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|  |
| B.Sc.,  hardware system and networking |
| |  | | --- | | **MoDEL SYLLABUS** | |  | |  | |  | |  | |  | |
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| **from the academic year**  **2023 - 2024** |
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| **TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION, CHENNAI – 600 005** |
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**1. Introduction**

**B.Sc. Hardware system and Networking**

Hardware System and Networking is a vast field comprising many topics of computer networking devices, are electronic devices which are required for communication and interaction between devices on a [computer network](https://en.wikipedia.org/wiki/Computer_network). Specifically, they mediate [data transmission](https://en.wikipedia.org/wiki/Data_transmission) in a computer network.[[1]](https://en.wikipedia.org/wiki/Networking_hardware#cite_note-IEEE_802.3-2012_Clause_9.1-1) Units which are the last receiver or generate data are called [hosts](https://en.wikipedia.org/wiki/Host_(network)), [end systems](https://en.wikipedia.org/wiki/End_system) or [data terminal equipment](https://en.wikipedia.org/wiki/Data_terminal_equipment).

The course is enabled to include several interdisciplinary areas like: programming languages, algorithms, operating systems, databases, machine learning, data mining, business intelligence, big data, probability and statistics, data optimization, statistical simulation and data analysis, management decision analysis, decision models and predictive analysis. Data Science has gained paramount importance in the computer science domain. The need for scientists who understand data in all its aspects will continue to grow strongly. Students graduating from the program will have significantly more depth and breadth in the broad area of Hardware System and Networking and receive all the information they need to work with various kinds of data and statistical data. The program is designed so that students have in-depth knowledge of the [many approaches, aptitudes, methodologies, and instruments](https://www.simplilearn.com/building-a-data-driven-future-with-synthetic-data-article) needed to deal with corporate data. Students receive instruction in the abilities needed to find the needed solutions and assist in making significant judgments.

This is the primary reason the syllabus of Hardware System and Networking courses includes concepts that touch base on of computer networking devices, are electronic devices which are required for communication and interaction between devices on a [computer network](https://en.wikipedia.org/wiki/Computer_network), cloud computing, big data, natural language processing, and data sentiment analysis. The future of Hardware System and Networking is estimated to bring opportunities in various areas of banking, finance, insurance, entertainment, telecommunication, automobile, etc. A data scientist will help grow an organization by assisting them in making better decisions. Data science has become important due to recent technology disruptions. Most fundamental is Moore's Law which has driven an exponential growth in computing, storage, and communications per rupee over the past 50 years. This rate of growth shows no signs of abating. Consequently, today we have the Internet of Things: a plethora of sensors costing 10s of rupees or less, a global Internet with almost limitless bandwidth, and enormous storage in global clouds. The present era is full of technological advances in almost all spectrum of life and we are flooded with enormous amount of data. There is an increasing demand of capturing, analyzing, and synthesizing this large amount of data sets in a number of application domains to better understand various phenomena and to convert the information available in the data into actionable strategies such as new scientific discoveries, business applications, policy making, and healthcare etc.

Hardware System and Networking is the area where applications of various tools and techniques from the disciplines of computer networking devices, are electronic devices which are required for communication and interaction between devices on a [computer network](https://en.wikipedia.org/wiki/Computer_network), cloud, IOT and computer science are used to get greater insight and to make better and informed decisions for various purposes by analysing a large amount of data. Consequently, the study of data science as a discipline has become essential to cater the growing need for professionals and researchers to deal with the future challenges.

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| **LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME** | | |
| **Programme:** | **B.Sc., Hardware System and Networking** | |
| **Programme Code:** |  | |
| **Duration:** | **3 years [UG]** | |
| **Programme Outcomes:** | **PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study  **PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one’s views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.  **PO3: Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.  **PO4: Problem solving: Capacity** to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one’s learning to real life situations.  **PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.  **PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation  **PO7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team  **PO8: Scientific reasoning**: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.  **PO9: Reflective thinking**: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.  **PO10 Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.  **PO 11 Self-directed learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.  **PO 12 Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.  **PO 13: Moral and ethical awareness/reasoning**: Ability to embrace moral/ethical values in conducting one’s life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demon starting the ability to identify ethical issues related to one‟s work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.  **PO 14: Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.  **PO 15: Lifelong learning:** Ability to acquire knowledge and skills, including „learning how to learn‟, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling. | |
| **Programme Specific Outcomes:** | | **PSO1**: To enable students to apply basic microeconomic, macroeconomic and monetary concepts and theories in real life and decision making.  **PSO 2**: To sensitize students to various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment.  **PSO 3**: To familiarize students to the concepts and theories related to Finance, Investments and Modern Marketing.  **PSO 4**: Evaluate various social and economic problems in the society and develop answer to the problems as global citizens.  **PSO 5:** Enhance skills of analytical and critical thinking to analyze effectiveness of economic policies. | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **PSO 1** | Y | Y | Y | Y | Y | Y | Y | Y |
| **PSO 2** | Y | Y | Y | Y | Y | Y | Y | Y |
| **PSO3** | Y | Y | Y | Y | Y | Y | Y | Y |
| **PSO 4** | Y | Y | Y | Y | Y | Y | Y | Y |
| **PSO 5** | Y | Y | Y | Y | Y | Y | Y | Y |

**3 – Strong, 2- Medium, 1- Low**

**Highlights of the Revamped Curriculum**:

* Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
* The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.
* The General Studies and Mathematics based problem solving skills are included as mandatory components in the ‘Training for Competitive Examinations’ course at the final semester, a first of its kind.
* The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.
* The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
* The Internship during the second year vacation will help the students gain valuable work experience, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
* Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
* State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest - Artificial Intelligence.

**Value additions in the Revamped Curriculum:**

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| --- | --- | --- |
| **Semester** | **Newly introduced Components** | **Outcome / Benefits** |
| **I** | **Foundation Course**  To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning Literature and analysing the world through the literary lens  gives rise to a new perspective. | * Instill confidence among students * Create interest for the subject |
| **I, II, III, IV** | **Skill Enhancement papers** (Discipline centric / Generic / Entrepreneurial) | * Industry ready graduates * Skilled human resource * Students are equipped with essential skills to   make them employable |
| * Training on language and communication skills enable the students gain   knowledge and  exposure in the competitive world. |
| * Discipline centric skill will improve the Technical knowhow of solving real life   problems. |
| **III, IV, V & VI** | Elective papers | * Strengthening the domain knowledge * Introducing the stakeholders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature * Emerging topics in higher education/ industry/ communication network / health sector etc. are introduced with   hands-on-training. |

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| **IV** | Elective Papers | | * Exposure to industry moulds students into solution providers * Generates Industry ready graduates * Employment opportunities enhanced |
| **V Semester** | Elective papers | | * Self-learning is enhanced * Application of the concept to real situation is conceived resulting   in tangible outcome |
| **VI Semester** | Elective papers | | * Enriches the study beyond the course. * Developing a research framework and   presenting their  independent and  intellectual ideas effectively. |
| **Extra Credits:**  **For Advanced Learners / Honors degree** | | | * To cater to the needs of peer learners / research   aspirants |
| **Skills acquired from the Courses** | | Knowledge, Problem Solving, Analytical  ability, Professional Competency, Professional Communication and Transferrable Skill | |

**Credit Distribution for UG Programmes**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sem I** | **Credit** | **H** | **Sem II** | **Credit** | **H** | **Sem III** | **Credit** | **H** | **Sem IV** | **Credit** | **H** | **Sem V** | **Credit** | **H** | **Sem VI** | **Credit** | **H** |
| Part 1. Language – Tamil | 3 | 6 | Part..1. Language – Tamil | 3 | 6 | Part..1. Language – Tamil | 3 | 6 | Part..1. Language – Tamil | 3 | 6 | 5.1 Core Course –\CC IX | 4 | 5 | 6.1 Core Course –  CC XIII | 4 | 6 |
| Part.2 English | 3 | 6 | Part..2 English | 3 | 6 | Part..2 English | 3 | 6 | Part..2 English | 3 | 6 | 5.2 Core Course – CC X | 4 | 5 | 6.2 Core Course –  CC XIV | 4 | 6 |
| 1.3 Core Course – CC I | 5 | 5 | 2..3 Core Course – CC III | 5 | 5 | 3.3 Core Course – CC V | 5 | 5 | 4.3 Core Course – CC VII  Core Industry Module | 5 | 5 | 5. 3.Core Course CC -XI | 4 | 5 | 6.3 Core Course –  CC XV | 4 | 6 |
| 1.4 Core Course – CC II | 5 | 5 | 2.4 Core Course – CC IV | 5 | 5 | 3.4 Core Course – CC VI | 5 | 5 | 4.4 Core Course –  CC VIII | 5 | 5 | 5. 4.Core Course –/ Project with viva- voce  CC -XII | 4 | 5 | 6.4 Elective -VII Generic/ Discipline Specific | 3 | 5 |
| 1.5 Elective I Generic/ Discipline Specific | 3 | 4 | 2.5 Elective II Generic/ Discipline Specific | 3 | 4 | 3.5 Elective III Generic/ Discipline Specific | 3 | 4 | 4.5 Elective IV Generic/ Discipline Specific | 3 | 3 | 5.5 Elective V Generic/ Discipline Specific | 3 | 4 | 6.5 Elective VIII  Generic/ Discipline Specific | 3 | 5 |
| 1.6 Skill Enhancement Course SEC-1 | 2 | 2 | 2.6 Skill Enhancement Course SEC-2 | 2 | 2 | 3.6 Skill Enhancement Course SEC-4,  (Entrepreneurial Skill) | 1 | 1 | 4.6 Skill Enhancement Course SEC-6 | 2 | 2 | 5.6 Elective VI Generic/ Discipline Specific | 3 | 4 | 6.6 Extension Activity | 1 | - |
| 1.7 Skill Enhancement -(Foundation Course) | 2 | 2 | 2.7 Skill Enhancement Course –SEC-3 | 2 | 2 | 3.7 Skill Enhancement Course SEC-5 | 2 | 2 | 4.7 Skill Enhancement Course SEC-7 | 2 | 2 | 5.7 Value Education | 2 | 2 | 6.7 Professional Competency Skill | 2 | 2 |
|  |  |  |  |  |  | 3.8 E.V.S. | - | 1 | 4.8 E.V.S | 2 | 1 | 5.8 Summer Internship /Industrial Training | 2 |  |  |  |  |
|  | **23** | **30** |  | **23** | **30** |  | **22** | **30** |  | **25** | **30** |  | **26** | **30** |  | **21** | **30** |
| **Total – 140 Credits** | | | | | | | | | | | | | | | | | |

**Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF) Guideline Based Credit and Hours Distribution System**

**for all UG courses including Lab Hours**

**First Year – Semester-I**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-1 | Language – Tamil | 3 | 6 |
| Part-2 | English | 3 | 6 |
| Part-3 | Core Courses & Elective Courses [in Total] | 13 | 14 |
| Part-4 | Skill Enhancement Course SEC-1 | 2 | 2 |
| Foundation Course | 2 | 2 |
|  |  | **23** | **30** |

**Semester-II**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-1 | Language – Tamil | 3 | 6 |
| Part-2 | English | 3 | 6 |
| Part-3 | Core Courses & Elective Courses including laboratory [in Total] | 13 | 14 |
| Part-4 | Skill Enhancement Course -SEC-2 | 2 | 2 |
| Skill Enhancement Course -SEC-3 (Discipline / Subject Specific) | 2 | 2 |
|  |  | **23** | **30** |

**Second Year – Semester-III**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-1 | Language - Tamil | 3 | 6 |
| Part-2 | English | 3 | 6 |
| Part-3 | Core Courses & Elective Courses including laboratory [in Total] | 13 | 14 |
| Part-4 | Skill Enhancement Course -SEC-4 (Entrepreneurial Based) | 1 | 1 |
| Skill Enhancement Course -SEC-5 (Discipline / Subject Specific) | 2 | 2 |
| E.V.S | - | 1 |
|  |  | **22** | **30** |

**Semester-IV**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-1 | Language - Tamil | 3 | 6 |
| Part-2 | English | 3 | 6 |
| Part-3 | Core Courses & Elective Courses including laboratory [in Total] | 13 | 13 |
| Part-4 | Skill Enhancement Course -SEC-6 (Discipline / Subject Specific) | 2 | 2 |
| Skill Enhancement Course -SEC-7 (Discipline / Subject Specific) | 2 | 2 |
| E.V.S | 2 | 1 |
|  |  | **25** | **30** |

**Third Year**

**Semester-V**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| **Part-3** | Core Courses including Project / Elective Based | 22 | 26 |
| **Part-4** | Value Education | 2 | 2 |
| Internship / Industrial Visit / Field Visit | 2 | 2 |
|  |  | **26** | **30** |

**Semester-VI**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| **Part-3** | Core Courses including Project / Elective Based & LAB | 18 | 28 |
| **Part-4** | Extension Activity | 1 | - |
| Professional Competency Skill | 2 | 2 |
|  |  | **21** | **30** |

**Consolidated Semester wise and Component wise Credit distribution**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parts** | **Sem I** | **Sem II** | **Sem III** | **Sem IV** | **Sem V** | **Sem VI** | **Total Credits** |
| **Part I** | 3 | 3 | 3 | 3 | - | - | 12 |
| **Part II** | 3 | 3 | 3 | 3 | - | - | 12 |
| **Part III** | 13 | 13 | 13 | 13 | 22 | 18 | 92 |
| **Part IV** | 4 | 4 | 3 | 6 | 4 | 1 | 22 |
| **Part V** | - | - | - | - | - | 2 | 2 |
| **Total** | 23 | 23 | 22 | 25 | 26 | 21 | **140** |

**\*Part I. II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.**

**Credit Distribution for all UG courses with LAB Hours**

**B.Sc. HARDWARE SYSTEM AND NETWORKING**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Semester I** | | | | | | | | | | |
| **Component** | **Course code** | | **List of courses** | | | | **Credits** | **No. of Hrs** | | |
| **Part I** |  | | Language – Tamil | | | | 3 | 6 | | |
| **Part II** |  | | English | | | | 3 | 6 | | |
| **Part-III** |  | | **Core Course CC- I**  Programming in C | | | | 5 | 5 | | |
| **Part-III** |  | | **Core Course CC-II**  Practical –Programming in C Lab | | | | 5 | 5 | | |
| **Part-III** |  | | **Elective Course I (Generic/Discipline Specific )**  Refer Annexure I | | | | 3 | 4 | | |
| **Part- IV** |  | | Skill Enhancement Course SEC – 1 (Non-Major Executive)  Fundamentals of Information Technology | | | | 2 | 2 | | |
| **Part- IV** |  | | Skill Enhancement (Foundation Course)  Problem Solving Technique | | | | 2 | 2 | | |
| **TOTAL** |  | |  | | | | **23** | **30** | | |
| **Semester II** | | | | | | | | | | |
| **Component** | **Course code** | | | **List of courses** | | | **Credits** | **No. of Hrs** | | |
| **Part I** |  | | | Language – Tamil | | | 3 | 6 | | |
| **Part II** |  | | | English | | | 3 | 6 | | |
| **Part III** |  | | | **Core Course CC III**  Data Structures and Algorithms | | | 5 | 5 | | |
| **Part III** |  | | | **Core Course CC IV**  Practical II - Data Structures and Algorithms Lab | | | 5 | 5 | | |
| **Part III** |  | | | **Elective Course II (General /Discipline Specific)**  Refer Annexure I | | | 3 | 4 | | |
| **Part IV** |  | | | Skill Enhancement Course SEC 2 (Non-Major Executive)  COMPUTER FUNDAMENTALS | | | 2 | 2 | | |
| **Part IV** |  | | | Skill Enhancement Course SEC 3  Refer Annexure II | | | 2 | 2 | | |
| **TOTAL** |  | | |  | | | **23** | **30** | | |
| **Semester – III** | | | | | | | | | | |
| **Component** | **Course code** | | | **List of courses** | | **Credits** | | **No. of Hrs** | | |
| **Part I** |  | | | Language – Tamil | | 3 | | 6 | | |
| **Part II** |  | | | English | | 3 | | 6 | | |
| **Part-III** |  | | | **Core Course CC V**  Computer Architecture | | 5 | | 5 | | |
| **Part-III** |  | | | **Core Course CC VI**  Practical II - Computer Architecture Lab | | 5 | | 5 | | |
| **Part-III** |  | | | **Elective Course III (Generic / Discipline Specific)**  Refer Annexure I | | 3 | | 4 | | |
| **Part-IV** |  | | | Skill Enhancement Course SEC 4  (Entrepreneurial Skill)  E-Commerce | | 1 | | 1 | | |
| **Part-IV** |  | | | Skill Enhancement Course SEC 5  Refer Annexure II | | 2 | | 2 | | |
| **Part-IV** |  | | | Environmental Studies | | - | | 1 | | |
| **TOTAL** |  | | |  | |  | |  | | |
|  | | | | | | | | | | |
| **Component** | **Course code** | | | **List of courses** | |  | |  | | |
| **Part I** |  | | | Language – Tamil | | 3 | | 6 | | |
| **Part II** |  | | | English | | 3 | | 6 | | |
| **Part III** |  | | | **Core Course CC VII**  Operating System | | 5 | | 5 | | |
| **Part III** |  | | | **Core Course CC VIII**  Operating System Lab | | 5 | | 5 | | |
| **Part III** |  | | | **Elective Course IV (General /Discipline Specific)**  Refer Annexure I | | 3 | | 3 | | |
| **Part IV** |  | | | Skill Enhancement Course -SEC-6  Refer Annexure II | | 2 | | 2 | | |
| **Part IV** |  | | | Skill Enhancement Course -SEC-7  Refer Annexure II | | 2 | | 2 | | |
| **Part IV** |  | | | Environmental Studies | | 2 | | 1 | | |
| **TOTAL** |  | | |  | | **25** | | **30** | | |
| **Semester – V** | | | | | | | | | |
| **Component** | | **Course code** | | | **List of courses** | **Credits** | | **No. of Hrs** |
| **Part-III** | |  | | | **Core Course CC IX**  Fundamentals Of Microprocessor | 4 | | 5 |
| **Part-III** | |  | | | **Core Course Lab CC X**  Fundamentals Of Microprocessor LAB | 4 | | 5 |
| **Part-III** | |  | | | **Core Course CC XI**  Server Administration | 4 | | 5 |
| **Part-III** | |  | | | **Elective Course V**  **(Generic /Discipline Specific)**  Refer Annexure I | 4 | | 5 |
| **Part-III** | |  | | | **Elective Course VI**  **(Generic /Discipline Specific)**  Refer Annexure I | 3 | | 4 |
| **Part-III** | |  | | | **Core Course CC XII**  Project with Viva Voce  Project (Individual) | 3 | | 4 |
| **Part-IV** | |  | | | Value Education | 2 | | 2 |
| **Part-IV** | |  | | | Summer Internship /Industrial Training | 2 | |  |
| **TOTAL** | |  | | |  | **26** | | **30** |
| **Semester – VI** | | | | | | | | |
| **Component** | | **Course code** | | | **List of courses** | **Credits** | | **No. of Hrs** |
| **Part III** | |  | | | **Core Course CC XIII**  Digital Principles And Computer Organization | 4 | | 6 |
| **Part III** | |  | | | **Core Course Lab CC XIV**  Digital Principles And Computer Organization Lab | 4 | | 6 |
| **Part III** | |  | | | **Core Course CC XV**  Web Technology | 4 | | 6 |
| **Part III** | |  | | | **Elective Course VII**  **(Generic / Discipline Specific)**  Refer Annexure II | 3 | | 5 |
| **Part III** | |  | | | **Elective Course VIII**  **(Generic / Discipline Specific) –**  Refer Annexure II | 3 | | 5 |
| **Part IV** | |  | | | **Professional Competency Skill** | 2 | | 2 |
| **Part IV** | |  | | | **Extension Activity** | 1 | |  |
| **TOTAL** | |  | | |  | **21** | | **30** |
| **TOTAL CREDITS** | | | | | |  | | **140** |

**ANNEXURE I**

**SUGGESTED TOPICS IN CORE COURSE COMPONENTS**

1. Object Oriented Programming Using C++
2. C++ Programming Lab
3. Machine Learning
4. Machine Learning Lab
5. Data Science
6. Data Science lab
7. Mobile Application Development
8. Mobile Application Development Lab
9. Software Project Management
10. Software Engineering Lab and more..

**SUGGESTED TOPICS IN GENERIC ELECTIVES**

1. Discrete Mathematics – I

2. Discrete Mathematics – II

3. Numerical Methods – I

4. Numerical Methods – II

5. Mathematical Statistics – I

6. Mathematical Statistics – II

7. Electronics Science

8. Nanotechnology

9. Optimization Technique / Operational Research

10. Introduction to Linear Algebra

11. Graph Theory and Its Applications

12. Digital Logic Fundamentals

13. Microprocessor & Micro Controller

**ANNEXURE I**

**DISCIPLINE SPECIFIC ELECTIVE**

1. Analytics for Service Industry
2. Financial Analytics
3. Marketing Analytics
4. Data Communication And Computer Networks
5. Computer Networks
6. Cryptography
7. Operating System
8. Artificial Neural Networks
9. Software Engineering
10. Software Metrics
11. Distributed Computing
12. Agile Project Management
13. Computing Intelligence
14. Information Security
15. Grid Computing and more..

**Annexure II**

**SKILL ENCHANCEMENT**

|  |  |
| --- | --- |
| 1 | INTRODUCTION TO HTML |
| 2 | OFFICE AUTOMATION |
| 3 | QUALITATIVE APTITUDE |
| 4 | CYBER FORENSICS |
| 5 | MULTIMEDIA SYSTEMS |
| 6 | SOFTWARE TESTING |
| 7 | DATA MINING AND WAREHOUSING |
| 8 | BIO METRICS |
| 9 | ENTERPRISE RETAIL PLANNING |
| 10 | ROBOTICS AND APPLICATIONS |
| 11 | SIMULATION AND MODELING |
| 12 | PATTERN RECOGNITION |
| 13 | ADVANCED EXCEL |
| 14 | OPEN SOURCE SOFTWARE TECHNOLOGIES |
| 15 | PHP PROGRAMMING |
| 16 | NETWORK SECURITY |
| 17 | IMAGE PROCESSING and more… |

**FIRST YEAR –SEMESTER- I**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | **External** | **Total** | |
|  | | | Programming in C | **CCI** | 5 | - | - | I | 4 | 25 | | 75 | 100 | |
| **Learning Objectives** | | | | | | | | | | | | | |  |
| **LO1** | To make students understand the concepts of C programming. | | | | | | | | | | | | | |
| **LO2** | To impart knowledge about Mathematical expressions using C Language | | | | | | | | | | | | | |
| **LO3** | To understand the concept of decision making and looping | | | | | | | | | | | | | |
| **LO4** | To make the students understand about Functions. | | | | | | | | | | | | | |
| **LO5** | To know the concept of pointers and File management. | | | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | | | | **No. of Hours** |
| I | **Overview of C:** Introduction - Character set - C tokens - keyword & Identifiers - Constants - Variables - Data types - Declaration of variables - Assigning values to variables - Defining Symbolic Constants - Arithmetic, Relational, Logical, Assignment, Conditional, Bitwise, Special, Increment and Decrement operators. | | | | | | | | | | | | | **15** |
| II | **Expressions** :Arithmetic Expressions - Evaluation of expression - precedence of arithmetic operators - Type conversion in expression – operator precedence & associativity - Mathematical functions - Reading & Writing a character - Formatted input and output. | | | | | | | | | | | | | **15** |
| III | **Decision Making and Branching:** Introduction – if, if….else, nesting of if …else statements- else if ladder – The switch statement, The ?: Operator – The goto Statement. Decision Making and Looping: Introduction- The while statement- the do statement – the for statement-jumps in loops. Arrays – Character Arrays and Strings | | | | | | | | | | | | | **15** |
| IV | **User-Defined Functions:** Introduction – Need and Elements of User-Defined Functions Definition-Return Values and their types - Function Calls – Declarations – Category of Functions- Nesting of Functions - Recursion – Passing Arrays and Strings to Functions – The Scope, Visibility and Lifetime of Variables- Multi file Programs. Structures and Unions | | | | | | | | | | | | | **15** |
| V | **Pointers:** Introduction-Understanding pointers -Accessing the address of a variable Declaration and Initialization of pointer Variable – Accessing a variable through its pointer Chain of pointers Pointer Expressions – Pointer Increments and Scale factor- Pointers and Arrays- Pointers and Strings – Array of pointers – Pointers as Function Arguments Functions returning pointers – Pointers to Functions – Pointers and Structures. **Files:** File Management in C. | | | | | | | | | | | | | **15** |
| **TOTAL HOURS** | | | | | | | | | | | | | | **75** |
| **Course Outcomes** | | | | | | | | | | | **Programme Outcomes** | | | |
| CO | | On completion of this course, students will | | | | | | | | | | | | |
| CO1 | | * Learn the basics of C Language, Do simple programs in using operators and expressions,   Learn how to use operators and expressions. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | | * Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | | Concept of array and Strings using C.  Work with arrays and Strings. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | | * Work with user defined function, structures and union. * Write program using function. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | | Usage of pointers in C and File operations in C.  Do programs using pointers and File operations. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | | |
| 1 | | E Balagurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill, Second Reprint 2008. | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1. | | Programming with C, Schaum‘s Outline Series, Gottfried, Tata McGraw Hill, 2006. | | | | | | | | | | | | |
| 2. | | Programming with ANSI and Turbo C , Ashok N.Kamthane , Pearson Education, 2006. | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| 1. | | <https://www.programiz.com/c-programming> | | | | | | | | | | | | |
| 2. | | <https://www.w3schools.com/c/c_intro.php> | | | | | | | | | | | | |
| 3. | | <https://www.javatpoint.com/c-programming-language-tutorial> | | | | | | | | | | | | |
| 4. | | https://www.geeksforgeeks.org/c-programming-language/ | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 2 | 2 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 2 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 15 | 14 | 15 | 15 | 13 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

**C PROGRAMMING PRACTICAL**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | |
| **CIA** | **External** | **Total** |
| **CCII** | | 0 | 0 | 5 | I | 4 | 5 | **25** | **75** | **100** |
| **Learning Objectives** | | | | | | | | | | |
| **LO1** | The Course aims to provide exposure to problem-solving through C programming | | | | | | | | | |
| **LO2** | It aims to train the student to the basic concepts of the C -Programming language | | | | | | | | | |
| **LO3** | Apply different concepts of C language to solve the problem | | | | | | | | | |
| **Prerequisites:** | | | | | | | | | | |
| **Contents** | | | | | | | | | | |
| 1. Programs using Input/ Output functions  2. Programs on conditional structures  3. Command Line Arguments  4. Programs using Arrays  5. String Manipulations  6. Programs using Functions  7. Recursive Functions  8. Programs using Pointers  9. Files  10. Programs using Structures & Unions  **TOTAL 75** | | | | | | | | | | |
| **CO** | **Course Outcomes** | | | | | | | | | |
| CO1 | Demonstrate the understanding of syntax and semantics of C programs. | | | | | | | | | |
| CO2 | Identify the problem and solve using C programming techniques. | | | | | | | | | |
| CO3 | Identify suitable programming constructs for problem solving. | | | | | | | | | |
| CO4 | Analyze various concepts of C language to solve the problem in an efficient way. | | | | | | | | | |
| CO5 | Develop a C program for a given problem and test for its correctness. | | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **2** | **3** | **2** | **2** |
| **CO2** | **3** | **3** | **2** | **3** | **2** | **2** |
| **CO3** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CO4** | **3** | **3** | **2** | **3** | **2** | **2** |
| **CO5** | **3** | **3** | **2** | **3** | **3** | **2** |
| **Weightage of course contributed to each PSO** | **15** | **14** | **11** | **15** | **11** | **10** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | **External** | | **Total** |
|  | | | Fundamentals of Information Technology | **SEC -I** | 2 |  |  |  | 2 | 25 | | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | | | |
| **LO1** | Understand basic concepts and terminology of information technology. | | | | | | | | | | | | | |
| **LO2** | Have a basic understanding of personal computers and their operation | | | | | | | | | | | | | |
| **LO3** | Be able to identify data storage and its usage | | | | | | | | | | | | | |
| **LO4** | Get great knowledge of software and its functionalities | | | | | | | | | | | | | |
| **LO5** | Understand about operating system and their uses | | | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | | | **No. Of. Hours** | |
| I | **Introduction to Computers:**  Introduction, Definition, .Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations of computer | | | | | | | | | | | | **6** | |
| II | **Basic Computer Organization:**  Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and its types. Printers: Impact Printers and its types. Non Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers. | | | | | | | | | | | | **6** | |
| III | **Storage Fundamentals:**  Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives | | | | | | | | | | | | **6** | |
| IV | **Software:**  Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w | | | | | | | | | | | | **6** | |
| V | **Operating System:**  Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux. | | | | | | | | | | | | **6** | |
| **TOTAL HOURS** | | | | | | | | | | | | | **30** | |
| **Course Outcomes** | | | | | | | | | | | **Programme Outcomes** | | | |
| CO | | On completion of this course, students will | | | | | | | | |  | | | |
| CO1 | | * Learn the basics of computer, Construct the structure of the required things in computer, learn how to use it. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | | * Develop organizational structure using for the devices present currently under input or output unit. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | | Concept of storing data in computer using two header namely RAM and ROM with different types of ROM with advancement in storage basis. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | | * Work with different software, Write program in the software and applications of software. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | | Usage of Operating system in information technology which really acts as a interpreter between software and hardware. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | | |
| 1 | | Anoop Mathew, S. Kavitha Murugeshan(2009), “ Fundamental of Information Technology”, Majestic Books. | | | | | | | | | | | | |
| 2 | | Alexis Leon, Mathews Leon,” Fundamental of Information Technology”, 2nd Edition. | | | | | | | | | | | | |
| 3 | | S. K Bansal, “ Fundamental of Information Technology”. | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1. | | Bhardwaj Sushil Puneet Kumar, “Fundamental of Information Technology” | | | | | | | | | | | | |
| 2. | | GG WILKINSON, “Fundamentals of Information Technology”, Wiley-Blackwell | | | | | | | | | | | | |
| 3. | | [A Ravichandran](https://www.bookganga.com/eBooks/Books?AID=5563813659127023211) , “Fundamentals of Information Technology”, Khanna Book Publishing | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| 1. | | <https://testbook.com/learn/computer-fundamentals> | | | | | | | | | | | | |
| 2. | | <https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html> | | | | | | | | | | | | |
| 3. | | <https://www.javatpoint.com/computer-fundamentals-tutorial> | | | | | | | | | | | | |
| 4. | | <https://www.tutorialspoint.com/computer_fundamentals/index.htm> | | | | | | | | | | | | |
| 5. | | <https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf> | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 3 | 2 | 3 | 3 | 2 |
| **Weightage of course contributed to each PSO** | 15 | 15 | 14 | 15 | 14 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | |
| **CIA** | | **External** | **Total** |
|  | | | Problem Solving Techniques | **FC** | 2 | - | - | I | 2 | 25 | | 75 | 100 |
| **Learning Objectives** | | | | | | | | | | | | | |
| LO1 | Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving. | | | | | | | | | | | | |
| LO2 | Implement different programming constructs and decomposition of problems into functions. | | | | | | | | | | | | |
| LO3 | Use data flow diagram, Pseudo code to implement solutions. | | | | | | | | | | | | |
| LO4 | Define and use of arrays with simple applications | | | | | | | | | | | | |
| LO5 | Understand about operating system and their uses | | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | **No. Of. Hours** | | |
| I | **Introduction:** History, characteristics and limitations of Computer. Hardware/Anatomy of Computer: CPU, Memory, Secondary storage devices, Input Devices and Output devices. Types of Computers: PC, Workstation, Minicomputer, Main frame and Supercomputer. Software: System software and Application software. **Programming Languages:** Machine language, Assembly language, High-level language,4 GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers. | | | | | | | | | | **6** | | |
| II | **Data:** Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output. Different phases in Program Development Cycle (PDC).**Structured Programming: Algorithm:** Features of good algorithm, Benefits and drawbacks of algorithm. **Flowcharts:** Advantages and limitations of flowcharts, when to use flowcharts, flowchart symbols and types of flowcharts. **Pseudocode:** Writing a pseudocode. Coding, documenting and testing a program: Comment lines and types of errors. **Program design:** Modular Programming. | | | | | | | | | | **6** | | |
| III | **Selection Structures:** Relational and Logical Operators -Selecting from Several Alternatives – Applications of Selection Structures.  **Repetition Structures:** Counter Controlled Loops –Nested Loops– Applications of Repetition Structures. | | | | | | | | | | **6** | | |
| IV | **Data:** Numeric Data and Character Based Data. **Arrays:** One Dimensional Array - Two Dimensional Arrays – Strings as Arrays of Characters. | | | | | | | | | | **6** | | |
| V | **Data Flow Diagrams:** Definition, DFD symbols and types of DFDs. **Program Modules:** Subprograms-Value and Reference parameters- Scope of a variable - Functions – Recursion. **Files:** File Basics-Creating and reading a sequential file- Modifying Sequential Files. | | | | | | | | | | **6** | | |
| **TOTAL HOURS** | | | | | | | | | | | **30** | | |
| **Course Outcomes** | | | | | | | | | | | **Programme Outcomes** | | |
| CO | | On completion of this course, students will | | | | | | | | |  | | |
| CO1 | | * Study the basic knowledge of Computers.   Analyze the programming languages. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO2 | | Study the data types and arithmetic operations.  Know about the algorithms.  Develop program using flow chart and pseudocode. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO3 | | Determine the various operators.  Explain about the structures.  Illustrate the concept of Loops | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO4 | | Study about Numeric data and character-based data.  Analyze about Arrays. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO5 | | Explain about DFD  Illustrate program modules.  Creating and reading Files | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| **Textbooks** | | | | | | | | | | | | | |
| 1 | | **Stewart Venit,** “Introduction to Programming: Concepts and Design”, Fourth Edition, 2010, Dream Tech Publishers. | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | |
| 1. | | https://www.codesansar.com/computer-basics/problem-solving-using-computer.htm | | | | | | | | | | | |
| 2. | | http://www.nptel.iitm.ac.in/video.php?subjectId=106102067 | | | | | | | | | | | |
| 3. | | <http://utubersity.com/?page_id=876> | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO 4** | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 2 |
| **Weightage of course contributed to each PSO** | 15 | 14 | 14 | 15 | 15 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

**FIRST YEAR –SEMESTER- II**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | **External** | | | **Total** |
|  | | | DATA STRUCTURES AND ALGORITHMS | **CC**  **III** | 5 | - | - | II | 4 | 25 | 75 | | | 100 |
| **Learning Objectives** | | | | | | | | | | | | | | |
| LO1 | Understand the meaning asymptotic time complexity analysis and various data structures | | | | | | | | | | | | | |
| LO2 | To enhancing the problem solving skills and thinking skills | | | | | | | | | | | | | |
| LO3 | To write efficient algorithms and Programs | | | | | | | | | | | | | |
| LO4 | To make the students learn best practices in Data Structures and Algorithms | | | | | | | | | | | | | |
| LO5 | To understand how to handle the files in Data Structure | | | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | | | **No. Of. Hours** | |
| I | **Arrays and ordered Lists** Abstract data types – asymptotic notations – complexity analysis- Linked lists: Singly linked list – doubly linked lists - Circular linked list, General lists- stacks – Queues – Circular Queues – Evaluation of expressions | | | | | | | | | | | | **15** | |
| II | **Trees and Graphs** Trees – Binary Trees – Binary Tree Traversal – Binary Tree Representations – Binary Search Trees - threaded Binary Trees - Application of trees (Sets). Representation of Graphs – Graph implementation – graph Traversals - Minimum Cost Spanning Trees – Shortest Path Problems-Application of graphs | | | | | | | | | | | | **15** | |
| III | **Searching and Sorting** Sorting – Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Selection Sort. Searching – Linear search, Binary search | | | | | | | | | | | | **15** | |
| IV | **Greedy Method and Dynamic programming** Greedy Method: Knapsack problem– Job Sequencing with deadlines – Optimal storage on tapes. General method – Multistage Graph Forward Method– All pairs shortest path – Single source shortest path – Search Techniques for Graphs – DFS – Connected Components – Bi-Connected Components | | | | | | | | | | | | **15** | |
| V | **Backtracking** General Method – 8-Queen‟s – Sum Of Subsets – Graph Colouring – Hamiltonian Cycles – Branch And Bound: General Method – Travelling Sales Person Problem | | | | | | | | | | | | **15** | |
| **TOTAL HOURS** | | | | | | | | | | | | | **75** | |
| **Course Outcomes** | | | | | | | | | | | | **Programme Outcomes** | | |
| CO | | On completion of this course, students will | | | | | | | | | |  | | |
| CO1 | | To understand the asymptotic notations and analysis of time and space complexity  To understand the concepts of Linked List, Stack and Queue. | | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO2 | | To understand the Concepts of Trees and Graphs  Perform traversal operations on Trees and Graphs.  To enable the applications of Trees and Graphs. | | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO3 | | To apply searching and sorting techniques | | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO4 | | To understand the concepts of Greedy Method  To apply searching techniques. | | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO5 | | Usage of File handlings in python, Concept of reading and writing files, Do programs using files. | | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| **Textbooks** | | | | | | | | | | | | | | |
| 1 | | Seymour Lipshutz(2011),Schaum‟s Outlines - Data Structures with C, Tata McGraw Hill publications. | | | | | | | | | | | | |
| 2 | | Ellis Horowitz and SartajSahni (2010), Fundamentals of Computer Algorithms, Galgotia Publications Pvt., Ltd. | | | | | | | | | | | | |
| 3 | | Dr. K. Nagesware Rao, Dr. Shaik Akbar, ImmadiMurali Krishna, Problem Solving and Python Programming(2018) | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1. | | Gregory L.Heileman(1996), Data Structures, Algorithms and Object-Oriented Programming, McGraw Hill International Edition, Singapore. | | | | | | | | | | | | |
| 2. | | A.V.Aho, J.D. Ullman, J.E.Hopcraft(2000). Data Structures and Algorithms, Addison Wesley Publication. | | | | | | | | | | | | |
| 3. | | Ellis Horowitz and SartajSahni, Sanguthevar Raja sekaran (2010) ,Fundamentals of Computer Algorithms, Galgotia Publications Pvt.Ltd. | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| 1. | | https://www.tutorialspoint.com/data\_structures\_algorithms/index.htm | | | | | | | | | | | | |
| 2. | | <https://www.programiz.com/dsa> | | | | | | | | | | | | |
| 3. | | https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/ | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 1 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 2 |
| **Weightage of course contributed to each PSO** | 15 | 15 | 15 | 15 | 13 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | DATASTRUCTURES ANDALGORITHMS LAB | **CC IV** | - | - | 5 | II | 4 | 25 | 75 | | 100 |
| **Objectives**  To predict the performance of different algorithms in order to guide design decisions, provide theoretical estimation for the required resources of an algorithm to solve a specific computational problem | | | | | | | | | | | | |
| **LIST OF PROGRAMS** | | | | | | | | | | | **Required Hour** | |
| 1. Perform stack operations  2. Perform queue operations  3. Perform tree traversal operations  4. Search an element in an array using linear search.  5. Search an element in an array using binary search  6. Sort the given set of elements using Merge Sort.  7. Sort the given set of elements using Quick sort.  8. Search the Kth smallest element using Selection Sort  9. Find the Optimal solution for the given Knapsack Problem using Greedy Method.  10. Find all pairs shortest path for the given Graph using Dynamic Programming method  11. Find the Single source shortest path for the given Travelling Salesman problem using  Dynamic Programming method  12. Find all possible solution for an N Queen problem using backtracking method  13. Find all possible Hamiltonian Cycle for the given graph using backtracking method | | | | | | | | | | | **75** | |
| **Course Outcomes** | | | | | | | | | | | | |
| CO | On completion of this course, students will | | | | | | | | | | | |
| CO1 | To understand the concepts of Linked List, Stack and Queue. | | | | | | | | | | | |
| CO2 | Concepts of Trees and Graphs. Perform traversal operations on Trees and Graphs.  To enable the applications of Trees and Graphs. | | | | | | | | | | | |
| CO3 | To apply searching and sorting techniques | | | | | | | | | | | |
| CO4 | To determine the concepts of Greedy Method To apply searching techniques. | | | | | | | | | | | |
| CO5 | Usage of File handlings in python, Concept of reading and writing files, Do programs using files. | | | | | | | | | | | |
| **LearningResources:**   * **RecommendedTexts**   1. Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition , “Fundamentals of Data in C”, Universities Press  2. E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition ,“Fundamentals of Computer Algorithms “ Universities Press   * **ReferenceBooks**   1. Seymour Lipschutz ,”Data Structures with C”, First Edition, Schaum’s outline series in computers, Tata McGraw Hill.  2. .2. R.Krishnamoorthy and G.Indirani Kumaravel, Data Structures using C, Tata McGrawHill – 2008.  3. A.K.Sharma, Data Structures using C , Pearson Education India,2011.  4. . G. Brassard and P. Bratley, “Fundamentals of Algorithms”, PHI, New Delhi, 1997.  5. 4, . A.V. Aho, J.E. Hopcroft, J.D. Ullmann,, “The design and analysis of Computer  6. Algorithms”, Addison Wesley, Boston, 1974  7. 5. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms, Third edition, MIT Press, 2009  8. Sanjoy Dasgupta, C.Papadimitriou and U.Vazirani , Algorithms , Tata McGraw-Hill, 2008. | | | | | | | | | | | | | |
| **Course Outcomes** | | | | | | | | | | | | | |
| CO | On completion of this course, students will | | | | | | | | | | | | |
| CO1 | Implement data structures using C | | | | | | | | | | | | |
| CO2 | Implement various types of linked lists and their applications | | | | | | | | | | | | |
| CO3 | Implement Tree Traversals | | | | | | | | | | | | |
| CO4 | Implement various algorithms in C | | | | | | | | | | | | |
| CO5 | Implement different sorting and searching algorithms | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 2 | 2 | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 1 | 2 |
| **Weightage of course contributed to each PSO** | 15 | 15 | 14 | 14 | 13 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | | | | Computer fundamentals | **SEC-2** | 2 | - | - | II | 2 | | 25 | 75 | 100 |
| **Learning Objectives** | | | | | | | | | | | | | | |
| LO1 | | | Discuss the Introduction about Computer and its Components. | | | | | | | | | | | |
| LO2 | | | To Perform the Microsoft Word, Excel, PowerPoint and its operations. | | | | | | | | | | | |
| LO3 | | | To get Knowledge about the Internet and Intranet | | | | | | | | | | | |
| LO4 | | | Insert heading levels within a web page. | | | | | | | | | | | |
| LO5 | | | Insert ordered and unordered lists within a web page. Create a web page. | | | | | | | | | | | |
| **UNIT** | | | **Contents** | | | | | | | | | | **No. Of. Hours** | |
| I | | | **Introduction to Computers** - Generations of Computer – Data and Information – Components of Computer – Software – Hardware – Input Devices - Output Devices –– Types of Operating System. | | | | | | | | | | **6** | |
| II | | | **MS Word**: Introduction – Elements of Window – Files, Folders and Directories – Text Manipulating: Cut, Copy, Paste, Drag and Drop – Text Formatting: Font – Style, Size, Face and Colors (Both foreground and background) – Alignment - Bullets and Numbering - Header and footer- watermark – inserting objects (images, other application document) – Table creation – Mail merge. | | | | | | | | | | **6** | |
| III | | | **Ms Excel**: Introduction – Inserting rows and columns – Sizing rows and columns – Implementing formulas – Generating series - Functions in excel – Creation of Chart – Inserting objects – Filter – Sorting – Inserting worksheet. | | | | | | | | | | **6** | |
| IV | | | **MS PowerPoint**: Introduction – Slides Manipulation (Inserting new, Copy, paste, delete and duplicate slides) – Slide show– Types of Views – Types of Animations – Inserting Objects – Implementing multimedia (Video and Audio) – Templates (Built-in and User-Defined). | | | | | | | | | | **6** | |
| V | | | **Internet**: Introduction to Internet and Intranet – Services of Internet - Domain Name – URL – Browser – Types of Browsers – Search Engine - E-Mail – Basic Components of E-Mail –.How to send group mail. **E-Commerce**: Digital Signature – Digital Currency – Online shopping and transaction. | | | | | | | | | | **6** | |
| **TOTAL HOURS** | | | | | | | | | | | | | **30** | |
| **Course Outcomes** | | | | | | | | | | | **Programme Outcomes** | | | |
| CO | | On completion of this course, students will | | | | | | | | |  | | | |
| CO1 | | * Understand the basics of Computer and its Generations.   Be able to understand the components of computer. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | | To Understand the introduction about MS Word.  Be able to perform the Elements of window, Text Formatting, Text Manipulating options in MS Word. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | | To Understand the introduction about MS Excel.  Be able to inserting and sizing the cells  Implementing formulas and inserting worksheet. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | | To Understand the introduction about MS PowerPoint  Be able to perform the slides manipulation.  Implementing Multimedia and templates. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | | To Understand the introduction about Internet and Intranet.  Be able to access the browsers.  To get knowledge about basic components of E-Mail and E-Commerce | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | | |
| 1 | G. Manjunath, “Computer Basics”, Vasan Publications, 2010. | | | | | | | | | | | | | |
| 2 | Pradeep K. Sinha&PritiSinha, “Computer Fundamentals”, 6th Edition, BPB Publications, 2004. | | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| 1. | <https://www.tutorialspoint.com/computer_fundamentals/index.htm> | | | | | | | | | | | | | |
| 2. | <https://www.tutorialspoint.com/basics_of_computers/index.htm> | | | | | | | | | | | | | |
| 3. | <https://www.tutorialspoint.com/word/index.htm> | | | | | | | | | | | | | |
| 4. | <https://www.tutorialspoint.com/excel/index.htm> | | | | | | | | | | | | | |
| 5. | <https://www.tutorialspoint.com/powerpoint/index.htm> | | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 2 | 2 | 3 | 3 | 2 |
| **CO 3** | 2 | 3 | 3 | 3 | 3 | 3 |
| **CO 4** | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 2 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 14 | 13 | 15 | 14 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

**SECOND YEAR –SEMESTER- III**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | | | COMPUTER ARCHITECTURE | **CC V** | 5 | - | - | III | 4 | 25 | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | | | |
| LO1 | | | To understand the different number systems and digital arithmetic & logic circuits | | | | | | | | | | | |
| LO2 | | | To understand the concepts of Combinational Logic and Sequential Circuits | | | | | | | | | | | |
| LO3 | | | To impart the knowledge of buses, I/O devices, flip flops, Memory and bus structure. | | | | | | | | | | | |
| LO4 | | | To understand the concepts of memory hierarchy and memory organization | | | | | | | | | | | |
| LO5 | | | To understand the various types of microprocessor architecture | | | | | | | | | | | |
| **UNIT** | | | **Contents** | | | | | | | | | | **No. Of. Hours** | |
| I | | | **Microcomputer System:** Introduction-Hardware and Software-Memory-ALU-Control Unit-Input and Output Techniques-Advanced System Concepts-Micro Computer Types Multitasking and Multiprogramming. | | | | | | | | | | **15** | |
| II | | | **Peripheral Devices:** Keyboard and Mouse-CRT-Printer-Printer Types-Magnetic Storage Devices-Hard disk drive-DVD-CDROM-Scanner-Modem-Speakers | | | | | | | | | | **15** | |
| III | | | **Micro programmed Control:** Control Memory-Addressing Sequence-Design of Control Unit. CPU: General Register Organization-Stack Organization-Instruction Format-Addressing Modes-RISC-Program Control. | | | | | | | | | | **15** | |
| IV | | | **Hardware Overview:** BIOS-Power Connector-Inside the System Box-SMPSMotherboard-PC Expansion Boards-Front Panel Indicator-Serial Interface-Floppy Disk Controller-Hard Disk Controller-Post Sequence. | | | | | | | | | | **15** | |
| V | | | **Microprocessor:** Types-Processor Modes-Features-Manufacturing-Sockets-Heat and Cooling Problems-Math Coprocessors-Processor Bugs-Processor Upgrades. | | | | | | | | | | **15** | |
| **TOTAL HOURS** | | | | | | | | | | | | | **75** | |
| **Course Outcomes** | | | | | | | | | | | **Programme Outcomes** | | | |
| CO | | On completion of this course, students will | | | | | | | | |  | | | |
| CO1 | | Learn the basic structure of number system methods like binary, octal and Hexadecimal and understand the arithmetic and logical operations are performed bycomputers. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | | * Define the functions to simplify the Boolean equations using logic gates. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | | Understand various data transfer techniques in digital computer and control unit operations. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | | * Compare the functions of the memory organization | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | | Analyze architectures and computational designs concepts related to architecture organization and addressing modes | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | | |
| 1 | Govinda Rajulu B, “PC IBM and Clones – Hardware, Troubleshooting and Maintenance”,Tata McGraw Hill Publishing Company Ltd., New Delhi, 1991(UNIT I & II) | | | | | | | | | | | | | |
| 2 | Computer System Architecuture-M. Morris Mano, Third Edition(UNIT III) | | | | | | | | | | | | | |
| 3 | Upgrading and Repairing PC’s, 17th Edition By „Scott Mueller”; Publisher: Que Pub Date: March 24, 2006 ; Print ISBN-10: 0-7897-3404-4(UNIT IV & V) | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1. | Digital Electronics Circuits and Systems, V.K. Puri, TMH. | | | | | | | | | | | | | |
| 2. | Computer Architecture, M. Carter, Schaum„s outline series, TMH. | | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 5** | 2 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 14 | 15 | 15 | 15 | 15 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | Computer architecture - lab | **CC VI** | - | - | 4 | III | 4 | 25 | 75 | 100 |
| **OBJECTIVES:**  The main objective of PC Assembling Lab is to provide the students a strong foundation on PC Assembling concepts and its applications through hands-on training. 2. To practice the Basic concepts, SMPS , Processor and Memory | | | | | | | | | | |
| **LIST OF PROGRAMS** | | | | | | | | | | |
| 1. Start Up, Navigate, and Shut Down a Windows System 2. Use Files and Folders 3. Collect Resource Information – Windows 98,XP,Windows 2000 4. Replace s Floppy Drive 5. Replace the Hard Drive 6. Install a Windows Mouse 7. Partition a Hard Drive – FAT32 8. Partition a Hard Drive – Two Partitions-using FDISK 9. Partition HDD-NTFS(Win XP) 10. Disk Management (Hard Disk) 11. Replace a Power Supply 12. Remove and Insert Memory 13. Remove and Replace a Motherboard 14. Troubleshoot Hardware Problems 15. Dual boot Windows XP and Windows 2000 | | | | | | | | | | |
| **TOTAL HOURS: 60** | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 5** | 2 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 14 | 15 | 15 | 15 | 15 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | | | E-commerce | **SEC**  **4** | 1 | - | - | III | 2 | 25 | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | | | |
| LO1 | | | Understanding of the foundations and importance of E-commerce | | | | | | | | | | | |
| LO2 | | | Understanding of retailing in E-commerce by in terms of branding and pricing strategies and determining the effectiveness of market research. | | | | | | | | | | | |
| LO3 | | | Assess the Internet trading relationships including Business to Consumer, Business- to-Business, Intra-organizational. | | | | | | | | | | | |
| LO4 | | | Knowing key features of Internet, Intranets and Extranets and how they relate to each other. | | | | | | | | | | | |
| LO5 | | | Understanding legal issues and privacy in E-Commerce. | | | | | | | | | | | |
| **UNIT** | | | **Contents** | | | | | | | | | | **No. Of. Hours** | |
| I | | | **E-Commerce:** E-Commerce Framework – E-Commerce and Media Convergence – The anatomy of E-commerce applications - E-Commerce Consumer Applications - E- Commerce Organization Applications. | | | | | | | | | | **6** | |
| II | | | **The Internet:** The Internet Terminology – NSFNET – Architecture and Components– National Research and Education Network – Internet Governance – An overview of Internet Applications. The Business of Internet Commercialization: Telco/Cable/Online companies - National Independent ISPs – Regional level ISPs – Local level ISPs. | | | | | | | | | | **6** | |
| III | | | **E-Commerce and the World Wide Web:** Architectural Framework for E-commerce – WWW as the architecture – Technology behind the web – Security and the web. | | | | | | | | | | **6** | |
| IV | | | **Electronic Payment Systems:** Types of Electronic Payment Systems  – Digital token Electronic Payment Systems – Credit Card Based Electronic Payment Systems – Risk and Electronic Payment Systems. Electronic Data Interchange: Legal, Security and Privacy issues. | | | | | | | | | | **6** | |
| V | | | **Advertising and Marketing on the Internet:** E-Commerce Catalogs  – Information Filtering – Consumer Data Interface – Emerging tools. Software Agents: Characteristics and Properties of Software Agents – Technology behind Software Agents - Applets, Browsers, and Software Agents. | | | | | | | | | | **6** | |
| **TOTAL HOURS** | | | | | | | | | | | | | **30** | |
| **Course Outcomes** | | | | | | | | | | | **Programme Outcomes** | | | |
| CO | | On completion of this course, students will | | | | | | | | |  | | | |
| CO1 | | Demonstrate E-Commerce Frameworks. Distinguish E-Commerce and media Convergence. Illustrate E-Commerce Applications. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | | Describe the E-Commerce Networks and Research Networks, Analyze the Internet Commercialization | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | | Evaluate the E-Commerce how incorporate the Internet, Construct the Web Security | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | | Distinguish the different payment system.  Illustrate the data interchange | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | | Understanding the Advertising and Marketing on the Internet, Describe Software Agents | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | | |
| 1 | **Ravi Kalakota& Andrew Whinston,** “*Frontiers of Electronic-Commerce*”, Addison Wesley. | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1. | **EfraimTurvanJ.Lee, David Kug and** **Chung**, “Electronic Commerce”, Pearson Education, Asia. | | | | | | | | | | | | | |
| 2. | **Manlyn Greenstein and Miklos**, “Electronic Commerce”, TMH. | | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| 1. | https:/[/www](http://www.the-reference.com/en/expertise/creation-and.../e-commerce).[the-reference.com/en/expertise/creation-and.../e-commerce](http://www.the-reference.com/en/expertise/creation-and.../e-commerce) | | | | | | | | | | | | | |
| 2. | 1. <https://en.wikipedia.org/wiki/E-commerce> | | | | | | | | | | | | | |
| 3. | 1. https:/[/www](http://www.tutorialspoint.com/e_commerce/index.htm).[tutorialspoint.com/e\_commerce/index.htm](http://www.tutorialspoint.com/e_commerce/index.htm) | | | | | | | | | | | | | |

**SECOND YEAR –SEMESTER- IV**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | **External** | | **Total** |
|  | | | operating system | **CC VII** | 5 | - | - | IV | 4 | 25 | | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | | | |
| LO1 | To understand the fundamental concepts and role of Operating System. | | | | | | | | | | | | | |
| LO2 | To learn the Process Management and Scheduling Algorithms. | | | | | | | | | | | | | |
| LO3 | To understand the Memory Management policies. | | | | | | | | | | | | | |
| LO4 | To gain insight on I/O and File management techniques. | | | | | | | | | | | | | |
| LO5 | Analyze resource management techniques | | | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | | | **No. Of. Hours** | |
| I | | **Introduction**- views and goals – Operating System Services - User and Operating System interface - System Call- Types of System Calls – Operating System Design and Implementation - Operating System Structure. **Process Management**: Process concept- Process Scheduling - Operations on Processes- Inter process Communication. **Threads**: Types of threads | | | | | | | | | | | **15** | |
| II | | **Process Scheduling**: Basic Concepts - Scheduling Criteria Scheduling Algorithm Multiple Processor Scheduling CPU Scheduling. **Synchronization**: The Critical-Section Problem Synchronization Hardware – Semaphores- Classic Problem of Synchronization. | | | | | | | | | | | **15** | |
| III | | **Deadlocks:** Deadlock Characterization - Methods for Handling Deadlocks-Deadlock Prevention- Deadlock Avoidance - Deadlock Detection- Recovery from Deadlock. | | | | | | | | | | | **15** | |
| IV | | **Memory**-Management Strategies: Swapping - Contiguous Memory Allocation Segmentation- Paging - Structure of the Page Table. **Virtual-Memory Management**: Demand Paging - Page Replacement - Allocation of Frames -Thrashing. | | | | | | | | | | | **15** | |
| V | | **Storage Management:** File System- File Concept - Access Methods- Directory and Disk Structure -File Sharing- Protection. Allocation Methods - Free- Space Management - Efficiency and Performance – Recovery. | | | | | | | | | | | **15** | |
| **TOTAL HOURS** | | | | | | | | | | | | | **75** | |
| **Course Outcomes** | | | | | | | | | | | **Programme Outcomes** | | | |
| CO | | On completion of this course, students will | | | | | | | | |  | | | |
| CO1 | | Define OS with its view and goals and services rented by it  Deign of Operating System with its structure. Message through Inter process communication. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | | * Describe the allocation of process through scheduling algorithms. Define critical section problems and its usage. Prevention of multiple process executing through the concept of semaphores. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | | Describe the concept of Mutual exclusion, Deadlock detection and agreement protocols for deadlock prevention and its avoidance. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | | * Analyze the strategies of Memory management schemes and the usage of Virtual memory. Apply Replacement algorithms to avoid thrashing. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | | Brief study of storage management. Categorize the methods to allocate files for proper protection. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | | |
| 1 | | A. SilberschatzP.B.Galvin, Gange. “Operating System Concepts”, Ninth Edition, 2013, Addison WesleyPublishing Co.. | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1. | | Anderw S Tanenbaum, Albert S. Woodhull, ” Operating System Design and Impletation”, prentice-Hall India Publication. | | | | | | | | | | | | |
| 2. | | William Stallings, “Operating Systems Internals and Design Principles”, Pearson, 2018, 9th Edition. | | | | | | | | | | | | |
| 3. | | Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition | | | | | | | | | | | | |
| 4. | | Operating System Concepts (2nd Ed) by James L. Peterson, Abraham Silberschatz, Addison – Wesley. | | | | | | | | | | | | |
| 5. | | Operating Systems Design & implementation Andrew S. Tanenbam, Albert S. Woodhull Pearson. | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| 1. | | <https://www.guru99.com/operating-system-tutorial.html> | | | | | | | | | | | | |
| 2. | | <https://www.mygreatlearning.com/blog/what> | | | | | | | | | | | | |
| 3. | | <https://en.wikipedia.org/wiki/Operating_system> | | | | | | | | | | | | |
| 4. | | https://www.geeksforgeeks.org/what-is-an-operating-system/ | | | | | | | | | | | | |
| 5. | | http://www.cs.kent.edu/~farrell/osf03/oldnotes/2. th-edition.pdf | | | | | | | | | | | | |

**Mapping with Programme Outcomes**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 2 | 3 | 3 | 3 | 2 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 2 | 2 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 15 | 15 | 15 | 12 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | operating system LAB | **CC**  **VIII** | - | - | 4 | IV | 4 | 25 | 75 | 100 |
| Course Objectives:   * To learn Process management and scheduling * To understand the concepts and implementation of memory management policies. * To understand the various issues in Inter Process Communication. * To Analyze the memory management and its allocation policies. * To evaluate the requirement for process synchronization | | | | | | | | | | |
| Lab Exercises: | | | | | | | | | | |
| Applications:  1. Basic I/O Programming: To implement CPU Scheduling Algorithms  2. Shortest Job First Algorithm  3. First Come First Serve Algoritm  4. Round Robin and Priority Scheduling Algorithms  5. To implement reader / writer problem using semaphore  6. To implement Banker’s Algorithm for Deadlock Avoidance  7. Program for page replacement algorithms  8. First in First out Algorithm  9. Least Recently Used Algorithm  10. To implement first fit, best fit, worst fit algorithm for memory management  11. Program for Inter-Process Communication  **TOTAL HOURS: 60** | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 2 | 3 | 3 | 2 |
| **CO 4** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 5** | 3 | 2 | 3 | 3 | 2 | 3 |
| **Weightage of course contributed to each PSO** | 15 | 14 | 14 | 15 | 14 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

**THIRD YEAR –SEMESTER- V**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | **External** | **Total** | |
|  | | FUNDAMENTALS OF MICROPROCESSOR | **CC IX** | 6 | - | - | V | 4 | 25 | | 75 | 100 | |
| **Learning Objectives** | | | | | | | | | | | | | |
| LO1 | | The competence and the development of small to medium sized application programs that demonstrate professionally acceptable coding | | | | | | | | | | | |
| LO2 | | Demonstrate the concept of microprocessor | | | | | | | | | | | |
| LO3 | | Apply the concept of data transfer | | | | | | | | | | | |
| LO4 | | Develop CPU I/O Communication | | | | | | | | | | | |
| LO5 | | Understand the fundamental concepts of RISC and CISC | | | | | | | | | | | |
| **UNIT** | | **Contents** | | | | | | | | **No. Of. Hours** | | | |
| I | | Introduction of Microprocessor , Block Diagram of Micro Computer , Block Diagram of CPU with system Bus -Architecture–Bus Organization– Bus Organization in Microprocessor , Pin Detail , Diagram of Microprocessor , Data & Address deviation , Generate Control Signal in Microprocessor , Detail of Microprocessor Functional diagram and pin out diagram of 8085 | | | | | | | | **18** | | | |
| II | | Addressing modes of 8085 – Direct addressing Mode-Indirect Addressing Mode – Data Transfer - Instruction set of 8085 – simple programs | | | | | | | | **18** | | | |
| III | | I/O Schemes – Peripherals and Interfaces .Input – Output Organization: Input – output interface – I/O Bus and Interface – I/O Bus Versus Memory Bus – Isolated Versus Memory – Mapped I/O – Example of I/O Interface. Asynchronous data transfer: Strobe Control and Handshaking – Priority Interrupt: Daisy-Chaining Priority, Parallel Priority Interrupt. Direct Memory Access: DMA Controller, DMA Transfer. Input – Output Processor: CPU-IOP Communication. | | | | | | | | **18** | | | |
| IV | | Memory Organization: Memory Hierarchy – Main Memory- Associative memory: Hardware Organization, Match Logic, Read Operation, Write Operation. Cache Memory: Associative, Direct, Set associative Mapping – Writing Into Cache Initialization. Virtual Memory: Address Space and Memory Space, Address Mapping Using Pages, Associative Memory Page Table, Page Replacement. | | | | | | | | **18** | | | |
| V | | Introduction to 8086: Pin out diagram -Functional Block diagram of 8086 – Architecture instruction set-comparison with 8085 & 8086 :Interfacing IC –RISC & CISC | | | | | | | | **18** | | | |
| **TOTAL HOURS** | | | | | | | | | | **90** | | | |
| **Course Outcomes** | | | | | | | | | | **Programme Outcomes** | | |
| CO | On completion of this course, students will | | | | | | | | |  | | |
| CO1 | The competence and the development of small to medium sized application programs that demonstrate professionally acceptable coding | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO2 | Understand the concept of microprocessor | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO3 | Apply the concept of data transfer | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO4 | Develop CPU I/O Communication | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO5 | Understand the fundamental concepts of RISC and CISC | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| **Textbooks** | | | | | | | | | | | | |
| 1 | Microprocessor Architecture programming & application with 8085 & 8080 – by Ramesh.s. Gaonkar –Wiley eastern | | | | | | | | | | | |
| 2 | Introduction to microprocessors – Adithya.P.Mathus – TMH Publication | | | | | | | | | | | |
| 3 | Microprocessor interfaces – Douglas Hall – MC Graw Hill. | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
| 1 | 8086/8088 family Design, programming and interfacing by John Utter Bery - PHI. | | | | | | | | | | | |
| 2 | Microprocessors PC Hardware and interfacing –N.Mathivanan –PHI | | | | | | | | | | | |
|  | **Web Resources** | | | | | | | | | | | |
| 1 | <https://www.tutorialspoint.com/microprocessor-basics> | | | | | | | | | | | |
| 2 | <https://www.javatpoint.com/microprocessor-introduction> | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 2 |
| **CO 2** | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 4** | 2 | 3 | 3 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 15 | 15 | 14 | 15 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | FUNDAMENTALS OF MICROPROCESSOR lab | **CC**  **X** | 5 | - | - | V | 4 | 25 | 75 | 100 |
| **Course Objectives**: To explain the competence and the development of small to medium sized applicationTo understand programs that demonstrate professionally acceptable codingTo Demonstrate the concept of microprocessorTo emphasize Apply the concept of data transferTo Develop CPU I/O Communication Understand the fundamental concepts of RISC and CISCLAB EXERCISES: 1. Addition – 8 bit, 16 bit  2. Subtraction – 8 bit, 16 bit  3. Multiplication.  4. Array addition (multibyte)  5. Logical operators – AND, OR NOT.  6. Decimal to ASCII and ASCII to Decimal  7. Decimal to Hexa and Hexa to Decimal  8. Ascending Order.  9. Descending Order  10. Up/down Counter.  11. Block data transfer  12. Rotating display – Flashing display  13. Interfacing with LED's  14. Square wave Generators  15. Interfacing with ADC  16. Interfacing with DAC | | | | | | | | | | |
| **TOTAL HOURS : 75** | | | | | | | | | | |

|  |  |
| --- | --- |
| **Course Outcomes** | |
| CO | On completion of this course, students will |
| CO1 | The competence and the development of small to medium sized application |
| CO2 | programs that demonstrate professionally acceptable coding |
| CO3 | Demonstrate the concept of microprocessor |
| CO4 | Apply the concept of data transfer |
| CO5 | Develop CPU I/O Communication Understand the fundamental concepts of RISC and CISC |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 2 |
| **CO 2** | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 4** | 2 | 3 | 3 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 15 | 15 | 14 | 15 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | **External** | | **Total** |
|  | server administration | **cc**  **XI** | 5 | - | - | - | 4 | 25 | | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | |
| LO1 | To understand server editions and New Active Directory Features | | | | | | | | | | | |
| LO2 | To enable students to learn the basics of Set Up Server Roles Manually | | | | | | | | | | | |
| LO3 | To familiar with Registry Security | | | | | | | | | | | |
| LO4 | To learn about the IIS. | | | | | | | | | | | |
| LO5 | To enable the students to learn how to hardware bootup. | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | **No. Of. Hours** | |
| I | Introducing Windows Server 2003 -Windows Server 2003 Editions- Standard Edition-Enterprise Edition- Datacenter Edition -Web Edition- Brand New in Windows Server 2003- New Remote Administration Tools -New Active Directory Features -Availability and Reliability Improvements Resultant Set of Policies | | | | | | | | | | **15** | |
| II | Installation. Hardware Requirements. Hardware Compatibility List. Symmetric Multiprocessing Hardware. Clustering Hardware. Plug and Play Support -ACPI Issues - Developing a Deployment Plan -Document the Hardware Document the Network- Document the Software Document the Legacy Components- Prepare for Problems -Complete the Pre- installation Tasks .-Understanding Installation Models | | | | | | | | | | **15** | |
| III | System Basics for Servers . Manage Your Server . Configure Your Server Wizards Removing Server Roles Configure Your Server Log . Set Up Server Roles Manually . Remote Desktop - Enable Remote Desktop on the Server -Client Remote Connection Software . Starting a Remote Desktop Session- Running a Remote Desktop Session -Leaving a Remote Desktop Session- Managing the Connections from the Server -Joining the Console Session-Using a Snap-in for Remote Desktop . - Changes in IIS -Use Web Edition for IIS . Installing IIS -Set Compatibility Options Manually | | | | | | | | | | **15** | |
| IV | The Windows Server 2003 Registry. Overview of the Registry . Registry structure. Hives and Hive Files. Registry Data Items. HKEY\_CLASSES\_ROOT . HKEY\_CURRENT\_USER . Regedit.exe. Prevent Regedit from Displaying the Last Accessed Key . Accessing Remote Registries. Searching the Registry- Creating Favorites - Tweak and Troubleshoot with the Registry . Exporting Keys - Adding Items to the Registry - Registry Security -Auditing the Registry . Reg.exe . General Guidelines for Reg.exe . | | | | | | | | | | **15** | |
| V | Web Services: Introduction- Infrastructure- SOAP-Building web services- Deploying and publishing web services- Finding and consuming web services | | | | | | | | | | **15** | |
| **TOTAL HOURS** | | | | | | | | | | | **75** | |
| **Course Outcomes** | | | | | | | | | **Programme Outcomes** | | | |
| CO | On completion of this course, students will | | | | | | | |  | | | |
| CO1 | Understand the basics of Client /Server architecture | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | Understand the procedures of windows server installtion | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | Understand and remember the components in Server Editions | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | Understand the Client Remote Connection Software | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | Knowledge on Starting a Remote Desktop Session and Leaving a Remote Desktop Session | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | |
| 1 | Windows® Server 2003:The Complete Reference: By Kathy Ivens with Rich Benack, Christian Branson, John Green, David Heinz, Tim Kelly, John Linkous, Christopher McKettrick, Patrick J. Santry, Mitch Tulloch; Publications McGraw- Hill/Osborne | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
| 1. | Linux: Powerful Server Administration by Uday Sawant, Oliver Pelz, Jonathan Hobson, William Leemans | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | |
| 1. | https://www.manning.com/books/learn-sql-server-administration-in-a-month-of-lunches | | | | | | | | | | | |
| 2. | https://www.flipkart.com/pro-ubuntu-server-administration/p/itmfbfztnbhqujhn | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 2 | 3 | 3 | 3 | 2 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 2 | 2 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 15 | 15 | 15 | 13 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

**THIRD YEAR –SEMESTER- VI**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | **External** | | **Total** |
|  | | DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION | **CC**  **XIII** | 6 | - | - | VI | 4 | 25 | | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | | |
| LO1 | | Analyze and design combinational circuits | | | | | | | | | | | |
| LO2 | | Analyze and design sequential circuits | | | | | | | | | | | |
| LO3 | | To understand the basic structure and operation of a digital computer | | | | | | | | | | | |
| LO4 | | To study the design of data path unit, control unit for processor and to familiarize with the hazards. | | | | | | | | | | | |
| LO5 | | To understand the concept of various memories and I/O interfacing. | | | | | | | | | | | |
| **UNIT** | | **Contents** | | | | | | | | | | **No. Of. Hours** | |
| I | | **Combinational Circuits** – Karnaugh Map - Analysis and Design Procedures – Binary Adder – Subtractor – Decimal Adder - Magnitude Comparator – Decoder – Encoder – Multiplexers - Demultiplexers | | | | | | | | | | **18** | |
| II | | **Introduction to Sequential Circuits** – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation - Registers – Counters. | | | | | | | | | | **18** | |
| III | | **Functional Units of a Digital Computer**: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High Level Language. | | | | | | | | | | **18** | |
| IV | | **Instruction Execution** – Building a Data Path – Designing a Control Unit – Hardwired Control, Microprogrammed Control – Pipelining – Data Hazard – Control Hazards. | | | | | | | | | | **18** | |
| V | | **MEMORY AND I/O** - Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA | | | | | | | | | | **18** | |
| **TOTAL HOURS** | | | | | | | | | | | | **90** | |
| **Course Outcomes** | | | | | | | | | | **Programme Outcomes** | | | |
| CO | On completion of this course, students will | | | | | | | | |  | | | |
| CO1 | * Design various combinational digital circuits using logic gates | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | * Design sequential circuits and analyze the design procedures | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | State the fundamentals of computer systems and analyze the execution of an instruction | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | * Analyze different types of control design and identify hazards | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | Identify the characteristics of various memory systems and I/O communication | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | |
| 1 | M. Morris Mano, Michael D. Ciletti, “Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog”, Sixth Edition, Pearson Education, 2018. | | | | | | | | | | | | |
| 2 | David A. Patterson, John L. Hennessy, “Computer Organization and Design, The Hardware/Software Interface”, Sixth Edition, Morgan Kaufmann/Elsevier, 2020. | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1. | Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, “Computer Organization and Embedded Systems”, Sixth Edition, Tata McGraw-Hill, 2012. | | | | | | | | | | | | |
| 2 | William Stallings, “Computer Organization and Architecture – Designing for Performance”, Tenth Edition, Pearson Education, 2016. | | | | | | | | | | | | |
| 3 | M. Morris Mano, “Digital Logic and Computer Design”, Pearson Education, 2016. | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 2 |
| **CO 2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 2 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 15 | 14 | 15 | 15 | 14 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION LAB | **CC**  **XIV** | - | - | 5 | VI | 4 | 25 | 75 | 100 |
| **Objectives**  To improve efficiency and bringing important information to the surface more quickly than a system depending on human intervention, provide easy, scalable access to computing resources and IT services.  **LIST OF PROGRAMS**  1. Verification of Boolean theorems using logic gates.  2. Design and implementation of combinational circuits using gates for arbitrary functions.  3. Implementation of 4-bit binary adder/ subtractor circuits.  4. Implementation of code converters  5. Implementation of BCD adder, encoder and decoder circuits  6. Implementation of functions using Multiplexers.  7. Implementation of the synchronous counters  8. Implementation of a Universal Shift register.  9. Simulator based study of Computer Architecture | | | | | | | | | | |
| **TOTAL HOURS: 75** | | | | | | | | | | |

|  |  |
| --- | --- |
| **Course Outcomes** | |
| CO | On completion of this course, students will |
| CO1 | * Design various combinational digital circuits using logic gates |
| CO2 | * Design sequential circuits and analyze the design procedures |
| CO3 | State the fundamentals of computer systems and analyze the execution of an instruction |
| CO4 | * Analyze different types of control design and identify hazards |
| CO5 | Identify the characteristics of various memory systems and I/O communication |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 4** | 3 | 3 | 2 | 2 | 2 | 3 |
| **CO 5** | 3 | 2 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 15 | 14 | 14 | 13 | 14 | 15 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | **External** | | **Total** |
|  | | | web technology | **CC XV** | 5 | - | - | VI | 4 | 25 | | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | | | |
| **LO1** | To understand different Internet Technologies | | | | | | | | | | | | | |
| **LO2** | To learn java-specific web services architecture | | | | | | | | | | | | | |
| **LO3** | To Develop web applications using frameworks | | | | | | | | | | | | | |
| **LO4** | Introduce the concept of PHP and XML | | | | | | | | | | | | | |
| **LO5** | Understand about Angular and Web Applications Frameworks | | | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | | | **No. Of. Hours** | |
| I | Web Essentials: Clients, Servers and Communication – The Internet – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Drag and Drop – Audio – Video controls - CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations. Bootstrap Framework | | | | | | | | | | | | **15** | |
| II | Java Script: An introduction to JavaScript–JavaScript DOM Model-Exception Handling-ValidationBuilt-in objects-Event Handling- DHTML with JavaScript- JSON introduction – Syntax – Function Files. | | | | | | | | | | | | **15** | |
| III | Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- DATABASE CONNECTIVITY: JDBC. | | | | | | | | | | | | **15** | |
| IV | An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions- Form Validation. XML: Basic XML- Document Type Definition- XML Schema, XML Parsers and Validation, XSL , | | | | | | | | | | | | **15** | |
| V | Introduction to Angular JS, MVC Architecture, Understanding ng attributes, Expressions and data binding, Conditional Directives, Style Directives, Controllers, Filters, Forms, Routers, Modules, Services; Web Applications Frameworks and Tools – Firebase- Docker- Node JS- React- Django UI & UX. | | | | | | | | | | | | **15** | |
| **TOTAL HOURS** | | | | | | | | | | | | | **75** | |
| **Course Outcomes** | | | | | | | | | | | **Programme Outcomes** | | | |
| CO | | On completion of this course, students will | | | | | | | | |  | | | |
| CO1 | | * Construct a basic website using HTML and Cascading Style Sheets | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | | * Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | | Develop server side programs using Servlets and JSP. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | | * Construct simple web pages in PHP and to represent data in XML format. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | | Develop interactive web applications. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | | |
| 1. | | Deitel and Deitel and Nieto, Internet and World Wide Web - How to Program, Prentice Hall, 5th Edition, 2011. | | | | | | | | | | | | |
| 2. | | Jeffrey C and Jackson, Web Technologies A Computer Science Perspective, Pearson Education, 2011. | | | | | | | | | | | | |
| 3. | | Angular 6 for Enterprise-Ready Web Applications, Doguhan Uluca, 1st edition, Packt Publishing | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1. | | Stephen Wynkoop and John Burke “Running a Perfect Website”, QUE, 2nd Edition,1999. | | | | | | | | | | | | |
| 2. | | Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009. | | | | | | | | | | | | |
| 3. | | Gopalan N.P. and Akilandeswari J., “Web Technology”, Prentice Hall of India, 2011. | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 15 | 14 | 14 | 15 | 15 | 15 |

**S-Strong-3 M-Medium-2 L-Low-1**

**ANNEXURE I**

**SUGGESTED CORE COURSES**

**OBJECT ORIENTED PROGRAMMING USING C++**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
| **CC** | | **5** | **0** | **0** | **-** | **4** | **5** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | To inculcate knowledge on Object-oriented concepts and programming using C++. | | | | | | | | | | |
| **LO2** | Demonstrate the use of various OOPs concepts with the help of programs | | | | | | | | | | |
| **Unit** | **Contents** | | | | | | | | | **No. of Hours** | |
| I | OOP Paradigm – Concepts of OOP – Benefits of OOP - Object Oriented Languages – Applications of OOP – OOP Design: Using UML as a Design Tool Beginning with C++ | | | | | | | | | **15** | |
| II | Tokens, Expressions and Control Structures - Functions in C++ : Function Prototyping – Call by Reference - Return by Reference – Inline Function – Default Arguments – Const Arguments – Recursion – Function Overloading – Classes and Objects | | | | | | | | | **15** | |
| III | Constructors and Destructors: Constructors – Parameterized Constructors – Multiple Constructors – Constructor with default Arguments – Copy Constructors – Dynamic Constructor – Destructors – Operator Overloading and Type Conversions: Operator Overloading – Overloading Unary Operators – Overloading Binary operators – Rules for Operator Overloading – Type Conversions | | | | | | | | | **15** | |
| IV | Inheritance: Introduction – Types of Inheritance – Virtual Base Classes – Abstract Classes – Pointers - Virtual Function - Polymorphism | | | | | | | | | **15** | |
| V | Templates: Class Templates – Function Templates – Overloading of template Function – Exception Handling | | | | | | | | | **15** | |
| **TOTAL** | | | | | | | | | | **75** | |
| **CO** | Course Outcomes | | | | | | | | | | |
| CO1 | Outline the C++ programming fundamentals and the concepts of object-oriented programming like object and class, Encapsulation, inheritance and polymorphism. | | | | | | | | | | |
| CO2 | Classify the control structures, types of constructors, inheritance and different type conversion mechanisms. | | | | | | | | | | |
| CO3 | Analyze the importance of object oriented programming features like polymorphism, reusability, generic programming, data abstraction and the usage of exception handling. | | | | | | | | | | |
| CO4 | Determine the use of object oriented features such as classes, inheritance and templates to develop C++ programs for complex problems. | | | | | | | | | | |
| CO5 | Create a program in C++ by implementing the concepts of object-oriented programming. | | | | | | | | | | |
| **Textbooks** | | | | | | | | | | | |
|  | E. Balaguruswamy, (2013), “Object Oriented Programming using C++”, 6th Edition, Tata McGraw Hill. | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
| 1 | BjarneStroustrup, “The C++ Programming Language”, Fourth Edition, Pearson Education. | | | | | | | | | | |
| 2 | Hilbert Schildt, (2009), “C++ - The Complete Reference”, 4th Edition, Tata McGrawHill | | | | | | | | | | |
| **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | |
| 1. | http:/fahad.cprogramming.blogspot.com/p/c-simple-examples.html | | | | | | | | | | |
| 2. | <http://www.sitesbay.com/cpp/cpp-polymorphism> | | | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **2** | **3** | **3** | **2** |
| **CO2** | **3** | **3** | **2** | **3** | **3** | **2** |
| **CO3** | **3** | **3** | **3** | **3** | **3** | **2** |
| **CO4** | **3** | **3** | **2** | **3** | **3** | **2** |
| **CO5** | **3** | **3** | **2** | **3** | **3** | **2** |
| **Weightage ofcoursecontributedtoeachPSO** | **15** | **14** | **11** | **15** | **15** | **10** |

**C++ Programming Lab**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
| **CC** | | **0** | **0** | **5** | **-** | **4** | **5** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | To inculcate knowledge on Object-oriented concepts and programming using C++. | | | | | | | | | | |
| **LO2** | Demonstrate the use of various OOPs concepts with the help of programs | | | | | | | | | | |
|  | **List of Exercises** | | | | | | | | |  | |
| Exercises:   1. Working with Classes and Objects 2. Using Constructors and Destructors 3. Using Function Overloading 4. Using Operator Overloading 5. Using Type Conversions 6. Using Inheritance 7. Using Polymorphism 8. Using Console I/O 9. Using Templates 10. Using Exceptions   **TOTAL 75** | | | | | | | | | | | |
| **CO** | Course Outcomes | | | | | | | | | | |
| CO1 | Understand the fundamentals of C++ programming structure | | | | | | | | | | |
| CO2 | Identify the basic features of OOPS such as classes, objects, polymorphism, inheritance | | | | | | | | | | |
| CO3 | Analyze the concept of inheritance with the understanding of early and late binding, usage of exception handling, constructors, destructors, generic programming and type conversions | | | | | | | | | | |
| CO4 | Determine the use of various data structures such as stacks, queues and lists to solve various computing problems in C++ by incorporating OOPS concepts. | | | | | | | | | | |
| CO5 | Develop a program in C++ with the concepts of object oriented programming to solve real-world problems. | | | | | | | | | | |

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| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **2** | **3** | **2** | **2** |
| **CO2** | **3** | **3** | **2** | **3** | **2** | **2** |
| **CO3** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CO4** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **2** |
| **Weightage of course contributed to each PSO** | **15** | **14** | **13** | **15** | **11** | **10** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | | |
| **CIA** | | **External** | | **Total** | |
|  | | MACHINE LEARNING techniques | **CC** | 6 | - | - | - | 4 | 25 | | 75 | | 100 | |
| **Learning Objectives** | | | | | | | | | | | | | | |
| LO1 | | To Learn about Machine Intelligence and Machine Learning applications | | | | | | | | | | | | |
| LO2 | | To implement and apply machine learning algorithms to real-world applications | | | | | | | | | | | | |
| LO3 | | To identify and apply the appropriate machine learning technique to classification,  pattern recognition, optimization and decision problems | | | | | | | | | | | | |
| LO4 | | To create instant based learning | | | | | | | | | | | | |
| LO5 | | To apply advanced learning | | | | | | | | | | | | |
| **UNIT** | | **Contents** | | | | | | | | | | **No. Of. Hours** | | |
| I | | **Introduction Machine Learning** - Difference between AI, Machine Learning and Big data. Supervised and unsupervised learning, parametric vs non-parametric models, parametric models for classification and regression- Linear Regression, Logistic Regression, Naïve Bayes classifier, simple non-parametric classifier-K-nearest neighbour, support vector machines | | | | | | | | | | **18** | | |
| II | | **Neural networks and genetic algorithms** Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning. | | | | | | | | | | **18** | | |
| III | | **Bayesian and computational learning** Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model. | | | | | | | | | | **18** | | |
| IV | | **Instant based learning** K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning. | | | | | | | | | | **18** | | |
| V | | **Advanced learning** Recommendation systems – opinion mining, sentiment analysis. Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning. | | | | | | | | | | **18** | | |
| **TOTAL HOURS** | | | | | | | | | | | | **90** | | |
| **Course Outcomes** | | | | | | | | | | **Programme Outcomes** | | | |
| CO | On completion of this course, students will | | | | | | | | |  | | | |
| CO1 | * Appreciate the importance of visualization in the data analytics solution | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | Apply structured thinking to unstructured problems | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | Understand a very broad collection of machine learning algorithms and problems | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theor | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | Develop an appreciation for what is involved in learning from data. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | |
| 1 | Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013. | | | | | | | | | | | | |
| 2 | Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning" 2015, MIT Press | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1. | EthemAlpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004. | | | | | | | | | | | | |
| 2 | Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009. | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 4** | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 2 |
| **Weightage of course contributed to each PSO** | 15 | 15 | 14 | 15 | 14 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | MACHINE LEARNING LAB | **CC** | - | - | 5 | - | 4 | 25 | 75 | | 100 |
| **Learning Objectives**:  To apply the concepts of Machine Learning to solve real-world problems and to implement basic algorithms in clustering & classification applied to text & numeric data | | | | | | | | | | | |
| LAB EXERCISES | | | | | | | | | | Required Hour | |
| 1. Solving Regression & Classification using Decision Trees 2. Root Node Attribute Selection for Decision Trees using Information Gain 3. Bayesian Inference in Gene Expression Analysis 4. Pattern Recognition Application using Bayesian Inference 5. Bagging in Classification 6. Bagging, Boosting applications using Regression Trees 7. Data & Text Classification using Neural Networks 8. Using Weka tool for SVM classification for chosen domain application 9. Data & Text Clustering using K-means algorithm 10. Data & Text Clustering using Gaussian Mixture Models | | | | | | | | | | **75** | |

|  |  |
| --- | --- |
| **Course Outcomes** | |
| CO | On completion of this course, students will |
| CO1 | Effectively use the various machine learning tools |
| CO2 | Understand and implement the procedures for machine learning algorithms CO3 |
| CO3 | Design Python programs for various machine learning algorithms |
| CO4 | Apply appropriate datasets to the Machine Learning algorithms |
| CO5 | Analyze the graphical outcomes of learning algorithms with specific datasets |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 2 |
| **CO 2** | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 4** | 2 | 3 | 3 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 15 | 15 | 14 | 15 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | | | Data Science | **CC** | 5 | - | - | - | 4 | 25 | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | | | |
| LO1 | | | To understand the basic concepts of Data Science | | | | | | | | | | | |
| LO2 | | | To understand the principles of algorithms, flowchart and source code | | | | | | | | | | | |
| LO3 | | | To acquire a solid foundation in Python. | | | | | | | | | | | |
| LO4 | | | To visualize data using plots in python | | | | | | | | | | | |
| LO5 | | | To understand and handle database and visualize. | | | | | | | | | | | |
| **UNIT** | | | **Contents** | | | | | | | | | | **No. Of. Hours** | |
| I | | | **Introduction to Data Science** Introduction: Data Science - Big Data and Data Science hype – getting past the hype - Datafication - Current landscape of perspectives - Skill sets needed - Statistical Inference - Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA – Applications of Data Science - Data Science in Business - Business Intelligence vs Data Science – Data Analytics Life Cycle - Machine Learning | | | | | | | | | | **15** | |
| II | | | **Introduction to Python** Features of Python - How to Run Python – Identifiers- Reserved Keywords- Variables - Comments in Python - Indentation in Python - Multi-Line Statements- Input, Output and Import Functions- Operators. Data Types and Operations: Numbers -Strings -List -Tuple - Set -Dictionary - Mutable and Immutable Objects - Data Type Conversion. Flow Control: Decision Making-Loops-Nested Loops-Control Statements- Types of Loops-List Comprehensions-Set Comprehensions-Dictionary Comprehensions-Nested Dictionaries. | | | | | | | | | | **15** | |
| III | | | **Functions** Function Definition - Function Calling - Function Arguments - Anonymous Functions (Lambda Functions) - Recursive Functions - Modules and Packages: Built-in Modules - Creating Modules - import Statement- Namespaces and Scope - The dir() function - The reload() function -Packages in Python - Date and Time Modules – Numpy Libraries and Data Manipulation Using Pandas | | | | | | | | | | **15** | |
| IV | | | **File Handling and Object Oriented Programming** Opening a File-Closing a File - Writing to a File - Reading from a File - File Methods - Renaming a File - Deleting a File - Directories in Python. Regular Expressions. Class Definition - Creating Objects - Built-in Attribute Methods - Built-in Class Attributes - Destructors in Python - Encapsulation - Data Hiding – Inheritance-Method Overriding – Polymorphism - Exception Handling | | | | | | | | | | **15** | |
| V | | | **Database Programming and Visualizations** Connecting to a Database - Creating Tables - INSERT Operation - UPDATE Operation - DELETE Operation - READ Operation - Transaction Control -Disconnecting from a Database - Exception Handling in Databases - GUI Programming - CGI Programming- Data Visualizations using Matplotlib – histograms, bar charts, pie charts. | | | | | | | | | | **15** | |
| **TOTAL HOURS** | | | | | | | | | | | | | **75** | |
| **Course Outcomes** | | | | | | | | | | | **Programme Outcomes** | | | |
| CO | | On completion of this course, students will | | | | | | | | |  | | | |
| CO1 | | To explain the basic concepts of data science and its application | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | | * To explain the Features of Python * To demonstrate Control Statements and Looping Statements | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | | To understand Python Functions  To create and illustrate Numpy Libraries  To perform Data Manipulation using Pandas. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | | * To understand the File Concepts * Apply Exception Handling Techniques | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | | To Create and manipulate Database  To create Data Visualization using Mat plot lib | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | | |
| 1 | Doing Data Science**,** Straight Talk From The Frontline**, Cathy O'Neil and Rachel**  **Schutt, O'Reilly** (2014) | | | | | | | | | | | | | |
| 2 | Big Data Analytics, paperback 2nd ed., **Seema Acharya, SubhasiniChellappan, Wiley** | | | | | | | | | | | | | |
| 3 | **Dr. Jeeva Jose (2018) ,**Taming Python By Programming, Khanna Publishers | | | | | | | | | | | | | |
| 4 | **Jake Vanderplas,** Python Data Science Handbook: Essential Tools for Working with Data 1st Edition. | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1. | LjubomirPerkovic(2012),Introduction to Computing Using Python: An Application DevelopmentFocus, John Wiley & Sons | | | | | | | | | | | | | |
| 2. | John V Guttag(2013), Introduction to Computation and Programming Using Python‟, Revised and expanded Edition, MIT Press. | | | | | | | | | | | | | |
| 3 | Kenneth A. Lambert(2012), Fundamentals of Python: First Programs, C engage Learning | | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 5** | 2 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 14 | 15 | 15 | 15 | 15 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | Data Science LAB | **CC** | - | - | 4 | - | 4 | 25 | 75 | | 100 |
| **OBJECTIVES:**  To build websites and software, automate tasks, and conduct data analysis.Open Source and Community Development. | | | | | | | | | | | |
|  | | | | | | | | | | **Required Hours** | |
| **LIST OF PROGRAMS**  1. Demonstrate the working of “id” and “type” functions.  2. Find all prime numbers within a given range.  3. Print n terms of Fibonacci series using iteration.  4. Demonstrate use of slicing in string.  5. Compute the frequency of the words from the input. The output should output after sorting the key alphanumerically.  6. Write a program that accepts a comma separated sequence of words as input and prints the words in a comma-separated sequence after sorting them alphabetically.  7. Demonstrate use of list & related functions.  8. Demonstrate use of Dictionary & related functions.  9. Demonstrate use of tuple & related functions.  10. Implement stack using list.  11. Implement queue using list.  12. Read and write from a file.  13. Copy a file.  14. Demonstrate working of classes and objects.  15. Demonstrate class method & static method.  16. Demonstrate constructors.  17. Demonstrate inheritance.  18. Demonstrate aggregation/composition.  19. Create a small GUI application for insert, update and delete in a table.  20. Bar charts, histograms and pie charts | | | | | | | | | | **60** | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 5** | 2 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 14 | 15 | 15 | 15 | 15 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | | |
| **CIA** | | **External** | | **Total** | |
|  | | MOBILE APPLICATION DEVELOPMENT | **CC** | 6 | - | - | - | 4 | 25 | | 75 | | 100 | |
| **Learning Objectives** | | | | | | | | | | | | | | |
| LO1 | | Develop in-depth Knowledge about the architecture and features of Android | | | | | | | | | | | | |
| LO2 | | Implementing the various options available in views. | | | | | | | | | | | | |
| LO3 | | Understand the file handling concepts and thereby enabling to manage data efficiently. | | | | | | | | | | | | |
| LO4 | | Able to describe clearly the features of SMS messaging. | | | | | | | | | | | | |
| LO5 | | Illustrate the concepts of Location Based Services | | | | | | | | | | | | |
| **UNIT** | | **Contents** | | | | | | | | | | **No. Of. Hours** | | |
| I | | **Android Fundamentals:** Android overview and Versions –Features of Android – Architecture of Android - Setting up Android Environment (Eclipse/Android Studio, SDK, AVD)- Anatomy of an Android Application - Simple Android Application Development. | | | | | | | | | | **18** | | |
| II | | **Android User Interface:** Layouts: Linear, Relative, Frame and Scrollview- Managing changes to Screen Orientation. Views: TextView, Button, ImageButton, EditText, CheckBox, RadioButton, RadioGroup, ProgressBar, AutoCompleteTextView, ListViews and WebView | | | | | | | | | | **18** | | |
| III | | **Data Persistence:** Saving and Loading User Preferences. File Handling: File System-Internal and External Storage-Permissions-File Manipulation-Managing Data using Sqlite: Creation of database-Insertion, Retrieval and Updation of records. | | | | | | | | | | **18** | | |
| IV | | **SMS Messaging:** Sending and Receiving messages - Sending E-mail–Networking: Downloading Binary Data – Downloading Text Files. | | | | | | | | | | **18** | | |
| V | | **Location Based Services:** Displaying maps- Displaying zoom control- Changing view – Adding Markers- Getting the location – Geo-coding Publishing Android Applications: Preparing for publishing-Deploying APK Files. | | | | | | | | | | **18** | | |
| **TOTAL HOURS** | | | | | | | | | | | | **90** | | |
| **Course Outcomes** | | | | | | | | | | **Programme Outcomes** | | | |
| CO | On completion of this course, students will | | | | | | | | |  | | | |
| CO1 | * Appreciate the importance of visualization in the data analytics solution | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | Apply structured thinking to unstructured problems | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | Understand a very broad collection of machine learning algorithms and problems | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theor | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | Develop an appreciation for what is involved in learning from data. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | |
| 1 | **WeiMeng Lee (2012),** “*Beginning Android Application Development*”, WroxPublications (John Wiley, New York) | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1. | **Ed Burnette**, “*Hello Android: Introducing Google's Mobile Development Platform*”, 3rd edition, 2010, The Pragmatic Publishers. | | | | | | | | | | | | |
| 2 | **Reto Meier**, “*Professional Android 4 Application Development*”, 2012, Wrox Publications (John Wiley, New York). | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | |
| 1. | https://www.tutorialspoint.com/mobile\_development\_tutorials.htm | | | | | | | | | | | | |
| 2 | https://www.tutorialspoint.com › Android › Android - Home | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 2 | 2 | 3 |
| **CO 3** | 3 | 2 | 3 | 2 | 3 | 3 |
| **CO 4** | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 15 | 14 | 14 | 13 | 14 | 15 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | |
| **CIA** | | **External** | **Total** |
|  | | MOBILE APPLICATION DEVELOPMENT lab | **CC** | - | - | 5 | - | 4 | 25 | | 75 | 100 |
| **Course Objectives**: To explain user defined functions and the concepts of class.To demonstrate the creation cookies and sessionsTo facilitate the creation of Database and validate the user inputs | | | | | | | | | | | | |
| Lab Exercises | | | | | | | | | | **Required Hours** | | |
| Develop an application for Simple Counter.  1. Develop an application to display your personal details using GUI Components. 2. Develop a Simple Calculator that uses radio buttons and text view. 3. Develop an application that uses Intent and Activity. 4. Develop an application that uses Dialog Boxes. 5. Develop an application to display a Splash Screen. 6. Develop an application that uses Layout Managers. 7. Develop an application that uses different types of Menus. 8. Develop an application that uses to send messages from one mobile to another mobile. 9. Develop an application that uses to send E-mail. Develop an application that plays Audio and Video. 10. Develop an application that uses Local File Storage. 11. Develop an application for Simple Animation. 12. Develop an application for Login Page using Sqlite. 13. Develop an application for Student Marksheet processing using Sqlite. | | | | | | | | | | **75** | | |
| **Course Outcomes** | | | | | | | | | | | | |
| CO | On completion of this course, students will | | | | | | | | | | | |
| CO1 | To understand the concepts of counters and dialogs. | | | | | | | | | | | |
| CO2 | Concepts of Layout Managers. Perform sending email on audio and video  To enable the applications of audio and video. | | | | | | | | | | | |
| CO3 | To apply Local File Storage and Development of files. | | | | | | | | | | | |
| CO4 | To determine the concepts of Simple Animation To apply searching pages. | | | | | | | | | | | |
| CO5 | Usage of Student mark sheet- preparation in MAD.  Concepts of processing Sqlite are implemented. | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 2 |
| **CO 2** | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 15 | 15 | 15 | 13 | 15 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

**SOFTWARE PROJECT MANAGEMENT**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
| **CC** | | **5** | **0** | **0** | **-** | **4** | **4** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | To define and highlight importance of software project management. | | | | | | | | | | |
| **LO2** | To formulate and define the software management metrics & strategy in managing projects | | | | | | | | | | |
| **LO3** | Understand to apply software testing techniques in commercial environment | | | | | | | | | | |
| **Unit** | **Contents** | | | | | | | | | **No. of Hours** | |
| I | Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models - The SEI CMM - International Organization for Standardization. | | | | | | | | | **15** | |
| II | Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project -Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones - Work Packages - Building a WBS for Software. | | | | | | | | | **15** | |
| III | Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed. | | | | | | | | | **15** | |
| IV | Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling. | | | | | | | | | **15** | |
| V | Quality: Requirements – The SEI CMM - Guidelines - Challenges - Quality Function Deployment - Building the Software Quality Assurance - Plan - Software Configuration Management: Principles - Requirements - Planning and Organizing - Tools - Benefits - Legal Issues in Software - Case Study | | | | | | | | | **15** | |
| **TOTAL** | | | | | | | | | | **75** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | Understand the principles and concepts of project management | | | | | | | | | | |
| CO2 | Knowledge gained to train software project managers | | | | | | | | | | |
| CO3 | Apply software project management methodologies. | | | | | | | | | | |
| CO4 | Able to create comprehensive project plans | | | | | | | | | | |
| CO5 | Evaluate and mitigate risks associated with software development process | | | | | | | | | | |
| **Textbooks** | | | | | | | | | | | |
|  | Robert T. Futrell, Donald F. Shafer, Linda I. Safer, “Quality Software Project Management”, Pearson Education Asia 2002. | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
| 1. | Pankaj Jalote, “Software Project Management in Practice”, Addison Wesley 2002. | | | | | | | | | | |
| 2. | Hughes, “Software Project Management”, Tata McGraw Hill 2004, 3rd Edition. | | | | | | | | | | |
| **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | |
| 1. | NPTEL & MOOC courses titled Software Project Management | | | | | | | | | | |
| 2. | [www.smartworld.com/notes/software-project-management](http://www.smartworld.com/notes/software-project-management) | | | | | | | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **1** | **2** | **2** | **2** |
| **CO2** | **3** | **1** | **3** | **2** | **2** | **2** |
| **CO3** | **2** | **3** | **2** | **3** | **3** | **3** |
| **CO4** | **3** | **3** | **2** | **3** | **3** | **2** |
| **CO5** | **2** | **2** | **2** | **3** | **3** | **3** |
| **Weightageof coursecontributed**  **toeachPSO** | **13** | **11** | **10** | **13** | **13** | **12** |

**software engineering Lab**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
| **CC** | | **0** | **0** | **5** | **-** | **4** | **5** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | To Impart Practical Training in Software Engineering | | | | | | | | | | |
| **LO2** | To understand about different Software Testing | | | | | | | | | | |
| **LO3** | Learn to write test cases using different testing techniques. | | | | | | | | | | |
| **List of Exercises** | | | | | | | | | | | |
| **Do the following 8 exercises for any project projects (Eg. Student Portal, Online exam registration)**  1) Development of problem statement.  2) Preparation of Software Requirement Specification Document.  3) Preparation of Software Configuration Management and Risk Management related documents.  4) Draw the entity relationship diagram  5) Draw the data flow diagrams at level 0 and level 1  6) Draw use case diagram  7) Draw activity diagram of all use cases.  8) Performing the Design by using any Design phase CASE tools.  9) Develop test cases for unit testing and integration testing  10) Develop test cases for various white box and black box testing techniques | | | | | | | | | | | |
| **TOTAL** | | | | | | | | | | **75** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | An ability to use the methodology and tools necessary for engineering practice. | | | | | | | | | | |
| CO2 | Ability to elicit, analyze and specify software requirements. | | | | | | | | | | |
| CO3 | Analyze and translate specifications into a design. | | | | | | | | | | |
| CO4 | Ability to derive test cases for different testing. | | | | | | | | | | |
| CO5 | Apply software engineering perspective through requirements analysis, software design and construction, verification, and validation to develop solutions to modern problems | | | | | | | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **2** | **3** | **2** | **2** | **2** |
| **CO2** | **2** | **3** | **3** | **3** | **3** | **2** |
| **CO3** | **2** | **2** | **3** | **3** | **3** | **3** |
| **CO4** | **3** | **2** | **2** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **13** | **12** | **14** | **14** | **14** | **13** |

**ANNEXURE I – DISCIPLINE SPECIFIC**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | **External** | | **Total** |
|  | ANALYTICS FOR SERVICE INDUSTRY | | **Elect** | 4 | - | - | - | 3 | 25 | | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | | |
| **LO1** | Recognize challenges in dealing with data sets in service industry. | | | | | | | | | | | | |
| **LO2** | Identify and apply appropriate algorithms for analyzing the healthcare, Human resource, hospitality and tourism data. | | | | | | | | | | | | |
| **LO3** | Make choices for a model for new machine learning tasks. | | | | | | | | | | | | |
| **LO4** | To identify employees with high attrition risk. | | | | | | | | | | | | |
| **LO5** | To Prioritizing various talent management initiatives for your organization. | | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | | **No. Of. Hours** | |
| I | **Healthcare Analytics :** Introduction to Healthcare Data Analytics- Electronic Health Records– Components of EHR- Coding Systems- Benefits of EHR- Barrier to Adopting HER Challenges-Phenotyping Algorithms. Biomedical Image Analysis and Signal Analysis- Genomic Data Analysis for Personalized Medicine. Review of Clinical Prediction Models. | | | | | | | | | | | **12** | |
| II | **Healthcare Analytics Applications :** Applications and Practical Systems for Healthcare– Data Analytics for Pervasive Health- Fraud Detection in Healthcare- Data Analytics for Pharmaceutical Discoveries- Clinical Decision Support Systems- Computer- Assisted Medical Image Analysis Systems- Mobile Imaging and Analytics for Biomedical Data. | | | | | | | | | | | **12** | |
| III | **HR Analytics:** Evolution of HR Analytics, HR information systems and data sources, HR Metric and HR Analytics, Evolution of HR Analytics; HR Metrics and HR Analytics; Intuition versus analytical thinking; HRMS/HRIS and data sources; Analytics frameworks like LAMP, HCM:21(r) Model. | | | | | | | | | | | **12** | |
| IV | **Performance Analysis:** Predicting employee performance, Training requirements, evaluating training and development, Optimizing selection and promotion decisions. | | | | | | | | | | | **12** | |
| V | **Tourism and Hospitality Analytics:** Guest Analytics – Loyalty Analytics – Customer Satisfaction – Dynamic Pricing – optimized disruption management – Fraud detection in payments. | | | | | | | | | | | **12** | |
| **TOTAL HOURS** | | | | | | | | | | | | **60** | |
| **Course Outcomes** | | | | | | | | | | | **Programme Outcomes** | | | |
| CO | | | On completion of this course, students will | | | | | | | |  | | | |
| CO1 | | | Understand and critically apply the concepts and methods of business analytics | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | | | Identify, model and solve decision problems in different settings. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | | | Interpret results/solutions and identify appropriate courses of action for a given managerial situation whether a problem or an opportunity. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | | | Create viable solutions to decision making problems. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | | | Instill a sense of ethical decision-making and a commitment to the long-run welfare of both organizations and the communities they serve. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | | |
| 1 | | | Chandan K. Reddy and Charu C Aggarwal, “Healthcare data analytics”, Taylor & Francis, 2015. | | | | | | | | | | | |
| 2 | | | Edwards Martin R, Edwards Kirsten (2016),“Predictive HR Analytics: Mastering the HR Metric”, Kogan Page Publishers, ISBN-0749473924 | | | | | | | | | | | |
| 3 | | | Fitz-enzJac (2010), “The new HR analytics: predicting the economic value of your company’s human capital investments”, AMACOM, ISBN-13: 978-0-8144-1643-3 | | | | | | | | | | | |
| 4 | | | RajendraSahu, Manoj Dash and Anil Kumar. Applying Predictive Analytics Within the Service Sector. | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1. | | | Hui Yang and Eva K. Lee, “Healthcare Analytics: From Data to Knowledge to Healthcare Improvement, Wiley, 2016 | | | | | | | | | | | |
| 2. | | | Fitz-enzJac, Mattox II John (2014), “Predictive Analytics for Human Resources”, Wiley, ISBN- 1118940709. | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| 1. | | | <https://www.ukessays.com/essays/marketing/contemporary-issues-in-marketing-marketing-essay.php> | | | | | | | | | | | |
| 2. | | | <https://yourbusiness.azcentral.com/examples-contemporary-issues-marketing-field-26524.html> | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 2 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 2 | 3 | 3 | 2 |
| **CO 4** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 15 | 14 | 15 | 15 | 14 |

S-Strong-3 M-Medium-2 L-Low-1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | | **External** | **Total** |
|  | FINANCIAL ANALYTICS | **Elect** | 4 | - | - | - | 3 | 25 | | | 75 | 100 |
| **Learning Objectives** | | | | | | | | | | | | |
| **LO1** | To analyze and model financial data. | | | | | | | | | | | |
| **LO2** | To construct and optimize asset portfolios. | | | | | | | | | | | |
| **LO3** | To evaluate and model Risk on various financial assets. | | | | | | | | | | | |
| **LO4** | To use the most powerful and sophisticated routines in R for analytical finance. | | | | | | | | | | | |
| **LO5** | To acquire logical & analytical skills in financial analytics. | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | **No. Of. Hours** | | |
| I | **Financial Analytics:** Introduction: Meaning-Importance of Financial Analytics uses-Features-Documents used in Financial Analytics: Balance Sheet, Income Statement, Cash flow statement-Elements of Financial Health: Liquidity, Leverage, Profitability. Financial Securities: Bond and Stock investments - Housing and Euro crisis - Securities Datasets and Visualization - Plotting multiple series. | | | | | | | | | **12** | | |
| II | **Descriptive Analytics:** Data Exploration, Dimension Reduction and Data Clustering Geographical Mapping, Market Basket Analysis. Predictive Analytics, Fraud Detection, Churn Analysis, Crime Mapping, Content Analytics, Sentiment Analysis. Analyzing financial data and implement financial models. Process of Data analytics: obtaining publicly available data, refining such data, implement the models and generate typical output, Prices and individual security returns, Portfolio returns, Risks, Factor Models. | | | | | | | | | **12** | | |
| III | **Forecasting Analytics:** Estimating Demand Curves and Optimize Price, Price Bundling, Non Linear Pricing and Price Skimming, Forecasting, Simple Regression and Correlation Multiple Regression to forecast sales. Modeling Trend and Seasonality Ratio to Moving Average Method, Winter’s Method. | | | | | | | | | **12** | | |
| IV | **Business Intelligence &Tableau:** Definition of BI – A Brief History of BI – The Architecture of BI. The origin and Drivers of BI. Successful BI Implementation – Analytics Overview – Descriptive, Predictive and Perspective Analytics. Business reporting and Visualization – components - A brief history of data visualization – Different types of charts and graphs – The emergence of data visualization and visual analytics – Performance dashboards – Dashboard design – Best practices in dashboarddesign – Business performance management – Balanced Scorecards – Six sigma as a performance measurement system. | | | | | | | | | **12** | | |
| V | **Visualizations:** Using Tableau to Summarize Data, Slicing and Dicing Financial Data, Charts to Summarize Marketing Data. Functions to Summarize Data, Pricing Analytics, Risk based pricing, Fraud Detection and Prediction, Recovery Management, Loss Risk Forecasting, Risk Profiling, Portfolio Stress Testing. | | | | | | | | | **12** | | |
| **Course Outcomes** | | | | | | | | | | **Programme Outcomes** | | | |
| CO | | On completion of this course, students will | | | | | | | |  | | | |
| CO1 | | Interpret and discuss the outputs of given financial models and create their own models. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | | Design and create visualizations that clearly communicate financial data insights. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | | Gain essential knowledge and hands-on experience in the data analysis process, including data scraping, manipulation, and exploratory data analysis. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | | Be prepared for more advanced applied financial modeling courses. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | | Improve leadership, teamwork and critical thinking skills for financial decision making. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | |
| 1 | | Analysis of Economic Data, Gary Koop, (4th Edition), Wiley. | | | | | | | | | | | |
| 2 | | Statistics and Data Analysis for Financial Engineering: with R examples; David Ruppert, David S. Matteson, Springers | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1. | | Analyzing Financial Data and Implementing Financial Models Using „R‟, Ang Clifford, Springers. | | | | | | | | | | | |
| 2. | | Microsoft Excel 2013: Data Analysis and Business Modeling, Wayne L. Winston, Microsoft Publishing | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | |
| 1. | | <https://www.techtarget.com/searcherp/definition/financial-analytics> | | | | | | | | | | | |
| 2. | | <https://www.teradata.com/Glossary/What-is-Finance-Analytics> | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 2 | 3 | 3 | 3 | 2 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 2 | 2 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 15 | 15 | 15 | 12 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | **External** | | **Total** |
|  | MARKETING ANALYTICS | | **ELECT** | 4 | - | - | - | 3 | 25 | | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | | |
| LO1 | | Understand the importance of marketing analytics for forward looking and systematic allocation of marketing resources 2. | | | | | | | | | | | |
| LO2 | | Know how to use marketing analytics to develop predictive marketing dashboard for organization | | | | | | | | | | | |
| LO3 | | Recognize challenges in dealing with data sets in marketing. | | | | | | | | | | | |
| LO4 | | Identify and apply appropriate algorithms for analyzing the social media and web data | | | | | | | | | | | |
| LO5 | | Make choices for a model for new machine learning tasks. | | | | | | | | | | | |
| **UNIT** | | **Contents** | | | | | | | | | | **No. Of. Hours** | |
| I | | **Marketing Analytics :** Introduction to marketing research, Research design setup, Qualitative research, Quantitative research, Concept development, scale development, Exploring Data, Descriptive Statistics. Product analytics- features, attributes, benefits, Price analytics, Promotion analytics, Channel analytics, Multiple Discriminate analysis. | | | | | | | | | | **12** | |
| II | | **Customer Analytics:** Customer Analytics, Analyzing customer satisfaction, Prospecting and Targeting the Right Customers, Covariance and Correlation analysis, Developing Customers, Retaining Customers, Customer lifetime value case, Factor analysis. Market Segmentation & Cluster Analysis, Scatterplots & Correlation Analysis, Linear Regression, Model Validation & Assessment, Positioning analytics, Cross tabulation**.** | | | | | | | | | | **12** | |
| III | | **Social Media Analytics (SMA)** :Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Application of SMA in different areas Network fundamentals and models: The social networks perspective - nodes, ties and influencers, Social network and web data and methods. Graphs and Matrices- Basic measures for individuals and networks. Information visualization. | | | | | | | | | | **12** | |
| IV | | **Facebook Analytics:** Introduction, parameters, demographics. Analyzing page audience. Reach and Engagement analysis. Post- performance on FB. Social campaigns. Measuring and Analyzing social campaigns, defining goals and evaluating outcomes, Network Analysis. 9 (LinkedIn, Instagram, YouTube Twitter etc. Google analytics. Introduction. (Websites) | | | | | | | | | | **12** | |
| V | | **Web Analytics and making connections** : Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity. Web analytics tools: Clickstream analysis, A/B testing, online surveys, Web crawling and Indexing. | | | | | | | | | | **12** | |
| **TOTAL HOURS** | | | | | | | | | | | | **60** | |
| **Course Outcomes** | | | | | | | | | | **Programme Outcomes** | | | |
| CO | | On completion of this course, students will | | | | | | | |  | | | |
| CO1 | | Critically evaluate the key analytical frameworks and tools used in marketing.  Apply key marketing theories, frameworks and tools to solve marketing problems. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | | Utilize information of a firm's external and internal marketing environment to identify and prioritize appropriate marketing strategies. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | | Exercise critical judgment through engagement and reflection with existing marketing literature and new developments in the marketing environment. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | | Critically evaluate the marketing function and the role it plays in achieving organizational success both in commercial and non-commercial settings. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | | Evaluate and act upon the ethical and environmental concerns linked to marketing activities. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | |
| 1 | | Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World, Chuck Hemann & Ken Burbary, Pearson, ISBN 9780789750303 | | | | | | | | | | | |
| 2 | | Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die, Eric Siegel, Pearson. | | | | | | | | | | | |
| 3 | | Marketing Analytics: Optimize Your Business with Data Science in R, Python, and SQL, Dave Jacobs. | | | | | | | | | | | |
| 4 | | Matthew Ganis, Avinash Kohirkar. Social Media Analytics: Techniques and Insights for Extracting Business Value Out of Social Media. Pearson 2016. | | | | | | | | | | | |
| 5 | | Jim Sterne. Social Media Metrics: How to Measure and Optimize Your Marketing Investment. Wiley, 2020. | | | | | | | | | | | |
| 6 | | Marshall Sponder. Social Media Analytics. McGraw Hill Latest edition. | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1. | | Marketing Analytics: A practical guide to real marketing science, Mike Grigsby, Kogen Page, ISBN 9780749474171 | | | | | | | | | | | |
| 2. | | Cutting Edge Marketing Analytics: Real World Cases and Data Sets for Hands on Learning, Raj Kumar Venkatesan, Paul Farris, Ronald T. Wilcox. | | | | | | | | | | | |
| 3. | | Marketing Metrices3e, Bendle, Farris, Pferfery, Reibstein | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | |
| 1. | | <https://www.coursera.org/learn/uva-darden-market-analytics> | | | | | | | | | | | |
| 2. | | https://www.wrike.com/marketing-guide/marketing-analytics/ | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 2 | 3 | 3 | 3 | 2 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 2 | 2 |
| **CO 4** | 3 | 3 | 2 | 3 | 2 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 15 | 14 | 15 | 12 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | **External** | | **Total** |
|  | DATA COMMUNICATION AND COMPUTER NETWORKS | **Elective** | 4 | - | - | - | 3 | 25 | | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | |
| LO1 | To introduce the fundamental network architecture concepts and their core principle issues in the emerging communication / data networks. | | | | | | | | | | | |
| LO2 | To have a complete picture of the data and computer networks systematically | | | | | | | | | | | |
| LO3 | To provide a strong foundation in networking concepts and technology | | | | | | | | | | | |
| LO4 | To know the significance of various Flow control and Congestion control Mechanisms | | | | | | | | | | | |
| LO5 | To know the Functioning of various Application layer Protocols. | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | **No. Of. Hours** | |
| I | **Data Communications:** Introduction– Networks – The Internet – Protocols and Standards- Network Models: OSI model – TCP/IP protocol suite – Transmission Media: Guided media – Unguided Media. | | | | | | | | | | **12** | |
| II | **Data Link Layer:** Error Detection and Correction: Introduction- Block coding – Linear block codes – Cyclic Codes – Checksum. Framing – Flow and Error Control: Protocols –Noiseless Channels: Stop- and –Wait – Noisy Channel: Stop-and Wait Automatic Repeat Request-Go-Back –N. | | | | | | | | | | **12** | |
| III | **Medium Access and Network Layer:** Multiple Access: Random Access – Controlled access- Channelization. Network Layer Logical addressing: IPv4 addresses – IPv6 addresses. Transport Layer: Process to Process delivery: UDP – TCP. Congestion Control – Quality of Service | | | | | | | | | | **12** | |
| IV | **Application Layer:** Domain Naming System: Name Space - Domain Name Space - Distribution of Name Space - DNS in the INTERNET - Resolution–Remote logging – E-mail – FTP. | | | | | | | | | | **12** | |
| V | **Wireless Networks:** Wireless Communications – Principles and Fundamentals. WLANs – WPAN- Satellite Networks - Ad-hoc Networks | | | | | | | | | | **12** | |
| **TOTAL HOURS** | | | | | | | | | | | **60** | |
| **Course Outcomes** | | | | | | | | | **Programme Outcomes** | | | |
| CO | On completion of this course, students will | | | | | | | |  | | | |
| CO1 | Understand the basics of data communication, networking, internet and their importance. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | Analyze the services and features of various protocol layers in data networks. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | Differentiate wired and wireless computer networks | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | Analyze TCP/IP and their protocols. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | Recognize the different internet devices and their functions. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | |
| 1 | Forouzan, A. Behrouz. (2006), Data Communications & Networking, Fourth Edition, Tata McGraw Hill Education | | | | | | | | | | | |
| 2 | Nicopolitidis, Petros, Mohammad SalamehObaidat, G. L. Papadimitriou(2018), Wireless Networks, John Wiley & Sons. | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
| 1. | Fred Halsall(1996), Data Communications Computer Networks and Open Systems, Fourth Edition, Addison Wesley. | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | |
| 1. | <https://www.tutorialspoint.com/data_communication_computer_network/index.htm> | | | | | | | | | | | |
| 2. | https://www.geeksforgeeks.org/data-communication-definition-components-types-channels/ | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 2 | 3 | 3 | 3 | 2 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 2 | 2 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 15 | 15 | 15 | 13 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | |
| **CIA** | | **External** | **Total** |
|  | | | COMPUTER NETWORKS | **Elect** | 4 | - | - | - | 3 | 25 | | 75 | 100 |
| **Learning Objectives** | | | | | | | | | | | | | |
| LO1 | To make students understand the concepts of Network hardware and Network Software. | | | | | | | | | | | | |
| LO2 | To analyze different network models | | | | | | | | | | | | |
| LO3 | To impart knowledge on Design Issues of Data Link Layer | | | | | | | | | | | | |
| LO4 | To impart knowledge on IP Addresses and Routing algorithm | | | | | | | | | | | | |
| LO5 | To make the students understand the establishment of Network connection | | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | | **No. Of. Hours** | |
| I | Introduction – Uses of Computer Networks – Network Hardware- Network Software- OSI Reference Model – TCP/IP Reference Model**.** | | | | | | | | | | | **12** | |
| II | Physical Layer – Guided Transmission media – Wireless Transmission – Public Switched Telephone Network –Local Loop – Trunks – Multiplexing- Switching. | | | | | | | | | | | **12** | |
| III | Data Link Layer – Design Issues- Error Detection and Correction- Simplex Stop and Wait Protocol- Sliding Window Protocol. | | | | | | | | | | | **12** | |
| IV | Network Layer – Design Issues – Routing Algorithm- IP Protocol – IP  Addresses-Internet Control Protocols. | | | | | | | | | | | **12** | |
| V | Transport Layer: Addressing- Connection Establishment-Connection Release. Internet Transport Protocol: UDP-TCP. Application Layer: DNS- Electronic Mail-World Wide Web. | | | | | | | | | | | **12** | |
| **TOTAL HOURS** | | | | | | | | | | | | **60** | |
| **Course Outcomes** | | | | | | | | | | | **Programme Outcomes** | | |
| CO | | On completion of this course, students will | | | | | | | | |  | | |
| CO1 | | * Usage of computer networks.   Describe the functions of each layer in OSI and TCP/IP model. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO2 | | * Basics of Physical layer and apply them in real time applications. * Techniques in multiplexing and switching. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO3 | | Design of Data link layer.  Deduction of errors and correction. Flow control using protocols | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO4 | | * Design of Network layers.Generate IP address to find out the route through Routing algorithms | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| CO5 | | Design of transport layer.Protocols needed for End–End delivery of packets. Role of Application layer in real time applications | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | |
| **Textbooks** | | | | | | | | | | | | | |
| 1 | | A. S. Tanenbaum, “Computer Networks”, Prentice-Hall of India 2008, 4th Edition. | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1. | | Stallings, “Data and Computer Communications”, Pearson Education 2012, 7th Edition | | | | | | | | | | | |
| 2. | | B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill 2007, 4th Edition. | | | | | | | | | | | |
| 3. | | F. Halsall, “Data Communications, Computer Networks and Open Systems”, Pearson Education 2008. | | | | | | | | | | | |
| 4. | | D. Bertsekas and R. Gallagher, “Data Networks”, PHI 2008, 2nd Edition. | | | | | | | | | | | |
| 5. | | Lamarca, “Communication Networks”, Tata McGraw Hill 2002. | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | |
| 1. | | <https://www.geeksforgeeks.org/basics-computer-networking/> | | | | | | | | | | | |
| 2. | | <https://en.wikipedia.org/wiki/Computer_network> | | | | | | | | | | | |
| 3. | | <https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm> | | | | | | | | | | | |
| 4. | | <https://www.javatpoint.com/computer-network-tutorial> | | | | | | | | | | | |
| 5. | | <http://ceit.aut.ac.ir/~91131079/SE2/SE2%20Website/Lecture%20Slides.html> | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 2 | 3 | 3 | 3 | 2 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 2 | 2 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 15 | 15 | 15 | 12 | 14 |

S-Strong-3 M-Medium-2 L-Low-1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | **External** | | **Total** |
|  | | **CRYPTOGRAPHY** | **Elect** | 4 | - | - | - | 3 | 25 | | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | | |
| LO1 | To understand the fundamentals of Cryptography | | | | | | | | | | | | |
| LO2 | To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity. | | | | | | | | | | | | |
| LO3 | To understand the various key distribution and management schemes. | | | | | | | | | | | | |
| LO4 | To understand how to deploy encryption techniques to secure data in transit across data networks | | | | | | | | | | | | |
| LO5 | To design security applications in the field of Information technology | | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | | **No. Of. Hours** | |
| I | **Introduction:** The OSI security Architecture – Security Attacks – Security Mechanisms – Security Services – A model for network Security. | | | | | | | | | | | **12** | |
| II | **Classical Encryption Techniques:** Symmetric cipher model – **Substitution Techniques:** Caesar Cipher – Monoalphabetic cipher – Play fair cipher – Poly Alphabetic Cipher – Transposition techniques – Stenography | | | | | | | | | | | **12** | |
| III | **Block Cipher and DES:** Block Cipher Principles – DES – The Strength of DES –**RSA:** The RSA algorithm. | | | | | | | | | | | **12** | |
| IV | **Network Security Practices**: IP Security overview - IP Security architecture – Authentication Header. **Web Security**: SecureSocket Layer and Transport Layer Security – Secure Electronic Transaction. | | | | | | | | | | | **12** | |
| V | Intruders – Malicious software – Firewalls. | | | | | | | | | | | **12** | |
| **TOTAL HOURS** | | | | | | | | | | | | **60** | |
| **Course Outcomes** | | | | | | | | | | **Programme Outcomes** | | | |
| CO | On completion of this course, students will | | | | | | | | |  | | | |
| CO1 | Analyze the vulnerabilities in any computing system and hence be able to design a security solution. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | Apply the different cryptographic operations of symmetric cryptographic algorithms | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | Apply the different cryptographic operations of public key cryptography | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | Apply the various Authentication schemes to simulate different applications. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | Understand various Security practices and System security standards | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | |
| 1 | **William Stallings,** “Cryptography and Network Security Principles andPractices”. | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1. | **Behrouz A. Foruzan,** “Cryptography and Network Security”, Tata McGraw-Hill, 2007. | | | | | | | | | | | | |
| 2 | **AtulKahate**, “*Cryptography and Network Security*”, Second Edition, 2003,TMH. | | | | | | | | | | | | |
| 3 | **M.V. Arun Kumar**, “*Network Security*”, 2011, First Edition,USP. | | | | | | | | | | | | |
|  | **Web Resources** | | | | | | | | | | | | |
| 1 | https:[//www.tutorialspoint.com/cryptography/](http://www.tutorialspoint.com/cryptography/) | | | | | | | | | | | | |
| 2 | <https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography> | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 2 | 3 | 2 |
| **CO 2** | 3 | 2 | 3 | 2 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO 4** | 2 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 2 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 13 | 15 | 12 | 14 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | **External** | | **Total** |
|  | | OPERATING SYSTEM | **Elect** | 4 | -\_ | - | - | 3 | 25 | | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | | |
| LO1 | To understand the fundamental concepts and role of Operating System. | | | | | | | | | | | | |
| LO2 | To learn the Process Management and Scheduling Algorithms. | | | | | | | | | | | | |
| LO3 | To understand the Memory Management policies. | | | | | | | | | | | | |
| LO4 | To gain insight on I/O and File management techniques. | | | | | | | | | | | | |
| LO5 | Analyze resource management techniques | | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | | **No. Of. Hours** | |
| I | **Introduction**- views and goals – Operating System Services - User and Operating System interface - System Call- Types of System Calls – Operating System Design and Implementation - Operating System Structure. **Process Management**: Process concept- Process Scheduling - Operations on Processes- Interprocess Communication. **Threads**: Types of threads | | | | | | | | | | | **12** | |
| II | **Process Scheduling**: Basic Concepts-Scheduling Criteria Scheduling Algorithm Multiple Processor Scheduling CPU Scheduling. **Synchronization**: The Critical-Section Problem Synchronization Hardware – Semaphores- Classic Problem of Synchronization. | | | | | | | | | | | **12** | |
| III | **Deadlocks:** Deadlock Characterization - Methods for Handling Deadlocks-Deadlock Prevention- Deadlock Avoidance - Deadlock Detection- Recovery from Deadlock. | | | | | | | | | | | **12** | |
| IV | **Memory**-Management Strategies: Swapping - Contiguous Memory Allocation Segmentation- Paging - Structure of the Page Table. **Virtual-Memory Management**: Demand Paging - Page Replacement - Allocation of Frames -Thrashing. | | | | | | | | | | | **12** | |
| V | **Storage Management:** File System- File Concept - Access Methods- Directory and Disk Structure -File Sharing- Protection. Allocation Methods - Free- Space Management - Efficiency and Performance – Recovery. | | | | | | | | | | | **12** | |
| **TOTAL HOURS** | | | | | | | | | | | | **60** | |
| **Course Outcomes** | | | | | | | | | | **Programme Outcomes** | | | |
| CO | On completion of this course, students will | | | | | | | | |  | | | |
| CO1 | Define OS with its view and goals and services rented by it  Deign of Operating System with its structure. Message through Inter process communication. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | * Describe the allocation of process through scheduling algorithms. Define critical section problems and its usage. Prevention of multiple process executing through the concept of semaphores. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | Describe the concept of Mutual exclusion, Deadlock detection and agreement protocols for deadlock prevention and its avoidance. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | * Analyze the strategies of Memory management schemes and the usage of Virtual memory. Apply Replacement algorithms to avoid thrashing. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | Brief study of storage management. Categorize the methods to allocate files for proper protection. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | | |
| 1 | A. SilberschatzP.B.Galvin, Gange. “Operating System Concepts”, Ninth Edition, 2013, Addison WesleyPublishing Co.. | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1. | Anderw S Tanenbaum, Albert S. Woodhull, ” Operating System Design and Impletation”, prentice-Hall India Publication. | | | | | | | | | | | | |
| 2. | William Stallings, “Operating Systems Internals and Design Principles”, Pearson, 2018, 9th Edition. | | | | | | | | | | | | |
| 3. | Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition | | | | | | | | | | | | |
| 4. | Operating System Concepts (2nd Ed) by James L. Peterson, Abraham Silberschatz, Addison – Wesley. | | | | | | | | | | | | |
| 5. | Operating Systems Design & implementation Andrew S. Tanenbam, Albert S. Woodhull Pearson. | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | |
| 1. | <https://www.guru99.com/operating-system-tutorial.html> | | | | | | | | | | | | |
| 2. | <https://www.mygreatlearning.com/blog/what> | | | | | | | | | | | | |
| 3. | <https://en.wikipedia.org/wiki/Operating_system> | | | | | | | | | | | | |
| 4. | https://www.geeksforgeeks.org/what-is-an-operating-system/ | | | | | | | | | | | | |
| 5. | [http://www.cs.kent.edu/~farrell/osf03/oldnotes/2. th-edition.pdf](http://www.cs.kent.edu/~farrell/osf03/oldnotes/2.%20th-edition.pdf) | | | | | | | | | | | | |

**Mapping with Programme Outcomes**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 2 | 3 | 3 | 3 | 2 | 3 |
| **CO 3** | 3 | 3 | 3 | 3 | 2 | 2 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 15 | 15 | 15 | 12 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | ARTIFICIAL neural network | | **Elect** | 4 | - | - | - | 3 | | 25 | 75 | 100 |
| **Learning Objectives:**  The objective of this course is to teach the basics of artificial neural networks, learning process, single layer and multi-layer perceptron networks. | | | | | | | | | | | | |
| **Course Outcomes:**  **CO1:** Understand the basics of artificial neural networks and its architecture.  **CO2:** Understand the various learning algorithms and their applications.  **CO3:** Identify the appropriate neural network model to a particular application.  **CO4:** Apply the selected neural network model to a particular application.  **CO5:** Analyze the performance of the selected neural network. | | | | | | | | | | | | |
| **Units** | | **Contents** | | | | | | | **Required Hours** | | | |
| **I** | | Artificial Neural Model- Activation functions- Feed forward and Feedback, Convex Sets, Convex Hull and Linear Separability, Non-Linear Separable Problem - Multilayer Networks. Learning Algorithms- Error correction - Gradient Descent Rules, Perceptron Learning Algorithm, Perceptron Convergence Theorem. | | | | | | | **12** | | | |
| **II** | | Introduction, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning, Boltzmann learning, credit assignment problem, Learning with and without teacher, learning tasks, Memory and Adaptation | | | | | | | **12** | | | |
| **III** | | Single layer Perception: Introduction, Pattern Recognition, Linear classifier, Simple perception, Perception learning algorithm, Modified Perception learning algorithm, Adaptive linear combiner, Continuous perception, learning in continuous perception, Limitation of Perception. | | | | | | | **12** | | | |
| **IV** | | Multi-Layer Perceptron Networks: Introduction, MLP with 2 hidden layers, Simple layer of a MLP, Delta learning rule of the output layer, Multilayer feed forward neural network with continuous perceptions, Generalized delta learning rule, Back propagation algorithm | | | | | | | **12** | | | |
| **V** | | Deep learning- Introduction- Neuro architectures building blocks for the DL techniques, Deep Learning and Neo cognitron, Deep Convolutional Neural Networks, Recurrent Neural Networks (RNN), feature extraction, Deep Belief Networks, Restricted Boltzmann Machines, Training of DNN and Applications | | | | | | | **12** | | | |
| **Learning Resources:**   * **Recommended Texts**   1. Neural Networks A Classroom Approach- Satish Kumar, McGraw Hill- Second Edition.  2. “Neural Network- A Comprehensive Foundation”- Simon Haykins, Pearson Prentice Hall, 2nd Edition, 1999.   * **Reference Books**   1. Artificial Neural Networks-B. Yegnanarayana, PHI, New Delhi 1998. | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 2 | 3 | 2 |
| **CO 2** | 3 | 2 | 3 | 2 | 3 | 3 |
| **CO 3** | 3 | 3 | 2 | 2 | 3 | 3 |
| **CO 4** | 2 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 2 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 13 | 14 | 12 | 14 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | Software engineering | | **Elect** | 4 | - | - | - | 3 | | 25 | 75 | 100 |
| **Learning Objectives:**  • To understand the software engineering concepts and to create a system model in real life applications | | | | | | | | | | | | |
| **Course Outcomes:**(for students: To know what they are going to learn)  **CO1:**Gain basic knowledge of analysis and design of systems  **CO2:** Ability to apply software engineering principles and techniques  **CO3:**Model a reliable and cost-effective software system  **CO4:** Ability to design an effective model of the system  **CO5:** Perform Testing at various levels and produce an efficient system. | | | | | | | | | | | | |
| **Units** | | **Contents** | | | | | | | **Required Hours** | | | |
| **I** | | **Introduction:** The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering. | | | | | | | **12** | | | |
| **II** | | **Requirements Analysis and Specification:** Requirements gathering and analysis, Software requirements specification (SRS)**Software Design**: Good software design, cohesion and coupling, neat arrangement, software design approaches, object- oriented vs function-oriented design | | | | | | | **12** | | | |
| **III** | | **Function-Oriented Software Design:** Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD’s), structured design, detailed design. | | | | | | | **12** | | | |
| **IV** | | **Coding and Testing: Coding;** code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; system testing; some general issues associated with testing. | | | | | | | **12** | | | |
| **V** | | **Software Maintenance:** Characteristic of software maintenance; software reverse engineering;  software maintenance process models; estimation of maintenance cost; | | | | | | | **12** | | | |
|  | |  | | | | | | | **60** | | | |
| **Learning Resources:**   * **Recommended Texts**  1. Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018  * **Reference Books**  1. Richard Fairley, Software Engineering Concepts*,* Tata McGraw-Hill publishing company Ltd, Edition 1997*.* 2. Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill*.* 3. James A. Senn, Analysis & Design of Information Systems, Second Edition, McGraw-Hill International Editions. | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 2 | 3 | 2 |
| **CO 2** | 2 | 2 | 3 | 2 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO 4** | 2 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 2 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 13 | 13 | 15 | 12 | 14 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

**SOFTWARE QUALITY ASSURANCE**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | **4** | **0** | **0** | **0** | **3** | **4** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | Learn the basic concepts of Software Quality Assurance. | | | | | | | | | | |
| **LO2** | Understand quality management processes | | | | | | | | | | |
| **LO3** | Understand the importance of standards in the quality management process and their impact on the final product. | | | | | | | | | | |
| **LO4** | Understand to apply software testing techniques in commercial environment | | | | | | | | | | |
| **LO5** | 1. Gain knowledge of the various software development methodologies and their impact on quality assurance processes. | | | | | | | | | | |
| **Unit** | Contents | | | | | | | | | **No. of Hours** | |
| I | Introduction- quality and the quality system – standards and procedures technical activities. Software tasks –management responsibility – quality system – contract review – design control – document control – purchasing product identification and traceability. | | | | | | | | | **12** | |
| II | Process control–checking– identification of testing tools– control of non conforming product –corrective action. | | | | | | | | | **12** | |
| III | Handling, storage, packing and delivery –quality records- internal quality audits –training –servicing –statistical techniques. | | | | | | | | | **12** | |
| IV | QA and new technologies –QA and Human–computer interface-process modeling–standards and procedures. | | | | | | | | | **12** | |
| V | ISO-9001-ElementsofISO9001-improvingqualitysystem– Case study. | | | | | | | | | **12** | |
| **TOTAL** | | | | | | | | | | **60** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | To have broad understanding of the role of Quality Assurance in Software Engineering. | | | | | | | | | | |
| CO2 | Illustrate the role of automation in software quality assurance and gain practical experience in using automated testing tools | | | | | | | | | | |
| CO3 | Apply the concepts in preparing the quality plan & documents. | | | | | | | | | | |
| CO4 | 1. Analyze and executing software test plans, test cases, and test scripts. | | | | | | | | | | |
| CO5 | Evaluate information quality, software quality and business value of information system. | | | | | | | | | | |
| **Textbooks** | | | | | | | | | | | |
|  | Darrel Ince “An introduction to software quality assurance and its implementation”, MGH 1994.  Darrel Ince “ISO 9001 software quality assurance”, MGH 1994. | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
|  | Alan C. Gillies, “Software Quality: Theory and Management”, International Thomson Computer Press, 1997. | | | | | | | | | | |
|  | Mordechai Ben-Menachem “Software Quality: Producing Practical Consistent Software”, International Thompson Computer Press, 1997 | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | |
|  | NPTEL & MOOC courses titled Software Quality Assurance | | | | | | | | | | |
|  | https:/[/www.linkedin.com/l](http://www.linkedin.com/learning/topics/software-quality-assurance)e[arning/topics/software-quality-assurance](http://www.linkedin.com/learning/topics/software-quality-assurance) | | | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- |
| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **1** | **2** | **2** | **2** |
| **CO2** | **3** | **1** | **3** | **2** | **2** | **2** |
| **CO3** | **2** | **3** | **2** | **3** | **3** | **3** |
| **CO4** | **3** | **3** | **2** | **3** | **3** | **2** |
| **CO5** | **2** | **2** | **2** | **3** | **3** | **3** |
| **Weightage of course contributed**  **to each PSO** | **13** | **11** | **10** | **13** | **13** | **12** |

**SOFTWARE METRICS**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | **4** | **0** | **0** | **0** | **3** | **4** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | Gain a solid understanding of what software metrics are and their significance | | | | | | | | | | |
| **LO2** | Learn how to identify and select appropriate software metrics based on project goals | | | | | | | | | | |
| **LO3** | Acquire knowledge and skills in collecting and measuring software metrics | | | | | | | | | | |
| **LO4** | Learn how to analyze and interpret software metrics data to extract valuable insights | | | | | | | | | | |
| **LO5** | Gain the ability to evaluate software quality using appropriate metrics | | | | | | | | | | |
| **Unit** | **Contents** | | | | | | | | | **No. of Hours** | |
| I | Fundamentals of Measurement: Need for Measurement: Measurement in Software Engineering, Scope of Software Metrics, The Basics of measurement: The representational theory of measurement, Measurement and models, Measurement scales and scale types, meaningfulness in measurement | | | | | | | | | **12** | |
| II | A Goal-Based Framework For Software Measurement: Classifying software measures, Determining what to Measure, Applying the framework, Software measurement validation, Performing Software MeasurementValidation  Empirical investigation: Principles of Empirical Studies, Planning Experiments, Planning case studies as quasi-experiments, Relevant and Meaningful Studies | | | | | | | | | **12** | |
| III | Software Metrics Data Collection: Defining good data, Data collection for incident reports, How to collect data, Reliability of data collectionProcedures Analyzing software measurement data: Statistical distributions and hypothesis testing, Classical data analysis techniques, Examples of simple analysis techniques | | | | | | | | | **12** | |
| IV | Measuring internal product attributes: Size Properties of Software Size, Code size, Design size, Requirements analysis and Specification size, Functional size measures and estimators, Applications of size measures Measuring internal product attributes: Structure: Aspects of Structural Measures, Control flow structure of program units, Design-level Attributes, Object-oriented Structural attributes and measures | | | | | | | | | **12** | |
| V | Measuring External Product Attributes: Modelling software quality, Measuring aspects of quality, Usability Measures, Maintainability measures, Security Measures Software Reliability: Measurement and Prediction: Basics of reliability theory, The software reliability problem, Parametric reliability growth models, Predictive accuracy | | | | | | | | | **12** | |
| **TOTAL** | | | | | | | | | | **60** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | Understand various fundamentals of measurement and software metrics | | | | | | | | | | |
| CO2 | Identify frame work and analysis techniques for software measurement | | | | | | | | | | |
| CO3 | Apply internal and external attributes of software product for effort estimation | | | | | | | | | | |
| CO4 | Use appropriate analytical techniques to interpret software metrics data and derive meaningful insights | | | | | | | | | | |
| CO5 | Recommend reliability models for predicting software quality | | | | | | | | | | |
| **Textbooks** | | | | | | | | | | | |
|  | Software Metrics A Rigorous and Practical Approach, Norman Fenton, James Bieman , ThirdEdition, 2014 | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
| 1 | Software metrics, Norman E, Fenton and Shari Lawrence Pfleeger, International Thomson Computer Press, 1997 | | | | | | | | | | |
| 2 | Metric and models in software quality engineering, Stephen H.Kan, Second edition, 2002, AddisonWesley Professional | | | | | | | | | | |
| 3 | Practical Software Metrics for Project Management and Process Improvement, Robert B.Grady, 1992, Prentice Hall. | | | | | | | | | | |
| **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | |
| 1. | https://lansa.com/blog/general/what-are-software-metrics-how-can-i-measure-these-metrics/ | | | | | | | | | | |
| 2. | https://stackify.com/track-software-metrics/ | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 2 | 3 | 2 |
| **CO 2** | 3 | 2 | 3 | 2 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 2 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 15 | 13 | 15 | 12 | 14 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **O** | **Credits** | **Inst. Hours** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | **Organizational Behaviour** | **Elect** | 4 | - | - | - | 3 | 5 | | 25 | 75 | 100 |
| **Learning Objectives** | | | | | | | | | | | | |
| CO1 | To have extensive knowledge on OB and the scope of OB. | | | | | | | | | | | |
| CO2 | To create awareness of Individual Behaviour. | | | | | | | | | | | |
| CO3 | To enhance the understanding of Group Behaviour | | | | | | | | | | | |
| CO4 | To know the basics of Organisational Culture and Organisational Structure | | | | | | | | | | | |
| CO5 | To understand Organisational Change, Conflict and Power | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | | **No. of Hours** | | | |
| I | INTRODUCTION : Concept of Organizational Behavior (OB): Nature, Scope and Role of OB: Disciplines that contribute to OB; Opportunities for OB (Globalization, Indian workforce diversity, customer service, innovation and change, networked organizations, work-life balance, people skills, positive work environment, ethics) | | | | | | | | 12 | | | |
| II | INDIVIDUAL BEHAVIOUR:  1. Learning, attitude and Job satisfaction: Concept of learning, conditioning, shaping and reinforcement. Concept of attitude, components, behavior and attitude. Job satisfaction: causation; impact of satisfied employees on workplace.  2. Motivation : Concept; Theories (Hierarchy of needs, X and Y, Two factor, McClelland, Goal setting, Self-efficacy, Equity theory); Job characteristics model; Redesigning jobs,  3. Personality and Values: Concept of personality; Myers-Briggs Type Indicator (MBTI); Big Five model. Relevance of values; Linking personality and values to the workplace (person-job fit, person-organization fit)  4. Perception, Decision Making : Perception and Judgement Factors; Linking perception to individual decision making: | | | | | | | | 12 | | | |
| III | GROUP BEHAVIOUR : 1. Groups and Work Teams : Concept : Five Stage model of group development; Group norms, cohesiveness ; Group think and shift ; Teams; types of teams; Creating team players from individuals and team based work(TBW) 2. Leadership : Concept; Trait theories; Behavioral theories (Ohio and Michigan studies); Contingency theories (Fiedler, Hersey and Blanchard, Path-Goal); | | | | | | | | 12 | | | |
| IV | ORGANISATIONAL CULTURE AND STRUCTURE : Concept of culture; Impact (functions and liability); Creating and sustaining culture: Concept of structure, Prevalent organizational designs: New design options | | | | | | | | 12 | | | |
| V | ORGANISATIONAL CHANGE, CONFLICT AND POWER: Forces of change; Planned change; Resistance; Approaches (Lewin's model, Organisational development);. Concept of conflict, Conflict process; Types, Functional/ Dysfunctional. Introduction to power and politics. | | | | | | | | 12 | | | |
|  | **TOTAL** | | | | | | | | **60** | | | |
| **Course Outcomes** | On Completion of the course the students will | | | | | | | | **Program Outcomes** | | | |
| **CO1** | To define Organisational Behaviour, Understand the opportunity through OB. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **CO2** | To apply self-awareness, motivation, leadership and learning theories at workplace. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **CO3** | To analyze the complexities and solutions of group behaviour. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **CO4** | To impact and bring positive change in the culture of the organisation. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **CO5** | To create a congenial climate in the organization. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Reading List** | | | | | | | | | | | | |
| 1. | [NeharikaVohra Stephen P. Robbins, Timothy A. Judge](https://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Neharika+Vohra+Stephen+P.+Robbins%2C+Timothy+A.+Judge&search-alias=stripbooks) , *Organizational Behaviour*, Pearson Education, 18th Edition, 2022. | | | | | | | | | | | |
| 2. | Fred Luthans, *Organizational Behaviour*, Tata McGraw Hill, 2017. | | | | | | | | | | | |
| 3. | Ray French, Charlotte Rayner, Gary Rees & Sally Rumbles, *Organizational Behaviour*, John Wiley & Sons, 2011 | | | | | | | | | | | |
| 4. | [Louis Bevoc](https://www.amazon.in/Louis-Bevoc/e/B071SKMB82/ref=dp_byline_cont_ebooks_1), [Allison Shearsett](https://www.amazon.in/s/ref=dp_byline_sr_ebooks_2?ie=UTF8&field-author=Allison+Shearsett&text=Allison+Shearsett&sort=relevancerank&search-alias=digital-text), [Rachael Collinson](https://www.amazon.in/s/ref=dp_byline_sr_ebooks_3?ie=UTF8&field-author=Rachael+Collinson&text=Rachael+Collinson&sort=relevancerank&search-alias=digital-text), *Organizational Behaviour Reference*, Nutri Niche System LLC (28 April 2017) | | | | | | | | | | | |
| 5. | Dr. Christopher P. Neck, Jeffery D. Houghton and Emma L. Murray, *Organizational Behaviour: A Skill-Building Approach,* SAGE Publications, Inc; 2nd edition (29 November 2018). | | | | | | | | | | | |
| **References Books** | | | | | | | | | | | | |
| 1. | Uma Sekaran, Organizational Behaviour Text & cases, 2nd edition, Tata McGraw Hill Publishing CO. Ltd | | | | | | | | | | | |
| 2. | GangadharRao, Narayana, V.S.P Rao, Organizational Behaviour 1987, Reprint 2000, Konark Publishers Pvt. Ltd, 1st edition | | | | | | | | | | | |
| 3. | S.S. Khanka, Organizational Behaviour, S. Chand & Co, New Delhi. | | | | | | | | | | | |
| 4. | J. Jayasankar, Organizational Behaviour, Margham Publications, Chennai, 2017. | | | | | | | | | | | |
| 5. | John Newstrom, *Organizational Behaviour: HumaBehaviour at Work*, McGraw Hill Education; 12th edition (1 July 2017) | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | |
| 1 | <https://www.iedunote.com/organizational-behavior> | | | | | | | | | | | |
| 2 | <https://www.london.edu/faculty-and-research/organisational-behaviour> | | | | | | | | | | | |
| 3 | [Journal of Organizational Behavior on JSTOR](https://www.jstor.org/journal/jorgabeha) | | | | | | | | | | | |
| 4 | [International Journal of Organization Theory & Behavior | Emerald Publishing](https://www.emeraldgrouppublishing.com/journal/ijotb) | | | | | | | | | | | |
| 5 | <https://2012books.lardbucket.org/pdfs/an-introduction-to-organizational-behavior-v1.1.pdf> | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 2 | 3 | 2 |
| **CO 2** | 3 | 2 | 3 | 2 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 2 | 3 | 2 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 15 | 13 | 15 | 11 | 14 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | | Agile Project Management | **Elect** | 4 | - | - | - | 3 | 25 | 75 | 100 |
| **Learning Objectives:**   * To provide students with a theoretical as well as practical understanding of Agile software development practices and how small teams can apply them to creating high-quality software. * To provide a good understanding of software design and a set of software technologies and APIs. * To provide a detailed examination and demonstration of Agile development and testing techniques. * To provide an understanding of the benefits and pitfalls of working in an Agile team. | | | | | | | | | | | |
| **Course Outcomes:**  **CO1:** Understanding of the Agile manifesto and its advantages over other SDLC paradigms.  **CO2:** Understanding essential Agile concepts.  **CO3:**Understanding how to plan and execute a project using Agile concepts  **CO4:** Understanding Agile management concepts.  **CO5:** Practical application of Agile principles. | | | | | | | | | | | |
| **Units** | **Contents** | | | | | | | **Required Hours** | | | |
| **I** | **Introduction: Modernizing Project Management:** Project Management Needed a Makeover – Introducing Agile Project Management.  **Applying the Agile Manifesto and Principles:** Understanding the Agile manifesto – Outlining the four values of the Agile manifesto – Defining the 12 Agile Principles – Adding the Platinum Principles – Changes as a result of Agile Values – The Agile litmus test.  **Why Being Agile Works Better:** Evaluating Agile benefits – How Agile approaches beat historical approaches – Why people like being Agile. | | | | | | | **12** | | | |
| **II** | **Being Agile: Agile Approaches:** Diving under the umbrella of Agile approaches – Reviewing the Big Three: Lean, Scrum, Extreme Programming - Summary  **Agile Environments in Action:** Creating the physical environment – Low-tech communicating – High-tech communicating – Choosing tools.  **Agile Behaviours in Action:** Establishing Agile roles – Establishing new values – Changing team philosophy. | | | | | | | **12** | | | |
| **III** | **Agile Planning and Execution**  Defining the Product Vision and Roadmap: Agile planning – Defining the product vision – Creating a product roadmap – Completing the product backlog.  Planning Releases and Sprints: Refining requirements and estimates – Release planning – Sprint planning.  Working Throughout the Day: Planning your day – Tracking progress – Agile roles in the sprint – Creating shippable functionality – The end of the day.  Showcasing Work, Inspecting and Adapting: The sprint review – The sprint retrospective.  Preparing for Release: Preparing the product for deployment (the release sprint) – Preparing the operational support – Preparing the organization for product deployment - Preparing the marketplace for product deployment | | | | | | | **12** | | | |
| **IV** | **Agile Management**  Managing Scope and Procurement: What’s different about Agile scope management – Managing Agile scope – What’s different about Agile procurement – Managing Agile procurement.  Managing Time and Cost: What’s different about Agile time management – Managing Agile schedules – What’s different about Agile cost management – Managing Agile budgets.  Managing Team Dynamics and Communication: What’s different about Agile team dynamics – Managing Agile team dynamics – What’s different about Agile communication – Managing Agile communication.  Managing Quality and Risk: What’s different about Agile quality – Managing Agile quality – What’s different about Agile risk management – Managing Agile risk. | | | | | | | **12** | | | |
| **V** | Implementing Agile  Building a Foundation: Organizational and individual commitment – Choosing the right pilot team members – Creating an environment that enables Agility – Support Agility initially and over time.  Being a Change Agent: Becoming Agile requires change – why change doesn’t happen on its own – Platinum Edge’s Change Roadmap – Avoiding pitfalls – Signs your changes are slipping.  Benefits, Factors for Success and Metrics: Ten key benefits of Agile project management – Ten key factors for project success – Ten metrics for Agile Organizations. | | | | | | | **12** | | | |
| **Learning Resources:**   * **Recommended Texts**  1. Mark C. Layton, Steven J. Ostermiller, *Agile Project Management for Dummies*, 2nd Edition, Wiley India Pvt. Ltd., 2018. 2. Jeff Sutherland, Scrum – The Art of Doing Twice the Work in Half the Time, Penguin, 2014.  * **Reference Books**  1. Mark C. Layton, David Morrow, *Scrum for Dummies*, 2nd Edition, Wiley India Pvt. Ltd., 2018. 2. Mike Cohn, Succeeding with Agile – Software Development using Scrum, Addison-Wesley Signature Series, 2010. 3. Alex Moore, Agile Project Management, 2020. 4. Alex Moore, *Scrum*, 2020. 5. Andrew Stellman and Jennifer Greene, *Learning Agile: Understanding Scrum, XP, Lean, and Kanban*, Shroff/O'Reilly, First Edition, 2014.  * **Web resources**  1. [www.agilealliance.org/resources](http://www.agilealliance.org/resources) | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 2 | 3 | 2 |
| **CO 2** | 3 | 2 | 3 | 2 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO 4** | 2 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 2 | 3 | 2 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 14 | 13 | 15 | 11 | 14 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | | | Computing Intelligence | **Elect** | 4 | - | - | - | 3 | | 25 | 75 | 100 |
| **Learning Objectives:**  • To provide strong foundation on fundamental concepts in Computing Intelligence  • To apply basic principles of Artificial Intelligence and solutions that require problem solving, influence, perception, knowledge representation and learning | | | | | | | | | | | | |
| **Course Outcomes:**  **CO1:** Describe the fundamentals of artificial intelligence concepts and searching techniques.  **CO2:** Develop the fuzzy logic sets and membership function and defuzzification techniques.  **CO3:**Understand the concepts of Neural Network and analyze and apply the learning techniques  **CO4:** Understand the artificial neural networks and its applications  **CO5:** Understand the concept of Genetic Algorithm and Analyze the optimization problems using GAs. | | | | | | | | | | | | |
| **Units** | **Contents** | | | | | | | | **Required Hours** | | | |
| **I** | Introduction to AI: Problem formulation – AI Applications – Problems – State Space and Search – Production Systems – Breadth First and Depth First – Travelling Salesman Problem – Heuristic search techniques: Generate and Test – Types of Hill Climbing. | | | | | | | | **12** | | | |
| **II** | Fuzzy Logic Systems:  Notion of fuzziness – Operations on fuzzy sets – T-norms and other aggregation operators – Basics of Approximate Reasoning – Compositional Rule of Inference – Fuzzy Rule Based Systems – Schemes of Fuzzification – Inferencing – Defuzzification – Fuzzy Clustering – fuzzy rule-based classifier. | | | | | | | | **12** | | | |
| **III** | Neural Networks: What is Neural Network, Learning rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Backpropagation (BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications. | | | | | | | | **12** | | | |
| **IV** | **Artificial Neural Networks:** Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network. | | | | | | | | **12** | | | |
| **V** | **Genetic Algorithm:** Introduction – Biological Background – Genetic Algorithm Vs Traditional Algorithm – Basic Terminologies in Genetic Algorithm – Simple GA – General Genetic Algorithm – Operators in Genetic Algorithm. | | | | | | | | **12** | | | |
| **Learning Resources:**  **Recommended Texts**   1. S.N. Sivanandam and S.N. Deepa, “Principles of Soft Computing”, 2nd Edition, Wiley India Pvt. Ltd. 2. Stuart Russell and Peter Norvig, “Artificial Intelligence - A Modern Approach”, 2nd Edition, Pearson Education in Asia. 3. S. Rajasekaran, G. A. Vijayalakshmi, “Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications”, PHI.   **Reference Books**   1. F. Martin, Mc neill, and Ellen Thro, “Fuzzy Logic: A Practical approach”, AP Professional, 2000. Chin Teng Lin, C. S. George Lee,” Neuro-Fuzzy Systems”, PHI. 2. Chin Teng Lin, C. S. George Lee,” Neuro-Fuzzy Systems”, PHI. | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 2 | 3 | 2 |
| **CO 2** | 3 | 2 | 3 | 2 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 3 | 3 | 2 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 15 | 14 | 15 | 11 | 14 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | | Information Security | **Elect** | 4 | - | - | - | 3 | | 25 | 75 | 100 |
| **Learning Objectives:**   * To know the objectives of information security * Understand the importance and application of each of confidentiality, integrity, authentication and availability * Understand various cryptographic algorithms * Understand the basic categories of threats to computers and networks | | | | | | | | | | | | | | |
| **Course Outcomes:**  **CO1:** Understand network security threats, security services, and countermeasures  **CO2:** Understand vulnerability analysis of network security  **CO3:** Acquire background on hash functions; authentication; firewalls; intrusion detection techniques.  **CO4:** Gain hands-on experience with programming and simulation techniques for security protocols.  **CO5:** Apply methods for authentication, access control, intrusion detection and prevention. | | | | | | | | | | | | | | |
| **Units** | | **Contents** | | | | | | | | **Required Hours** | | | | |
| **I** | | Introduction to Information Security : Security mindset, Computer Security Concepts (CIA), Attacks, Vulnerabilities and protections, Security Goals, Security Services, Threats, Attacks, Assets, malware, program analysis and mechanisms. | | | | | | | | **12** | | | | |
| **II** | | The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defense. Cryptography: Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption | | | | | | | | **12** | | | | |
| **III** | | Symmetric and Asymmetric Cryptographic Techniques: DES, AES, RSA algorithms .Authentication and Digital Signatures: Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos. | | | | | | | | **12** | | | | |
| **IV** | | Program Security : Non-malicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels. File protection Mechanisms, User Authentication Designing Trusted O.S: Security polices, models of security, trusted O.S design, Assurance in trusted O.S. Implementation examples. | | | | | | | | **12** | | | | |
| **V** | | Security in Networks: Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security. Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction. | | | | | | | | **12** | | | | |
| **Learning Resources:**   * **Recommended Texts**   1. Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education  2. Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson   * **Reference Books**   1.Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, lst Edition.  2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 2"d Edition  3. Information Security, Principles and Practice: Mark Stamp, Wiley India.  4. Principles of Computer Sceurity: WM.Arthur Conklin, Greg White, TMH | | | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 2 | 3 | 2 |
| **CO 2** | 3 | 2 | 3 | 2 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 3 | 3 | 2 | 3 | 2 |
| **Weightage of course contributed to each PSO** | 15 | 14 | 15 | 11 | 14 | 13 |

**S-Strong-3 M-Medium-2 L-Low-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | | Grid Computing | **Elect** | 4 | - | - | - | 3 | | 25 | 75 | 100 |
| **Learning Objectives:**  • To provide the knowledge on the basic construction and use of Grid computing.  • To know and understand the grid computing applications.  • To assess the efficiency of the grid computing in solving large scale scientific problems | | | | | | | | | | | | |
| **Course Outcomes:**  **CO1:**To understand the basic elements and concepts related to Grid computing  **CO2:** To identify the Grid computing toolkits and Framework.  **CO3:**To know about the concepts of Virtualization  **CO4:** To analyze the concept of service oriented architecture.  **CO5:**To Gain knowledge on grid and web service architecture. | | | | | | | | | | | | |
| **Units** | **Contents** | | | | | | | | **Required Hours** | | | |
| **I** | Introduction: Early Grid Activity, Current Grid Activity, Overview of Grid Business areas, Grid Applications, Grid Infrastructures. | | | | | | | | **12** | | | |
| **II** | Grid Computing organization and their Roles: Organizations Developing Grid Standards, and Best Practice Guidelines, Global Grid Forum (GCF), #Organization Developing Grid Computing Toolkits and Framework#, Organization and building and using grid based solutions to solve computing, commercial organization building and Grid Based solutions. | | | | | | | | **12** | | | |
| **III** | Grid Computing Anatomy: The Grid Problem, The conceptual of virtual organizations, # Grid Architecture # and relationship to other distributed technology | | | | | | | | **12** | | | |
| **IV** | The Grid Computing Road Map: Autonomic computing, Business on demand and infrastructure virtualization, Service-Oriented Architecture and Grid, #Semantic Grids#. | | | | | | | | **12** | | | |
| **V** | Merging the Grid services Architecture with the Web Services Architecture: Service-Oriented Architecture, Web Service Architecture, #XML messages and Enveloping#, Service message description Mechanisms, Relationship between Web Services and Grid Services, Web services Interoperability and the role of the WS-I Organization. | | | | | | | | **12** | | | |
| **Learning Resources:**  **Recommended Texts**   1. Joshy Joseph and Craig Fellenstein, Grid computing, Pearson / IBM Press, PTR, 2004.   **Reference Books**   1. Ahmer Abbas and Graig computing, A Practical Guide to technology and applications, Charles River Media, 2003. | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 2 | 3 | 2 |
| **CO 2** | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO 4** | 3 | 3 | 3 | 3 | 2 | 3 |
| **CO 5** | 3 | 3 | 2 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 15 | 14 | 14 | 13 | 14 | 14 |

**S-Strong-3 M-Medium-2 L-Low-1**

**ANNEXURE II**

**SKILL ENHANCEMENT BASED**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | | | Introduction to HTML | **SEC** | 2 | - | - | - | 2 | | 25 | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | | | | |
| LO1 | | | Insert a graphic within a web page. | | | | | | | | | | | | |
| LO2 | | | Create a link within a web page. | | | | | | | | | | | | |
| LO3 | | | Create a table within a web page. | | | | | | | | | | | | |
| LO4 | | | Insert heading levels within a web page. | | | | | | | | | | | | |
| LO5 | | | Insert ordered and unordered lists within a web page. Create a web page. | | | | | | | | | | | | |
| **UNIT** | | | **Contents** | | | | | | | | | | | **No. Of. Hours** | |
| I | | | **Introduction:** Introduction to Java-Features of Java-Object Oriented Concepts-Software Evolution - Software Development, SDLC Models – SDLC steps – Software Testing – Software Quality - Lexical Issues-Data Types – Variables – Arrays – Operators - Control Statements – Classes – Objects –Constructors - Overloading method - Access control - static and fixed methods - Inner classes -Inheritance-Overriding Methods-Using super-Abstract class. | | | | | | | | | | | **6** | |
| II | | | **Packages & Threads:** Packages-Access Protection-Importing Packages-Interfaces-Exception Handling-Throw and Throws- Thread-Synchronization-Messaging- Runnable Interface-Inter thread communication-Deadlock-suspending, resuming and stopping threads-Multithreading | | | | | | | | | | | **6** | |
| III | | | **Input/Output & Collection API:** I/O Streams-File Streams-String Objects-String Buffer-Char Array - Java Utilities-Collectionsinterface - Collection classes-Enumeration – Vector -Stack –Hash tables - String class. | | | | | | | | | | | **6** | |
| IV | | | **Networking:** Networking –Networking basics – java and the Net – InetAddress- TCP/IP Client Sockets –URL- URLConnection – TCP/IP Server Sockets – Datagrams. | | | | | | | | | | | **6** | |
| V | | | **Graphical User Interface in Java:** Working with windows using AWT Classes - Class Hierarchy of Window and Panel -AWT controls - Layout Managers – Menus- Menu bars - Dialog Boxes- File Dialog- Applets-Lifecycle of Applet-Types of Applets-Event handling-Applet tags - JDBC and connecting to Databases – CRUD operations. | | | | | | | | | | | **6** | |
| **TOTAL HOURS** | | | | | | | | | | | | | | **30** | |
| **Course Outcomes** | | | | | | | | | | | **Programme Outcomes** | | | | |
| CO | | On completion of this course, students will | | | | | | | | |  | | | | |
| CO1 | | * Knows the basic concept in HTML   Concept of resources in HTML | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | | |
| CO2 | | Knows Design concept.  Concept of Meta Data  Understand the concept of save the files. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | | |
| CO3 | | Understand the page formatting.  Concept of list | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | | |
| CO4 | | Creating Links.  Know the concept of creating link to email address | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | | |
| CO5 | | Concept of adding images  Understand the table creation. | | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | | |
| **Textbooks** | | | | | | | | | | | | | | | |
| 1 | “Mastering HTML5 and CSS3 Made Easy”, TeachUComp Inc., 2014. | | | | | | | | | | | | | | |
| 2 | Thomas Michaud, “Foundations of Web Design: Introduction to HTML & CSS” | | | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | | |
| 1. | <https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf> | | | | | | | | | | | | | | |
| 2. | <https://www.w3schools.com/html/default.asp> | | | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 2 | 3 | 3 | 2 |
| **CO 4** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 15 | 15 | 14 | 15 | 15 | 14 |

S-Strong-3 M-Medium-2 L-Low-1

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | OFFICE AUTOMATION | **SEC** | 2 | - | - | - | 2 | 25 | 75 | 100 |
| **LearningObjectives:**(forteachers:whattheyhavetodointheclass/lab/field)   * The major objective in introducing the Computer Skills course is to impart training for students in Microsoft Office which has different components like MS Word, MS Excel and Power point. * Thecourseishighlypracticeorientedratherthanregularclassroomteaching. * To acquire knowledge on editor, spreadsheet and presentation software. | | | | | | | | | | |
| **Course Outcomes:**(for students: To know what they are going to learn)  **CO1:** Understand the basics of computer systems and its components.  **CO2:** Understand and apply the basic concepts of a word processing package.  **CO3:** Understand and apply the basic concepts of electronic spreadsheet software.  **CO4:** Understand and apply the basic concepts of database management system.  **CO5:** Understand and create a presentation using PowerPoint tool. | | | | | | | | | | |
| **Units** | **Contents** | | | | | | | **Required Hours** | | |
| **I** | **Introductory concepts:** Memory unit– CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems &its features: DOS– UNIX–Windows. Introduction to Programming Languages. | | | | | | | **6** | | |
| **II** | **Word Processing:** Open, Save and close word document; Editing text – tools, formatting, bullets; Spell Checker - Document formatting – Paragraph alignment, indentation, headers and footers, numbering; printing–Preview, options, merge. | | | | | | | **6** | | |
| **III** | **Spreadsheets:** Excel-opening, entering extend data, formatting, navigating; Formulas–entering, handling and copying; Charts–creating, formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics. | | | | | | | **6** | | |
| **IV** | **Database Concepts:** The concept of data base management system; Data field, records, and files, Sorting and indexing data; Searching records. Designing queries, and reports; Linking of data files; Understanding Programming environment in DBMS; Developing menu drive application sin query language (MS–Access). | | | | | | | **6** | | |
| **V** | **Power point:** Introduction to Power point - Features – Understanding slide typecasting & viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition–Animation effects, audio inclusion, timers. | | | | | | | **6** | | |
|  |  | | | | | | | **30** | | |
| **Learning Resources:**   * **Recommended Texts**   1. Peter Norton, “Introduction to Computers”–Tata McGraw-Hill. * **Reference Books**  1. JenniferAckermanKettel,GuyHat-Davis,CurtSimmons,“Microsoft2003”,TataMcGraw-Hill. | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO 1** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO 3** | 3 | 3 | 2 | 3 | 3 | 2 |
| **CO 4** | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO 5** | 3 | 3 | 3 | 3 | 3 | 3 |
| **Weightage of course contributed to each PSO** | 15 | 15 | 12 | 15 | 15 | 14 |

S-Strong-3 M-Medium-2 L-Low-1

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | Quantitative Aptitude | **SEC** | 2 | - | - | - | 2 | 25 | 75 | 100 |

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| **LearningObjectives:**(forteachers:whattheyhavetodointheclass/lab/field)   * Toimprovethequantitativeskillsofthestudents * Topreparethestudentsforvariouscompetitiveexams | | |
| **CourseOutcomes:**(forstudents:Toknowwhattheyaregoingtolearn)  **CO1:**To gain knowledge on LCM and HCF and its related problems  **CO2:**To get an idea of age, profit and loss related problem solving.  **CO3:**Able to understand time series simple and compound interests  **CO4:**Understanding the problem related to probability, and series  **CO5:**Able to understand graphs, charts | | |
| **Units** | **Contents** | **Required Hours** |
| **I** | Numbers- HCF and LCM of numbers-Decimal fractions- Simplification- Square roots and cube roots- Average- problems on Numbers | **6** |
| **II** | Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion-partnership- Chain rule. | **6** |
| **III** | Time and work - pipes and cisterns - Time and Distance - problems on trains -Boats and streams - simple interest - compound interest - Logarithms - Area -Volumeandsurfacearea-racesandGamesofskill. | **6** |
| **IV** | Permutationandcombination-probability-TrueDiscount-BankersDiscount   * Height and Distances-Odd man out & Series. |  |
| **V** | Calendar - Clocks - stocks and shares - Data representation - Tabulation – Bar Graphs- Piecharts-Linegraphs | **6** |
| **LearningResources:**   * **RecommendedTexts**  1. .“QuantitativeAptitude”,R.S.AGGARWAL.,S.Chand&CompanyLtd.,  * **Webresources: Authentic** Web resources related to Competitive examinations | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **2** | **3** | **2** | **2** | **3** |
| **CO2** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO3** | **3** | **2** | **2** | **2** | **3** | **3** |
| **CO4** | **3** | **3** | **2** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **13** | **13** | **13** | **14** | **15** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | | | CYBER FORENSICS | **SEC** | 2 | - | - | - | 2 | | 25 | 75 | 100 |
| **Learning Objectives:**  • To correctly define and cite appropriate instances for the application of computer forensics.  • To Correctly collect and analyze computer forensic evidence and data seizure. Identify the essential and up–to–date concepts, algorithms, protocols, tools, and methodology of Computer Forensics. | | | | | | | | | | | | |
| **Course Outcomes:**  **CO1:** Understand the definition of computer forensics fundamentals.  **CO2:** Evaluate the different types of computer forensics technology.  **CO3:** Analyze various computer forensics systems.  **CO4:** Apply the methods for data recovery, evidence collection and data seizure.  **CO5:** Gain your knowledge of duplication and preservation of digital evidence. | | | | | | | | | | | | |
| **Units** | **Contents** | | | | | | | | **Required Hours** | | | |
| **I** | **Overview of Computer Forensics Technology:**   * Computer Forensics Fundamentals: What is Computer Forensics? Use of Computer * Forensics in Law Enforcement, Computer Forensics Assistance to Human * Resources/Employment Proceedings, Computer Forensics Services, Benefits of professional * Forensics Methodology, Steps taken by Computer Forensics Specialists. Types of Computer. * Forensics Technology: Types of Business Computer Forensic, Technology–Types of | | | | | | | | **6** | | | |
| **II** | **Computer Forensics Evidence and capture:**   * Data Recovery: Data Recovery Defined, Data Back–up and Recovery, The Role of Back –up * in Data Recovery, The Data –Recovery Solution. Evidence Collection and Data Seizure: * Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collections, Artefacts, Collection Steps, Controlling Contamination: The chain of custody. | | | | | | | | **6** | | | |
| **III** | **Duplication and Preservation of Digital Evidence:**   * Processing steps, Legal Aspects of collecting and Preserving Computer forensic Evidence. Computer image Verification and Authentication: Special needs of Evidential Authentication, Practical Consideration, Practical Implementation. | | | | | | | | **6** | | | |
| **IV** | **Computer Forensics Analysis:**   * Discovery of Electronic Evidence: Electronic   Document Discovery: A Powerful New Litigation Tool. Identification of Data: Time Travel, Forensic Identification and Analysis of Technical Surveillance Devices. | | | | | | | | **6** | | | |
| **V** | **Reconstructing Past Events:**   * How to Become a Digital Detective, Useable File Formats, * Unusable File Formats, Converting Files. * Networks: Network Forensics Scenario, a technical approach, Destruction Of E–Mail, Damaging Computer Evidence, Documenting * The Intrusion on Destruction of Data, System Testing. | | | | | | | | **6** | | | |
| **Learning Resources:**   * **Recommended Texts**  1. John R. Vacca, “Computer Forensics: Computer Crime Investigation”, 3/E, Firewall Media, New Delhi, 2002.  * **Reference Books**  1. Nelson, Phillips Enfinger, Steuart, “Computer Forensics and Investigations” Enfinger, Steuart, CENGAGE Learning, 2004. 2. Anthony Sammes and Brian Jenkinson, ”Forensic Computing: A Practitioner&#39;s Guide”,Second Edition, Springer–Verlag London Limited, 2007. 3. Robert M.Slade,” Software Forensics Collecting Evidence from the Scene of a DigitalCrime”, TMH 2005. | | | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **3** | **3** | **2** | **2** | **2** |
| **CO2** | **2** | **3** | **3** | **3** | **3** | **2** |
| **CO3** | **3** | **2** | **3** | **3** | **3** | **3** |
| **CO4** | **3** | **2** | **2** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **14** | **13** | **14** | **14** | **14** | **13** |

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| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | | | Multimedia Systems | **SEC** | 2 | - | - | - | 2 | | 25 | 75 | 100 |
| **Learning Objectives:**   * Tounderstandthestandardsavailablefordifferentaudio,videoandtextapplications * Tolearnvariousmultimediaauthoringsystemsinmultimediaproductionteam | | | | | | | | | | | | |
| **Course Outcomes:**  **CO1:** Write action script for a particular problem.  **CO2:** Design and Draw customized GUI components.  **CO3:** Apply Transformations on Components.  **CO4:** To make use of fundamental concepts and formulate best practices  **CO5:** Apply technical concepts and practices in specialized areas | | | | | | | | | | | | |
| **Units** | **Contents** | | | | | | | | **Required Hours** | | | |
| **I** | Multimedia Definition- Use Of Multimedia-Delivering Multimedia- Text: About Fonts and Faces - Using Text in Multimedia - Computers and Text – Font Editing and Design Tools-Hypermedia and Hypertext. | | | | | | | | **6** | | | |
| **II** | Images: Plan Approach - Organize Tools - Configure Computer Workspace -Making Still Images - Color - Image File Formats. Sound: The Power of Sound -DigitalAudio-MidiAudio-Midivs. | | | | | | | | **6** | | | |
| **III** | Animation: The Power of Motion- Principles of Animation – Animation by Computer - Making Animations that Work. Video: Using Video - Working with Video and Displays- Digital Video Containers- Obtaining Video Clips -Shooting and Editing Video. | | | | | | | | **6** | | | |
| **IV** | Making Multimedia: The Stage of Multimedia Project - The Intangible Needs -The Hardware Needs - The Software Needs – An Authoring System Needs- Multimedia Production Team. | | | | | | | | **6** | | | |
| **V** | Planning and Costing: The Process of Making Multimedia-Scheduling-Estimating - RFPs and Bid Proposals. Designing and Producing - Content and Talent: Acquiring Content-Ownership of Content Created for Project-Acquiring Talent. | | | | | | | | **6** | | | |
| **Learning Resources:**   * **Recommended Texts**   1. Tay Vaughan, "Multimedia: Making It Work", 8th Edition, Osborne/McGraw- Hill, 2001.   * **Reference Books**  1. RalfSteinmetz&KlaraNahrstedt"MultimediaComputing,Communication&Applications",PearsonEducation,2012 | | | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **3** | **3** | **3** | **3** | **2** |
| **CO2** | **3** | **3** | **3** | **3** | **3** | **2** |
| **CO3** | **3** | **2** | **3** | **3** | **3** | **3** |
| **CO4** | **3** | **2** | **2** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **13** | **14** | **15** | **15** | **13** |

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| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | | | Software  Testing | **SEC** | 2 | - | - | - | 2 | | 25 | 75 | 100 |
| **Learning Objectives:**   * To study various Software techniques * To study fundamental concepts in software testing | | | | | | | | | | | | |
| **Course Outcomes:**  **CO1:** Understand and describe the basic concepts of functional (black box) software testing.  **CO2:** Understand the basic application of techniques used to identify useful ideas for tests.  **CO3:** Help determine the mission and communicate the status of your testing with the rest of your project team.  **CO4:** Characterize a good bug report, peer-review the reports of your colleagues, and improve your own report writing.  **CO5:** Understand where key testing concepts apply within the context of unified processes. | | | | | | | | | | | | |
| **Units** | **Contents** | | | | | | | | **Required Hours** | | | |
| **I** | Introduction: Purpose–Productivity and Quality in Software– Testing Vs Debugging– Model for Testing– Bugs– Types of Bugs – Testing and Design Style. | | | | | | | | **6** | | | |
| **II** | Flow / Graphs and Path Testing – Achievable paths – Path instrumentation – Application– Transaction Flow Testing Techniques | | | | | | | | **6** | | | |
| **III** | Data Flow Testing Strategies - Domain Testing: Domains and Paths – Domains and Interface Testing. | | | | | | | | **6** | | | |
| **IV** | Linguistic–Metrics – Structural Metric – Path Products and Path Expressions. Syntax Testing–Formats–Test Cases. | | | | | | | | **6** | | | |
| **V** | Logic Based Testing – Decision Tables–Transition Testing– States, State Graph, State Testing. | | | | | | | | **6** | | | |
| **Learning Resources:**   * **Recommended Texts**  1. B.Beizer,“SoftwareTestingTechniques”,IIEdn.,DreamTechIndia,NewDelhi,2003. 2. K.V.K.Prasad,“SoftwareTestingTools”,DreamTech.India,NewDelhi,2005.  * **Reference Books**  1. Burnstein, 2003,“PracticalSoftwareTesting”,SpringerInternationalEdn. 2. . Kit, 1995, “Software Testing in the Real World: Improving the Process”, Pearson Education, Delhi. 3. R.RajaniandP, P.Oak, 2004, “SoftwareTesting”, TataMcgrawHill, NewDelhi. | | | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **2** | **3** | **2** | **2** | **2** |
| **CO2** | **2** | **3** | **3** | **2** | **3** | **2** |
| **CO3** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO4** | **3** | **2** | **2** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **14** | **13** | **14** | **13** | **14** | **13** |

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| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | | | Data Mining and Warehousing | **SEC** | 2 | - | - | - | 2 | | 25 | 75 | 100 |
| **Learning Objectives:**   * To provide the knowledge on Data Mining and Warehousing concepts and techniques. * To study the basic concepts of cluster analysis * To study a set of typical clustering methodologies, algorithms and applications. | | | | | | | | | | | | |
| **Course Outcomes:**  **CO1:**To understand the basic concepts and the functionality of the various data mining and data warehousing component  **CO2:** To know the concepts of Data mining system architectures  **CO3:**To analyze the principles of association rules  **CO4:** To get analytical idea on Classification and prediction methods.  **CO5:** To Gain knowledge on Cluster analysis and its methods. | | | | | | | | | | | | |
| **Recap:**(notforexamination)Motivation/previouslecture/relevantportionsrequiredforthe  course)[Thisisdoneduring2Tutorialhours) | | | | | | | | | | | | |
| **Units** | **Contents** | | | | | | | | **Required Hours** | | | |
| **I** | Introduction: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Preprocessing: Preprocessing the Data – Data cleaning – Data Integration and Transformation – Data Reduction. | | | | | | | | **6** | | | |
| **II** | Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Concept Description, Data Generalization and Summarization. | | | | | | | | **6** | | | |
| **III** | Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases, Multilevel Association Rules from transaction databases. | | | | | | | | **6** | | | |
| **IV** | Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation. | | | | | | | | **6** | | | |
| **V** | Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Petitioning Methods – Hierarchical Methods-Density Based Methods | | | | | | | | **6** | | | |
| **Learning Resources:**   * **Recommended Texts**   1. Han and M. Kamber, “Data Mining Concepts and Techniques”, 2001, Harcourt India Pvt. Ltd, New Delhi.   * **Reference Books**  1. K.P. Soman, Shyam Diwakar, V. Ajay “Insight into Data Mining Theory and Practice “,   Prentice Hall of India Pvt. Ltd, New Delhi 2. Parteek Bhatia, ‘Data Mining and Data Warehousing: Principles and Practical Techniques’,   Cambridge University Press, 2019 | | | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **3** | **3** | **2** | **2** | **2** |
| **CO2** | **3** | **3** | **3** | **3** | **3** | **2** |
| **CO3** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO4** | **3** | **2** | **2** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **14** | **14** | **14** | **14** | **13** |

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| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | | | Biometrics | **SEC** | 2 | - | - | - | 2 | | 25 | 75 | 100 |
| **Learning Objectives:**(forteachers:whattheyhavetodointheclass/lab/field)   * To learn and understand biometric technologies and their functionalities. * To learn the role of biometrics, computational methods, context of Biometric Applications. * To learn to develop applications with biometric security | | | | | | | | | | | | |
| **Course Outcomes:** (forstudents:Toknowwhattheyaregoingtolearn)  **CO1:** Identify the various biometric technologies.  **CO2:** Design of biometric recognition.  **CO3:** Develop simple applications for privacy  **CO4:** Understand the need of biometric in the society  **CO5:** Understand the scope of biometric techniques | | | | | | | | | | | | |
| **Units** | **Contents** | | | | | | | | **Required Hours** | | | |
| **I** | **Introduction**: What is Biometrics, History, Types of biometric Traits, General architecture of biometric systems, Basic working of biometric matching.  **Face Biometrics:** Introduction, Background of Face Recognition, Design of Face Recognition System. | | | | | | | | **6** | | | |
| **II** | **Retina and Iris Biometrics:** Introduction, Performance of Biometrics, Design of Retina Biometrics, Design of Iris Recognition System, Iris Segmentation Method , Determination of Iris Region, Determination of Iris Region. | | | | | | | | **6** | | | |
| **III** | **Privacy Enhancement Using Biometrics:** Introduction, Privacy Concerns Associated with Biometric Deployments, Identity and Privacy, Privacy Concerns, Biometrics with Privacy Enhancement, Comparison of Various Biometrics in Terms of Privacy, Soft Biometrics. | | | | | | | | **6** | | | |
| **IV** | **Watermarking Techniques:** Introduction, Data Hiding Methods, Basic Framework of Watermarking, Classification of Watermarking, Applications of Watermarking, Attacks on Watermarks, Performance Evaluation, Characteristics of Watermarks, General Watermarking Process. | | | | | | | | **6** | | | |
| **V** | **Scope and Future:** Scope and Future Market of Biometrics, Biometric Technologies, Applications of Biometrics, Biometrics and Information Technology Infrastructure, Role of Biometrics in Enterprise Security, Role of Biometrics in Border Security, Smart Card Technology and Biometrics. | | | | | | | | **6** | | | |
| **Learning Resources:**   * **Recommended Texts**  1. Biometrics: Concepts and Applications by G.R Sinha and Sandeep B.Patil , Wiley, 2013  * **Reference Books**  1. Guide to Biometrics by Ruud M. Bolle , Sharath Pankanti, Nalini k.Ratha, Andrew W.Senior, Jonathan H. Connell , Springer 2009 2. Introduction to Biometrics by Anil k. Jain, Arun A. Ross, Karthik Nandakumar 3. Hand book of Biometrics by Anil K. Jain, Patrick Flynn, Arun A.Ross | | | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **2** | **3** | **2** | **2** | **2** |
| **CO2** | **3** | **3** | **3** | **3** | **3** | **2** |
| **CO3** | **3** | **2** | **2** | **2** | **3** | **3** |
| **CO4** | **3** | **2** | **2** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **12** | **13** | **13** | **14** | **13** |

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| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | | | ENTERPRISE RESOURCE PLAnning | **SEC** | 2 | - | - | - | 2 | | 25 | 75 | 100 |
| **Learning Objectives:**(forteachers:whattheyhavetodointheclass/lab/field)   * Understand the concept of ERP and the ERP model; define key terms; identify the levels of ERP maturity. * To integrate business processes; define and analyze a process; create a process map and improve and/or simplify the process; apply the result to an ERP implementation. * To know the elements of a value chain, and explain how core processes relate; identify how the organizational infrastructure supports core business processes; explain the effect of a new product launch on the three core business processes | | | | | | | | | | | | |
| **Course Outcomes:**(forstudents:Toknowwhattheyaregoingtolearn)  **CO1:** Understand the basic concepts of ERP.  **CO2:** Identify different technologies used in ERP  **CO3:**Understand and apply the concepts of ERP Manufacturing Perspective and ERP Modules  **CO4:** Discuss the benefits of ERP  **CO5:**Apply different tools used in ERP | | | | | | | | | | | | |
| **Units** | **Contents** | | | | | | | | **Required Hours** | | | |
| **I** | ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP, Components and needs of ERP, ERP Vendors; Benefits & Limitations of ERP Packages. | | | | | | | | **6** | | | |
| **II** | Need to focus on Enterprise Integration/ERP; Information mapping; Role of common shared Enterprise database; System Integration, Logical vs. Physical System Integration, Benefits & limitations of System Integration. | | | | | | | | **6** | | | |
| **III** | ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP- Func-tional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain. | | | | | | | | **6** | | | |
| **IV** | ERP Implementation Basics, , ERP implementation Strategy, ERP Implementation Life Cycle ,Pre- Implementation task,Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees. | | | | | | | | **6** | | | |
| **V** | ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into or-ganizational culture. Using ERP tool: either SAP or ORACLE format to case study. | | | | | | | | **6** | | | |
| **Learning Resources:**   * **Recommended Texts**  1. Enterprise Resource Planning – Alexis Leon, Tata McGraw Hill.  * **Reference Books**   1. Enterprise Resource Planning – Diversified by Alexis Leon, TMH.  2. Enterprise Resource Planning – Ravi Shankar & S. Jaiswal , Galgotia | | | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **3** | **3** | **2** | **2** | **2** |
| **CO2** | **2** | **3** | **3** | **3** | **3** | **2** |
| **CO3** | **2** | **3** | **3** | **3** | **3** | **3** |
| **CO4** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **13** | **15** | **15** | **14** | **14** | **13** |

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| **Subject Code** | | **Subject Name** | | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | | Robotics and Its Applications | | **SEC** | 2 | - | - | - | 2 | | 25 | 75 | 100 |
| **LearningObjectives:**(forteachers:whattheyhavetodointheclass/lab/field)   * To make the students familiar with the various drive systems of robots, sensors and their applications in robots * To introduce the parts of robots, basic working concepts and types of robots | | | | | | | | | | | | |
| **Course Outcomes:** (forstudents:Toknowwhattheyaregoingtolearn)  **CO1:**Describe the different physical forms of robot architectures  **CO2:** Kinematically model simple manipulator and mobile robots  **CO3:** Mathematically describe a kinematic robot system.  **CO4:** Analyze manipulation and navigation problems using knowledge of coordinate frames,  kinematics, optimization, control, and uncertainty.  **CO5:** Program robotics algorithms related to kinematics, control, optimization, and   uncertainty. | | | | | | | | | | | | |
| **Units** | | **Contents** | | | | | | | **Required Hours** | | | |
| **I** | | Introduction: Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics. | | | | | | | **6** | | | |
| **II** | | Actuators and sensors :Types of actuators, stepper-DC-servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers | | | | | | | **6** | | | |
| **III** | | Localization: Self-localizations and mapping - Challenges in localizations – IR based localizations – vision based localizations – Ultrasonic based localizations - GPS localization systems. | | | | | | | **6** | | | |
| **IV** | | Path Planning :Introduction, path planning-overview-road map path planning-cell decomposition path planning potential field path planning-obstacle avoidance-case studies | | | | | | | **6** | | | |
| **V** | | Application: Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications- nuclear applications-space applications | | | | | | | **6** | | | |
| **Learning Resources:**   * **Recommended Texts**  1. RicharedD.Klafter. Thomas Achmielewski and MickaelNegin, Robotic Engineering and Integrated Approach, Prentice Hall India-Newdelhi-2001 2. SaeedB.Nikku, Introduction to robotics, analysis, control and applications, Wiley-India, 2 nd edition 2011  * **Reference Books**   1. Industrial robotic technology-programming and application by M.P.Groover et.al, McGrawhill2008  2. Robotics technology and flexible automation by S.R.Deb, THH-2009 | | | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **2** | **3** | **2** | **2** | **2** |
| **CO2** | **3** | **3** | **3** | **3** | **3** | **2** |
| **CO3** | **3** | **2** | **3** | **3** | **3** | **3** |
| **CO4** | **3** | **2** | **2** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **12** | **14** | **14** | **14** | **13** |

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| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | | | Simulation and Modeling | **SEC** | 2 | - | - | - | 2 | | 25 | 75 | 100 |
| **LearningObjectives:**(forteachers:whattheyhavetodointheclass/lab/field)  In this course, modeling and simulation (M&S) methodologies considering the theoretical aspects. A wide range of Modeling and Simulation concepts that will lead you to develop your own M&S applications. Students learn the methodologies and tools for simulation and modeling of a real time problem/ mathematical model. | | | | | | | | | | | | |
| **Course Outcomes:**(forstudents:Toknowwhattheyaregoingtolearn)  **CO1:**Introduction To Modeling & Simulation, Input Data Analysis and Modeling.  **CO2:** Random Variate and Number Generation. Analysis of Simulations and methods.  **CO3:**Comparing Systems via Simulation  **CO4:** Entity Body Modeling, Visualization, Animation.  **CO5:** Algorithms and Sensor Modeling. | | | | | | | | | | | | |
| **Units** | **Contents** | | | | | | | | **Required Hours** | | | |
| **I** | Introduction To Modeling & Simulation – What is Modeling and Simulation? – Complexity Types – Model Types – Simulation Types – M&S Terms and Definitions Input Data Analysis – Simulation Input Modeling | | | | | | | | **6** | | | |
| **II** | Random Variate Generation – Random Numbers – Random Number Generators – General principles – Inverse Transform Method –Acceptance Rejection Method –Composition Method –Relocate and Rescale Method - Specific distributions-Output Data Analysis | | | | | | | | **6** | | | |
| **III** | Comparing Systems via Simulation – Introduction – Comparison Problems - Comparing Two Systems - Screening Problems - Selecting the Best - Comparison with a Standard - Comparison with a Fixed Performance Discrete Event Simulations – Introduction - Next-Event Time Advance - | | | | | | | | **6** | | | |
| **IV** | Entity Modeling – Entity Body Modeling – Entity Body Visualization – Entity Body Animation – Entity Interaction Modeling – Building Modeling Distributed Simulation – High Level Architecture (HLA) – Federation Development and Execution Process (FEDEP) | | | | | | | | **6** | | | |
| **V** | Optimization Algorithms – Genetic Algorithms – Simulated Annealing Examples: Sensor Systems Modeling – Human Eye Modeling – Optical Sensor Modeling – Radar Modeling. | | | | | | | | **6** | | | |
| **Learning Resources:**   * **Recommended Texts**   1. Jerry Banks, “Handbook of Simulation: Principles, Methodology, Advances, Applications, and Practice”, John Wiley & Sons, Inc., 1998.  2. George S. Fishman, “Discrete-Event Simulation: Modeling, Programming and Analysis”, Springer-Verlag New York, Inc., 2001.   * **Reference Books**  1. Andrew F. Seila, Vlatko Ceric, Pandu Tadikamalla, “Applied Simulation Modeling”, Thomson Learning Inc., 2003. | | | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **2** | **3** | **2** | **2** | **2** |
| **CO2** | **3** | **3** | **3** | **3** | **3** | **2** |
| **CO3** | **3** | **2** | **3** | **3** | **3** | **3** |
| **CO4** | **3** | **2** | **3** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **12** | **15** | **14** | **14** | **13** |

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| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | | | Pattern Recognition | **SEC** | 2 | - | - | - | 2 | | 25 | 75 | 100 |
| **Learning Objectives:** (forteachers:whattheyhavetodointheclass/lab/field)  To study the Pattern Recognition techniques and its applications | | | | | | | | | | | | |
| **Course Outcomes:** (forstudents:Toknowwhattheyaregoingtolearn)  **CO1:**To learn the fundamentals of Pattern Recognition techniques  **CO2:** To learn the various Statistical Pattern recognition techniques  **CO3:**To learn the linear discriminant functions and unsupervised learning and clustering  **CO4:**To learn the various Syntactical Pattern recognition techniques  **CO5:** To learn the Neural Pattern recognition techniques | | | | | | | | | | | | |
| **Recap:**(notforexamination)Motivation/previouslecture/relevantportionsrequiredforthe  course)[Thisisdoneduring2Tutorialhours) | | | | | | | | | | | | |
| **Units** | **Contents** | | | | | | | | **Required Hours** | | | |
| **I** | PATTERN RECOGNITION OVERVIEW: Pattern recognition, Classification and Description-Patterns and feature Extraction with Examples-Training and Learning in PR systems-Pattern recognition Approaches | | | | | | | | **6** | | | |
| **II** | STATISTICAL PATTERN RECOGNITION: Introduction to statistical Pattern Recognition-supervised Learning using Parametric and Non-Parametric Approaches. | | | | | | | | **6** | | | |
| **III** | LINEAR DISCRIMINANT FUNCTIONS AND UNSUPERVISED LEARNING AND CLUSTERING: Introduction-Discrete and binary Classification Problems-Techniques to directly Obtain linear Classifiers - Formulation of Unsupervised Learning Problems-Clustering for unsupervised learning and classification | | | | | | | | **6** | | | |
| **IV** | SYNTACTIC PATTERN RECOGNITION: Overview of Syntactic Pattern Recognition-Syntactic recognition via parsing and other grammars–Graphical Approaches to syntactic pattern recognition-Learning via grammatical inference. | | | | | | | | **6** | | | |
| **V** | NEURAL PATTERN RECOGNITION: Introduction to Neural Networks-Feed forward Networks and training by Back Propagation-Content Addressable Memory Approaches and Unsupervised Learning in Neural PR | | | | | | | | **6** | | | |
| **Learning Resources:**   * **Recommended Texts**  1. Robert Schalkoff, “Pattern Recognition: Statistical Structural and Neural Approaches”, John wiley & sons.  * **Reference Books**   1. Earl Gose, Richard Johnson baugh, Steve Jost, “Pattern Recognition and Image Analysis”, Prentice Hall of India, Pvt Ltd, New Delhi.  2. Duda R.O., P.E.Hart & D.G Stork, “ Pattern Classification”, 2nd Edition, J.Wiley.  3. Duda R.O.& Hart P.E., “Pattern Classification and Scene Analysis”, J.wiley.  4. Bishop C.M., “Neural Networks for Pattern Recognition”, Oxford University Press. | | | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **2** | **3** | **3** | **2** | **2** |
| **CO2** | **2** | **3** | **3** | **3** | **3** | **2** |
| **CO3** | **3** | **2** | **3** | **3** | **3** | **3** |
| **CO4** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **14** | **13** | **15** | **15** | **14** | **13** |

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| **Title of the Course/ Paper** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | | **Credits** | **Inst. Hours** | **Marks** | | |
| **CIA** | **External** | **Total** |
| **Skill Enhancement course** | **ADVANCED EXCEL** | SEC | 2 | - | - | - | | 2 | 2 | 25 | 75 | 100 |
| **Course Objective** | | | | | | | | | | | | |
| C1 | Handle large amounts of data | | | | | | | | | | | |
| C2 | Aggregate numeric data and summarize into categories and subcategories | | | | | | | | | | | |
| C3 | Filtering, sorting, and grouping data or subsets of data | | | | | | | | | | | |
| C4 | Create pivot tables to consolidate data from multiple files | | | | | | | | | | | |
| C5 | Presenting data in the form of charts and graphs | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | | | | **No. of Hours** | |
| I | Basics of Excel- Customizing common options- Absolute and relative cells- Protecting and un-protecting worksheets and cells- Working with Functions - Writing conditional expressions - logical functions - lookup and reference functions- VlookUP with Exact Match, Approximate Match- Nested VlookUP with Exact Match- VlookUP with Tables, Dynamic Ranges- Nested VlookUP with Exact Match- Using VLookUP to consolidate Data from Multiple Sheets | | | | | | | | | | 6 | |
| II | Data Validations - Specifying a valid range of values - Specifying a list of valid values- Specifying custom validations based on formula - Working with Templates Designing the structure of a template- templates for standardization of worksheets - Sorting and Filtering Data -Sorting tables | | | | | | | | | | 6 | |
| III | Creating Pivot tables Formatting and customizing Pivot tables- advanced options of Pivot tables- Pivot charts- Consolidating data from multiple sheets and files using Pivot tables- external data sources- data consolidation feature to consolidate data- Show Value As % of Row, % of Column, Running Total, Compare with Specific Field- Viewing Subtotal under Pivot- Creating Slicers. | | | | | | | | | | 6 | |
| IV | More Functions Date and time functions- Text functions- Database functions- Power Functions - Formatting Using auto formatting option for worksheets- Using conditional formatting option for rows, columns and cells- WhatIf Analysis - Goal Seek- Data Tables- Scenario Manager. | | | | | | | | | | 6 | |
| V | Charts - Formatting Charts- 3D Graphs- Bar and Line Chart together- Secondary Axis in Graphs- Sharing Charts with PowerPoint / MS Word, Dynamically- New Features Of Excel Sparklines, Inline Charts, data Charts- Overview of all the new features. | | | | | | | | | | 6 | |
|  | **Total** | | | | | | | | | | **30** | |
| **Course Outcomes** | | | | | | | **Programme Outcome** | | | | | |
| CO | Upon completion of the course the students would be able to: | | | | | |  | | | | | |
| 1 | Handle large amounts of data | | | | | | PO1, PO6 | | | | | |
| 2 | Aggregate numeric data and summarize into categories and subcategories | | | | | | PO2 | | | | | |
| 3 | Filtering, sorting, and grouping data or subsets of data | | | | | | PO4 ,PO7 | | | | | |
| 4 | Create pivot tables to consolidate data from multiple files | | | | | | PO6 | | | | | |
| 5 | Presenting data in the form of charts and graphs | | | | | | PO7,PO8 | | | | | |
| **Text Book** | | | | | | | | | | | | |
| 1 | E. Balagurusamy, “Object-Oriented Programming with C++”, TMH 2013, 7th Edition. | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
| 1. | Ashok N Kamthane, “Object-Oriented Programming with ANSI and Turbo C++”,  Pearson Education 2003. | | | | | | | | | | | |
| 2. | Maria Litvin& Gray Litvin, “C++ for you”, Vikas publication 2002. | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | |
| 1. | <https://alison.com/course/introduction-to-c-plus-plus-programming> | | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **2** | **3** | **2** | **2** | **2** |
| **CO2** | **3** | **3** | **3** | **2** | **3** | **2** |
| **CO3** | **3** | **2** | **3** | **3** | **3** | **3** |
| **CO4** | **3** | **2** | **2** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **12** | **14** | **13** | **14** | **13** |

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| **Subject Code** | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | | **Credits** | **Inst. Hours** | **Marks** | | | | |
| **CIA** | **External** | **Total** | | |
| **SKILL ENHANCEMENT COURSE** | | **Open Source Software Technologies** | SEC | 2 | - | - | - | | 2 | 2 | 25 | 75 | 100 | | |
| **Course Objective** | | | | | | | | | | | | | | | |
| C1 | | Able to Acquire and understand the basic concepts in Java,application of OOPS concepts. | | | | | | | | | | | | | |
| C2 | | Acquire knowledge about operators and decision-making statements. | | | | | | | | | | | | | |
| C3 | | To Identify the significance and application of Classes, arrays and interfaces and analyzing java arrays | | | | | | | | | | | | | |
| C4 | | Understand about the applications of OOPS concepts and analyze overriding and packages through java programs. | | | | | | | | | | | | | |
| C5 | | Can Create window-based programming using applet and graphics programming. | | | | | | | | | | | | | |
| **UNIT** | | **Details** | | | | | | | | | | **No. of Hours** | | | **CO** |
| I | | Open Source – open source vs. commercial software – What is Linux? – Free Software – Where I can use Linux? - Linux kernel – Linux distributions. | | | | | | | | | | 6 | | C1 | |
| II | | Introduction Linux Essential Commands – File System concept – Standard Files –The Linux Security Model – Introduction to Unix – Unix Components Unix Files – | | | | | | | | | | 6 | | C2 | |
| III | | Introduction - Apache Explained – Starting, Stopping and Restarting Apache –Modifying the Default configuration – Securing Apache – Set user and Group | | | | | | | | | | 6 | | C3 | |
| IV | | **MySQL:** Introduction to MySQL – The show databases and table – The USE command –Create Database and Tables – Describe Table – | | | | | | | | | | 6 | | C4 | |
| V | | I**ntroduction** –PHP Form processing – Database Access with PHP – MySQL, MySQLFunctions – Inserting Records – Selecting Records – Deleting Records – Update Records. | | | | | | | | | | 6 | | C6 | |
|  | | **Total** | | | | | | | | | | **30** | | | |
| **Course Outcomes** | | | | | | | | **Programme Outcome** | | | | | | | |
| CO | On completion of this course, students will | | | | | | |  | | | | | | | |
| 1 | Acquire and understand the basic concepts in Java, application of OOPS concepts. | | | | | | | Po1 | | | | | | | |
| 2 | Acquire knowledge about operators and decision-making statements. | | | | | | | Po1,Po2 | | | | | | | |
| 3 | Identify the significance and application of Classes, arrays and interfaces and analyzing java arrays | | | | | | | Po4,Po6 | | | | | | | |
| 4 | Understand about the applications of OOPS concepts and analyze overriding and packages through java programs. | | | | | | | Po4,Po5,Po6 | | | | | | | |
| 5 | Create window-based programming using applet and graphics programming. | | | | | | | Po3,Po8 | | | | | | | |
| **Text Book** | | | | | | | | | | | | | | | |
| 1 | 1. James Lee and Brent Ware “Open Source Web Development with LAMP using | | | | | | | | | | | | | | |
| 2 | 1. LINUX, Apache, MySQL, Perl and PHP”, Dorling Kindersley (India) Pvt. Ltd, 2008. | | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | | |
| 1. | Eric Rosebrock, Eric Filson, “Setting up LAMP: Getting Linux, Apache, MySQL and PHP and   working together”, John Wiley and Sons, 2004. | | | | | | | | | | | | | | |
| 2. | 2. Anthony Butcher , “Teach Yourself MySQL in 21 days”, 2nd Edition, Sams Publication. | | | | | | | | | | | | | | |
| 3. | 3. Rich Bower, Daniel Lopez Ridreejo, Alian Liska , “Apache Administrator’s Handbook”, Sams   Publication. | | | | | | | | | | | | | | |
| 4. | 4. Tammy Fox, “RedHat Enterprise Linux 5 Administration Unleashed”, Sams Publication. | | | | | | | | | | | | | | |
| 5. | 5. Naramore Eligabette, Gerner Jason, Wrox Press, Wiley Dreamtech Press, “Beginning PHP5,   Apache, MySQL Web Development”, 2005. | | | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | | |
| 1. | [Introduction to Open-Source and its benefits - GeeksforGeeks](https://www.geeksforgeeks.org/introduction-to-open-source-and-its-benefits/) | | | | | | | | | | | | | | |
| 2. | [https://www.bing.com/](https://www.bing.com/search?q=open+source+STUDY+NOTES&qs=n&form=QBRE&sp=-1&pq=open+source+study+notes&sc=8-23&sk=&cvid=B56C9B9082BD4543B5424F5D24AC1E44&ghsh=0&ghacc=0&ghpl=) | | | | | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **2** | **3** | **2** | **3** | **2** |
| **CO2** | **2** | **3** | **3** | **3** | **3** | **2** |
| **CO3** | **2** | **2** | **3** | **3** | **3** | **3** |
| **CO4** | **3** | **3** | **2** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **13** | **13** | **14** | **14** | **15** | **13** |

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| **Subject Code** | **Subject Name** | | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Inst. Hours** | **Marks** | | |
| **CIA** | **External** | **Total** |
| **SKILL ENHANCEMENT COURSE** | **PHP Programming** | | SEC | 2 | - | - | - | 2 | | 2 | 25 | 75 | 100 |
| **LearningObjectives:**(forteachers:whattheyhavetodointheclass/lab/field)  The objective of this course is to teach the fundamentals of quantum information processing, including quantum computation, quantum cryptography, and quantum information theory. | | | | | | | | | | | | | |
| **Course Outcomes:**(forstudents:Toknowwhattheyaregoingtolearn)  **CO1:**Analyze the behaviour of basic quantum algorithms  **CO2:**Implement simple quantum algorithms and information channels in the quantum circuit model  **CO3:**Simulate a simple quantum error-correcting code  **CO4:** Prove basic facts about quantum information channels  **CO5:** | | | | | | | | | | | | | |
| **Units** | | **Contents** | | | | | | | **Required Hours** | | | | |
| **I** | | Introduction to PHP -Basic Knowledge of websites -Introduction of Dynamic Website -Introduction to PHP -Scope of PHP -XAMPP and WAMP Installation- PHP Programming Basics -Syntax of PHP | | | | | | | **6** | | | | |
| **II** | | Introduction to PHP Variable -Understanding Data Types -Using Operators -Using Conditional Statements -If(), else if() and else if condition Statement -Switch() Statements -Using the while() Loop -Using the for() Loop | | | | | | | **6** | | | | |
| **III** | | PHP Functions -PHP Functions -Creating an Array -Modifying Array Elements -Processing Arrays with Loops -Grouping Form Selections with Arrays -Using Array | | | | | | | **6** | | | | |
| **IV** | | PHP Advanced Concepts -Reading and Writing Files -Reading Data from a File -Managing Sessions and Using Session Variables | | | | | | | **6** | | | | |
| **V** | | OOPS Using PHP -OOPS Concept-Class, Object, Abstractions, Encapsulation, Inheritance, Polymorphism -Creating Classes and Object in PHP-Cookies and Session Management | | | | | | | **6** | | | | |
| **LearningResources:**   * **RecommendedTexts**   Head First PHP & MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison.   * **ReferenceBooks**   The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes | | | | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **2** | **3** | **2** | **2** | **2** |
| **CO2** | **3** | **3** | **3** | **3** | **3** | **2** |
| **CO3** | **3** | **2** | **3** | **3** | **3** | **3** |
| **CO4** | **3** | **2** | **2** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **2** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **12** | **13** | **14** | **14** | **13** |

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| **Subject Code** | **Subject Name** | | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Inst. Hours** | **Marks** | | |
| **CIA** | **External** | **Total** |
| **SKILL ENHANCEMENT COURSE** | **NETWORK SECURITY** | | SEC | 2 | - | - | - | 2 | | 2 | 25 | 75 | 100 |
| **LearningObjectives:**(forteachers:whattheyhavetodointheclass/lab/field)   * To study the number theory used for network security * To understand the design concept of cryptography and authentication * To develop experiments on algorithm used for security | | | | | | | | | | | | | |
| **Course Outcomes:**(forstudents:Toknowwhattheyaregoingtolearn)  **CO1:** Develop an understanding of the fundamentals of networking and security  **CO2:** Gain an appreciation for the complexities of protecting networks and systems from attack  **CO3:** Learn about the tools used to detect and protect against malicious attacks  **CO4:** Develop the skills to configure various security-related technologies  **CO5:** Utilize protocols such as TLS/SSL, IPSec, and SNMP in order to build secure systems. | | | | | | | | | | | | | |
| **Units** | | **Contents** | | | | | | | **Required Hours** | | | | |
| **I** | | Model of network security–Security attacks, services and attacks– OSI security architecture – Classical encryption techniques – SDES – Block cipher Principles DES– Strength of DES–Block cipher design principles – Block cipher mode of operation | | | | | | | **6** | | | | |
| **II** | | Number Theory– Prime number–Modular arithmetic– Euclid’s algorithm | | | | | | | **6** | | | | |
| **III** | | Authentication requirement – Authentication function – MAC – Hash function –Security of hash function and MAC – SHA - HMAC – CMAC | | | | | | | **6** | | | | |
| **IV** | | Authentication applications – Kerberos – X.509 Authentication services - E-mail security–IP security- Web security. | | | | | | | **6** | | | | |
| **V** | | Intruder–Intrusion detection system–Virus and related threats– Counter measures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security | | | | | | | **6** | | | | |
| **Learning Resources:**   * **Recommended Texts**  1. WilliamStallings,“Cryptography&NetworkSecurity”,PearsonEducation,FourthEdition2010.  * **Reference Books**  1. CharlieKaufman,RadiaPerlman,MikeSpeciner,“NetworkSecurity,Privatecommunicationinpublicworld”,PHISecondEdition,2002. 2. BruceSchneier,NeilsFerguson,“PracticalCryptography”,WileyDreamtechIndiaPvtLtd,FirstEdition,2003. 3. DouglasRSimson“Cryptography–Theoryandpractice”,CRCPress,FirstEdition,1995. | | | | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **2** | **3** | **2** | **3** | **2** |
| **CO2** | **2** | **3** | **3** | **3** | **3** | **2** |
| **CO3** | **2** | **2** | **2** | **3** | **3** | **3** |
| **CO4** | **3** | **2** | **2** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **13** | **12** | **13** | **14** | **15** | **13** |

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| **Subject Code** | **Subject Name** | | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Inst. Hours** | **Marks** | | |
| **CIA** | **External** | **Total** |
| **SKILL ENHANCEMENT COURSE** | **IMAGE PROCESSING** | | SEC | 2 | - | - | - | 2 | | 2 | 25 | 75 | 100 |
| **LearningObjectives:**(forteachers:whattheyhavetodointheclass/lab/field)  • To become familiar with digital image fundamentals  • To get exposed to simple image enhancement techniques in Spatial and Frequency domain.  • To learn concepts of degradation function and restoration techniques.  • To study the image segmentation and representation techniques.  • To become familiar with image compression and recognition methods | | | | | | | | | | | | | |
| **Course Outcomes:**(forstudents:Toknowwhattheyaregoingtolearn)  **CO1:** Gain a fundamental understanding of digital image processing  **CO2:** Learn the basics of how digital images are represented and processed  **CO3:** Understand image enhancement techniques  **CO4:** Develop your programming skills to apply digital image processing algorithms  **CO5:** Design solutions for real-world problems that involve digital image processing. | | | | | | | | | | | | | |
| **Units** | | **Contents** | | | | | | | **Required Hours** | | | | |
| **I** | | **DIGITAL IMAGE FUNDAMENTALS:** Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization | | | | | | | **6** | | | | |
| **II** | | **IMAGE ENHANCEMENT**: Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, | | | | | | | **6** | | | | |
| **III** | | **IMAGE RESTORATION:** Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters | | | | | | | **6** | | | | |
| **IV** | | **IMAGE SEGMENTATION:** Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging | | | | | | | **6** | | | | |
| **V** | | **IMAGE COMPRESSION AND RECOGNITION:** Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. | | | | | | | **6** | | | | |
| **LearningResources:**   * **Recommended Texts**  1. Anil K. Jain , Digital Image Processing: Principles and Applications 2. Wayne Niblack, "Introduction to Digital Image Processing" 3. B.S. Manjunath and Srimat T.V. Rao, "Digital Image Processing: An Algorithmic Approach Using Java"  * **Reference Books**  1. Rafael C. Gonzalez and Richard Eugene Woods, "Digital Image Processing"  * **Web resources** * <https://www.learnopencv.com/> * <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-435j-digital-image-processing-fall-2004/> * http://web.stanford.edu/class/cs155/ | | | | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **2** | **3** | **2** | **2** | **2** |
| **CO2** | **2** | **3** | **3** | **3** | **3** | **2** |
| **CO3** | **2** | **2** | **3** | **3** | **3** | **3** |
| **CO4** | **3** | **2** | **2** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **2** | **3** |
| **Weightage of course contributed to each PSO** | **13** | **12** | **14** | **14** | **13** | **13** |