**DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING**

**STRUCTURE FOR FIRST YEAR B.TECH PROGRAMME**

**I YEAR I SEMESTER**

|  |  |  |  |  |  |  |  |  |  |  |
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|  | | | | | | | | | | |
| **S.NO.** | **COURSE CODE** | **TITLE OF THE COURSE** | **SCHEME OF INSTRUCTIION** | | | | **SCHEME OF EXAMINATION** | | | **NO. OF CREDITS** |
| **L** | **T** | **P/D** | **Total** | **CIA** | **SEA** | **Total** |
| **1** | **20A1100101** | **Professional Communication** | 2 | 0 | 2 | 4 | 30 | 70 | 100 | 3 |
| **2** | **20A1100201** | **Engineering Mathematics-1** | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| **3** | **20A1100204** | **Applied Chemistry** | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| **4** | **20A1105392** | **Computer Engineering Workshop** | 1 | 0 | 4 | 5 | 15 | 35 | 50 | 3 |
| **5** | **20A1105301** | **Programming and Problem Solving With C** | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| **6** | **20A1100293** | **Applied Chemistry LAB** | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| **7** | **20A1105391** | **Programming and Problem Solving With C Lab** | 0 | 0 | 4 | 4 | 15 | 35 | 50 | 2 |
| **8** | **20A1100801** | **Environmental Sciences** | 2 | 0 | 0 | 2 | 30 | 70\* | 100 | 0 |
| **TOTAL** | | | 14 | 0 | 13 | 27 | 195 | 455 | 650 | 18.5 |
|  |  |  |  |  |  |  |  |  |  |  |
| **I YEAR II SEMESTER** | | | | | | | | | | |
| **S.NO.** | **COURSE CODE** | **TITLE OF THE COURSE** | **SCHEME OF INSTRUCTIION** | | | | **SCHEME OF EXAMINATION** | | | **NO. OF CREDITS** |
| **L** | **T** | **P/D** | **Total** | **CIA** | **SEA** | **Total** |
| **1** | **20A1200201** | **Engineering Mathematics-2** | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| **2** | **20A1200203** | **Applied Physics** | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| **3** | **20A1204302** | **Digital Logic Design** | 2 | 0 | 2 | 4 | 30 | 70 | 100 | 3 |
| **4** | **20A1205401** | **Oops Through Java** | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| **5** | **20A1205303** | **Data Structures** | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| **6** | **20A1200292** | **Applied Physics Lab** | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| **7** | **20A1205491** | **Oops Through Java Lab** | 0 | 0 | 4 | 4 | 15 | 35 | 50 | 2 |
| **8** | **20A1205393** | **Data Structures Lab** | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| **9** | **20A1200191** | **Communicative English Lab** | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| **TOTAL** | | | 14 | 0 | 15 | 29 | 210 | 490 | 700 | 21.5 |

\* No external Evaluation

**DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING**

**STRUCTURE FOR SECOND YEAR B.TECH PROGRAMME**

**II YEAR I SEMESTER**

|  |  |  |  |  |  |  |  |  |  |  |
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| **Sl. No** | **Course Code** | **Title of the Course** | **Scheme of Instruction (Periods Per Week)** | | | | **Scheme of Examination (Maximum Marks )** | | | **No. of Credits** |
| **L** | **T** | **P** | **Total** | **CIA** | **SEA** | **Total** |
| 1 | 20A2100201 | Vector calculus, Transform Techniques and Partial Differential Equations | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 2 | 20A2105401 | Python Programming | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 3 | 20A2105402 | Data Base Management Systems | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 4 | 20A2105403 | Computer Organization and Architecture | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 5 | 20A2105404 | Internet of Things | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 6 | 20A2105491 | Python programming Lab | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| 7 | 20A2105492 | Data Base Management System Lab | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| 8 | 20A2105493 | Internet of ThingsLab | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| 9 | 20A2105992 | Web Application Development Using Full Stack – Frontend Development – Module - I | 0 | 0 | 4 | 4 | 15 | 35 | 50 | 2 |
| 10 | 20A2105901 | Aptitude and Reasoning | 0 | 2 | 0 | 2 | 15 | 35 | 50\* | 0 |
| **Total** | | | **15** | **2** | **13** | **30** | **225** | **525** | **750** | **21.5** |

**II YEAR II SEMESTER**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No** | **Course Code** | **Title of the Course** | **Scheme of Instruction (Periods Per Week)** | | | | **Scheme of Examination (Maximum Marks )** | | | **No. of Credits** |
| **L** | **T** | **P** | **Total** | **CIA** | **SEA** | **Total** |
| 1 | 20A2200201 | Probability and Statistics | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 2 | 20A2205401 | Web Technologies | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 3 | 20A2205402 | Software Engineering | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 4 | 20A2205403 | Operating Systems | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 5 | 20A2205404 | Formal Languages and Automata theory | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 6 | 20A2205491 | Web Technologies Lab | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| 7 | 20A2205492 | Software Engineering Lab | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| 8 | 20A2205493 | Operating Systems and Unix Programming Lab | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| 9 | 20A2205991 | Applications of Python-Numpy, Pandas | 0 | 0 | 4 | 4 | 15 | 35 | 50 | 2 |
| 10 | 20A2200802 | Professional ethics and Human Values | 0 | 2 | 0 | 2 | 30 | 70\* | 100 | 0 |
| **Total** | | | **15** | **2** | **13** | **30** | **240** | **560** | **800** | **21.5** |

**\* Internal Evaluation**

L - LECTURE T – TUTORIAL P - PRACTICAL

CIA – Continuous Internal Assessment SEA – Semester End Assessment

|  |  |  |  |
| --- | --- | --- | --- |
| **Internship2Months(Mandatory)during summer vacation** | | | |
| **Honors/Minorcourses (The hours distribution can be3-0-2or3-1-0also)** | **4** | 0 | **0** | | **4** |

**DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING**

**PRPOPSED STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME**

**III YEAR I SEMESTER**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No** | **Course Code** | **Title of the Course** | **Scheme of Instruction (Periods Per Week)** | | | | **Scheme of Examination (Maximum Marks )** | | | **No. of Credits** |
| **L** | **T** | **P/D** | **Total** | **CIA** | **SEA** | **Total** |
| 1 | 20A3105402 | Artificial Intelligence | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 2 | 20A3105401 | Computer Networks | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 3 | 20A3142403 | Design and Analysis of Algorithms | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 4 | 20A314460X | OE-1 | 2 | 0 | 2 | 4 | 30 | 70 | 100 | 3 |
| 5 | 20A314451X | PE-1 | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 6 | 20A3142491 | Computer Networks lab | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| 7 | 20A3105492 | AI Programming Lab | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| 8 | 20A3105991 | DEVOPS | 0 | 0 | 4 | 4 | 15 | 35 | 50 | 2 |
| 10 | 20A3105801 | Employability Skills | 2 | 0 | 0 | 2 | 30 | 70 | 100 | 0 |
| Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester) | | | 0 | 0 | 0 | 0 | 30 | 70 | 100 | 1.5 |
| **Total** | | | 16 | 0 | 12 | 28 | 255 | 595 | 850 | 21.5 |
| **Honors/Minor courses - 2** | | | **3** | **0** | **2** | **5** | 30 | 70 | 100 | **4** |
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| **Code** | **Professional Elective - 1** |
| 20A3105511 | * 1. Distributed systems |
| 20A3105512 | * 1. Software Project Management |
| 20A3105513 | * 1. Data Warehousing and Data Mining |
| 20A3105514 | * 1. Advanced Data Structures |

**III YEAR II SEMESTER**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No** | **Course Code** | **Title of the Course** | **Scheme of Instruction (Periods Per Week)** | | | | **Scheme of Examination (Maximum Marks )** | | | **No. of Credits** |
| **L** | **T** | **P/D** | **Total** | **CIA** | **SEA** | **Total** |
| 1 | 20A3205403 | Machine Learning | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 2 | 20A3205402 | Compiler Design | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 3 | 20A3205401 | Cryptography and Network Security | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 4 | 20A320560X | OE-2 | 2 | 0 | 2 | 4 | 30 | 70 | 100 | 3 |
| 5 | 20A320551X | PE-2 | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 6 | 20A3205491 | Machine Learning Lab | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| 7 | 20A3205492 | R Programming lab | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| 8 | 20A3205493 | Compiler Design Lab | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| 9 | 20A3205991 | MEAN Stack Technologies | 0 | 0 | 4 | 4 | 15 | 35 | 50 | 2 |
| 10 | 20A3205801 | Employability Skills - 2 | 2 | 0 | 0 | 2 | 30 | 70 | 100 | 0 |
| **Total** | | | 16 | 0 | 15 | 31 | 240 | 560 | 800 | 21.5 |
| **Honors/Minor courses - 3** | | | **3** | **0** | **2** | **5** | 30 | 70 | 100 | **4** |
| **Industrial/Research Internship (Mandatory) 2 Months during summer vacation** | | | | | | | | | | |

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| **Code** | **Professional Elective -2** |
| 20A3205511 | 2.1 Advanced Database Management Systems |
| 20A3205512 | 2.2 Network Programming |
| 20A3205513 | 2.3 Big data Analytics |
| 20A3205514 | 2.4 Object Oriented Analysis and Design |

**Course Title: Artificial Intelligence**

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| --- | --- | --- | --- |
| **Lecture–Tutorial-Practical::** | 3-0-0 | **Internal Marks:** | 30 |
| **Credits:** | 3 | **External Marks:** | 70 |
| **Prerequisites: None** | | | |
| **Course Objectives** | | | |
| * To learn the difference between optimal reasoning vs human like reasoning * To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities * To learn different knowledge representation techniques * To understand the applications of AI: namely Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing | | | |
| **Course Outcomes:**  **Upon Completion of the course, the students will be able to**  CO1 Possess the ability to formulate an efficient problem space for a problem expressed in English.  CO 2 Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.  CO3 Possess the skill for representing knowledge using the appropriate technique  CO4 Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems, Machine Learning and Natural Language Processing  CO5 Apply the knowledge to develop the solutions for real life problems CO6 Develop new algorithms to contribute to the research arena | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | |

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|  | **PO** | **PO** | **PO** | **PO** | **PO** | **PO** | **PO** | **PO** | **PO** | **PO** | **PO** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** |
| CO1 | 3 | - | 2 | - | 2 | - | - | - | - | 2 | - | - | 2 | - | - |
| CO2 | 3 | 2 | - | 2 | - | - | - | - | 2 | - | 2 | - | - | 3 | - |
| CO3 | 3 | - | 2 | - | - | - | - | 2 | - | - | - | - | - | 3 | - |
| CO4 | 3 | 2 | - | 2 | - | - | - |  | - | - | - | - | - | 2 | - |
| CO5 | 3 | - | 2 | - | 2 | - | - | 2 | 2 | 2 | - | - | 2 | - | 2 |

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| Unit–I Introduction, History, Intelligent Systems, Foundations of AI, Sub areas of AI, Applications. Problem Solving –State-Space Search and Control Strategies: Introduction, General Problem Solving, Characteristics of Problem,ExhaustiveSearches,HeuristicSearchTechniques,Iterative-DeepeningA\*,ConstraintSatisfaction |
| UNIT II: LogicConceptsandLogicProgramming:Introduction,PropositionalCalculus,Propositional Logic,NaturalDeduction System, Resolution Refutation in Propositional Logic, Predicate Logic,Logic Programming. RepresentingKnowledgeUsingRules:Logicprogramming,ProceduralVsDeclarativeknowledge,ForwardVsBackwardReasoning,Matching,ControlKnowledge |
| **UNIT III:**  Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge RepresentationusingSemanticNetwork,ExtendedSemanticNetworksforKR, Knowledge Representation usingFrames,Conceptualdependencies,Scripts |
| **UNIT IV:**  Natural Language Processing: Steps in The Natural Language Processing, Syntactic Processing and AugmentedTransitionNets,SemanticAnalysis,NLPUnderstandingSystems;  Fuzzy Logic: CrispSets,Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences & Fuzzy Systems Planning with state-spacesearch–partial-orderplanning–planninggraphs–planningandactingintherealworld |
| **UNIT V:**  Experts Systems: Overview of an Expert System, Architecture of an Expert Systems, Different Types of ExpertSystems, Architectures, Knowledge Acquisition and Validation Techniques, Knowledge System Building Tools,ExpertSystemShells.AIProgramminglanguages:Overviewof LISPandPROLOG, ProductionSysteminProlog |
| **Text Book:**   1. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata Mcgraw-Hill Publications 2. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI publications |
| **REFERENCE BOOKS:**   1. ArtificialIntelligence,GeorgeFLuger,PearsonEducationPublications 2. ArtificialIntelligence:AmodernApproach,RussellandNorvig,PrenticeHall 3. ArtificialIntelligence,RobertSchalkoff,Mcgraw-HillPublications 4. ArtificialIntelligenceandMachineLearning,VinodChandraS.S.,AnandHareendranS. |
| **E-RESOURCES** |
| 1. <https://onlinecourses.nptel.ac.in/noc22_cs56/preview> 2. <https://nptel.ac.in/courses/106105077> 3. <https://nptel.ac.in/courses/106102220> 4. <https://onlinecourses.nptel.ac.in/noc19_me71/preview> 5. <https://nptel.ac.in/courses/106106126> |

**Course Title: Computer Networks**

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| --- | --- | --- | --- | --- |
| **Lecture – Tutorial:** | | 3-0-0 | **Internal Marks:** | 30 |
| **Credits:** | | 3 | **External Marks:** | 70 |
| **Prerequisites: Computer Networks** | | | | |
| **Course Objectives:** | | | | |
| * Understand state-of-the-art in network protocols, architectures, and applications. * Process of networking research * Constraints and thought processes for networking research * Problem Formulation—Approach---Analysis | | | | |
| **Course Outcomes:** | | | | |
| CO1 | Able to understand OSI and TCP/IP models. | | | |
| CO2 | Understand data link layer protocols and flow control | | | |
| CO3 | Understand routing and network layer protocols and IPV4 | | | |
| CO4 | Understand transport layer congestion, flow control and protocols | | | |
| CO5 | Understand application layer protocols | | | |

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| **UNIT I :** INTRODUCTION  OSI, TCP/IP and other networks models, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN.  PHYSICAL LAYER Transmission media copper, twisted pair wireless, switching and encoding asynchronous communications |
| **UNIT II:** DATA LINK LAYER:  Design issues, framing, error detection and correction, CRC, Elementary Protocol-stop and wait, Sliding Window. Medium Access Sub Layer: ALOHA, MAC addresses, Carrier sense multiple access, IEEE 802.X Standard Ethernet, Bridges. |
| **UNIT III:** NETWORK LAYER  Virtual circuit and Datagram subnets-Routing algorithm shortest path routing, Flooding, Hierarchical routing, Broad cast, Multi cast, distance vector routing. OSPF. IPV4 |
| **UNIT IV** TRANSPORT LAYER  Transport Services, Connection management, TCP and UDP protocols congestion control. |
| **UNIT V** APPLICATION LAYER  Network Security, Domain name system, SNMP, Electronic Mail; the World WEB, Multi Media. |
| **Text Book:**  1. Tanenbaum and David J Wetherall, Computer Networks, 5th Edition, Pearson Edu, 2010. |
| **REFERENCE BOOKS:**   1. Computer Networks: A Top-Down Approach, Behrouz A. Forouzan, FirouzMosharraf, McGraw Hill Education. 2. Computer Networks, 5ed, David Patterson, Elsevier. 3. Larry L. Peterson and Bruce S. Davie, “Computer Networks- A Systems Approach” 5th Edition, Morgan Kaufmann/Elsevier, 2011. 4. Computer Networks, Mayank Dave, CENGAGE. 5. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education. 6. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson |
| **E-RESOURCES** |
| 1. [**www.tutorialspoint.com**](http://www.tutorialspoint.com) 2. nptl.ac.in/courses/ |

**Course Title: Design and Analysis of Algorithms**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Lecture–Tutorial-Practical::** | | | | | | | | 3-0-0 | | | **Internal Marks:** | | | | | | | 30 | | |
| **Credits:** | | | | | | | | 3 | | | **External Marks:** | | | | | | | 70 | | |
| **Prerequisites: None** | | | | | | | | | | | | | | | | | | | | |
| **Course Objectives** | | | | | | | | | | | | | | | | | | | | |
| * Analyze the asymptotic performance of algorithms and components * To study divide and conquer paradigm approach used to analyze and design algorithms * To study greedy method approach used to analyze and design algorithms. * To study Dynamic programming paradigm Backtracking approach used to analyze and design algorithms * To study Backtracking approach used to analyze and design algorithms * To study branch and bound paradigm and Deterministic approach used to analyze and design algorithms | | | | | | | | | | | | | | | | | | | | |
| **Course Outcomes:**  **Upon Completion of the course, the students will be able to** | | | | | | | | | | | | | | | | | | | | |
| CO1:Analyze worst-case running times of algorithms using asymptotic analysis and components | | | | | | | | | | | | | | | | | | | | |
| CO2: Describe the divide and conquer method explains when an algorithmic design situation demands it. | | | | | | | | | | | | | | | | | | | | |
| CO3: Describe the greedy method explains when an algorithmic design situation demands it. | | | | | | | | | | | | | | | | | | | | |
| CO4: Describe the dynamic-programming paradigm explains when an algorithmic design demands it. | | | | | | | | | | | | | | | | | | | | |
| CO5: Describe the back tracking method explains when an algorithmic design demands it. | | | | | | | | | | | | | | | | | | | | |
| CO6: Describe the branch and bound paradigm and deterministic methods e-plain when an algorithmic design demands it. | | | | | | | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | | | | | | |
|  | **PO** | **PO** | **PO** | **PO** | **PO** | **PO** | | **PO** | **PO** | | **PO** | **PO** | **PO** | **PO12** | **PSO1** | **PSO2** | | **PSO3** |
| **1** | **2** | **3** | **4** | **5** | **6** | | **7** | **8** | | **9** | **10** | **11** |
| CO1 | 3 | - | 2 | - | 2 | - | | - | - | | - | 2 | - | - | 2 | - | | - |
| CO2 | 3 | 2 | - | 2 | - | - | | - | - | | 2 | - | 2 | - | - | 3 | | - |
| CO3 | 3 | - | 2 | - | - | - | | - | 2 | | - | - | - | - | - | 3 | | - |
| CO4 | 3 | 2 | - | 2 | - | - | | - |  | | - | - | - | - | - | 2 | | - |
| CO5 | 3 | - | 2 | - | 2 | - | | - | 2 | | 2 | 2 | - | - | 2 | - | | 2 |
| CO6 | 3 | - | 3 | 3 | - | - | | - | - | | - | - | - | - | 3 | 3 | | 3 |

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| **UNIT I Introduction to Algorithms**  Fundamentals of algorithmic problem solving – Analysis framework - Performance Analysis: - Space complexity, Time complexity - Growth of Functions: Asymptotic Notation- Big oh notation, Omega notation, Theta notation, little oh. |
| **UNIT II Divide and Conquer:**Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Finding the Maximum and Minimum |
| Unit III **Greedy method:**The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, Prim’s Algorithm, Kruskal’s Algorithms, Optimal Merge Patterns, Single Source Shortest Paths |
| **UNIT IV Dynamic Programming:** General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design. |
| **UNIT V Backtracking:** General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.  **Branch and Bound:** General method, applications - Travelling sales person problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution |
| **TEXT BOOKS:** |
| Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahni and Rajasekaran, University press |
| **REFERENCE BOOKS:** |
| 1. Introduction to The Design and Analysis of Algorithms, 3rd Edition, Anany Levitin, Pearson Education, 2017. 2. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L. Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education 3. Design and Analysis of algorithms, Aho, Ullman and Hopcroft,Pearson education. 4. Algorithms – Richard Johnson Baugh and Marcus Schaefer, Pearson Education |

**Course Code-Distributed Systems**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Lecture – Tutorial- Practical::** | | | | 3-0-0 | | | | | | **Internal Marks:** | | | | 30 | |
| **Credits:** | | | | 3 | | | | | | **External Marks:** | | | | 70 | |
| **Prerequisites: C- Programming, Data Structures, Statistics fundamentals** | | | | | | | | | | | | | | | |
| **Course Objectives:**   * To understand the foundations of distributed systems. * To learn issues related to clock Synchronization and the need for global state in distributed systems * To learn distributed mutual exclusion and deadlock detection algorithms * To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems * To learn the characteristics of peer-to-peer and distributed shared memory systems | | | | | | | | | | | | | | | |
| **Course Outcomes:** | | | | | | | | | | | | | | | |
| Upon successful completion of the course, the student will be able to: | | | | | | | | | | | | | | | |
| CO1 | Elucidate the foundations and issues of distributed system. | | | | | | | | | | | | | | |
| CO2 | Illustrate the various synchronization issues and global state for distributed systems | | | | | | | | | | | | | | |
| CO3 | Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems | | | | | | | | | | | | | | |
| CO4 | Describe the agreement protocols and fault tolerance mechanisms in distributed systems | | | | | | | | | | | | | | |
| CO5 | Describe the features of peer-to-peer and distributed shared memory systems | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | |
|  | PO  1 | PO  2 | PO  3 | | PO  4 | PO  5 | PO  6 | PO  7 | PO  8 | | PO  9 | PO  10 | PO  11 | | PO  12 |
| CO1 | 3 | 3 | 2 | | -- | 3 | -- | -- | -- | | -- | -- | -- | |  |
| CO2 | 3 | 2 | 3 | | -- | 2 | -- | -- | -- | | -- | -- | -- | | -- |
| CO3 | 2 | 2 | 3 | | -- | -- | -- | -- | -- | | -- | -- | -- | |  |
| CO4 | 3 | -3 | 2 | | 2 | 2 | -- | -- | -- | | -- | -- | -- | | -- |
| CO5 | 2 | 3 | 3 | | 3 | 2 | -- | -- | -- | | -- | -- | -- | |  |
|  | | | | | | | | | | | | | | | |
| **UNIT-1: Distributed Systems**: Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues and challenges, **A model of distributed computations**: A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of process communications. **Logical Time:** A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP. | | | | | | | | | | | | | | | |
| **UNIT-2: Message Ordering & Snapshots:** Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order. Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels. | | | | | | | | | | | | | | | |
| **UNIT-3:** **Distributed Mutex & Deadlock**: Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport‘s algorithm – Ricart-Agrawala algorithm – Maekawa‘s algorithm – Suzuki–Kasami‘s broadcast algorithm. Deadlock detection in distributed systems: Introduction – System model – Preliminaries – Models of deadlocks – Knapp‘s classification – Algorithms for the single resource model, the AND model and the OR model. | | | | | | | | | | | | | | | |
| **UNIT-4:** **Recovery & Consensus**: Check pointing and rollback recovery: Introduction – Background and definitions – Issues in failure recovery – Checkpoint-based recovery – Log-based rollback recovery – Coordinated check pointing algorithm – Algorithm for asynchronous check pointing and recovery. Consensus and agreement algorithms: Problem definition – Overview of results – Agreement in a failure – free system – Agreement in synchronous systems with failures. | | | | | | | | | | | | | | | |
| **UNIT-5: Peer-to-peer computing and overlay graphs:** Introduction – Data indexing and overlays – Chord – Content addressable networks – Tapestry.  **Distributed shared memory**: Abstraction and advantages – Memory consistency models –Shared memory Mutual Exclusion. | | | | | | | | | | | | | | | |
| **TEXT BOOKS:**   1. Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and Tim Kindberg, Fifth Edition, Pearson Education, 2012. 2. Distributed computing: Principles, algorithms, and systems, Ajay D Kshemkalyani and Mukesh Singhal, Cambridge University Press, 2011.   **REFERENCE BOOKS:**   1. Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall of India, 2007. 2. Advanced concepts in operating systems. Mukesh Singhal and Niranjan G. Shivaratri, McGraw-Hill, 1994. 3. Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M.,Pearson Education, 2007.   **e-Resources:**   1. [**https://nptel.ac.in**](https://nptel.ac.in/courses/106106168/) 2. https://onlinecourses.nptel.ac.in/noc21\_cs87/preview | | | | | | | | | | | | | | | |

**Course Title: Software Project Management**

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| **Lecture – Practical:** | | | | 3-0-0 | | | | | **Internal Marks:** | | | 30 | | | | |
| **Credits** | | | | 3 | | | | | **External Marks:** | | | 70 | | | | |
| **Prerequisites: Software Engineering** | | | | | | | | | | | | | | | | |
| **Course Objectives** | | | | | | | | | | | | | | | | |
| 1.Understand the fundamental principles of software project management & have a good knowledge of responsibilities of  project manager. 2. Be familiar with the different methods and techniques used for project management 3. Be able to apply the knowledge in an effective manner | | | | | | | | | | | | | | | | |
| **Course Outcomes** | | | | | | | | | | | | | | | | |
| Upon successful completion of the course, the student will be able to: | | | | | | | | | | | | | | | | |
| CO1 | Identify project planning objectives, along with various cost/effort estimation models. | | | | | | | | | | | | | | | |
| CO2 | Organize & schedule project activities to compute critical path for risk analysis. | | | | | | | | | | | | | | | |
| CO3 | Monitor and control project activities. | | | | | | | | | | | | | | | |
| CO4 | Formulate testing objectives and test plan to ensure good software quality | | | | | | | | | | | | | | | |
| CO5 | Configure changes and manage risks using project management tools. | | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | | |
|  | PO  1 | PO  2 | PO  3 | PO  4 | PO  5 | PO  6 | PO  7 | PO  8 | | PO  9 | PO  10 | PO  11 | PO12 | PSO1 | **PSO2** | **PSO3** |
| CO1 | 3 | 2 | 2 | - | - | - |  |  | |  |  |  |  | - | - | 2 |
| CO2 | 3 | 2 | 2 | 2 | - | - |  |  | |  |  |  |  | - | 3 | 2 |
| CO3 | 2 | 2 | 3 | 2 | - | - |  |  | |  |  |  |  | 2 | 2 | - |
| CO4 | 3 | 3 | 2 | - | - | - |  |  | |  |  |  |  | - | 2 | 3 |
| CO5 | 2 | 2 | 3 | 2 | 2 | 2 |  |  | |  |  |  |  | 1 | 3 | - |
| **UNIT I: Project Evaluation and Project Planning :** Importance of Software Project Management – Activities – Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.. | | | | | | | | | | | | | | | | |
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| **UNIT II: Project Life Cycle and Effort Estimation :** | | | | | | | | | | | | | | | | |
| Software process and Process Models – Choice of Process models – Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming–techniques – COSMIC Full function points – COCOMO II – a Parametric Productivity Model. | | | | | | | | | | | | | | | | |
| **UNIT III: Activity Planning and Risk Management :**  Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass-Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules. | | | | | | | | | | | | | | | | |
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| **UNIT IV: Project Management and Control:** Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control– Software Configuration Management – Managing contracts – Contract Management. | | | | | | | | | | | | | | | | |
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| **UNIT V: Staffing in Software Projects :** Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership**.** | | | | | | | | | | | | | | | | |
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| **Text Book**  1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, McGraw Hill,  New Delhi, 2012. 2. Robert K. Wysocki ―Effective Software Project Management – Wiley Publication, 2011. 3. Walker Royce: ―Software Project Management- Addison-Wesley, 1998..  4. Gopalaswamy Ramesh, ―Managing Global Software Projects – McGraw Hill Education (India), Fourteenth | | | | | | | | | | | | | | | | |
| **REFERENCE BOOKS:** | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | |
| **E-RESOURCES** | | | | | | | | | | | | | | | | |
| 1. <https://www.tutorialspoint.com/software_engineering/software_project_management.htm> 2. https://www.geeksforgeeks.org/software-engineering-software-project-management-spm/ | | | | | | | | | | | | | | | | |

**Course Title: Data Warehousing and Data Mining**

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| **Lecture – Practical:** | | | | 3-0-0 | | | | | **Internal Marks:** | | | 30 | | | | |
| **Credits** | | | | 3 | | | | | **External Marks:** | | | 70 | | | | |
| **Prerequisites: Data Structures** | | | | | | | | | | | | | | | | |
| **Course Objectives** | | | | | | | | | | | | | | | | |
| The objective of this course is to provide knowledge of techniques and strategies to create and use the data warehouses, to understand, learn different data mining techniques and to understand the applicability of these techniques. | | | | | | | | | | | | | | | | |
| **Course Outcomes** | | | | | | | | | | | | | | | | |
| Upon successful completion of the course, the student will be able to: | | | | | | | | | | | | | | | | |
| CO1 | Understand the basic concepts of warehousing and data preprocessing techniques | | | | | | | | | | | | | | | |
| CO2 | Derive various interesting patterns and associations in datasets. | | | | | | | | | | | | | | | |
| CO3 | Design and develop classifier models to predict future trends. | | | | | | | | | | | | | | | |
| CO4 | Apply unsupervised learning techniques for a given application. | | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | | |
|  | PO  1 | PO  2 | PO  3 | PO  4 | PO  5 | PO  6 | PO  7 | PO  8 | | PO  9 | PO  10 | PO  11 | PO12 | PSO1 | **PSO2** | **PSO3** |
| CO1 | - | - | - | 3 | - | - | - | - | | - | - | - | 2 | - | - | 2 |
| CO2 | 2 | 2 | - | 3 | - | - | - | - | | - | - | - | - | - | 3 | 2 |
| CO3 | 2 | 2 | - | 3 | 2 | - | - | - | | - | - | - | 2 | 2 | 2 | - |
| CO4 | 3 | 2 | - | 3 | - | - | - | - | | - | - | - | 2 | - | 2 | 3 |
| **UNIT I: DATAWAREHOUSING AND BUSINESSANALYSIS**  Data Warehouse and Online Analytical Processing: Data Warehouse basic concepts, Data Warehouse Modeling: Data cube and OLAP, Data Warehouse Implementation, Data Generalization by Attribute Oriented Induction. Data Preprocessing: Overview, Data Cleaning, Data Integration,Data Reduction, Data Transformation and Data Discretization. | | | | | | | | | | | | | | | | |
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| **UNIT II:** **DATA MINING OVERVIEW AND ADVANCEDPATTERN MINING** | | | | | | | | | | | | | | | | |
| Data Mining Introduction: Introduction, Why Data Mining, kinds of Data that can be mined, Patterns that can be Mined, technologies where it can be used, major issues in data Mining.  **Mining Frequent Patterns, Associations, and Correlations:** Basic Concepts, Frequent Item-set Mining Methods. (Apriori and FP growth algorithms) | | | | | | | | | | | | | | | | |
| **UNIT III: CLASSIFICATION AND PREDICTION**  Classification: Introduction, Decision tree induction, Bayesian Classification, Rule-Based Classification, Techniques to improve Classification Accuracy, Classification by Back propagation, Support Vector Machines | | | | | | | | | | | | | | | | |
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| **UNIT IV: CLUSTERING ANALYSIS**  Cluster Analysis: Introduction, overview of basic clustering methods, Partitioning methods, Hierarchical methods, Density-Based Methods: DBSCAN& OPTICS, introduction to outlier analysis | | | | | | | | | | | | | | | | |
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| **UNIT V: WEB AND TEXT MINING**  Multidimensional Analysis and Descriptive Mining of Complex Data Objects-Introduction, web mining, web content mining, web structure mining, we usage mining, Text mining, unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering**.** | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | |
| **Text Books**  [1].Jiawei Han and Micheline Kamber, ―Data Mining Concepts and Techniques‖, Third Edition, Elsevier, 2012. | | | | | | | | | | | | | | | | |
| **REFERENCE BOOKS:**  [1].G.K.Gupta,―IntroductiontoDataMiningwithCaseStudies‖,EasterEconomyEdition,Prentice Hall of India, 2006  [2].APang-Ning Tan, Michael Steinbach and Vipin Kumar, ―Introduction to DataMining‖, Second Edition Pearson Education, 2016  [3].K.P. Soman, ShyamDiwakar and V. Ajay ―Insight into Data mining Theory and Practice‖, Easter Economy Edition, Prentice Hall of India, 2006 | | | | | | | | | | | | | | | | |
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| **E-RESOURCES** | | | | | | | | | | | | | | | | |
| Data Warehouse Tutorial For Beginners | Data Warehouse Concepts | Data Warehousing | Edureka (2017)<https://www.youtube.com/watch?v=J326LIUrZM8&t=4s>  How Artificial Neural Network (Ann) Algorithm Work | Data Mining | Introduction To Neural Network(2016)https://[www.youtube.com/watch?v=fwnaijgpih,](http://www.youtube.com/watch?v=fwnaijgpih) | | | | | | | | | | | | | | | | |

**Course Title: Advanced Data Structures**

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| **Lecture – Practical:** | | | | 3-0-0 | | | | | **Internal Marks:** | | | 30 | | | | |
| **Credits** | | | | 3 | | | | | **External Marks:** | | | 70 | | | | |
| **Prerequisites: Data Structures** | | | | | | | | | | | | | | | | |
| **Course Objectives** | | | | | | | | | | | | | | | | |
| * Describe and implement a variety of advanced data structures (hash tables, priority queues, balanced search trees, digital search trees). * Analyze the space and time complexity of the algorithms studied in the course. * Identify different solutions for a given problem; analyze advantages and disadvantages to different solutions. | | | | | | | | | | | | | | | | |
| **Course Outcomes** | | | | | | | | | | | | | | | | |
| Upon successful completion of the course, the student will be able to: | | | | | | | | | | | | | | | | |
| CO1 | Able to understand the importance, operations and application of Hashing | | | | | | | | | | | | | | | |
| CO2 | Able to understand implementation of skip lists | | | | | | | | | | | | | | | |
| CO3 | Able to get a good understanding about different balanced trees. | | | | | | | | | | | | | | | |
| CO4 | Able to understand the implementation of heaps and binomial queues. | | | | | | | | | | | | | | | |
| CO5 | Have an idea on applications of algorithms in a variety of areas, like string matching,  indexing etc. | | | | | | | | | | | | | | | |
| CO6 | Able to understand the importance and applications of tries | | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | | |
|  | PO  1 | PO  2 | PO  3 | PO  4 | PO  5 | PO  6 | PO  7 | PO  8 | | PO  9 | PO  10 | PO  11 | PO12 | PSO1 | **PSO2** | **PSO3** |
| CO1 | 3 | 2 | 2 | - | - | - | - | - | | - | - | - | - | - | - | 2 |
| CO2 | 3 | 2 | 2 | 2 | - | - | - | - | | - | - | - | - | - | 3 | 2 |
| CO3 | 2 | 2 | 3 | 2 | - | - | - | - | | - | - | - | - | 2 | 2 | - |
| CO4 | 3 | 3 | 2 | - | - | - | - | - | | - | - | - | - | - | 2 | 3 |
| CO5 | 2 | 2 | 3 | 2 | 2 | 2 | - | - | | - | - | - | - | 3 | 3 | - |
| CO6 | 3 | 3 | 2 | - | - | - | - | - | | - | - | - | - | 3 | 2 | 3 |
| Dictionaries: Sets,Dictionaries,Static Hashing- Hash Table, Hash Functions- Secure Hash Function, Overflow Handling, Theoretical Evaluation of Overflow Techniques | | | | | | | | | | | | | | | | |
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| **UNIT II:** **Dynamic Hashing and Skip Lists** | | | | | | | | | | | | | | | | |
| Dynamic Hashing- Motivation for Dynamic Hashing, Dynamic Hashing Using Directories, Directory less Dynamic Hashing, Hash Table Restructuring, Skip Lists,Analysis of Skip Lists. | | | | | | | | | | | | | | | | |
| **UNIT III: Balanced Trees**  AVL Trees: Maximum Height of an AVL Tree, Insertions and Deletions. 2-3 Trees : Insertion, Deletion, applications, introduction to Red-black trees | | | | | | | | | | | | | | | | |
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| **UNIT IV: Priority Queues**  Binary Heaps : Implementation of Insert and Delete min, Creating Heap.  Binomial Queues : Binomial Queue Operations, Binomial Amortized Analysis, Lazy Binomial Queues | | | | | | | | | | | | | | | | |
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| **UNIT V: Pattern matching and Tries**  Pattern matching algorithms- the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm  Tries: Definitions and concepts of digital search tree, Binary trie, Patricia , Multi-way trie | | | | | | | | | | | | | | | | |
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| **Text Book**   1. Fundamentals of DATA STRUCTURES in C: 2 nded, , Horowitz , Sahani, Anderson-freed, Universities Press. 2. Data structures and Algorithm Analysis in C, 2 nd edition, Mark Allen Weiss, Pearson | | | | | | | | | | | | | | | | |
| **REFERENCE BOOKS:**   1. Data Structures, a Pseudocode Approach, Richard F Gilberg, Behrouz A Forouzan,Cengage. 2. Introduction to Algorithms, 3rd Edition by *Thomas H.* Cormen , *Charles E. Leiserson, Ronald L. Rivest, Clifford Stein* | | | | | | | | | | | | | | | | |
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| **E-RESOURCES** | | | | | | | | | | | | | | | | |
| 1. Web : <http://lcm.csa.iisc.ernet.in/dsa/dsa.html> 2. <http://utubersity.com/?page_id=878> 3. <http://fr>ee[videolectures.com/Course/2519/C-Programming-and-Data-Structures](http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures) 4. <http://fr>ee[videolectures.com/Course/2279/Data-Structures-And-Algorithms](http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms) | | | | | | | | | | | | | | | | |

**Course Title: Computer Networks Lab**

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| **Lecture – Tutorial- Practical::** | | | | 0-0-3 | | | | | | **Internal Marks:** | | | | 15 | |
| **Credits:** | | | | 1.5 | | | | | | **External Marks:** | | | | 35 | |
| **Prerequisites:** Knowledge of C Programming, Basic commands of UNIX. | | | | | | | | | | | | | | | |
| Knowledge of C Programming, Basic commands of UNIX | | | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | |
| The object of this course is to provide hands-on practice on implementing different network related commands (like netstat, ping, arp, telnet, etc.,) and programming (like socket programming, routing algorithms, etc.,) in C programming and Java. | | | | | | | | | | | | | | | |
| **Course Outcomes:** | | | | | | | | | | | | | | | |
| Upon successful completion of the course, the student will be able to: | | | | | | | | | | | | | | | |
| CO1 | Should be able to Calculate Data link layer farming methods like bit stuffing and byte stuffing. | | | | | | | | | | | | | | |
| CO2 | Should be able to Analyze Cyclic redundancy check on different polynomials. | | | | | | | | | | | | | | |
| CO3 | Should be able to understand Socket Programming Implementation by using TCP and UDP Protocols. | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | |
|  | PO  1 | PO  2 | PO  3 | | PO  4 | PO  5 | PO  6 | PO  7 | PO  8 | | PO  9 | PO  10 | PO  11 | | PO  12 |
| CO1 | 2 | 2 | - | | 2 | - | - | - | - | | - | - | - | | - |
| CO2 | - | 2 | 2 | | - | - | - | - | - | | - | - | 2 | | 2 |
| CO3 | 3 | - | - | | 2 | 2 | - | - | - | | - | - | 2 | | 2 |
|  | | | | | | | | | | | | | | | |
| **List of Programs**  1. Understanding and using of commands like ifconfig, netstat, ping, arp, telnet, ftp, finger, traceroute, whois etc. Usage of elementary socket system calls (socket (), bind(), listen(),  accept(),connect(),send(),recv(),sendto(),recvfrom()).  2. Implementation of Connection oriented concurrent service (TCP).  3. Implementation of Connectionless Iterative time service (UDP).  4. Implementation of Select(),of getpeername () system call.  5. Implementation of gesockopt (), setsockopt () system calls.  6. Implementation of remote command execution using socket system calls.  7. Implement the data link layer framing methods such as character stuffing and bit stuffing.  8. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.  9. Implement Dijkstra‘s algorithm to compute the Shortest path thru a graph.  10. Implementation of Distance Vector Routing Algorithm.  11. Implementation of SMTP.  12. Implementation of FTP.  **Note: Implement programs 2 to 6 in C and 8 to 12 in JAVA.** | | | | | | | | | | | | | | | |
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| **TEXT BOOKS:** | | | | | | | | | | | | | | | |
| 1.Tanenbaum and David J Wetherall, Computer Networks, 5th Edition, Pearson Edu, 2010.  2.Computer Networks: A Top Down Approach, Behrouz A. Forouzan , FirouzMosharraf, McGraw Hill Education. | | | | | | | | | | | | | | | |
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| **E-RESOURCES:** | | | | | | | | | | | | | | | |
| * <http://www.softpanorama.org/Internals/unix_system_calls.shtml> * <https://www.tutorialspoint.com/system-calls-in-unix-and-windows> | | | | | | | | | | | | | | | |

**Course Title: Artificial Intelligence Programming Lab**

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| **Lecture–Tutorial-Practical::** | 0-0-3 | **Internal Marks:** | 15 |
| **Credits:** | 1.5 | **External Marks:** | 35 |
| **Prerequisites:** Artificial Intelligence concepts | | | |
| **Course Objectives** | | | |
| * To provide skills for designing and analyzing AI based algorithms. * To enable students to work on various AI tools. * To provide skills to work towards solution of real life problems. | | | |
| **CourseOutcomes:**  **UponCompletionofthecourse,thestudentswillbeableto**  CO1: Elicit, analyze and specify software requirements.  CO2: Simulate given problem scenario and analyze its performance.  CO3: Develop programming solutions for given problem scenario. | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | |

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|  | **PO** | **PO** | **PO** | **PO** | **PO** | **PO** | **PO** | **PO** | **PO** | **PO** | **PO** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** |
| CO1 | 3 | - | 2 | - | 2 | - | - | - | - | 2 | - | - | 2 | - | - |
| CO2 | 3 | 2 | - | 2 | - | - | - | - | 2 | - | 2 | - | - | 3 | - |
| CO3 | 3 | - | 2 | - | - | - | - | 2 | - | - | - | - | - | 3 | - |

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| **List of Experiments**  Use any language such as C/C++/LISP/PROLOG   1. Solve “Water Jug Problem”. 2. Write a program to solve 8 queens’ problem 3. Solve any problem using depth first search. 4. Solve any problem using best first search. 5. Solve 8-puzzle problem using best first search 6. Write A Program to Generate the output for A\* Algorithm 7. Write a program to implement tower of Hanoi 8. Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing. 9. Write a program to solve the Monkey Banana problem 10. Write a program to solve Hill climbing. 11. Implementation of searching techniques in AI. 12. Installation and working on various AI tools viz. Python, R tool, GATE, NLTK, MATLAB, etc. 13. Data preprocessing and annotation and creation of datasets. 14. Learn existing datasets and Treebanks 15. Implementation of Knowledge representation schemes. 16. Application of Classification and clustering problem. 17. Natural language processing tool development.   Note: The concerned Course Coordinator will finalize the actual list of experiments/problems at the start of semester based on above generic list. |

**Course Title:** DEVOPS LAB

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| **Lecture – Practical:** | | | | 0-0-4 | | | | | **Internal Marks:** | | | 15 | | | | | | |
| **Credits** | | | | 2 | | | | | **External Marks:** | | | 35 | | | | | | |
| * **Prerequisites:**   Working knowledge of one or more high-level programming languages (C#, Java, PHP, Ruby, Python, etc.) Intermediate knowledge of administering Linux or Windows systems at the command-line level | | | | | | | | | | | | | | | | | | |
| **Course Objectives :** The Objective of this course is to give a strong foundation of the Development and its Operations. | | | | | | | | | | | | | | | | | | |
| **Course Outcomes** | | | | | | | | | | | | | | | | | | |
| Upon successful completion of the course, the student will be able to: Understand the traditional software development. Learn the rise of agile methodologies.• Define and design purpose of DevOps.• | | | | | | | | | | | | | | | | | | |
| CO1 | Realize the importance of agile software development practices in determining the requirements for a software system | | | | | | | | | | | | | | | | | |
| CO2 | Analyze and execute iterative software development processes to manage software development activities. | | | | | | | | | | | | | | | | | |
| CO3 | Apply a systematic understanding of Agile principles and defined practices for a specific circumstance or need. | | | | | | | | | | | | | | | | | |
| CO4 | Examine the impact of DevOps in the successful completion of software development by improving team collaboration and software quality. | | | | | | | | | | | | | | | | | |
| CO5 | Perform software process improvement by applying DevOps capabilities at enterprise level. | | | | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | | | | |
|  | PO  1 | PO  2 | PO  3 | PO  4 | PO  5 | PO  6 | PO  7 | PO  8 | | PO  9 | PO  10 | PO  11 | PO12 | PSO1 | **PSO2** | | **PSO3** | |
| CO1 | 2 | 2 | - | - | - | - | 2 | 2 | | - | - |  | 3 | 2 | | 3 | | 3 |
| CO2 | 2 | 3 | 2 | 3 | - | - | - | - | | - | - | 2 | 3 | 3 | | 3 | | 3 |
| CO3 | 2 | 2 | 3 | 3 | 2 | - | 2 | - | | 2 | - | 2 | - | 2 | | - | | 3 |
| CO4 | 2 | - | 2 | 2 | 2 | - | 2 | - | | - | - | - | 3 | 2 | | 3 | | - |
| CO5 | - | - | 2 | 2 | 2 | - | 3 | - | | 2 | - | 2 | 3 | 3 | | 3 | | 3 |
| PROGRAMS LIST | | | | | | | | | | | | | | | | | | |
| 1. **In-depth knowledge of DevOps methodology** 2. **Implementing Software Version Control** 3. **Containerizing Code on production using Docke** 4. **Creating CI/CD Pipelines using Jenkins** 5. **Configuration Management using Puppet and Ansible** 6. **Automating build and test using Selenium and Maven** 7. **Container Orchestration using Kubernetes** 8. **Performance Tuning and Monitoring using Nagios** 9. **Devops Tools : Jenkins,Docker. Phantom.,NagiosVagrant,Ansible,GitHub.** | | | | | | | | | | | | | | | | | | |
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| **E-RESOURCES** | | | | | | | | | | | | | | | | | | |
| https://www.guru99.com/ | | | | | | | | | | | | | | | | | | |

**Course Code-Employability Skills-I**

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| **Lecture – Practical:** | | | | 2-0-0 | | | | | **Internal Marks:** | | | 30 | | | | |
| **Credits** | | | | 0 | | | | | **External Marks:** | | | 70\* | | | | |
| **Prerequisites: None** | | | | | | | | | | | | | | | | |
| Course Objectives:  1.To explore and practice basic communication skills  2.To learn skills for effective discussions & team work  3.To assess and improve personal grooming | | | | | | | | | | | | | | | | |
| **Course Outcomes** | | | | | | | | | | | | | | | | |
| **Upon successful completion of the course, the student will be able to:** | | | | | | | | | | | | | | | | |
| CO1 | Establish effective communication with employers, supervisors, and co-workers | | | | | | | | | | | | | | | |
| CO2 | Identify to explore their values and career choices through individual skill assessments | | | | | | | | | | | | | | | |
| CO3 | Adapts positive attitude and appropriate body language | | | | | | | | | | | | | | | |
| CO4 | Interpret the core competencies to succeed in professional and personal life | | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | | |
|  | **PO**  **1** | **PO**  **2** | **PO**  **3** | **PO**  **4** | **PO**  **5** | **PO**  **6** | **PO**  **7** | **PO**  **8** | | **PO**  **9** | **PO**  **10** | **PO**  **11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
| CO1 |  |  |  |  |  |  |  | 2 | |  | 2 |  |  |  |  |  |
| CO2 |  |  |  |  |  |  |  | 2 | |  |  |  |  |  |  |  |
| CO3 |  |  |  |  |  |  |  |  | |  | 2 |  |  |  |  | 2 |
| CO4 |  |  |  |  |  |  |  | 2 | |  | 2 |  | 2 |  |  |  |
| **UNIT I:** **Soft Skills:**  An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. Self-Discovery: Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue. | | | | | | | | | | | | | | | | |
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| **Unit 2:** Positivity and Motivation: | | | | | | | | | | | | | | | | |
| Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels | | | | | | | | | | | | | | | | |
| **UNIT III:** Interpersonal Communication:  Interpersonal relations; communication models, process and barriers; team communication; developing interpersonal relationships through effective communication; listening skills; essential formal writing skills; corporate communication styles, assertion, persuasion, negotiation. | | | | | | | | | | | | | | | | |
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| **UNIT IV:** Public Speaking:  Skills, Methods, Strategies and Essential tips for effective public speaking.Group Discussion: Importance, Planning, Elements, Skills assessed; Effectively disagreeing, Initiating, Summarizing and Attaining the Objective. | | | | | | | | | | | | | | | | |
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| **UNIT V:** **Non-Verbal Communication**  Importance and Elements; Body Language. Teamwork and Leadership Skills: Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills. | | | | | | | | | | | | | | | | |
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| **REFERENCE BOOKS:**  1) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.  2) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.  3) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018. 4) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.  5) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.  6) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011. | | | | | | | | | | | | | | | | |
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| **E-RESOURCES** | | | | | | | | | | | | | | | | |
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**III YEAR II SEMESTER**

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| **Sl. No** | **Course Code** | **Title of the Course** | **Scheme of Instruction (Periods Per Week)** | | | | **Scheme of Examination (Maximum Marks )** | | | **No. of Credits** |
| **L** | **T** | **P/D** | **Total** | **CIA** | **SEA** | **Total** |
| 1 | Professional Core courses | Machine Learning | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 2 | Professional Core courses | Compiler Design | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 3 | Professional Core courses | Cryptography and Network Security | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 4 | Open Elective Course/Job oriented elective | OE-2 | 2 | 0 | 2 | 4 | 30 | 70 | 100 | 3 |
| 5 | Professional Elective courses | PE-2 | 3 | 0 | 0 | 3 | 30 | 70 | 100 | 3 |
| 6 | Professional Core courses Lab | Machine Learning Lab | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| 7 | Professional Core courses Lab | R Programming lab | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| 8 | Professional Core courses Lab | Compiler Design Lab | 0 | 0 | 3 | 3 | 15 | 35 | 50 | 1.5 |
| 9 | Skill advanced course/ soft skill course\* | MEAN Stack Technologies | 0 | 0 | 4 | 4 | 15 | 35 | 50 | 2 |
| 10 | Mandatory course (AICTE suggested) | Employability Skills - 2 | 2 | 0 | 0 | 2 | 30 | 70 | 100 | 0 |
| **Total** | | | 16 | 0 | 15 | 31 | 240 | 560 | 800 | 21.5 |
| **Honors/Minor courses - 3** | | | **3** | **0** | **2** | **5** | 30 | 70 | 100 | **4** |
| **Industrial/Research Internship (Mandatory) 2 Months during summer vacation** | | | | | | | | | | |

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| **Code** | **Professional Elective -2** |
|  | 2.1 Advanced Database Management Systems |
|  | 2.2 Network Programming |
|  | 2.3 Big data Analytics |
|  | 2.4 Object Oriented Analysis and Design |

**Course Title: Machine Learning**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Lecture – Practical:** | | | | 3-0-0 | | | | | **Internal Marks:** | | | 30 | | | | |
| **Credits** | | | | 3 | | | | | **External Marks:** | | | 70 | | | | |
| **Prerequisites: Calculus and Probability** | | | | | | | | | | | | | | | | |
| **Course Objectives** | | | | | | | | | | | | | | | | |
| 1. Explain about data preprocessing and its uses in prediction 2. Explain how linear models are learning from the data. 3. Explain the Improving efficiency of the models using nonlinearity and ensembles 4. Explain how neural networks help in increasing efficiency | | | | | | | | | | | | | | | | |
| **Course Outcomes** | | | | | | | | | | | | | | | | |
| Upon successful completion of the course, the student will be able to: | | | | | | | | | | | | | | | | |
| CO1 | Understanding the machine learning basics and how data is preprocessed | | | | | | | | | | | | | | | |
| CO2 | How linear models help in prediction | | | | | | | | | | | | | | | |
| CO3 | Distance based models complexity | | | | | | | | | | | | | | | |
| CO4 | Probabilistic models understanding | | | | | | | | | | | | | | | |
| CO5 | Nonlinear models and ensembles improve efficiency | | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | | |
|  | PO  1 | PO  2 | PO  3 | PO  4 | PO  5 | PO  6 | PO  7 | PO  8 | | PO  9 | PO  10 | PO  11 | PO12 | PSO1 | **PSO2** | **PSO3** |
| CO1 | 3 | 2 | 2 | - | - | - | - | - | | - | - | - | - | - | - | 2 |
| CO2 | 3 | 2 | 2 | 2 | - | - | - | - | | - | - | - | - | - | 3 | 2 |
| CO3 | 2 | 2 | 3 | 2 | - | - | - | - | | - | - | - | - | 2 | 2 | - |
| CO4 | 3 | 3 | 2 | - | - | - | - | - | | - | - | - | - | - | 2 | 3 |
| CO5 | 2 | 2 | 3 | 2 | 2 | 2 | - | - | | - | - | - | - | 3 | 3 | - |
| **UNIT I The Ingredients of Machine Learning:**  Introduction to Machine Learning, Types of Machine Learning, Models - The output of Machine Learning  **Binary Classification and related tasks:** Classification, Calculating accuracy in classification. | | | | | | | | | | | | | | | | |
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| **UNIT II(NLP):**  Text data preprocessing, Bag of words, TF IDF, Word2vec, Plane and Hyper-plane for machine learning, Data Cleaning, Data Preprocessing (Min – Max Scaling), Normalizing, Standardize, Mean, Variance, Standard Deviation, One Hot Encoding | | | | | | | | | | | | | | | | |
| **Unit III :**  **Beyond Binary Classification:** Handling more than two classes, finding minimum and maximum of a function, Gradient Descent, Linear Regression, Multiple Regression, Calculating accuracy in regression (RMSE), Effect of outliers and noisy data, overfitting and underfitting models, K-fold cross validation, confusion matrix for cross validation imbalanced data, ROC\_AUC curve for imbalanced data, F1 score | | | | | | | | | | | | | | | | |
| **UNIT IV :**  **Logistic Regression:** Sigmoid function in logistic regression, loss functions in logistic regression.  **Linear Models:** The Least Square method, Support Vector Machine (SVM)  **Tree Model:** Decision Trees, Ranking and Probability estimation trees, | | | | | | | | | | | | | | | | |
| **UNIT V :**  **Distance Based Models:** Distance Measures (Euclidean, Manhattan and Minkowski), Neighbors, KNN, Distance based clustering, Hierarchical Clustering, Agglomerative Clustering  **Probabilistic model:** Naive Bayes algorithm for classification, Laplace, smoothing  **Model Ensembles:** Bagging and Random Forest, Boosting | | | | | | | | | | | | | | | | |
| **Text Book**   1. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge. 2. Machine Learning, Tom M. Mitchell, MGH. | | | | | | | | | | | | | | | | |
| **REFERENCE BOOKS:**   1. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai Ben- David, Cambridge. 2. Machine Learning in Action, Peter Harington, 2012, Cengage. | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | |
| **E-RESOURCES** | | | | | | | | | | | | | | | | |
| 1.<https://alex.smola.org/drafts/thebook.pdf>  [2](https://courses.edx.org/asset-v1:ColumbiaX+CSMM.101x+1T2017+type@asset+block@AI_edx_ml_5.1intro.pdf).<https://www.slideshare.net/liorrokach/introduction-to-machine-learning-13809045> | | | | | | | | | | | | | | | | |

**Title of the Course: Compiler Design**

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| **Lecture – Tutorial- Practical::** | | | | 3-0-0 | | | | | | **Internal Marks:** | | | | 30 | |
| **Credits:** | | | | 3 | | | | | | **External Marks:** | | | | 70 | |
| **Prerequisites:** Formal Language and Automata Theory | | | | | | | | | | | | | | | |
| **Course Objectives:**  1. To describe the design of a compiler including its phases and components and basic understanding of  Grammars and language definition.  2. To Identify the similarities and differences among various parsing techniques and grammar transformation  Techniques.  3. To Understand the syntax analysis, intermediate code generation, type checking, the role of symbol table and  its organization.  4. To Understand, design code generation and optimization schemes. | | | | | | | | | | | | | | | |
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| **Course Outcomes:** | | | | | | | | | | | | | | | |
| Upon successful completion of the course, the student will be able to: | | | | | | | | | | | | | | | |
| CO1 | To use the knowledge of patterns, tokens & regular expressions for solving a problem. | | | | | | | | | | | | | | |
| CO2 | To apply the knowledge of lex tool & yacc tool to develop a scanner & parser. | | | | | | | | | | | | | | |
| CO3 | To write the new code optimization techniques to improve the performance of a program in terms of speed & space. | | | | | | | | | | | | | | |
| CO4 | To employ the knowledge of modern compiler & its features. | | | | | | | | | | | | | | |
| CO5 | To participate in GATE, PGECET and other competitive examinations | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | |
|  | PO  1 | PO  2 | PO  3 | | PO  4 | PO  5 | PO  6 | PO  7 | PO  8 | | PO  9 | PO  10 | PO  11 | | PO  12 |
| CO1 | 3 | 3 | 2 | | 3 | 3 |  |  |  | |  |  | - | | 2 |
| CO2 | 2 | 3 | 3 | | 2 | 2 | 2 |  |  | |  | 2 | 2 | | 3 |
| CO3 | 3 | 3 | 3 | | 3 | 3 | 2 |  |  | |  |  |  | | 2 |
| CO4 | 3 | 2 | 3 | | 2 | 3 |  |  |  | |  | 2 | 2 | | 2 |
| CO5 | 3 | 3 | 3 | | 1 | - | 2 | 1 | 1 | | - | 2 | - | | 2 |
| **UNIT I :** | | | | | | | | | | | | | | | |
| **Overview of Compilation:** Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA. Interpretation, bootstrapping, LEX - lexical analyzer generator and Boot Strapping. | | | | | | | | | | | | | | | |
| **UNIT II:** | | | | | | | | | | | | | | | |
| **SYNTAX ANALYSIS:** Context free grammars, Top down parsing – Backtracking, LL (1), Recursive Descent Parsing, Predictive Parsing. Bottom up Parsing: Shift Reduce parsing, LR and LALR parsing, Operator Precedence parsing, Error recovery in parsing, handling ambiguous grammar, YACC – automatic parser generator. | | | | | | | | | | | | | | | |
| **UNIT III:** | | | | | | | | | | | | | | | |
| **Semantic analysis:** Intermediate forms of source Programs – abstract syntax tree, polish notation and three address codes. Attributed grammars, Syntax directed translation, Type checker.  **Symbol Tables:** Symbol table format, organization for block structures languages. Block structures and non block structure storage allocation: static, runtime stack and heap storage allocation. | | | | | | | | | | | | | | | |
| **UNIT IV:** | | | | | | | | | | | | | | | |
| **RUN-TIME ENVIRONMENT AND CODE GENERATION :**  Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management – Issues in Code Generation – Design of a simple Code Generator. | | | | | | | | | | | | | | | |
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| **UNIT V:** | | | | | | | | | | | | | | | |
| **CODE OPTIMIZATION:**  Semantic preserving transformations, global common sub expression elimination, copy propagation, dead code elimination, constant folding, strength reduction, loop optimization. Instruction scheduling, inter procedural optimization.  Principal Sources of Optimization – Peep-hole optimization – DAG- Optimization of Basic Blocks-Global Data Flow Analysis – Efficient Data Flow Algorithm. | | | | | | | | | | | | | | | |
| **TEXT BOOKS:** | | | | | | | | | | | | | | | |
| 1. Alfred V. Aho, Ravi Sethi & Jeffrey. D. Ullman, “Compilers Principles, Techniques & Tools”, Pearson  Education, third edition, 2007.  2. Andrew N. Appel, “Modern Compiler Implementation in C”, Cambridge University Press, 2004. | | | | | | | | | | | | | | | |
| **REFERENCE BOOKS:**  1. John R. Levine, Tony Mason, Doug Brown, “lex & yacc”, O'Reilly Media, Inc., 1992.  2. Kenneth C. Louden, Compiler Construction: Principles and Practice, Course Technology Inc; International  edition, 1997 | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | |
| **E-RESOURCES:** | | | | | | | | | | | | | | | |
| 1. https://www.holub.com/software/compiler.design.in.c.html | | | | | | | | | | | | | | | |

**Course Title: Cryptography and Network Security**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Lecture–Tutorial-Practical::** | | | | | | | 3-0-0 | | | **Internal Marks:** | | | | | | | 30 | |
| **Credits:** | | | | | | | 3 | | | **External Marks:** | | | | | | | 70 | |
| **Prerequisites:** Students are expected to have knowledge on the following topics: Engineering Mathematics, Number Theory, Computer Networks, Problem Solving Skills, Web Technologies | | | | | | | | | | | | | | | | | | |
| **Course Objectives** | | | | | | | | | | | | | | | | | | |
| 1. The Objectives of first unit is to present an overview of the main concepts of cryptography, understand the threats & attacks, understand ethical hacking 2. The Objectives of second unit is to understand the difference between stream ciphers & block ciphers, present an overview of the Feistel Cipher and explain the encryption and decryption, present an overview of DES, Triple DES, Blowfish, IDEA 3. The objectives of third unit is to present the basic principles of public key cryptography, Distinct uses of public key cryptosystems 4. The objectives of fourth unit is to Present overview of the basic structure of cryptographic functions, Message Authentication Codes, Understand the operation of SHA-512, HMAC, Digital Signature 5. The objectives of fifth unit is to Present an overview of techniques for remote user authentication, Kerberos, Summarize Web Security threats and Web traffic security approaches, overview of SSL & TLS. Present an overview of electronic mail security. 6. The objectives of fifth unit is to Provide an overview of IP Security, concept of security association, Intrusion Detection Techniques | | | | | | | | | | | | | | | | | | |
| **CourseOutcomes:**  **UponCompletionofthecourse,thestudentswillbeableto**   1. Understand the principles of cryptography and security, with enciphering Techniques and analyze a variety of threats and attacks. 2. Distinguish the black ciphers and stream ciphers and apply them on a various symmetric cryptographic technique. 3. Understand the principle and mathematical models used in public-key cryptosystems by applying them on different (various) types of algorithms. 4. Analyze the message authentication functions with its types and digital certifications for secure communication. 5. Understand the user authentications principles and security approach at both the web and email. 6. Understand the concept of IP Security with its services and dealing with the prevention and detection of intrusions. | | | | | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | | | | |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PO6** | **PO7** | | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | | **PSO2** | | **PSO3** |
| **CO1** | 3 | 2 | - | - | - | | 2 | - | | 1 | - | - | - | 1 | 3 | | 1 | | 1 |
| **CO2** | 3 | 3 | 1 | 2 | 1 | | 2 | - | | 1 | - | - | - | 1 | 3 | | 1 | | 1 |
| **CO3** | 3 | 3 | - | 1 | 1 | | 1 | - | | 1 | - | - | - | 1 | 3 | | 2 | | - |
| **CO4** | 3 | 3 | - | 2 | 1 | | 1 | - | | 1 | - | - | - | 1 | 3 | | 2 | | 1 |
| **CO5** | 3 | 2 | 1 | 2 | 1 | | 1 | - | | 1 | - | - | - | 1 | 3 | | 1 | | 1 |
| **CO6** | 3 | 2 | - | 2 | 1 | | 1 | - | | 1 | - | - | - | 1 | 3 | | 2 | | 1 |

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| Unit–I **Introduction**, Computer Security Concepts, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Mathematics of Cryptography  **Classical Encryption Techniques**, Symmetric Cipher Model,Substitution Techniques, Transposition Techniques |
| UNIT II: **Symmetric Encryption**, Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard, BlowFish, IDEA, CAST-128 algorithms |
| **UNIT III:**  **Asymmetric Encryption**, Mathematics of Asymmetric Key Cryptography, Number Theory, Prime Numbers, Fermat’s and Euler’s Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms, Asymmetric Key Ciphers Principles of Public-Key Cryptosystems, The RSA Algorithm, Diffie-Hellman Key Exchange, ElGamal Cryptosystem, EllipticCipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode, Counter Mode, |
| **UNIT IV:**  **DATA INTEGRITY, Digital Signature schemes, & Key Management**  Message Integrity and message authentication, Cryptographic hash functions, Digital Signature and Key Management |
| **UNIT V:**  Network Security: Security at Application layer: PGP and MIME, Security at Transport layer: SSL and TLS, Security at Network layer: IPSec, System Security |
| **Text Book:**   1. Cryptography and Network Security Principles and Practice 6th Edition, William Stallings, Pearson Education 2. Cryptography and Network Security, Behrouz A Forouzan, DebdeepMukhopadhyay, 3E) Mc Gra Hill 3. AtulKahate, Cryptography and Network Security, TMH. (2003) |
| **REFERENCE BOOKS:**   1. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall 2. Cryptography: Theory and Practice by Douglas R. Stinson, CRC press. 3. Charlie Kaufman, Radia Perlman, Mike Speciner, Network Security: Private Communication in Public World, 2 nd Edition,2011, Pearson Education. 95 4. Network Security and Cryptography, Bernard Meneges, Cengage Learning |
| **E-RESOURCES:**   1. <http://users.abo.fi/ipetre/crypto/> 2. <https://www.vssut.ac.in/lecture_notes/lecture1428550736.pdf> 3. <https://analyticsindiamag.com/top-10-free-resources-to-learn-cybersecurity/> 4. <https://lecturenotes.in/subject/112/cryptography-and-network-security-cns> 5. <https://www.smartzworld.com/notes/cryptography-network-security-notes-pdf-cns-notes-pdf/> 6. <https://studentsfocus.com/cs6701-cns-notes-cryptography-network-security-lecture-handwritten-notes-cse-7th-sem-anna-university/> 7. <https://www.jntufastupdates.com/jntuk-r16-4-1-cns-material/> |

**Course Title: Advanced Database Management Systems**

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| **Lecture – Tutorial-Practical:** | | | | | | | 3-0-0 | | | | **Internal Marks:** | | | 30 | | |
| **Credits:3** | | | | | | |  | | | | **External Marks:** | | | 70 | | |
| **Prerequisites: DBMS, Programming concepts** | | | | | | | | | | | | | | | | |
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| **Course Objectives:**  **1.Design databases using data models, Query and manage databases .**  **2.Distinguish between centralized and distributed databases**  **3.Implement applications involving complex transaction processing.**  **4.Do query evaluation and query optimization** | | | | | | | | | | | | | | | | |
| **COURSE OUTCOMES:** Upon successful completion of the course, the student will be able to: | | | | | | | | | | | | | | | | |
| CO1 | | **Describe** basic database concepts, Data Models, Schemas, Instances, and Components in the DBMS architecture. | | | | | | | | | | | | | | |
| CO2 | | **Implement** practical solutions to GIS database problems using OO/OR database, spatial database, data warehousing and data mining approaches | | | | | | | | | | | | | | |
| CO3 | | **Evaluate** simple strategies for executing a distributed query to select the strategy that minimizes the amount of data transfer | | | | | | | | | | | | | | |
| CO4 | | **Demonstrate** the issues involved in data integration for distributed query processing | | | | | | | | | | | | | | |
| CO5 | | **Develop** practical skills in the use of these models and approaches to be able to select and apply the appropriate methods for a particular case | | | | | | | | | | | | | | |
| CO6 | | **Analysed** internal structures, query evaluation and optimization. | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | | | |
|  | PO  1 | | PO  2 | PO  3 | PO  4 | PO  5 | | PO  6 | PO  7 | PO  8 | | PO  9 | PO  10 | | PO  11 | PO  12 | |
| CO1 | 2 | | - | 2 | - | - | | - | - | - | | 2 | - | | - | - | |
| CO2 | 3 | | - | 2 | - | 2 | | - | - | - | | 2 | - | | - | - | |
| CO3 | 2 | | 2 |  |  | 2 | | - | - | - | | - | - | | 3 | - | |
| CO4 | 2 | | - | - | - | - | | - | - | - | | - | - | | - | 2 | |
| CO5 | 2 | | - | - | - | - | | - | - | - | | - | - | | - | 2 | |
| CO6 | 2 | | - | - | - | - | | - | - | - | | - | - | | - | 2 | |
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| **UNIT – I** | | | | | | | | | | | | | | | | |
| **INTRODUCTION**  Introduction of object database systems: Structured data types, operations on structured data, encapsulation and ADTS, Inheritance**.** | | | | | | | | | | | | | | | | |
| **UNIT – II** | | | | | | | | | | | | | | | | |
| **ORDBMS**  Database design for ORDBMS, ORBMS implementation and challenges, OODBMS, comparison of RDBMS, OODBMS and ORDBMS. Introduction to Parallel databases, architectures for parallel databases, Parallel Query Evaluation: Data partitioning and parallelizing sequential operator evaluation code, parallelizing individual operations, and parallel query optimization. | | | | | | | | | | | | | | | | |
| **UNIT-III** | | | | | | | | | | | | | | | | |
| **DISTRIBUTED DATABASES**  Introduction to distributed databases: Features of distributed databases vs centralized databases, Why distributed databases.  DDBMS: Levels of transparency, reference architecture for DDB, types of data fragmentation, distribution transparency for read-only and update applications, distributed database access primitives, Integrity constraints in distributed databases. | | | | | | | | | | | | | | | | |
| **UNIT – IV** | | | | | | | | | | | | | | | | |
| **DISTRIBUTED DATABASE DESIGN**  Distributed database design: framework for distributed database design, the design of database fragmentation, allocation of fragments; Distributed Query processing: Equivalence of transformations for queries, transforming global queries into fragment queries, distributed grouping and aggregation functions. | | | | | | | | | | | | | | | | |
| **UNIT – V** | | | | | | | | | | | | | | | | |
| **QUERY OPTIMIZATION**  A framework for query optimization, join queries and general queries. non-join queries in a distributed DBMS, joins in a distributed DBMS, cost based query optimization. DBMS Vs IR systems, Introduction to Information retrieval, Indexing for text search, web search engine, managing text in a DBMS, a data model for XML, Querying XML data, and efficient evaluation of XML queries. | | | | | | | | | | | | | | | | |
| **TEXT BOOKS:** | | | | | | | | | | | | | | | | |
| 1. Raghuramakrishnan and Johannes Gehrke, “Database Management Systems”, 3rd Edition, TMH, 2006.  2. S Ceri and G Pelagatti, “Distributed databases principles and systems”, 1st Edition, TMH, 2008. | | | | | | | | | | | | | | | | |
| **REFERENCE BOOKS:** | | | | | | | | | | | | | | | | |
| 1. Silberschatz, Korth, “Database System Concepts”, 6th Edition, TMH, 2010.  2. Elmasri R, Navathe S B, Somayajulu D V L N, and Gupta S K, “Fundamentals of  Database Systems”, 5th Edition, Pearson Education,2009.  3. C. J. Date, “Introduction to Database Systems”, 8th Edition, Pearson Education, 2009. | | | | | | | | | | | | | | | | |
| **E-RESOURCES:** | | | | | | | | | | | | | | | | |
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**Course Title: Network Programming**

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| **Lecture – Practical:** | | | | 3-0-0 | | | | | **Internal Marks:** | | | 30 | | | |
| **Credits** | | | | 3 | | | | | **External Marks:** | | | 70 | | | |
| **Prerequisites: None** | | | | | | | | | | | | | | | |
| **Course Objectives** | | | | | | | | | | | | | | | |
| * Students will gain the understanding of core network programming by using sockets and transport layer protocols like TCP and UDP * Students will gain the understanding of inter process communication and implementation of different forms of IPC in client-server environment * Students will get an exposure to various application layer protocols which are designed using sockets and transport layer protocols | | | | | | | | | | | | | | | |
| **Course Outcomes** | | | | | | | | | | | | | | | |
| Upon successful completion of the course, the student will be able to: | | | | | | | | | | | | | | | |
| CO1 | Explain the client-server paradigm and socket structures. | | | | | | | | | | | | | | |
| CO2 | Describe the basic concepts of TCP sockets and TCP echo client-server programs. | | | | | | | | | | | | | | |
| CO3 | Discuss the UDP sockets and UDP echo client-server programs. | | | | | | | | | | | | | | |
| CO4 | Explain Socket options and ability to understand IPC. | | | | | | | | | | | | | | |
| CO5 | Apply the applications of sockets and demonstrate skill to design simple applications like FTP, TELNET etc. | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | |
|  | PO  1 | PO  2 | PO  3 | PO  4 | PO  5 | PO  6 | PO  7 | PO  8 | | PO  9 | PO  10 | PO  11 | PO12 | PSO1 | **PSO2** | | **PSO3** | |
| CO1 | 3 | 2 | 3 | 3 | - | - | - | - | | - | - | - | - | 3 | | 3 | | - |
| CO2 | - | 2 | 3 | 3 | - | - | - | - | | - | - | - | - | 2 | | 2 | | 2 |
| CO3 | - | 2 | 2 | 3 | 2 | - | - | - | | - | - | - | - | 2 | | 2 | | 2 |
| CO4 | 2 | 2 | 3 | - | - | - | - | - | | - | - | - | - | 3 | | - | | 3 |
| CO5 | 2 | 2 | 2 | 2 | 3 | - | - | - | | - | - | - | - | 3 | | 2 | | 3 |
| **UNIT I:**  Introduction to Network Programming: OSI model-transport layer protocols: TCP, UDP and SCTP-network architecture: client-server and peer-to-peer systems, Sockets-socket Address structures: IPv4, IPv6 and Generic-value result arguments-Byte ordering functions-Byte manipulation functions-Address conversion functions | | | | | | | | | | | | | | | |
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| **UNIT II:** | | | | | | | | | | | | | | | |
| TCP: introduction to TCP-TCP connection establishment and terminationTIME\_WAIT State. Elementary TCP sockets – Socket-connect-bind-listen-accept-fork-exec function-concurrent servers-Close function-read and write functions | | | | | | | | | | | | | | | |
| **UNIT III:**  TCP echo client server program-getsockname and getpeername functions I/O multiplexing: I/O models-Select function-TCP echo server using select function-shutdown function-Poll function | | | | | | | | | | | | | | | |
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| **UNIT IV:**  UDP: Introduction to UDP-difference between TCP and UDP-recvfrom( ) and sendto( ) functions-UDP echo client server program-UDP echo client server using select function. Socket Options: IPv4 socket options-IPv6 socket options | | | | | | | | | | | | | | | |
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| **UNIT V:**  Generic socket options-TCP socket options. IPC: Introduction to IPC-forms of IPC-UNIX kernel support for pipes, FIFO, message queues, semaphores and shared memory Network programming concepts Implementation: FTP-ping-arp-SMTP-TELNET | | | | | | | | | | | | | | | |
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| **Text Book:**  Unix Network programming, the socket networking API, W.Richard Stevens, bill fenner, Andrew m.rudoff ,PHI. | | | | | | | | | | | | | | | |
| **REFERENCE BOOKS:**  Advanced programming in the UNIX environment, W.Richard Stevens ,pearson education | | | | | | | | | | | | | | | |
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**Course Title: Big Data Analytics**

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| **Lecture – Practical:** | | | | **3-0-0** | | | | | **Internal Marks:** | | | 30 | | | | | | |
| **Credits** | | | | 3 | | | | | **External Marks:** | | | 70 | | | | | | |
| **Prerequisites: None** | | | | | | | | | | | | | | | | | | |
| **Course Objectives** | | | | | | | | | | | | | | | | | | |
| • To understand the need and application of Map Reduce.  • To understand the various search algorithms applicable to Big Data.  • To analyze and interpret streaming data.  • To learn how to handle large data sets in main memory.  • To learn the various clustering techniques applicable to Big Data. | | | | | | | | | | | | | | | | | | |
| **Course Outcomes** | | | | | | | | | | | | | | | | | | |
| Upon successful completion of the course, the student will be able to: | | | | | | | | | | | | | | | | | | |
| CO1 | Understand the key issues in big data management and its associated applications in intelligent business and scientific computing | | | | | | | | | | | | | | | | | |
| CO2 | Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics | | | | | | | | | | | | | | | | | |
| CO3 | Students Interpret business models and scientific computing paradigms, and apply software tools for big data analytics | | | | | | | | | | | | | | | | | |
| CO4 | Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications | | | | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | | | | |
|  | PO  1 | PO  2 | PO  3 | PO  4 | PO  5 | PO  6 | PO  7 | PO  8 | | PO  9 | PO  10 | PO  11 | PO12 | PSO1 | **PSO2** | | **PSO3** | |
| CO1 | 2 |  |  | 3 |  |  | 2 |  | |  |  |  | 2 | 2 | |  | |  |
| CO2 |  |  |  | 3 |  |  |  |  | | 3 |  |  |  |  | |  | | 2 |
| CO3 |  | 3 |  |  |  | 3 |  |  | |  | 2 |  |  |  | | 3 | |  |
| CO4 |  |  |  | 3 |  |  |  |  | | 2 |  |  | 2 | 2 | |  | |  |
| **UNIT I:**  Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Mode | | | | | | | | | | | | | | | | | | |
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| **UNIT II:**  Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions .- Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes? Theorem — Naïve Bayes Classifier. | | | | | | | | | | | | | | | | | | |
| **UNIT III:**  Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association& finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches. | | | | | | | | | | | | | | | | | | |
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| **UNIT IV:**  Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics | | | | | | | | | | | | | | | | | | |
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| **UNIT V:**  NoSQL Databases : Schema-less Models?: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding — Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R | | | | | | | | | | | | | | | | | | |
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| **Text Book:**  1. Jure Leskovec, AnandRajaraman, Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, Second Edition, 2014. | | | | | | | | | | | | | | | | | | |
| **REFERENCE BOOKS:**  1. Jiawei Han, MichelineKamber, Jian Pei, “Data Mining Concepts and Techniques”, Morgan Kaufman Publications, Third Edition, 2011.  2. Ian H.Witten, Eibe Frank “Data Mining – Practical Machine Learning Tools and Techniques”, Morgan Kaufman Publications, Third Edition, 2011.  3. David Hand, HeikkiMannila and Padhraic Smyth, “Principles of Data Mining”, MIT Press,2001 | | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | |
| **E-RESOURCES** | | | | | | | | | | | | | | | | | | |
| [Big Data Analytics Tutorial (tutorialspoint.com)](https://www.tutorialspoint.com/big_data_analytics/index.htm)  [Big Data Analytics Notes Pdf Download & List of Reference Books for BDA (ncertbooks.guru)](https://www.ncertbooks.guru/big-data-analytics/) | | | | | | | | | | | | | | | | | | |

**Course Code-OBJECT ORIENTED ANALYSIS AND DESIGN**

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| **Lecture – Tutorial- Practical::** | | | | 3-0-0 | | | | | | | | | **Internal Marks:** | | | 30 | |
| **Credits:** | | | | 3 | | | | | | | | | **External Marks:** | | | 70 | |
| **Prerequisites:** | | | | | | | | | | | | | | | | | |
| No particular skills are required as a prerequisite before learning UML. | | | | | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | |
| * To understand how to solve complex problems * Analyze and design solutions to problems using object oriented approach * Study the notations of Unified Modeling Language * Specify, analyze and design the use case driven requirements for a particular system. * Model the event driven state of object and transform them into implementation specific layouts. * Identify, Analyze the subsystems, various components and collaborate them interchangeably. | | | | | | | | | | | | | | | | | |
| **Course Outcomes:** | | | | | | | | | | | | | | | | | |
| Upon successful completion of the course, the student will be able to: | | | | | | | | | | | | | | | | | |
| CO1 | Analyse, design, document the requirements through use case driven approach | | | | | | | | | | | | | | | | |
| CO2 | Identify, analyse, and model structural concepts of the system | | | | | | | | | | | | | | | | |
| CO3 | Develop,explore the conceptual model into various scenarios and applications. | | | | | | | | | | | | | | | | |
| CO4 | Apply the concepts of architectural design for deploying the code for software. | | | | | | | | | | | | | | | | |
| CO5 | Identify, analyse, and model Architectural concepts of the system | | | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | | | |
|  | PO1 | PO2 | PO3 | | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | | PO12 | PSO1 | | PSO2 | | PSO3 |
| CO1 | 2 | 2 | 2 | |  | 2 |  |  |  |  |  |  | | 2 |  | |  | |  |
| CO2 | 3 | 3 | 3 | |  |  |  |  |  |  |  | 2 | | 2 |  | |  | |  |
| CO3 | 3 | 3 |  | |  | 3 | 2 |  |  |  |  | 2 | | 2 |  | |  | |  |
| CO4 | 2 | 2 | 3 | |  | 2 | 2 |  |  |  |  | 2 | | 3 |  | |  | |  |
| CO5 | 3 | 3 | 3 | |  | 2 | 3 |  |  |  |  | 2 | | 2 |  | |  | |  |
| **UNIT I :** | | | | | | | | | | | | | | | | |
| **Introduction to UML:**  The meaning of Object-Orientation, object identity, encapsulation, information hiding, polymorphism, genericity, importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture | | | | | | | | | | | | | | | | |
| **UNIT II:** | | | | | | | | | | | | | | | | |
| **Basic structural Modeling**: Classes, relationships, common mechanisms, diagrams, Advanced structural modeling: advanced relationships, interfaces, types & roles, packages, instances.  **Class & object diagrams**: Terms, concepts, examples, modeling techniques, class & Object diagrams. | | | | | | | | | | | | | | | | |
| **UNIT III:** | | | | | | | | | | | | | | | | |
| **Collaboration diagrams**: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages.  **Sequence diagrams:** Terms, concepts, differences between collaboration and sequence diagrams, depicting synchronous messages with/without priority call back mechanism broadcast message. | | | | | | | | | | | | | | | | |
| **UNIT IV:** | | | | | | | | | | | | | | | | |
| **Behavioral Modeling**: Interactions, use cases, use case diagrams, activity diagrams.  **Advanced Behavioral Modeling**: Events and signals, state machines, processes & threads, time and space, state chart diagrams. | | | | | | | | | | | | | | | | |
| **UNIT V:** | | | | | | | | | | | | | | | | |
| **Architectural Modeling:** Terms, concepts, examples, modeling techniques for component diagrams and deployment diagrams. | | | | | | | | | | | | | | | | |
| **TEXT BOOKS:** | | | | | | | | | | | | | | | | |
| 1. The Unified Modeling Language User Guide, Grady Booch, Rambaugh, Ivar Jacobson, PEA  2. Fundamentals of Object Oriented Design in UML, Meilir Page- Jones, Addison Wesley | | | | | | | | | | | | | | | | |
| **REFERENCE BOOKS:**  1. Head First Object Oriented Analysis &Design, Mclaughlin, SPD OReilly,2006  2. Object oriented Analysis& Design Using UML, Mahesh ,PHI  3. The Unified Modeling Language Reference Manual, 2/e, Rambaugh, GradyBooch,etc., PEA  4. Object Oriented Analysis & Design, Satzinger, Jackson, Thomson  5 Object Oriented Analysis Design & implementation, Dathan.,Ramnath, University Press  6. Object Oriented Analysis & Design, John Deacon, PEA  7. Fundamentals of Object Oriented Analysis and Design in UML, M Pages-Jones, PEA  8. Object-Oriented Design with UML, Barclay, Savage, Elsevier,2008 | | | | | | | | | | | | | | | | |
| **E-RESOURCES:** | | | | | | | | | | | | | | | | |
| 1.https://www.geeksforgeeks.org/unified-modeling-language-uml-introduction/  2.https://www.javatpoint.com/uml  3.https://www.uml-diagrams.org/ | | | | | | | | | | | | | | | | |

**Course Title: Machine Learning Lab**

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| **Lecture – Tutorial- Practical::** | | | | 0-0-3 | | | | | | **Internal Marks:** | | | | 15 | |
| **Credits:** | | | | 1.5 | | | | | | **External Marks:** | | | | 75 | |
| **Prerequisites:** Knowledge of C Programming, Basic commands of UNIX. | | | | | | | | | | | | | | | |
| Knowledge of C Programming, Basic commands of UNIX | | | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | |
| The object of this course is to provide hands-on practice on implementing different machine learning models and using different accuracy techniques to improve the prediction percentage. | | | | | | | | | | | | | | | |
| **Course Outcomes:** | | | | | | | | | | | | | | | |
| Upon successful completion of the course, the student will be able to: | | | | | | | | | | | | | | | |
| CO1 | Should be able to do data cleaning and data preprocessing | | | | | | | | | | | | | | |
| CO2 | Should be able to apply imbalanced data sets accuracy | | | | | | | | | | | | | | |
| CO3 | Should be able to apply machine learning techniques to large data sets | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | |
|  | PO  1 | PO  2 | PO  3 | | PO  4 | PO  5 | PO  6 | PO  7 | PO  8 | | PO  9 | PO  10 | PO  11 | | PO  12 |
| CO1 | 2 | 2 | - | | 2 | - | - | - | - | | - | - | - | | - |
| CO2 | - | 2 | 2 | | - | - | - | - | - | | - | - | 2 | | 2 |
| CO3 | 3 | - | - | | 2 | 2 | - | - | - | | - | - | 2 | | 2 |
|  | | | | | | | | | | | | | | | |
| **List of Programs**   1. Implement data cleaning techniques 2. Implement data preprocessing techniques. 3. Make your data ready for model training. 4. Train, validate and test KNN model using gridsearchcv 5. Train, validate and test naïve bayes model 6. Train Validate and test logistic regression model. 7. Train Validate and test SVM model. 8. Train Validate and test random forest ensemble. | | | | | | | | | | | | | | | |
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| **TEXT BOOKS:** | | | | | | | | | | | | | | | |
| Hands-On Machine Learning with Scikit-Learn, Keras and Tensor Flow: Concepts, Tools and Techniques to Build Intelligent Systems (Colour Edition) Paperback – 23 October 2019 by [AurelienGeron](https://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Aurelien+Geron&search-alias=stripbooks)(Author)Introduction to Machine Learning with Python: A Guide for Data Scientists (Greyscale Indian Edition) Paperback – 1 January 2016 by [Andreas Muller](https://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Andreas+Muller&search-alias=stripbooks) | | | | | | | | | | | | | | | |
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| **E-RESOURCES:** | | | | | | | | | | | | | | | |
| [www.numpy.org](http://www.numpy.org)  [www.pandas.org](http://www.pandas.org) | | | | | | | | | | | | | | | |

**Course Code-R Programming Lab**

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| **Lecture – Tutorial- Practical::** | | | | 0-0-3 | | | | | | **Internal Marks:** | | | | 15 | |
| **Credits:** | | | | 1.5 | | | | | | **External Marks:** | | | | 35 | |
| **Prerequisites: C- Programming, Data Structures, Statistics fundamentals** | | | | | | | | | | | | | | | |
| **Course Objectives:**   1. Learn the fundamentals of ‘R’. 2. Use of Sorting and Searching techniques. 3. Learn the basic Statistical functions. 4. Use of Classifications. 5. Applications of Regressions. | | | | | | | | | | | | | | | |
| **Course Outcomes:** | | | | | | | | | | | | | | | |
| Upon successful completion of the course, the student will be able to: | | | | | | | | | | | | | | | |
| CO1 | Perform basic ‘R’ operations. | | | | | | | | | | | | | | |
| CO2 | Understand the Sorting and Searching techniques. | | | | | | | | | | | | | | |
| CO3 | Perform Statistical functions on datasets. | | | | | | | | | | | | | | |
| CO4 | Apply Classification and Regression techniques. | | | | | | | | | | | | | | |
| CO5 | Perform Clustering. | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | |
|  | PO  1 | PO  2 | PO  3 | | PO  4 | PO  5 | PO  6 | PO  7 | PO  8 | | PO  9 | PO  10 | PO  11 | | PO  12 |
| CO1 | 3 | 3 | 2 | | -- | 3 | -- | -- | -- | | -- | -- | -- | |  |
| CO2 | 3 | 2 | 3 | | -- | 2 | -- | -- | -- | | -- | -- | -- | | -- |
| CO3 | 2 | 2 | 3 | | -- | -- | -- | -- | -- | | -- | -- | -- | |  |
| CO4 | 3 | -3 | 2 | | 2 | 2 | -- | -- | -- | | -- | -- | -- | | -- |
| CO5 | 2 | 3 | 3 | | 3 | 2 | -- | -- | -- | | -- | -- | -- | |  |
|  | | | | | | | | | | | | | | | |
| List of Experiments  1. Implementation of Data Frames and Lists.  2. Implementation of Matrix operations.  3. Implementation of Factors.  4. Implementation of Quick Sort, Merge Sort.  5. Implementation of Binary Search Tree.  6. Implementation of Reading and Writing files.  7. Implementation of Descriptive and Summary Statistics.  8. Implement Charts- Bar(Side by Side, Stacked), Line.  9. Implementation of Correlation, T-test, ANOVA.  10. Implementation of Decision tree, Support Vector Classifications.  11. Implementation of Linear, Random Forest Regressions.  12. Implementation of Clustering. | | | | | | | | | | | | | | | |
| **TEXT BOOKS**:   1. The Art of R Programming, Norman Matloff, Cengage Learning. 2. R for Everyone, Lander, Pearson.   **REFERENCE BOOKS:**  1. R Cookbook, PaulTeetor, Oreilly.  2. R in Action,RobKabacoff, Manning  E-Resources:   1. <https://onlinecourses.nptel.ac.in/noc19_ma33/preview> 2. <https://nptel.ac.in/courses/111104100>. 3. <https://ict.iitk.ac.in/courses/r-programming-a-practical-approach/> | | | | | | | | | | | | | | | |

**Course Code-Complier Design Lab**

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| **Lecture – Tutorial- Practical::** | | | | 0-0-3 | | | | | | **Internal Marks:** | | | | 15 | |
| **Credits:** | | | | 1.5 | | | | | | **External Marks:** | | | | 35 | |
| **Prerequisites: C- Programming, Data Structures, Statistics fundamentals** | | | | | | | | | | | | | | | |
| **Course Objectives:**  1. To describe the design of a compiler including its phases and components and basic understanding of  Grammars and language definition.  2. To Identify the similarities and differences among various parsing techniques and grammar transformation  Techniques.  3. To Understand the syntax analysis, intermediate code generation, type checking, the role of symbol table and  its organization.  4. To Understand, design code generation and optimization schemes. | | | | | | | | | | | | | | | |
| **Course Outcomes:** | | | | | | | | | | | | | | | |
| Upon successful completion of the course, the student will be able to: | | | | | | | | | | | | | | | |
| CO1 | To use the knowledge of patterns, tokens & regular expressions for solving a problem. | | | | | | | | | | | | | | |
| CO2 | To apply the knowledge of lex tool & yacc tool to develop a scanner & parser. | | | | | | | | | | | | | | |
| CO3 | To write the new code optimization techniques to improve the performance of a program in terms of speed & space. | | | | | | | | | | | | | | |
| CO4 | To employ the knowledge of modern compiler & its features. | | | | | | | | | | | | | | |
| CO5 | To participate in GATE, PGECET and other competitive examinations | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | |
|  | PO  1 | PO  2 | PO  3 | | PO  4 | PO  5 | PO  6 | PO  7 | PO  8 | | PO  9 | PO  10 | PO  11 | | PO  12 |
| CO1 | 3 | 3 | 2 | | -- | 3 | -- | -- | -- | | -- | -- | -- | |  |
| CO2 | 3 | 2 | 3 | | -- | 2 | -- | -- | -- | | -- | -- | -- | | -- |
| CO3 | 2 | 2 | 3 | | -- | -- | -- | -- | -- | | -- | -- | -- | |  |
| CO4 | 3 | -3 | 2 | | 2 | 2 | -- | -- | -- | | -- | -- | -- | | -- |
| CO5 | 2 | 3 | 3 | | 3 | 2 | -- | -- | -- | | -- | -- | -- | |  |
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| List of Experiments   1. Design a lexical analyzer for given language and the lexical analyzer should ignore redundant spaces, tabs and new lines. It should also ignore comments. Although the syntax specification states that identifiers can be arbitrarily long, you may restrict the length to some reasonable value. Simulate the same in C language. | | | | | | | | | | | | | | | |
| **TEXT BOOKS**:   1. The Art of R Programming, Norman Matloff, Cengage Learning. 2. R for Everyone, Lander, Pearson.   **REFERENCE BOOKS:**  1. R Cookbook, PaulTeetor, Oreilly.  2. R in Action,RobKabacoff, Manning  E-Resources:   1. <https://onlinecourses.nptel.ac.in/noc19_ma33/preview> 2. <https://nptel.ac.in/courses/111104100>. 3. <https://ict.iitk.ac.in/courses/r-programming-a-practical-approach/> | | | | | | | | | | | | | | | |

**Course Title:** MEAN STACK TECHNOLOGY -LAB

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| **Lecture – Practical:** | | | | 0-0-4 | | | | | **Internal Marks:** | | | 30 | | | | | | |
| **Credits** | | | | 2 | | | | | **External Marks:** | | | 70 | | | | | | |
| * **Prerequisites:** * To have basic knowledge on developing web applications * Knowing HTML and CSS web languages * JavaScript, IDE or Text Editor, Command Line Interface (CLI) * Server-side development with any programming language. | | | | | | | | | | | | | | | | | | |
| **Course Objectives :** The Objective of this course is to give a strong foundation of the Development and its Operations. | | | | | | | | | | | | | | | | | | |
| **Course Outcomes** | | | | | | | | | | | | | | | | | | |
| Upon successful completion of the course, the student will be able to:  1.Understand the traditional software development.  2.Learn the rise of agile methodologies.  3.Define and design purpose of DevOps. | | | | | | | | | | | | | | | | | | |
| CO1 | To code a MEAN Stack Application | | | | | | | | | | | | | | | | | |
| CO2 | Developing Single Page Applications (SPAs) via MEAN Stack | | | | | | | | | | | | | | | | | |
| CO3 | Setup routing within Angular & Express | | | | | | | | | | | | | | | | | |
| CO4 | Write Express Back-End Web Services with Express & Node | | | | | | | | | | | | | | | | | |
| CO5 | Employ Express Web Services | | | | | | | | | | | | | | | | | |
| CO6 | Understanding Mango DBMS | | | | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | | | | |
|  | PO  1 | PO  2 | PO  3 | PO  4 | PO  5 | PO  6 | PO  7 | PO  8 | | PO  9 | PO  10 | PO  11 | PO12 | PSO1 | **PSO2** | | **PSO3** | |
| CO1 | 3 | 2 | 2 | - | - | - |  |  | |  |  |  | 3 | - | | - | | 2 |
| CO2 | 3 | 2 | 2 | 2 | - | - |  |  | |  |  |  |  | - | | 3 | | 2 |
| CO3 | 2 | 2 | 3 | 2 | - | - |  |  | |  |  |  | 3 | 2 | | 2 | | - |
| CO4 | 3 | 3 | 2 | - | - | - |  |  | |  |  |  |  | - | | 2 | | 3 |
| CO5 | 2 | 2 | 3 | 2 | 2 | 2 |  |  | |  |  |  |  | 1 | | 3 | | - |
| CO6 |  | 3 |  | 3 | 3 | 3 |  |  | |  |  |  | 3 | 3 | | 3 | | 3 |
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| List of Experments | | | | | | | | | | | | | | | | | | |
| • Angular :  • Getting Started with Angular  • Introduction to Components  • Templates, Interpolation, and Directives  • Data Binding & Pipes  • More on Components  • Building Nested Components  • Forms  • Services and Dependency Injection  • Retrieving Data Using HTTP  Navigation and Routing Basics | | | | | | | | | | | | | | | | | | |
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| • Node Js :  • Introduction  • Exploring language additions to the V8 JavaScript engine  • Understanding NodeJS  • HTTP and File System  • Buffers, Streams, and Events  • Using Express Framework  • Working with Models, Views, and Routes  • Database  • Working with MongoDB  • Working with RESTful web services  Angular With Node | | | | | | | | | | | | | | | | | | |
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**Course Title: EMPLOYABILITY SKILLS –II**

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| **Lecture – Practical:** | | | | **2-0-0** | | | | | **Internal Marks:** | | | 30 | | | | | | |
| **Credits** | | | | 0 | | | | | **External Marks:** | | | 70\* | | | | | | |
| **Prerequisites: None** | | | | | | | | | | | | | | | | | | |
| **Course Objectives** | | | | | | | | | | | | | | | | | | |
| * To learn skills for discussing and resolving problems on the work site * To assess and improve personal grooming * To promote safety awareness including rules and procedures on the work site * To develop and practice self management skills for the work site | | | | | | | | | | | | | | | | | | |
| **Course Outcomes** | | | | | | | | | | | | | | | | | | |
| Upon successful completion of the course, the student will be able to: | | | | | | | | | | | | | | | | | | |
| CO1 | Recite the corporate etiquette. | | | | | | | | | | | | | | | | | |
| CO2 | Make presentations effectively with appropriate body language | | | | | | | | | | | | | | | | | |
| CO3 | Be composed with positive attitude | | | | | | | | | | | | | | | | | |
| CO4 | Apply their core competencies to succeed in professional and personal life | | | | | | | | | | | | | | | | | |
| **Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)** | | | | | | | | | | | | | | | | | | |
|  | PO  1 | PO  2 | PO  3 | PO  4 | PO  5 | PO  6 | PO  7 | PO  8 | | PO  9 | PO  10 | PO  11 | PO12 | PSO1 | **PSO2** | | **PSO3** | |
| CO1 | 2 |  |  | 3 |  |  | 2 |  | |  | 2 |  | 2 | 2 | |  | |  |
| CO2 |  |  |  | 3 |  |  |  |  | | 2 |  |  |  |  | |  | | 2 |
| CO3 |  | 3 |  |  |  | 2 |  |  | |  | 3 |  |  |  | | 3 | |  |
| CO4 |  |  |  | 3 |  |  |  |  | | 2 | 3 |  | 2 | 2 | |  | |  |
| **UNIT I:**  Interview Skills: Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success. Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness | | | | | | | | | | | | | | | | | | |
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| **UNIT II:**  Etiquette and Manners – Social and Business. Time Management – Concept, Essentials, Tips.  Personality Development – Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability  Skills. | | | | | | | | | | | | | | | | | | |
| **UNIT III:**  Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills. Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods of Conflict Resolution. | | | | | | | | | | | | | | | | | | |
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| **UNIT IV:**  Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Management of Stress Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behavior; Assertiveness Skills. | | | | | | | | | | | | | | | | | | |
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| **UNIT V:** Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management  Excellence; Strategies to enhance Emotional Intelligence | | | | | | | | | | | | | | | | | | |
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| **Text Book:**  1) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011. | | | | | | | | | | | | | | | | | | |
| **REFERENCE BOOKS:**  1) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.  2) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.  3) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.  4) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.  5) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011. | | | | | | | | | | | | | | | | | | |