** | **3** | **3** | **2** |
| **CLO3** | **3** | **2** | **3** | **2** | **3** | **3** |
| **CLO4** | **3** | **3** | **2** | **3** | **3** | **3** |
| **CLO5** | **3** | **3** | **3** | **2** | **3** | **3** |

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| **SEMESTER: II****PART: A****ELECTIVE – IV** | **23PINTE25- 2 : OBJECT ORIENTED ANALYSIS AND DESIGN** | **Credit:3****Hours:4** |

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| **Objectives of the Course** | The primary objective is to understand the principles & requirements and apply the UML (Unified Modeling Language) and tools for OOA and Design. |
| **UNIT-I :**  Object Basics : Object- oriented Philosophy – Object – Object State, Behaviours and Methods. Encapsulation and Information Hiding – Class Hierarchy – Polymorphism, Aggregation, Object Containment, Meta Classes. |
| **UNIT-II :**  Object Oriented Methodologies: Rumbaugh Object Model, Booch Methodology- Jacobson Methodology, Patterns, Frameworks and Unified Approach. |
| **UNIT-III :**  Object Oriented Analysis: Business Object Analysis– Use Case Driven Approach – Use Case Model. Object Analysis – Noun Phrase Approach – CRC – Identifying Object Relationships and Methods. |
| **UNIT-IV :** Object Oriented Design: The Design Process – Design Axioms – Corollaries – Design Patterns – Designing Classes. Software Quality: Tests- Testing Strategies – Test Cases – Test Plan – Continuous Testing – Mier‟s Debugging Principles. |
| **UNIT-V:**  UML and Programming: Introduction – State and Dynamic Models – UML Diagrams – Class Diagrams – Use Case Diagrams- UML Dynamic Modeling. |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** Ali Brahami, Object Oriented Systems Development, Tata-McGraw Hill, New Delhi. |
| **Reference Books**1. Martin Fowler, Kendall Scott, UML Distilled- Applying the Standard Object Modeling Language, Addition Wesley.
2. Grady Booch, (1994), Object-oriented Analysis and Design with applications, 2nd Edition, Addition Wesley.
 |
| **Website and e-Learning Source**1. <http://www.slideshare.net/helghareeb/object-oriented-analysis-and-design-12164752>
2. <http://www.uml-diagrams.org/uml-object-oriented-concepts.html>
3. <http://www.tutorialspoint.com/object_oriented_analysis_design/index.htm>
4. htt[ps://www.mppmu.mp](http://www.mppmu.mpg.de/english/kluth_oo_intro.pdf)g[.de/english/kluth\_oo\_intro.pdf](http://www.mppmu.mpg.de/english/kluth_oo_intro.pdf)
5. <http://www.agilemodeling.com/artifacts/useCaseDiagram.htm>(Unit V: Use Case Diagrams)
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes**  |
| **CLO1** | Recognize the concepts and principles of object-oriented analysis, design and Testing |
| **CLO2** | Demonstrate the importance of system development process using variousapproaches and choose the relevant technique for a system in each phases of SDLC |
| **CLO3** | Differentiate various object-oriented analysis, design and testing methods and models. |
| **CLO4** | Assess various analysis, design and testing strategies appropriate to build high- performance object-oriented system |
| **CLO5** | Design Object oriented systems using object modeling techniques and analyze them for correctness and quality |

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| **CO/ PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **3** | **2** | **2** | **3** | **2** | **2** |
| **CLO2** | **3** | **2** | **2** | **3** | **2** | **3** |
| **CLO3** | **3** | **3** | **2** | **3** | **2** | **3** |
| **CLO4** | **3** | **2** | **2** | **3** | **2** | **3** |
| **CLO5** | **3** | **2** | **3** | **3** | **3** | **3** |

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| **SEMESTER: II****PART: A****ELECTIVE – IV** | **23PINTE25- 3 : SOFTWARE PROJECT MANAGEMENT** | **Credit:3****Hours:4** |

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| **Objectives of the Course** | The primary objective is to define and highlight importance of software project management and to become familiarize in formulating software management metrics & strategy in managing projects |
| **UNIT-I :**  Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models - The SEI CMM - International Organization for Standardization. |
| **UNIT-II :**  Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project -Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones - Work Packages - Building a WBS for Software. |
| **UNIT-III :**  Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed. |
| **UNIT-IV :** Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling |
| **UNIT-V:**  Quality: Requirements – The SEI CMM - Guidelines - Challenges - Quality Function Deployment - Building the Software Quality Assurance - Plan - Software Configuration Management: Principles - Requirements - Planning and Organizing - Tools - Benefits - Legal Issues in Software - Case Study |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour) |
| Skills acquired from this course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** Robert T. Futrell, Donald F. Shafer, Linda I. Safer, “Quality Software Project Management”, Pearson Education Asia 2002 |
| **Reference Books**1. Pankaj Jalote, “Software Project Management in Practice”, Addison Wesley 2002.
2. Hughes, “Software Project Management”, Tata McGraw Hill 2004, 3rd Edition.
 |
| **Website and e-Learning Source**1. <https://highered.mheducation.com/sites/0077109899/information-center-view/>
2. <https://www.tutorialspoint.com/software_engineering/software_project_management.htm>
3. <https://www.smartsheet.com/content/software-project-management>
4. <https://www.philadelphia.edu.jo/academics/lalqoran/uploads/SPM_Chapter_1-%202016%204.ppt>
5. https://cs.gmu.edu/~kdobolyi/cs421/projectmanagement.ppt
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**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

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| **CO’s** | **Course Outcomes**  |
| **CLO1** | Understanding of project management fundamentals such as project planning, risk management and quality assurance |
| **CLO2** | Choose the appropriate scheduling and testing techniques to build a quality product |
| **CLO3** | Apply different cost estimation techniques and quality measures for software development |
| **CLO4** | Differentiate various software development models and methodologies, planning activities and scheduling methods |
| **CLO5** | Asses the importance of software project documentation and identify the methods to create project documentation, including requirements documents, design documents, and project plans |

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| **CO/ PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CLO1** | **3** | **2** | **2** | **3** | **3** | **2** |
| **CLO2** | **3** | **2** | **2** | **3** | **3** | **2** |
| **CLO3** | **3** | **2** | **3** | **2** | **3** | **3** |
| **CLO4** | **3** | **3** | **2** | **3** | **3** | **3** |
| **CLO5** | **3** | **3** | **3** | **2** | **3** | **3** |
| **SEMESTER: II****PART: A****SEC: 1**  | **23PINTS26: Object Oriented Programming through Java, HTML Basics** | **Credit:2****Hours:4** |

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| **Course Objectives:** |
| The main objectives of this course are to:1. To implement the static web pages using HTML and do client side validation using JavaScript.
2. To introduce Node JS implementation for server side programming.
3. To experiment with single page application development using React.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| 1 | Develop a proper understanding of Web Development Architecture. | K1, K2 |
| 2 | Create application using React components. | K2, K3 |
| 3 | Perform Navigation using Routes. | K3, K4 |
| 4 | Build Web Applications using React with Redux. | K5, K6 |
| 5 | Perform ReactJS animations | K6 |
| **K1**-Remember; **K2**-Understand; **K3**-Apply; **K4**-Analyze; **K5**-Evaluate; **K6**-Create |
| **Unit:1** |  | **15hours** |
| ReactJS introduction, why to learn ReactJS, React Environment Setup- pre-requisite for ReactJS, ways to install ReactJS, ReactJS - Architecture, ReactJS - creating a React Application, React create-react-app, Features of ReactJS, ReactJS vs Native React, ReactJSvs AngularJS. |
| **Unit:2** |  | **15hours** |
| ReactJS - JSX, ReactJS - components: creating a React component, creating a class component, creating a function component, ReactJS - styling, ReactJs - properties (props), React Props Validation. |
| **Unit:3** |  | **15hours** |
| ReactJS state management, ReactJS event Management, React Constructor, React component API, React component Life-cycle, React Forms and user input, controlled Component, Un-Controlled Component, Form link. |
| **Unit:4** |  | **15hours** |
| ReactJS - Http client Programming, React Lists, The map() function, React Keys, React Refs, React Fragments, React Router, ReactCSS, React Animation, React Date picker, DoM in React. |
| **Unit:5** |  | **13hours** |
| React AJAX call - HTTP GET request, HTTP GET Request and Looping through data, React Bootstrap, React Table, React Hooks, React building and deployment. |
| **Unit:6** | **Contemporary Issues** | **2 hours** |
| Expert lectures, online seminars– webinars |
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|  | **Total Lecture hours** | **75hours** |

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| **Text Books** |
| 1 | Learning React: Functional web Development with React and Redux 1st Edition by Alex Banks. |
| 2 | The Road to React: your journey to master plain yet pragmatic React.js by Robin Wieruch |
| **Reference Books** |
| 1 | React.js Essentials: A fast-paced guide to designing and building scalable and maintainable web apps with React.js Artemij Fedosejev. |
| 2 | Full-Stack React projects: Learn MERN stack development by building modem web apps using MongoDB, Express, React, and Node.js, 2nd Edition paperback by shama Hoque |
| 3 | React.js Book: Learning React Javascript Library From Scratch by Greg Sidelnikov |
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| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** |
| 1 | https://www.mygreatlearning.com/academy/learn-for-free/courses/react-js-tutorial |
| 2 | https://www.classcentral.com/course/edx-introduction-to-reactjs-8770 |
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| **Mapping with Programming Outcomes** |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | S | M | S | L | M | L | S | M |
| **CO2** | S | S | S | S | S | M | S | M | S | M |
| **CO3** | S | S | S | S | S | M | S | M | S | M |
| **CO4** | S | S | S | S | S | M | S | M | S | M |
| **CO5** | S | S | S | S | S | M | S | M | S | M |

\*S-Strong; M-Medium; L-Low