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| B.sc.,  software engineering |
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| **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. Software Engineering**

Education is the key to development of any society. Role of higher education is crucial for securing right kind of employment and also to pursue further studies in best available world class institutes elsewhere within and outside India. Quality education in general and higher education in particular deserves high priority to enable the young and future generation of students to acquire skill, training and knowledge in order to enhance their thinking, creativity, comprehension and application abilities and prepare them to compete, succeed and excel globally. Learning Outcomes-based Curriculum Framework (LOCF) which makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve. LOCF also aims at ensuring uniform education standard and content delivery across the state which will help the students to ensure similar quality of education irrespective of the institute and location.

Computer Science is the study of quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. throughout the world in last couple of decades and it has carved out a space for itself like any other disciplines of basic science and engineering. Computer science is a discipline that spans theory and practice and it requires thinking both in abstract terms and in concrete terms. Nowadays, practically everyone is a computer user, and many people are even computer programmers. Computer Science can be seen on a higher level, as a science of problem solving and problem solving requires precision, creativity, and careful reasoning. The ever-evolving discipline of computer science also has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and knowledge of the particular application domain. Computer science has a wide range of specialties. These include Computer Architecture, Software Systems, Graphics, Artificial Intelligence, Computational Science, and Software Engineering. Drawing from a common core of computer science knowledge, each specialty area focuses on specific challenges. Computer Science is practiced by mathematicians, scientists and engineers. Mathematics, the origins of Computer Science, provides reason and logic. Science provides the methodology for learning and refinement. Engineering provides the techniques for building hardware and software.

The Students completing this programme will be able to present Software application clearly and precisely, make abstract ideas precise by formulating them in the Computer languages. Completion of this programme will also enable the learners to join teaching profession, enhance their employability for government jobs, jobs in software industry, banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

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| **LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME** | | |
| **Programme:** | **B.Sc., Software Engineering** | |
| **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.**

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| **Methods of Evaluation** | | |
| **Internal Evaluation** | Continuous Internal Assessment Test | 25 Marks |
| Assignments |
| Seminars |
| Attendance and Class Participation |
| **External Evaluation** | End Semester Examination | 75 Marks |
|  | Total | 100 Marks |
| **Methods of Assessment** | | |
| **Recall (K1)** | Simple definitions, MCQ, Recall steps, Concept definitions | |
| **Understand/ Comprehend (K2)** | MCQ, True/False, Short essays, Concept explanations, Short summary or  overview | |
| **Application (K3)** | Suggest idea/concept with examples, Suggest formulae, Solve problems,  Observe, Explain | |
| **Analyze (K4)** | Problem-solving questions, Finish a procedure in many steps, Differentiate | |
|  | between various ideas, Map knowledge | |
| **Evaluate (K5)** | Longer essay/ Evaluation essay, Critique or justify with pros and cons | |
| **Create (K6)** | Check knowledge in specific or offbeat situations, Discussion, Debating or  Presentations | |

**Template for Curriculum Design for UG Programme in B.Sc Software Engineering**

**Credit Distribution for UG Programme in Software Engineering**

**B.Sc Software Engineering**

**First Year**

**Semester-I**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **Hours per week (L/T/P)** |
| Part-I | Language -Tamil | 3 | 6 |
| Part-II | English | 3 | 6 |
| Part-III | Core Courses 2 (CC1, CC2) | 5 | 5 |
| Elective Course 1 ( Generic / Discipline Specific)EC1 | 3 | 4 |
| Part-IV | Skill Enhancement Course SEC-1 (Non Major Elective) | 2 | 2 |
| Foundation Course FC | 2 | 2 |
|  |  |  |  |

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| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **Hours per week (L/T/P)** |
| Part-I | Language -Tamil | 3 | 6 |
| Part-II | English | 3 | 6 |
| Part-III | Core Courses 2 (CC3, CC4) | 5 | 5 |
| Elective Course 1 ( Generic / Discipline Specific) EC2 | 3 | 4 |
| Part-IV | Skill Enhancement Course -SEC-2 (Non Major Elective) | 2 | 2 |
| Skill Enhancement Course -SEC-3 (Discipline Specific / Generic) | 2 | 2 |
|  |  |  |  |

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**Second Year Semester-III**

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| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **Hours per week (L/T/P)** |
| Part-I | Language -Tamil | 3 | 6 |
| Part-II | English | 3 | 6 |
| Part-III | Core Courses 2 (CC5, CC6) | 5 | 5 |
| Elective Course 1 ( Generic / Discipline Specific)EC3 | 3 | 4 |
| Part-IV | Skill Enhancement Course -SEC-4 (Entrepreneurial Based) | 1 | 1 |
| Skill Enhancement Course -SEC-5 (Discipline Specific/ Generic) | 2 | 2 |
| Environmental Studies(EVS) | - | 1 |
|  |  |  |  |

**Semester-IV**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **Hours per week (L/T/P)** |
| Part-I | Language- Tamil | 3 | 6 |
| Part-II | English | 3 | 6 |
| Part-III | Core Courses 2 (CC7, CC8) | 5  5 | 5  5 |
| CC7: Core Industry Module -1 - **Industrial Statistics** |
| CC8 : Any Core paper |
| Elective Course 1 (Generic / Discipline Specific)EC4 | 3 | 3 |
| Part-IV | Skill Enhancement Course -SEC7 | 2 | 2 |
| Skill Enhancement Course -SEC-8 (Discipline Specific / Generic) | 2 | 2 |
| Environmental Studies EVS | 2 | 1 |
|  |  | **25** | **30** |

**Third Year Semester-V**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **Hours per week (L/T/P)** |
| Part-III | Core Courses 3(CC9, CC10, CC11) | 4 | 5 |
| Elective Courses 2 (Generic / Discipline Specific) EC5, EC6 | 3 | 4 |
| Core /Project with Viva voce CC12 | 4 | 5 |
| Part-IV | Value Education | 2 | 2 |
| Internship / Industrial Training (Carried out in II Year Summer vacation) (30 hours) | 2 |  |
|  |  | **26** | **30** |

**Semester-VI**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **Hours per week (L/T/P)** |
| Part-III | Core Courses 3 (CC13, CC14, CC15) | 4 | 6 |
| Elective Courses 2 (Generic / Discipline Specific) EC7, EC8 | 3 | 5 |
| Part IV | Professional Competency Skill Enhancement Course SE8 | 2 | 2 |
| Part-V | Extension Activity (Outside college hours) | 1 |  |
|  |  | **21** | **30** |

**Total Credits: 140**

**Suggested topics in Core component**

1. Object Oriented Programming Using C++
2. C++ Programming Lab
3. Data Communication and Networking
4. .NET Programming
5. .NET Programming Lab
6. Software Metrics
7. Machine Learning
8. Network Security
9. Mobile Application Development
10. Object Oriented Software Engineering and more..

## **Suggested topics in Elective Course**

**Generic Specific**

1. Discrete Mathematics – I
2. Discrete Mathematics-II
3. Statistical Methods and its Application-I
4. Statistical Methods and its Application-II
5. Optimization Techniques
6. Nano Technology
7. Introduction to Linear Algebra
8. Graph Theory and its Application
9. Financial Accounting
10. Cost and Management Accounting
11. Digital Logic Fundamentals
12. Numerical Methods

**Elective course – (1- 8)-Discipline Specific**

1. Natural Language Processing
2. Cryptography
3. Big Data Analytics
4. Internet of Things
5. Human Computer Interaction
6. Fuzzy Logic
7. Software Project Management
8. Image Processing
9. Information Security
10. Analytics for Service Industry
11. Grid Computing
12. Cyber Forensics
13. Pattern Recognition
14. Artificial Intelligence
15. Robotics and its applications and more..

## **Annexure II**

**Suggested topics in Skill Enhancement(SEC1-SEC8) Course**

1. Fundamentals of Information Technology
2. Understanding Internet
3. Multimedia Lab
4. Web Designing
5. Software Testing
6. PHP Programming
7. Office Automation
8. Quantitative Aptitude
9. Multimedia Systems
10. Biometrics
11. Enterprise Resource Planning
12. Organization Behaviour
13. Simulation and Modeling
14. Virtual Reality
15. Computer Graphics and more..

**FIRST YEAR – SEMESTER – I**

**Core – I: PROBLEM SOLVING THROUGH C**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | **5** | **0** | **0** | **I** | **4** | **5** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | Understand and apply C programming concepts to solve problems. | | | | | | | | | | |
| **LO2** | Develop algorithms and use programming constructs in C to solve various problems. | | | | | | | | | | |
| **LO3** | Use debugging and testing techniques to ensure code accuracy and efficiency. | | | | | | | | | | |
| **LO4** | Analyze problem requirements and design appropriate solutions. | | | | | | | | | | |
| **LO5** | Collaborate effectively with others to solve programming problems. | | | | | | | | | | |
| **Unit** | **Contents** | | | | | | | | | **No. of Hours** | |
| I | Overview of Computers and Programming: Electronic Computers Then and Now , Computer Hardware, Computer Software , The Software Development Method, Applying the Software Development Method , Professional Ethics for Computer Programmers Fundamentals of C Languages: History of C, Character Set, Identifiers and Overview of C:– Introduction - character set - C tokens - keyword & identifiers – constants – variables - data types – Declarations of variables ,operators - expressions - Evaluation of expression - Mathematical functions - Formatted input and output | | | | | | | | | **15** | |
| II | Decision Statements: If, if else, switch, break, continue - the? Operator - The GOTO statement. – Loop Control Statements: Introduction – for, nested for loops – while, do-while statements – Arrays: One-dimensional - Two dimensional - Multidimensional arrays | | | | | | | | | **15** | |
| III | Character string handling - Declaring and initializing string variables - Reading strings from terminal - Writing strings to screen - String handling functions - User-defined functions: Need for user defined functions – Types of functions - calling a function category of functions - no arguments and no return values - Arguments but no return values - Arguments with return values – Recursion - functions with arrays - The scope and lifetime of variables in functions | | | | | | | | | **15** | |
| IV | Structure: Definition- Structure initialization - Comparison of structure variables - Arrays of structures - Arrays within structures - Structures within structures – unions. Pointers: understanding pointers - accessing the address of a variable- declaring and initializing pointers - accessing a variable through its pointers - pointer expressions - pointers and arrays - pointers and character strings - pointers and functions - pointers and structures | | | | | | | | | **15** | |
| V | File Management in C: defining and opening a file - closing file - I/O operations on files - error handling during I/O operations - Random access to files - command line arguments. Preprocessors | | | | | | | | | **15** | |
| **TOTAL** | | | | | | | | | | **75** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | Outline the fundamental concepts of C programming languages, and its features | | | | | | | | | | |
| CO2 | Demonstrate the programming methodology | | | | | | | | | | |
| CO3 | Identify suitable programming constructs for problem solving | | | | | | | | | | |
| CO4 | Select the appropriate data representation, control structures, Functions and concepts based on the problem requirement | | | | | | | | | | |
| CO5 | Evaluate the program performance by fixing the errors | | | | | | | | | | |

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| **Textbooks** | |
|  | “Problem solving and program design in C”, Jeri R. Hanly, Elliot B. Koffman. —7th ed.,PEARSON |
|  | E. Balagurusamy, “Programming in ANSI C” , fifth edition, Tata McGraw- Hill. |
| **Reference Books** | |
|  | V. Rajaraman,“Computer Programming in C” ,Prentice Hall of India Pvt Ltd, 1st Edition,2004 |
|  | Yashwvant Kanetkar , “Let us C”, BPB Publications 13th Edition, 2014 |
| **NOTE: Latest Edition of Textbooks May be Used** | |
| **Web Resources** | |
|  | <http://www.learn-c.org/> |
|  | <http://crasseux.com/books/ctutorial/> |

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

**FIRST YEAR – SEMESTER – I**

**Core – II: C PROGRAMMING-PRACTICAL**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | **0** | **0** | **4** | **I** | **4** | **4** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | Develop problem-solving skills through applying programming concepts and techniques. | | | | | | | | | | |
| **LO2** | Gain mastery over C programming constructs to develop efficient programs. | | | | | | | | | | |
| **LO3** | Acquire skills to debug and troubleshoot C programs using various techniques. | | | | | | | | | | |
| **LO4** | Foster good programming practices for reliable and maintainable code. | | | | | | | | | | |
| **LO5** | Improve collaborative programming abilities for effective teamwork. | | | | | | | | | | |
| **List of Exercises** | | | | | | | | | | | |
| 1. Develop a C program to print prime numbers within the range of integers given. .  2. Develop a C Program to find the sum and average of given N numbers.  3. Develop a C Program using all decision making and looping statements.  4. Develop a C Program to arrange the given numbers in ascending /descending order.  5. Develop a C Program to perform matrix multiplication.  6. Develop a C Program to manipulate string functions.  7. Develop a C Program to find the Fibonacci series for a give number using recursive function.  8. Develop a C Program to show Call by Value and Call by Reference.  9. Develop a C program to swap two numbers using pointers.  10. Develop a C Program to update the student’s details using various file modes.  11. Develop a C Program to copy the content of one file to another file. | | | | | | | | | | | |
| **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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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **3** | **2** | **2** | **2** | **2** |
| **CO2** | **3** | **2** | **2** | **2** | **2** | **2** |
| **CO3** | **3** | **2** | **2** | **2** | **3** | **3** |
| **CO4** | **3** | **2** | **2** | **2** | **2** | **3** |
| **CO5** | **3** | **2** | **2** | **3** | **2** | **2** |
| **Weightage of course**  **contributed to each PSO** | **15** | **11** | **10** | **11** | **11** | **12** |

**FIRST YEAR – SEMESTER – II**

**CORE III: JAVA PROGRAMMING WITH DATA STRUCTURES**

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| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
| **C3** | | **5** | **0** | **0** | **II** | **4** | **5** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | To enable the students to learn the basic concepts of Java programming | | | | | | | | | | |
| **LO2** | To use class and objects to create applications | | | | | | | | | | |
| **LO3** | To have an overview of interfaces, packages, multithreading and exceptions. | | | | | | | | | | |
| **LO4** | To familiarize students with basic data structures and their use in algorithms | | | | | | | | | | |
| **Unit** | **Contents** | | | | | | | | | **No. of Hours** | |
| I | History and Evolution of Java - Features of Java - Object Oriented Concepts–Bytecode-Lexical Issues- DataTypes – Variables- Type Conversion and Casting- Operators - Arithmetic Operators - Bitwise – Relational Operators - Assignment Operator - The conditional Operator  - Operator Precedence- Control Statements – Arrays. | | | | | | | | | **15** | |
| II | Classes - Objects - Constructors - Overloading method - Static and fixed methods - Inner Classes - String Class Overriding methods - Using super-Abstract class - this keyword – finalize() method –  Garbage Collection | | | | | | | | | **15** | |
| III | Packages - Access Protection - Importing Packages - Interfaces - Exception Handling - Throw and Throws- Java Thread Model- Creating a Thread and Multiple Threads - Thread Priorities Synchronization - Inter thread Communication - Deadlock -  Suspending, Resuming and stopping threads – Multithreading-I/O Streams - FileStreams - Applets . | | | | | | | | | **15** | |
| IV | Abstract Data Types(ADTs)-List ADT-Array based implementation- linked list implementation-singly linked list doubly linked list-circular linked list-Stack ADT operations-Applications-Evaluating arithmetic expressions Conversion of infix to postfix expression-Queue ADT-  operations-Applications of Queues. | | | | | | | | | **15** | |
| V | Trees-Binary Trees- representation - Operations on Binary Trees- Traversal of a Binary Tree -Binary Search Trees, Graphs-  Representation of Graphs - Traversal in Graph -Dijkstra’s Algorithm, Depth-First vs Breadth-First Search. | | | | | | | | | **15** | |
| **TOTAL** | | | | | | | | | | **75** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | Outline the different fundamental concepts of data structures | | | | | | | | | | |
| CO2 | Describe the different memory representation for datastorage and apply various operations | | | | | | | | | | |
| CO3 | Construct an algorithm for different data structure operations. | | | | | | | | | | |
| CO4 | Analyze the data structures applications. | | | | | | | | | | |
| CO5 | Discover suitable techniques to provide solution for solving the problems. | | | | | | | | | | |
| **Textbooks** | | | | | | | | | | | |
|  | E.Balagurusamy, “*Programming with Java: A Primer*”, Tata McGraw Hill 2014, 5th  Edition. | | | | | | | | | | | |
|  | Mark Allen Weiss, “*Data Structures and Algorithms Analysis in C++*”,Person  Education 2014, 4th Edition. | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
| 1. | Herbert Schildt, “*JAVA 2: The Complete Reference*”, McGraw Hill, 2018, 11th  Edition. | | | | | | | | | | | |
| 2. | Aho, Hopcroft and Ullman, “*Data Structures and Algorithms*”, Pearson Education 2003. | | | | | | | | | | | |
| 3. | S. Sahni, “*Data Structures, Algorithms and Applications in JAVA*”, Universities Press 2005, 2nd Edition. | | | | | | | | | | | |
| **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | |
| 1. | NPTEL & MOOC courses titled Java and Data Structures | | | | | | | | | | | |
| 2. | https://nptel.ac.in/courses/106106127/ | | | | | | | | | | | |
| 3. | https://nptel.ac.in/courses/106105191/ | | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **CO1** | **3** | **2** | **1** | **2** | **1** | **2** |
| **CO2** | **3** | **3** | **2** | **2** | **3** | **3** |
| **CO3** | **3** | **3** | **2** | **3** | **3** | **2** |
| **CO4** | **3** | **2** | **3** | **2** | **2** | **3** |
| **CO5** | **3** | **2** | **2** | **2** | **3** | **3** |
| **Weightage of course contributed to**  **each PSO** | **15** | **12** | **10** | **11** | **12** | **13** |

**FIRST YEAR – SEMESTER – II**

**CORE IV: JAVA PROGRAMMING PRACTICAL**

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| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | | |
| **CIA** | **External** | | **Total** | |
| **CC4** | | **0** | **0** | **5** | **II** | **4** | **5** | **25** | **75** | | **100** | |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | To implement linear and non-linear data structures | | | | | | | | | | |
| **LO2** | To understand the different operations of search trees | | | | | | | | | | |
| **LO3** | To implement graph traversal algorithms | | | | | | | | | | |
|  | **LIST OF EXERCISES** | | | | | | | | |  | |
| 1. Write a Java program to implement the Stack ADT using a singly linked list. 2. Write a Java program to implement the Queue ADT using a singly linked list. 3. Write a Java program for the implementation of circular Queue. 4. Write a Java program that reads an infix expression, converts into postfix form 5. Write a Java program to evaluate the postfix expression (use stack ADT). 6. Write a Java program to an Insert an element into a binary search tree. 7. Write a Java program to delete an element from a binary search tree. 8. Write a Java program to search for a key element in a binary search tree. 9. Write a Java program for the implementation of BFS for a given graph. 10. Write a Java program for the implementation of DFS for a given graph | | | | | | | | | | | |
| **TOTAL** | | | | | | | | | | **75** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | Demonstrate the understanding of syntax and semantics of Java programs. | | | | | | | | | | |
| CO2 | Identify the problem and solve using Java programming techniques. | | | | | | | | | | |
| CO3 | Ability to write functions to implement linear and non-linear data structure operations. | | | | | | | | | | |
| CO4 | Suggest appropriate linear and non-linear data structure operations for solving a given problem. | | | | | | | | | | |
| CO5 | Develop a Java program for a given problem and test for its correctness. | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/ PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **3** | **2** | **2** | **2** | **2** |
| **CO2** | **3** | **2** | **2** | **2** | **2** | **2** |
| **CO3** | **3** | **2** | **2** | **2** | **3** | **3** |
| **CO4** | **3** | **2** | **2** | **2** | **2** | **3** |
| **CO5** | **3** | **2** | **2** | **3** | **2** | **2** |
| **Weightage of course contributed toeach PSO** | **15** | **11** | **10** | **11** | **11** | **12** |

**SECOND YEAR – SEMESTER – III**

**Core – V: RELATIONAL DATABASE MANAGEMENT SYSTEM**

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| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | **5** | **0** | **0** | **III** | **4** | **5** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | Learn to design and organize a relational database in an efficient manner. | | | | | | | | | | |
| **LO2** | Learn how to use SQL to manage and retrieve data from a database quickly and effectively. | | | | | | | | | | |
| **LO3** | Learn how to set rules in the database to ensure the accuracy and consistency of the data. | | | | | | | | | | |
| **LO4** | Learn how to optimize database queries to make them run faster and more efficiently. | | | | | | | | | | |
| **LO5** | Learn how to manage multiple users of a database and ensure their transactions are processed efficiently and without errors. | | | | | | | | | | |
| **Unit** | **Contents** | | | | | | | | | **No. of Hours** | |
| I | Introduction: Database System Applications-Purpose of Database Systems-View of Data-Database Languages- Transaction Management-Database Architecture-Database users and Administrators.  Relational Model: Structure of Relational Databases – Database Design – ER Model-Overview of the Design Process – The Entity – relationship Model – Constraints – Entity Relationship  Diagrams. | | | | | | | | | **15** | |
| II | Relational Algebra Operations –Relational Languages: The Tuple Relational Calculus –The Domain Relational Calculus – SQL: Background – Data Definition – Basic Structure of SQL Queries – Set Operations – Aggregate Functions – Null Values –  Nested Sub-Queries – Views – Modification of the Database. | | | | | | | | | **15** | |
| III | Data Normalization: Pitfalls in Relational Database Design – Decomposition – Functional Dependencies – Normalization – First Normal Form – Second Normal Form – Third Normal Form – Boyce-Codd Normal Form – Fourth Normal Form – Fifth Normal Form – De-normalization – Database Security: Data Security Requirements – Protecting the Data within the Database – Granting and Revoking Privileges – Data  Encryption. | | | | | | | | | **15** | |
| IV | PL/SQL: A programming Language: History - Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Declaration – Assignment operation – Bind variables – Substitution Variables – Printing – Arithmetic Operators. Control Structures and Embedded SQL: Control Structures – Nested Blocks – SQ L IN PL/SQL – Data Manipulation- Transaction Control statements. PL/SQL Cursors and Exceptions: Cursors – Implicit & Explicit Cursors and Attributes  – Cursor FOR loops – SELECT...FOR UPDATE – WHERE  CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions. | | | | | | | | | **15** | |
| V | PL/SQL Composite Data Types: Records – Tables – Varrays. Named Blocks: Procedures – Functions – Packages - Triggers – Data Dictionary Views. | | | | | | | | | **15** | |
| **TOTAL** | | | | | | | | | | **75** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | Outline the fundamental RDBMS concepts and PL/SQL | | | | | | | | | | |
| CO2 | Apply database operations, mapping, normalization, SQL and | | | | | | | | | | |
| CO3 | Analyze the requirements to implement relational database PL/SQL concepts | | | | | | | | | | |
| CO4 | Evaluate the database based on various models and normalization. | | | | | | | | | | |
| CO5 | Design and construct normalized tables and manipulate it effectively using SQL and PL/SQL database objects. | | | | | | | | | | |
| **Textbooks** | | | | | | | | | | | |
|  | “Database System Concepts”,Abraham Silberschatz, Henry F.Korth, S.Sudarshan, TMH 5th Edition (Units – I,II) | | | | | | | | | | |
|  | “Fundamentals of Database Management Systems”, Alexis Leon, Mathews Leon, Vijay Nicole Imprints Private Limited. (Unit-III) | | | | | | | | | | |
|  | “Database Systems Using Oracle”,Nilesh Shah,2nd edition,PHI.UNIT-IV: Chapters 10 & 11 | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
|  | Alexix Leon & Mathews Leon, "Essential of DBMS", 2nd reprint, Vijay Nicole Publications, 2009. | | | | | | | | | | |
| **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | |
|  | htt[ps://www.w3schools.com/sql](http://www.w3schools.com/sql) | | | | | | | | | | |
|  | htt[ps://www.tutorialspoint.com/sql](http://www.tutorialspoint.com/sql/) | | | | | | | | | | |
|  | <https://livesql.oracle.com> | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/ PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **2** | **3** | **3** | **3** |
| **CO2** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO3** | **3** | **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** | **15** | **14** | **14** | **15** | **15** | **15** |

**SECOND YEAR – SEMESTER – III**

**Core – VI: RDBMS LAB**

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| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | **0** | **0** | **4** | **III** | **4** | **4** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | Understand the basics of SQL and how to write simple queries to retrieve and manipulate data in a database. | | | | | | | | | | |
| **LO2** | Learn how to use more advanced SQL features, such as joins, subqueries, and aggregate functions, to perform complex data operations. | | | | | | | | | | |
| **LO3** | Learn how to write PL/SQL code to automate tasks and implement business logic within a database. | | | | | | | | | | |
| **LO4** | Develop proficiency in using SQL Developer and other tools to develop and test SQL and PL/SQL code. | | | | | | | | | | |
| **LO5** | Understand best practices for database security | | | | | | | | | | |
| **List of Exercises** | | | | | | | | | | | |
| Demonstrate the following SQL commands  1. Data Definition of Base Tables.  2. DDL with Primary key constraints.  3. DDL with constraints and verification by insert command.  4. Data Manipulation of Base Tables and Views.  5. Demonstrate the Query commands.  6. Write a PL/SQL code block that will accept an account number from the user and debit an amount of Rs. 2000 from the account if the account has a minimum balance of 500 after the amount is debited. The Process is to fire on the Accounts table.  7. Write a PL/SQL code block to calculate the area of the circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated area in a table Areas. Areas – radius, area.  8. Write a PL/SQL block of code for reversing a number. (Example: 1234 as 4321).  9. Create a transparent audit system for a table Client\_master (client\_no, name, address, Bal\_due). The system must keep track of the records that are being deleted or updated. The functionality being when a record is deleted or modified the original record details and the date of operation are stored in the audit client (client\_no, name, bal\_due, operation, userid, opdate) table, then the delete or update is allowed to go through. | | | | | | | | | | | |
| **TOTAL** | | | | | | | | | | **60** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | Choose appropriate SQL queries and PL/SQL blocks for the database. | | | | | | | | | | |
| CO2 | Implement SQL and PL/SQL blocks for the given problem effectively. | | | | | | | | | | |
| CO3 | Analyze the problem and Exceptions using queries and PL/SQL blocks. | | | | | | | | | | |
| CO4 | Validate the database for normalization using SQL and PL/SQL blocks. | | | | | | | | | | |
| CO5 | Design Database tables, create Procedures, user-defined functions and Triggers. | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/ PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO2** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO3** | **3** | **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** | **15** | **15** | **15** | **15** | **15** | **15** |

**SECOND YEAR – SEMESTER – IV**

**Core – VII: SOFTWARE ENGINEERING**

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| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | **5** | **0** | **0** | **IV** | **4** | **5** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | To introduce the software development life cycles | | | | | | | | | | |
| **LO2** | To introduce concepts related to structured and objected oriented analysis & design | | | | | | | | | | |
| **LO3** | To provide an insight into cost estimation | | | | | | | | | | |
| **LO4** | Learn to write test cases using different testing techniques. | | | | | | | | | | |
| **LO5** | The students should be able to specify software requirements and design the software using tools | | | | | | | | | | |
| **Unit** | **Contents** | | | | | | | | | **No. of Hours** | |
| I | Introduction to Software Engineering: Definition - The changing nature of software - Software Myths - Terminologies - Role of Management in Software Development - Software Life Cycle Models: The Waterfall Model - Increment Process Model - Evolutionary Process Model - The Unified Process. | | | | | | | | | **15** | |
| II | Software Requirements Analysis and Specifications: Requirements Engineering - Type of Requirements - Feasibility Studies - Requirements Elicitation - Requirements Analysis - Requirements Documentation - Requirements Validation | | | | | | | | | **15** | |
| III | Software Project Planning: Size Estimation - Cost Estimation - The Constructive Cost Model (COCOMO) - COCOMO II - The Putnam Resource Allocation Model - Software Risk Management - Software Design: Definition - Modularity - Strategy of Design - Function Oriented Design. | | | | | | | | | **15** | |
| IV | Software Testing: A Strategic Approach to Software Testing -  Terminologies - Functional Testing - Structural Testing - Levels of Testing - Validation Testing - Testing Tools. | | | | | | | | | **15** | |
| V | Software Reliability: Basic Concepts - Software Quality - McCall Software Quality Model - Boehm Software Quality Model - Capability Maturity Model - Software Maintenance: Definition - Process - Models - Configuration Management -Documentation. | | | | | | | | | **15** | |
| **TOTAL** | | | | | | | | | | **75** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | Define the basic terminologies involved in the entire software developmental life cycle | | | | | | | | | | |
| CO2 | Identify suitable models, techniques and tools for the development of a software product | | | | | | | | | | |
| CO3 | Apply software engineering perspective through requirements analysis, software design and construction, verification, and validation to develop solutions to modern problems | | | | | | | | | | |
| CO4 | Compare and contrast different process, cost, quality models and testing techniques | | | | | | | | | | |
| CO5 | Estimate the project cost using suitable cost estimation models,  rate the software risks  and evaluate management strategies for effective software development | | | | | | | | | | |
| **Textbooks** | | | | | | | | | | | |
|  | K.K Agarwal, Yogesh Singh (2009), “Software Engineering”, 3 rd Edition, New Age International Publishers. | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
|  | Roger S. Pressman, “Software Engineering – A Practioners Approach”, 5 th Edition, Tata Mc Graw Hill Publication. | | | | | | | | | | |
|  | Thomas T. Baker, “Writing Software Documentation – A task oriented approach”, Second Edition, Pearson Education, 2004. | | | | | | | | | | |
|  | Pankaj Jalote (2005), “An Integrated Approach to Software Engineering”, 3 rd Edition, Narosa Publication | | | | | | | | | | |
| **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | |
|  | http://www/tutorialspoint.com/software\_engineering | | | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- |
| **MAPPING TABLE** | | | | | | |
| **CO/ PSO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **1** | **1** | **1** | **2** |
| **CO2** | **3** | **1** | **3** | **1** | **1** | **2** |
| **CO3** | **3** | **3** | **2** | **3** | **3** | **2** |
| **CO4** | **3** | **3** | **2** | **3** | **3** | **2** |
| **CO5** | **3** | **2** | **2** | **3** | **3** | **2** |
| **Weightage of course contributed**  **to each PSO** | **15** | **11** | **10** | **11** | **11** | **10** |

**SECOND YEAR – SEMESTER – IV**

**Core – VIII: Software ENGINEERING--LAB**

|  |  |  |  |  |  |  |  |  |  |  |  |
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| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | **0** | **0** | **4** | **IV** | **4** | **4** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | Provide hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development | | | | | | | | | | |
| **LO2** | Gain an understanding of the different phases of the software development lifecycle and how they are applied in practice | | | | | | | | | | |
| **LO3** | Learn how to design software systems | | | | | | | | | | |
| **LO4** | Understand various software testing techniques and tools to ensure the quality of their code | | | | | | | | | | |
| **LO5** | Learn how to create documentation that accurately describes the software system | | | | | | | | | | |
| **List of Exercises** | | | | | | | | | | | |
| 1. Write down the problem statement for a suggested system of relevance.  2. Do requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system.  3. Perform Data Flow Diagram (DFD) using any Design phase CASE tools.  4. Perform the user‘s view analysis for the suggested system: Use case diagram.  5. Draw the structural view diagram for the system: Class diagram.  6. Draw behavioral view diagram : Sequence diagram, Activity diagram  7. Perform the implementation view diagram: Component diagram for the system.  8. Perform various testing using the testing tool unit testing, integration testing for a sample code of the suggested system.  9. Develop test cases for unit testing and integration testing  10.Perform Estimation of effort using FP Estimation for chosen system.  11.Prepare time line chart/Gantt Chart/PERT Chart for selected software project. | | | | | | | | | | | |
| **TOTAL** | | | | | | | | | | **60** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | Describe the individual Phases/modules of the project and identify deliverables, functional and non-functional requirements. | | | | | | | | | | |
| CO2 | Translate end-user requirements into system and software requirements | | | | | | | | | | |
| CO3 | Generate a high-level design of the system from the software requirements | | | | | | | | | | |
| CO4 | Asses the testing problems and able to develop a simple testing report | | | | | | | | | | |
| CO5 | Develop the prototype of the product | | | | | | | | | | |

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

**THIRD YEAR – SEMESTER – V**

**Core – IX: PYTHON PROGRAMMING**

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| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | **5** | **0** | **0** | **VI** | **4** | **5** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | Learn how to write and run Python code to solve basic programming problems. | | | | | | | | | | |
| **LO2** | Learn how to use different data types and structures in Python. | | | | | | | | | | |
| **LO3** | Learn how to implement conditional statements and loops in Python programs. | | | | | | | | | | |
| **LO4** | Learn how to write functions and modules in Python to make code reusable. | | | | | | | | | | |
| **LO5** | Learn how to work with files and external libraries in Python. | | | | | | | | | | |
| **Unit** | **Contents** | | | | | | | | | **No. of Hours** | |
| I | Python – origins – features – variable and assignment - Python basics – statement and syntax – Identifiers – Basic style guidelines – Python objects – Standard types and other built-in types – Internal types – Standard type operators – Standard type built-in functions. | | | | | | | | | **15** | |
| II | Numbers – Introduction to Numbers – Integers – Double precision floating point numbers – Complex numbers – Operators – Numeric type functions – Sequences: Strings, Lists and Tuples – Sequences – Strings and strings operators – String built-in methods – Lists – List type Built in Methods – Tuples | | | | | | | | | **15** | |
| III | Mapping type: Dictionaries – Mapping type operators – Mapping type Built-in and Factory Functions - Mapping type built in methods – Conditionals and loops – if statement – else Statement – elif statement – conditional expression – while statement – for statement – break statement – continue statement – pass statement – Iterators and the iter( ) function - Files and Input/Output – File objects – File built-in functions – File built- in methods – File built-in attributes – Standard files – command line arguments. | | | | | | | | | **15** | |
| IV | Functions and Functional Programming – Functions – calling functions – creating functions – passing functions – Built-in Functions: apply( ), filter( ), map( ) and reduce( ) - Modules – Modules and Files – Modules built-in functions - classes – class attributes – Instances. | | | | | | | | | **15** | |
| V | Database Programming – Introduction - Basic Database Operations and SQL - Example of using Database Adapters, Mysql - Regular Expression – Special Symbols and Characters – REs and Python. | | | | | | | | | **15** | |
| **TOTAL** | | | | | | | | | | **75** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | Explain the basic concepts in python language. | | | | | | | | | | |
| CO2 | Apply the various data types and identify the usage of control statements, loops, functions and | | | | | | | | | | |
| CO3 | Modules in python for processing the data | | | | | | | | | | |
| CO4 | Analyze and solve problems using basic constructs and techniques of python. | | | | | | | | | | |
| CO5 | Assess the approaches used in the development of interactive application. | | | | | | | | | | |
| **Textbooks** | | | | | | | | | | | |
|  | Wesley J. Chun Core Python Programming Pearson Education Publication 2012 | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
|  | Eric Matthes Python crash course William pollock 2016 | | | | | | | | | | |
|  | Zed Shaw Learn Python the hard way Addition Wesley 2017 | | | | | | | | | | |
| **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | |
|  | https://www.tutorialspoint.com/python/ | | | | | | | | | | |
|  | [www.spoken-tutorial.org](http://www.spoken-tutorial.org) | | | | | | | | | | |

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

**THIRD YEAR – SEMESTER – V**

**Core – X: PYTHON PROGRAMMING LAB**

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| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | | **0** | **0** | **5** | **VI** | **4** | **5** | **25** | **75** | **100** |
| **Learning Objectives** | | | | | | | | | | |
| **LO1** | Understand the fundamentals of programming using Python, such as variables, data types, control structures, and functions. | | | | | | | | | |
| **LO2** | Learn how to use Python libraries and modules to solve problems. | | | | | | | | | |
| **LO3** | Practice writing Python code to solve real-world problems and build basic applications. | | | | | | | | | |
| **LO4** | Gain experience with common programming paradigms, such as object-oriented programming and functional programming. | | | | | | | | | |
| **LO5** | Understand best practices for debugging and testing code. | | | | | | | | | |

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| **List of Exercises** | | |
| 1. Create a simple calculator to do all the arithmetic operations.  2. Write a program to use control flow tools like if.  3. Write a program to use for loop.  4. Data structures  a. use list as stack.  b. use list as queue.  c. tuple, sequence.  5. Create new module for mathematical operations and use in your program.  6. Write a program to read and write files, create and delete directories.  7. Write a program with exception handling.  8. Write a program using classes.  9. Connect with MySQL and create address book  10. Write a program using string handling and regular expression | | |
| **TOTAL** | | **75** |
| **CO** | **Course Outcomes** | |
| CO1 | Understand the significance of control statements, loops and functions in creating  Simple programs. | |
| CO2 | Apply the core data structures available in python to store, process and sort the data. | |
| CO3 | Analyze the real time problem using suitable python concepts. | |
| CO4 | Assess the complex problems using appropriate concepts in python. | |
| CO5 | Develop the real time applications using python programming language. | |

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| **MAPPING TABLE** | | | | | | |
| **CO/ PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **3** | **2** | **3** | **3** |
| **CO2** | **3** | **3** | **2** | **2** | **3** | **3** |
| **CO3** | **3** | **2** | **2** | **3** | **3** | **2** |
| **CO4** | **3** | **2** | **3** | **3** | **2** | **2** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **2** |

**THIRD YEAR – SEMESTER – V**

**Core – XI: OPERATING SYSTEMS**

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| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | **5** | **0** | **0** | **V** | **4** | **5** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | Learn how operating systems work and how they manage computer resources like memory, CPU, and input/output devices. | | | | | | | | | | |
| **LO2** | Understand different types of operating systems and their advantages and disadvantages. | | | | | | | | | | |
| **LO3** | Learn how to manage processes and threads in an operating system and how to schedule them for execution. | | | | | | | | | | |
| **LO4** | Learn how to manage memory in an operating system and how to ensure efficient use of available memory. | | | | | | | | | | |
| **LO5** | Understand how file systems work in an operating system and how to manage files and directories. | | | | | | | | | | |
| **Unit** | **Contents** | | | | | | | | | **No. of Hours** | |
| I | Introduction – History of operating system- Different kinds of operating system – Operation system concepts - System calls- Operating system structure. | | | | | | | | | **15** | |
| II | Processes and Threads: Processes – threads – thread model and usage – inter process communication. | | | | | | | | | **15** | |
| III | Scheduling - Memory Management: Memory Abstraction – Virtual Memory - page replacement algorithms. | | | | | | | | | **15** | |
| IV | Deadlocks: Resources- introduction to deadlocks – deadlock detection and recovery – deadlocks avoidance – deadlock prevention. Multiple processor system: multiprocessors – multi computers. | | | | | | | | | **15** | |
| V | Input/Output: principles of I/O hardware - principles of I/O software. Files systems: Files – directories - files systems implementation – File System Management and Optimization. | | | | | | | | | **15** | |
| **TOTAL** | | | | | | | | | | **75** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | Outline the fundamental concepts of an OS and their respective functionality | | | | | | | | | | |
| CO2 | Illustrate the importance of open source operating system commands | | | | | | | | | | |
| CO3 | Identify and stimulate management activities of operating system | | | | | | | | | | |
| CO4 | Analyze the various services provided by the operating system. | | | | | | | | | | |
| CO5 | Interpret different problems related to Process, Scheduling, Deadlock, memory and Files. | | | | | | | | | | |
| **Textbooks** | | | | | | | | | | | |
|  | Andrew S. Tanenbaum, ―Modern Operating Systems‖, 2ndEdition, PHI private Limited, New Delhi, 2008. | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
|  | William Stallings, “Operating Systems – Internals & Design Principles”, 5th Edition, Prentice – Hall of India private Ltd, New Delhi, 2004. | | | | | | | | | | |
|  | Sridhar Vaidyanathan, “Operating System”, 1st Edition, Vijay Nicole Publications, 2014 | | | | | | | | | | |
| **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | |
|  | www.wikipedia.org/wiki/Operating\_system | | | | | | | | | | |
|  | http://www.freetechbooks.com/introduction-to-operating-systems-t340.html | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/ PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **2** | **2** | **2** | **2** |
| **CO2** | **3** | **2** | **1** | **1** | **1** | **2** |
| **CO3** | **2** | **3** | **2** | **2** | **2** | **2** |
| **CO4** | **2** | **1** | **2** | **2** | **2** | **2** |
| **CO5** | **2** | **2** | **2** | **3** | **2** | **2** |
| **Weightage of course contributed to each PSO** | **12** | **10** | **9** | **10** | **9** | **10** |

**THIRD YEAR – SEMESTER – VI**

**Core – XIII: Data MINING AND WAREHOUSING**

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| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | **6** | **0** | **0** | **VI** | **4** | **6** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | To learn different data mining techniques | | | | | | | | | | |
| **LO2** | To develop skills of using recent data mining software for solving practical problems. | | | | | | | | | | |
| **LO3** | Gain knowledge of independent study and research | | | | | | | | | | |
| **Unit** | **Contents** | | | | | | | | | **No. of Hours** | |
| I | Introduction: Data mining tasks – Data Mining versus Knowledge Discovery in Data bases - Mining Issues – Metrics – Social implications of Data mining. Data Mining Techniques – Introduction – A statistical perspective on Data Mining – similarity measures – Decision Trees – Neural Networks – Genetic Algorithms | | | | | | | | | **18** | |
| II | Data Preprocessing: Why Preprocess the data – Data cleaning – Data Integration – Data Transformation – Data Reduction – Data Discretization | | | | | | | | | **18** | |
| III | Data Mining Techniques: Association Rule Mining – The Apriori Algorithm – Multilevel Association Rules – Multidimensional Association Rules – Constraint Based Association Mining | | | | | | | | | **18** | |
| IV | Classification and Prediction: Issues regarding Classification and Prediction – Decision Tree induction – Bayesian Classification – Back Propagation – Classification Methods – Prediction – Classifiers accuracy | | | | | | | | | **18** | |
| V | Clustering Techniques: cluster Analysis – Clustering Methods – Similarity and Distance Measures – Hierarchical Methods - Partitional Methods – Outlier Analysis | | | | | | | | | **18** | |
| **TOTAL** | | | | | | | | | | **90** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | Outline the fundamentals of Data Mining concepts | | | | | | | | | | |
| CO2 | To develop skills of using recent data mining software for solving practical problems | | | | | | | | | | |
| CO3 | Apply suitable different preprocessing techniques on data. | | | | | | | | | | |
| CO4 | Analyze the various data mining algorithms with respect to functionality | | | | | | | | | | |
| CO5 | Recommend appropriate data models for data warehousing and data mining techniques to solve real world problems | | | | | | | | | | |
| **Textbooks** | | | | | | | | | | | |
|  | Jiawei Han, Micheline Kamber, Jian Pei, “Data Mining concepts and techniques”, 3rd Edition, Elsevier publication, 2012. | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
| 1 | G.K. Gupta, “Introduction to Data mining with case studies”, 2nd Edition, PHI Private limited, New Delhi, 2011 | | | | | | | | | | |
| 2 | M. H.Dunham, 2003, “Data Mining : Introductory and Advanced Topics” , Pearson Education, Delhi | | | | | | | | | | |
| **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | |
| 1. | http://nptel.iitm.ac.in/video.php?subjectId=106106093 | | | | | | | | | | |
| 2. | https://nptel.ac.in/courses/106105174/ | | | | | | | | | | |

**THIRD YEAR – SEMESTER – VI**

**Core – XIV: SOFTWARE TESTING AND QUALITY ASSURANCE**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | **5** | **0** | **0** | **VI** | **4** | **5** | **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. | | | | | | | | | **15** | |
| II | Process control – checking – identification of testing tools – control of nonconforming product –corrective action. | | | | | | | | | **15** | |
| III | Handling, storage, packing and delivery –quality records- internal quality audits –training –servicing –statistical techniques. | | | | | | | | | **15** | |
| IV | QA and new technologies –QA and Human –computer interface- process modeling –standards and procedures. | | | | | | | | | **15** | |
| V | ISO- 9001-Elements of ISO 9001- improving quality system – Case study. | | | | | | | | | **15** | |
| **TOTAL** | | | | | | | | | | **75** | |
| **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 | | | | | | | | | | |
| **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | |
| **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) | | | | | | | | | | |

**THIRD YEAR – SEMESTER – VI**

**Core XV – SOFTWARE TESTING-LAB**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | **0** | **0** | **5** | **VI** | **4** | **5** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | Discuss the distinctions between validation testing and defect testing | | | | | | | | | | |
| **LO2** | Describe the principles of system and component testing | | | | | | | | | | |
| **LO3** | Describe strategies for generating system test cases | | | | | | | | | | |
| **LO4** | Understand the essential characteristics of tool used for test automation | | | | | | | | | | |
| **List of Exercises** | | | | | | | | | | | |
| |  |  | | --- | --- | | 1 | Using Selenium IDE, Write a test suite containing minimum 3 test cases. | | 2 | Using Selenium write a simple test script to validate each field of the registration page ( Eg: Student Portal Registration Page) | | 3 | Install Selenium server and demonstrate it using a script in Java/PHP. | | 4 | Conduct a test suite for any two web sites. | | 5 | Write and test a program to login a specific web page. | | 6 | Write test cases to validate a mobile number using one time pin identification (OTP) | | 7 | Write and test a program to find out list of employees having salary greater than Rs 30,000 and age between 20 to 30 years. | | 8 | Write and test a program to update 10 student records into table into Excel file. | | 9 | Write and test a program to select the number of students who have scored more than 80 in any one subject. | | 10 | Write and test a program to provide total number of objects present / available on the page. | | 11 | Write and test a program to get the number of list items in a list / combo box. | | 12 | Write and test a program to count number of items present on a desktop. | | 13 | Understanding the use of bug tracking and testing tool Bugzilla and Jira | | | | | | | | | | | | |
| **TOTAL** | | | | | | | | | | **75** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | Understanding Selenium tool to perform testing | | | | | | | | | | |
| CO2 | Writing test suits for applications | | | | | | | | | | |
| CO3 | Examine the bugs and analyze how to prevent and remove the bugs | | | | | | | | | | |
| CO4 | Use of bug tracking and testing tool Bugzilla, Jira | | | | | | | | | | |
| CO5 | Create test case and perform different testing | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/ PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **2** | **2** | **3** | **3** | **3** | **2** |
| **CO2** | **2** | **3** | **2** | **3** | **2** | **1** |
| **CO3** | **3** | **2** | **3** | **3** | **3** | **2** |
| **CO4** | **3** | **2** | **2** | **3** | **2** | **2** |
| **CO5** | **2** | **3** | **1** | **3** | **3** | **3** |
| **Weightage of course contributed to each**  **PSO** | **12** | **12** | **11** | **15** | **13** | **10** |

**SUGGESTED TOPICS IN CORE COMPONENT**

**OBJECT ORIENTED PROGRAMMING USING C++**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
| **CC14** | | **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 | Bjarne Stroustrup, “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 of course contributed toeach PSO** | **15** | **14** | **11** | **15** | **15** | **10** |

**C++ Programming Lab**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
| **CC14** | | **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 Excercises** | | | | | | | | |  | |
| 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 va  computing problems in C++ by incorporating OOPS concepts. | | | | | | | | | | |
| CO5 | Develop a program in C++ with the concepts of object oriented programming to solve  problems. | | | | | | | | | | |

**DATA COMMUNICATION AND NETWORKIMG**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject**  **Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst.**  **Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | **5** | 0 | 0 | - | 4 | **5** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | This course is to provide students with an overview of the concepts and fundamentals  of data communication and computer networks | | | | | | | | | | |
| **LO2** | To familiarize the student with the basic taxonomy and terminology of the computer. | | | | | | | | | | |
| **Prerequisites:** | | | | | | | | | | | |
| **Unit** | **Contents** | | | | | | | | | **No. of**  **Hours** | |
| I | Introduction: Data Communication-Networks: Distributed Processing- Network Criteria Physical Structures –Network Models-Categories of  Network-Internetwork - The Internet | | | | | | | | | **15** | |
|  | Protocols and Standards – Network Models: Layers in the OSI Model - TCP/IP Protocol Suite. | | | | | | | | |  | |
| II | Data and Signals: Analog and Digital Data - Analog and Digital Signals  – Performance - Digital Transmission: Transmission Modes – Multiplexing: FDM – WDM - Synchronous TDM -Statistical TDM - Transmission Media: Guided media - Unguided Media. | | | | | | | | | **15** | |
| III | Switching: Circuit Switched Networks - Datagram Networks-Virtual Circuit Network - Error Detection and Correction: Introduction - Block Coding - Linear Block Codes - Cyclic Codes: Cyclic Redundancy Check - Checksum. Data Link Control: Framing - Flow Control  and Error Control - Noiseless Channel: Stop-and-wait Protocol. | | | | | | | | | **15** | |
| IV | Wired LANs: Standard Ethernet-GIGABIT Ethernet-Wireless LAN: Bluetooth Connecting LANs: Connecting Devices**:** Passive Hubs- Repeaters-Active Hubs-Bridges-Two Layer Switches-Routers-Three layer Switches-Gateway-Network Layer: Internet Protocol: IPv4 –  Ipv6-Transition from IPv4 to IPv6. | | | | | | | | | **15** | |
| V | Network Layer: Delivery, Forwarding and Routing- Unicast Routing Protocols: Distance Vector Routing-Link state routing- Future & Current Trends in Computer Networks: 5G Network: Salient Features- Technology-Applications-Advanced Features-Advantages & Disadvantages-Internet of Things: key Features -Advantages & Disadvantages-IOT Hardware- IOT Technology and Protocols-IOT  Common Uses-Applications-WiFi-WiMax Lifi- Lifi vs Wifi. | | | | | | | | | **15** | |
| **TOTAL** | | | | | | | | | | **75** | |
|  | | | | | | | | | | | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | Understand the fundamental concepts of computer networks and its application areas | | | | | | | | | | |
| CO2 | Identify and use various networking techniques and components to establish  networking connection and transmission | | | | | | | | | | |
| CO3 | Analyze the services performed by different network layers and recent advancements  in networking | | | | | | | | | | |
| CO4 | Compare various networking models, layers, protocols and technologies. | | | | | | | | | | |
| CO5 | Select the appropriate networking mechanisms to build a reliable network | | | | | | | | | | |
| **Textbooks** | | | | | | | | | | | |
|  | Behrouz and Forouzan,(2006), Data Communication and Networking‖, 4th Edition,  TMH. | | | | | | | | | | |
|  | Ajit Pal,(2014), Data Communication and Computer Networks, PHI. | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
| 1. | Jean Walrand (1998), ―Communication Networks,Second Edition‖, TataMcGraw  Hill. | | | | | | | | | | |
| **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | |
| 1. | <http://www.tutorialspoint.com/data_communication_computer_network/> | | | | | | | | | | |
| 2. | <http://www.slideshare.net/zafar_ayub/data-communication-and-network-11903853> | | | | | | | | | | |
| 3. | <http://www.freetechbooks.com/data-communication-and-networks-f31.html> | | | | | | | | | | |

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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 of course contributed toeach PSO** | **15** | **14** | **11** | **15** | **15** | **10** |

**.NET PROGRAMMING**

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| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
| **CORE** | | **5** | **-** | **-** | **IV** | **4** | **5** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | To develop ASP.NET Web application using standard controls. | | | | | | | | | | |
| **LO2** | To create rich database applications using ADO.NET. | | | | | | | | | | |
| **LO3** | To implement file handling operations. | | | | | | | | | | |
| **LO4** | To utilize ASP.NET security features for authenticating the web site. | | | | | | | | | | |
| **LO5** | To handles SQL Server Database using ADO.NET. | | | | | | | | | | |
| **Unit** | **Contents** | | | | | | | | | **No. of Hours** | |
| **I** | Overview of .NET framework: Common Language Runtime (CLR), Framework Class Library- C# Fundamentals: Primitive types and Variables – Operators - Conditional statements -Looping statements – Creating and using Objects – Arrays – String operations. | | | | | | | | | **15** | |
| **II** | Introduction to ASP.NET - IDE-Languages supported Components -Working with Web Forms – Web form standard controls: Properties and its events – HTML controls - List Controls: Properties and its events. | | | | | | | | | **15** | |
| **III** | Rich Controls: Properties and its events – validation controls: Properties and its events – File Stream classes - File Modes – File Share – Reading and Writing to files – Creating, Moving, Copying and Deleting files – File uploading. | | | | | | | | | **15** | |
| **IV** | ADO.NET Overview – Database Connections – Commands – Data Reader - Data Adapter - Data Sets - Data Controls and its Properties - Data Binding | | | | | | | | | **15** | |
| **V** | Grid View control: Deleting, editing, Sorting and Paging. XML classes – Web form to manipulate XML files - Website Security - Authentication - Authorization – Creating a Web application. | | | | | | | | | **15** | |
| **TOTAL** | | | | | | | | | | **75** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| **CO1** | To identify and understand the goals and objectives of the .NET framework and ASP.NET with C# language. | | | | | | | | | | |
| **CO2** | To develop web application using various controls. | | | | | | | | | | |
| **CO3** | To analyze C# programming techniques in developing web applications. | | | | | | | | | | |
| **CO4** | To assess a Web application using Microsoft ADO.NET. | | | | | | | | | | |
| **CO5** | To develop a software to solve real-world problems using ASP.NET | | | | | | | | | | |
| **Textbooks** | | | | | | | | | | | |
| **1.** | SvetlinNakov,VeselinKolev& Co, Fundamentals of Computer Programming with C#,Faber publication, 2019. | | | | | | | | | | |
| **2.** | Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill ,2015. | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
|  | Herbert Schildt, The Complete Reference C#.NET, Tata McGraw-Hill,2017. | | | | | | | | | | |
|  | Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtech pres,2013. | | | | | | | | | | |
| **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | |
|  | <http://www.w3schools.com/aspnet/default.asp> | | | | | | | | | | |
|  | <http://www.maconstateit.net/tutorials/ASPNET20/default.htm> | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/ PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **1** | **2** | **2** | **2** |
| **CO2** | **2** | **3** | **1** | **3** | **2** | **2** |
| **CO3** | **1** | **3** | **1** | **1** | **3** | **1** |
| **CO4** | **-** | **2** | **1** | **1** | **3** | **1** |
| **CO5** | **-** | **2** | **1** | **1** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **5** | **12** | **5** | **8** | **13** | **9** |

**.NET PROGRAMMING LAB**

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| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
| **CC** | | **-** | **-** | **5** | **IV** | **5** | **5** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | To develop ASP.NET Web application using standard controls. | | | | | | | | | | |
| **LO2** | To create rich database applications using ADO.NET. | | | | | | | | | | |
| **LO3** | To implement file handling operations. | | | | | | | | | | |
| **LO4** | To utilize ASP.NET security features for authenticating the web site. | | | | | | | | | | |
| **LO5** | To handles SQL Server Database using ADO.NET. | | | | | | | | | | |
| **List of Exercises** | | | | | | | | | | | |
| 1. C# Basics  2. Looping Constructs  3. Arrays & Jagged Array  4. Strings  5. Classes and Objects  6. Method overloading  7. Delegates  8. LINQ  9. Lambda Expressions  10. Web Sever Controls  11. AdRotator Control  12. Calendar Control  13. Validation Controls  14. Developing Database Applications using Data Grid  15. Crystal Reports | | | | | | | | | | | |
| **TOTAL** | | | | | | | | | | **75** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| **CO1** | To identify and understand the goals and objectives of the .NET framework and ASP.NET with C# language. | | | | | | | | | | |
| **CO2** | To develop web application using various controls. | | | | | | | | | | |
| **CO3** | To analyze C# programming techniques in developing web applications. | | | | | | | | | | |
| **CO4** | To assess a Web application using Microsoft ADO.NET. | | | | | | | | | | |
| **CO5** | To develop a software to solve real-world problems using ASP.NET | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **CO/ PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **2** | **2** | **1** | **3** | **3** | **-** |
| **CO2** | **1** | **3** | **2** | **3** | **2** | **1** |
| **CO3** | **1** | **2** | **1** | **3** | **3** | **2** |
| **CO4** | **-** | **2** | **1** | **2** | **1** | **2** |
| **CO5** | **1** | **3** | **-** | **3** | **3** | **3** |
| **Weightage of course**  **contributed to each PSO** | **5** | **12** | **5** | **14** | **12** | **8** |

**SOFTWARE METRICS**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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** | 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 | | | | | | | | | **15** | |
| II | A Goal-Based Framework For Software Measurement: Classifying software measures, Determining what to Measure, Applying the framework, Software measurement validation, Performing SoftwareMeasurementValidation  Empirical investigation: Principles of Empirical Studies, Planning Experiments, Planning case studies as quasi-experiments, Relevant and Meaningful Studies | | | | | | | | | **15** | |
| III | Software Metrics Data Collection: Defining good data, Data collection for incident reports, How to collect data, Reliability of data collection Procedures  Analyzing software measurement data: Statistical distributions and hypothesis testing, Classical data analysis techniques, Examples of simple analysis techniques | | | | | | | | | **15** | |
| 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- levelAttributes, Object-oriented Structural attributes and measures | | | | | | | | | **15** | |
| V | Measuring External Product Attributes: Modelling software quality, Measuring aspects of quality, Usability Measures, Maintainability measures,SecurityMeasures  Software Reliability: Measurement and Prediction: Basics of reliability theory, The software reliability problem, Parametric reliability growth models, Predictive accuracy | | | | | | | | | **15** | |
| **TOTAL** | | | | | | | | | | **75** | |
| **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 , Third Edition, 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, Addison Wesley 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/ | | | | | | | | | | |

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

**MACHINE LEARNING**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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 comprehend the raw data and to design the same with the appropriate machine learning algorithms for a meaningful representation of data.. | | | | | | | | | | |
| **Unit** | | **Contents** | | | | | | | | | **No. of Hours** | |
| I | | **Introduction:** Machine Learning – Examples of Machine Learning Applications. **Supervised Learning:** Learning a Class from Examples – Vapnik-Chervonenkis (VC) Dimension – Probably Approximately Correct (PAC) Learning – Noise – Learning Multiple Classes – Regression – Model Selection and Generalization – Dimensions of a Supervised Machine Learning Algorithm. **Bayesian Decision Theory:** Introduction – Classification – Losses and Risks – Discriminant  Functions – Association Rules. | | | | | | | | | **15** | |
| II | | **Parametric Methods:** Maximum Likelihood Estimation – Evaluating an Estimator: Bias and Variance – The Bayes’ Estimator – Parametric Classification – Regression – Tuning Model Complexity: Bias/Variance Dilemma – Model Selection Procedures. **Nonparametric Methods:** Nonparametric Density Estimation – Generalization to Multivariate Data  – Nonparametric Classification – Condensed Nearest Neighbor – Distance-Based Classification – Outlier Detection – Nonparametric Regression: Smoothing Models | | | | | | | | | **15** | |
| III | | **Linear Discrimination** – Generalizing the Linear Model – Geometry of the Linear Discriminant – Pairwise Separation – Gradient Descent – Logistic Discrimination – Discrimination by Regression – Learning to Rank. **Multilayer Perceptrons:** The Perceptron – Training a Perceptron  – Learning Boolean Functions – Multilayer Perceptrons – MLP as a Universal Approximator – Backpropagation Algorithm | | | | | | | | | **15** | |
| IV | | **Combining Multiple Learners:** Generating Diverse Learners – Model Combination Schemes – Voting – Bagging – Boosting – Stacked Generalization – Fine-Tuning an Ensemble – Cascading Reinforcement Learning: Elements of Reinforcement Learning – Model-Based Learning  – Temporal Difference Learning – Generalization – Partially Observable States | | | | | | | | | **15** | |
| V | | **Machine Learning with Python**: Data Pre-processing, Analysis & Visualization - Training Data and Test Data – Techniques – Algorithms: List of Common Machine Learning Algorithms- Decision Tree Algorithm- Naïve Bayes Algorithm - K-Means-Random Forest- Dimensionality Reduction Algorithm- Boosting Algorithms – Applications: Social Media-Refinement of Search Engine Results-  Product Recommendations-Detection of Online frauds. | | | | | | | | | **15** | |
| **TOTAL** | | | | | | | | | | | **75** | |
| **CO** | | **Course Outcomes** | | | | | | | | | | |
| CO1 | | Outline the importance of machine learning in terms of designing intelligent machines | | | | | | | | | | |
| CO2 | | Identify suitable machine learning techniques for the real time applications | | | | | | | | | | |
| CO3 | | Analyze the theoretical concepts and how they relate to the practical aspects of machine  learning. | | | | | | | | | | |
| CO4 | Assess the significance of principles, algorithms and applications of machine learning through a  hands-on approach | | | | | | | | | | | |
| CO5 | Compare the machine learning techniques with respective functionality | | | | | | | | | | | |
| **Textbooks** | | | | | | | | | | | | |
|  | Ethem Alpaydın, “Introduction to Machine Learning” Third Edition, MIT, 2014. (Unit I – Unit IV) https:/[/www.tutorialspoint.com/m](http://www.tutorialspoint.com/machine_learning_with_python/machine_learning_with)a[chine\_learning\_with\_python/machine\_learning\_with](http://www.tutorialspoint.com/machine_learning_with_python/machine_learning_with)  \_python\_tutorial.pdf (**Unit V:** Machine learning with python tutorial) | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
|  | 1. Bertt Lantz, "Machine Learning with R," Packt Publishing, 2013 | | | | | | | | | | | |
|  | 2. Jason Bell, "Machine Learning: Hands-On for Developers and Technical  Professionals," Wiley Publication, 2015. | | | | | | | | | | | |
|  |  | | | | | | | | | | | |
| **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | |
|  | 1. https:/[/www.e](http://www.expertsystem.com/machine-learning-definition/)x[pertsystem.com/machine-learning-definition/](http://www.expertsystem.com/machine-learning-definition/) | | | | | | | | | | | |
| . | 2. https://searchenterpriseai.techtarget.com/definition/machine-learning-ML | | | | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Inst. Hours** | **Marks** | | | |
| **CIA** | | **External** | **Total** |
| CC | **Network Security** | Core | - | 5 | - | - | 4 | | 5 | 25 | | 75 | 100 |
| **Course Objectives** | | | | | | | | | | | | | |
| CO1 | To familiarize on the model of network security, Encryption techniques | | | | | | | | | | | | |
| CO2 | To understand the design concept of cryptography and authentication | | | | | | | | | | | | |
| CO3 | To develop experiments on algorithm used for security | | | | | | | | | | | | |
| CO4 | To understand about virus and threats, firewalls, and implementation of | | | | | | | | | | | | |
|  | Cryptography | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | **No. of Hours** | | |  | | |
| I | Model of network security – Security attacks, services and attacks – OSI security architecture – Classical encryption techniques – SDES – Block cipher PrinciplesDES – Strength of DES – Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – RC4 - Differential and linear cryptanalysis – Placement of encryption function  – traffic confidentiality. | | | | | | | 15 | | |  | | |
| II | Number Theory – Prime number – Modular arithmetic – Euclid’s algorithm - Fermet’s and Euler’s theorem – Primality – Chinese remainder theorem – Discrete logarithm – Public key cryptography and RSA – Key distribution – Key management – Diffie Hellman key exchange – Elliptic curve cryptography | | | | | | | 15 | | |  | | |
| III | Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS. | | | | | | | 15 | | |  | | |
| IV | Authentication applications – Kerberos – X.509 Authentication services - E- mail security – IP security  - Web security | | | | | | | 15 | | |  | | |
| V | Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security | | | | | | | 15 | | |  | | |
|  | **Total** | | | | | | | **75** | | |  | | |
| **Course Outcomes** | | | | | | | | | | | | | |
| **Course Outcomes** | On completion of this course, students will; | | | | | | | | | | | | |
| **CO1** | Understand public-key cryptography, RSA and other  public-key cryptosystems such as Diffie-Hellman Key Exchange, ElGamal Cryptosystem. | | | | | | |  | | | | | |
| **CO2** | Understand the security issues. | | | | | | |  | | | | | |
| **CO3** | Apply key management and distribution schemes design. User Authentication | | | | | | |  | | | | | |
| **CO4** | Analyze and design hash and MAC algorithms, and digital signatures. Analyze and design classical encryption techniques and block ciphers. | | | | | | |  | | | | | |
| **CO5** | Assess Intruders and Intruder Detection mechanisms,  Types of Malicious software, | | | | | | |  | | | | | |
| **Reference Text :** | | | | | | | | | | | | | |
| 1. | William Stallings, “Cryptography & Network Security”, Pearson Education, Fourth Edition 2010. | | | | | | | | | | | | |
| **References :** | | | | | | | | | | | | | |
| 1. | CharlieKaufman,RadiaPerlman,MikeSpeciner,“NetworkSecurity,P rivatecommunicationinpublicworld”,PHISecondEdition,2002 | | | | | | | | | | | | |
| 2. | Bruce Schneier, Neils Ferguson, “Practical Cryptography”, Wiley Dreamtech  India Pvt Ltd, First Edition, 2003. | | | | | | | | | | | | |
| 3. | DouglasRSimson“Cryptography–  Theoryandpractice”,CRCPress,FirstEdition,1995 | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | |
| 1. | <https://www.javatpoint.com/computer-network-security> | | | | | | | | | | | | |
| 2. | [https://www.tutorialspoint.com/information\_security\_cyber\_law/network\_security.ht](https://www.tutorialspoint.com/information_security_cyber_law/network_security.htm) [m](https://www.tutorialspoint.com/information_security_cyber_law/network_security.htm) | | | | | | | | | | | | |
| 3. | <https://www.geeksforgeeks.org/network-security/> | | | | | | | | | | | | |

**MOBILE APPLICATION DEVELOPMENT**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | | **5** | **0** | **0** | **-** | **4** | **5** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | | |
| **LO1** | | To provide the students with the basics of Android Software Development tools and development of software on mobile platform. | | | | | | | | | | |
| **Unit** | | **Contents** | | | | | | | | | **No. of Hours** | |
| I | | Introduction to Android Operating System – Configuration of Android Environment- Create the First Android Application. Layout: Vertical, Vertical Scroll, horizontal, horizontal Scroll, Table Layout arrangement. **Designing User Interface:** Label Text - TextView – Password Text Box - Button –ImageButton  – CheckBox – Image - RadioButton – Slider – Autocomplete text View. | | | | | | | | | **15** | |
| II | | User Interface: Spinner – Switch – Side Bar- ListView - List Picker - Image Picker - Notifier - Time and Date Picker - Web Viewer | | | | | | | | | **15** | |
| III | | Media: Camcorder - Camera – Player – Speech Recognizer – Text to Speech – Video Player - Canvas | | | | | | | | | **15** | |
| IV | | Maps: Maps - Sensor: Location Sensor – Barcode Scanner Social components: Contact Picker – Email Picker – Phone Number Picker – Phone Call - Social: Texting | | | | | | | | | **15** | |
| V | | Storage: Cloud DB – Tiny DB – Experimental – Fire DB | | | | | | | | | **15** | |
| **TOTAL** | | | | | | | | | | | **75** | |
| **CO** | | **Course Outcomes** | | | | | | | | | | |
| CO1 | | Chart the requirements needed for developing android application | | | | | | | | | | |
| CO2 | | Identify the results by executing the application in emulator or in android device | | | | | | | | | | |
| CO3 | | Apply proper interface setup, styles & themes, storing and management | | | | | | | | | | |
| CO4 | | Analyze the problem and add necessary user interface components, graphics and  multimedia components into the application. | | | | | | | | | | |
| CO5 | | Evaluate the results by implementing the concept behind the problem with proper code. | | | | | | | | | | |
| **Textbooks** | | | | | | | | | | | | |
|  | | Karen Lang and Selim Tezel, (2022), Become an App Inventor The official guide from MIT App Inventor, Miteen Press, Walker Books Limited. | | | | | | | | | | |
| Reference Books | | | | | | | | | | | | |
|  | Wei – Meng Lee, (2012), Beginning Android 4 Application Development, Wiley India Edition. | | | | | | | | | | | |
|  | Deital, Android for Programmers-An App-Driven Approach,Second Edition. | | | | | | | | | | | |
|  |  | | | | | | | | | | | |
| **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | |
|  | <http://ai2.appinventor.mit.edu/reference/> | | | | | | | | | | | |
| . | <http://appinventor.mit.edu/explore/paint-pot-extended-camera> | | | | | | | | | | | |

**OBJECT ORIENTED SOFTWARE ENGINEERING**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
|  | | **5** | **0** | **0** | **VI** | **4** | **5** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | |
| **LO1** | Learn how to analyze requirements and identify objects, classes, attributes, methods, and relationships | | | | | | | | | | |
| **LO2** | Gain proficiency in using Unified Modeling Language (UML) notations to represent and communicate object-oriented analysis and design concepts | | | | | | | | | | |
| **LO3** | Develop a solid understanding of fundamental concepts of object-oriented programming and design, including encapsulation, inheritance, polymorphism, abstraction, and object relationships | | | | | | | | | | |
| **Unit** | **Contents** | | | | | | | | | **No. of Hours** | |
| I | SOFTWARE DEVELOPMENT AND PROCESS MODELS  Introduction to Software Development – Challenges – An Engineering Perspective – Object Orientation –  Software Development Process – Iterative Development Process – Process Models – Life Cycle Models –  Unified Process – Iterative and Incremental – Agile Processes  SOFTWARE DEVELOPMENT AND PROCESS MODELS  Introduction to Software Development – Challenges – An Engineering Perspective – Object Orientation –  Software Development Process – Iterative Development Process – Process Models – Life Cycle Models –  Unified Process – Iterative and Incremental – Agile Processes  **Software Development and Process Models:** Introduction to Software Development – Challenges – An Engineering Perspective – Object Orientation – Software Development Process – Iterative Development Process – Process Models – Life Cycle Models- Unified Process – iterative and Incremental – Agile Processes. | | | | | | | | | **15** | |
| II | **Modeling OO Systems:** Object Oriented Analysis : Coad-Yourdon, Object Oriented Design: Booch, Hierarchical – Object Modeling Technique: Requirement Elicitation- Use Cases – SRS Document – Identification of Classes and Relationships, Identifying State and Behaviour- Interaction Diagrams- Sequence Diagrams – Collaboration Diagrams – Unified Modeling Language and Tools | | | | | | | | | **15** | |
| III | Design Patterns: Design Principles – Design Patterns – GRASP-GoF- Dynamic Object Modelling – Static Object Modeling | | | | | | | | | **15** | |
| IV | System Testing: Software Testing: Software Verification Techniques – Object Oriented Checklist: Functional Testing- Structural Testing – Class Testing – Mutation Testing – Level of Testing – Static and Dynamic Testing Tools – Software Maintenance – Categories- Challenges of Software Maintenance- Maintenance of Object Oriented Software – Regression Testing | | | | | | | | | **15** | |
| V | Software Quality and Metrics: Need of Object Oriented Software Estimation – Lorenz and Kidd Estimation – Use Case Points Method- Class Point Method- Object Oriented Function Point – Risk Management – Software Quality Models – Analyzing the Metric Data – Metrics for Measuring Size and Structure – Measuring Software Quality – Object Oriented Metrics | | | | | | | | | **15** | |
| **TOTAL** | | | | | | | | | | **75** | |
| **CO** | **Course Outcomes** | | | | | | | | | | |
| CO1 | Recognize the concepts and principles of object-oriented analysis, design and  testing | | | | | | | | | | |
| CO2 | Demonstrate the importance of system development process using various  approaches and choose the relevant technique for a system in each phases of SDLC | | | | | | | | | | |
| CO3 | Differentiate various object-oriented analysis, design and testing methods and  models | | | | | | | | | | |
| CO4 | Assess various analysis, design and testing strategies appropriate to build high- performance object-oriented system | | | | | | | | | | |
| CO5 | Design Object oriented systems using object modeling techniques and analyze  them for correctness and quality | | | | | | | | | | |
| **Textbooks** | | | | | | | | | | | |
|  | Yogesh Singh, RuchikaMalhotra, : Object – Oriented Software Engineering:, PHI Learning Private Limited, First Edition, 2012 | | | | | | | | | | |
|  | Ivar Jacobson.Magnus Chriserson, PatrikLonsson, Gunnar Overgaard,” Object- oriented Software Engineering, A Use Case Driven Approach”, Pearson Education, Seventh Impression, 2009 | | | | | | | | | | |
| Reference Books | | | | | | | | | | | |
| 1 | Craig Larman, “Applying UML and Patterns, an Introduction to Odject-Oriented Analysis and Design and Iterative Development, Pearson Education, Third Edition, 2008 | | | | | | | | | | |
| 2 | "Object-Oriented Analysis and Design with Applications" by Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, and Kelli A. Houston. (3rd Edition) - Published by Addison-Wesley Professional. | | | | | | | | | | |
| 3 | “Object-Oriented Analysis and Design" by Ali Bahrami. (3rd Edition) - Published by McGraw-Hill Education. | | | | | | | | | | |
| **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | |
| 1. | <http://www.slideshare.net/helghareeb/object-oriented-analysis-and-design-12164752> | | | | | | | | | | |
| 2. | <http://www.uml-diagrams.org/uml-object-oriented-concepts.html> | | | | | | | | | | |
| 3. | <http://www.tutorialspoint.com/object_oriented_analysis_design/index.htm> | | | | | | | | | | |
| 4. | htt[ps://www.mppmu.mp](http://www.mppmu.mpg.de/english/kluth_oo_intro.pdf)g[.de/english/kluth\_oo\_intro.pdf](http://www.mppmu.mpg.de/english/kluth_oo_intro.pdf) | | | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- |
| **MAPPING TABLE** | | | | | | |
| **CO/ PSO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **1** | **1** | **1** | **2** |
| **CO2** | **3** | **1** | **3** | **1** | **1** | **2** |
| **CO3** | **3** | **3** | **2** | **3** | **3** | **2** |
| **CO4** | **3** | **3** | **2** | **3** | **3** | **2** |
| **CO5** | **3** | **2** | **2** | **3** | **3** | **2** |
| **Weightage of course contributed**  **to each PSO** | **15** | **11** | **10** | **11** | **11** | **10** |

# ANNEXURE - I

# Elective course – (EC1-EC8)-Discipline Specific Syllabus

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | **Extern al** | | **Total** |
|  | **NATURAL LANGUAGE PROCESSING** | **Elect** | 4 | - | - |  | 3 | 25 | | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | |
| **LO1** | To understand approaches to syntax and semantics in NLP. | | | | | | | | | | | |
| **LO2** | To learn natural language processing and to learn how to apply basic algorithms in  this field. | | | | | | | | | | | |
| **LO3** | To understand approaches to discourse, generation, dialogue and summarization within NLP. | | | | | | | | | | | |
| **LO4** | Toget acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, pragmatics etc. | | | | | | | | | | | |
| **LO5** | To understand current methods for statistical approaches to machine translation. | | | | | | | | | | | |
| **UNIT** | **Contents** | | | | | | | | | | **No. Of. Hours** | |
| I | **Introduction :** Natural Language Processing tasks in syntax, semantics, and pragmatics – Issue- Applications – The role of machine learning – Probability Basics –Information theory – Collocations -N-gram Language  Models – Estimating parameters and smoothing – Evaluating language models. | | | | | | | | | | **12** | |
| II | **Word level and Syntactic Analysis:**Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging.Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing. | | | | | | | | | | **12** | |
| III | **Semantic analysis and Discourse Processing:** Semantic Analysis: Meaning Representation-Lexical Semantics- Ambiguity-Word Sense Disambiguation. Discourse Processing: cohesion-Reference Resolution- Discourse Coherence and Structure. | | | | | | | | | | **12** | |
| IV | **Natural Language Generation:** Architecture of NLG Systems- Generation Tasks and Representations- Application of NLG. Machine Translation: Problems in Machine Translation. Characteristics of Indian Languages- Machine Translation Approaches-Translation involving Indian Languages. | | | | | | | | | | **12** | |
| V | **Information retrieval and lexical resources:** Information Retrieval: Design features of Information Retrieval Systems-Classical, Non- classical, Alternative Models of Information Retrieval – valuation Lexical Resources: WorldNet-Frame NetStemmers- POS Tagger- Research Corpora SSAS. | | | | | | | | | | **12** | |
| **Course Outcomes** | | | | | | | | | **Programme Outcomes** | | | |
| CO | On completion of this course, students will | | | | | | | |  | | | |
| CO1 | Describe the fundamental concepts and techniques of natural language processing.  Explain the advantages and disadvantages of different NLP technologies and their applicability in different business situations. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO2 | Distinguish among the various techniques, taking into account the assumptions, strengths, and weaknesses of each  Use NLP technologies to explore and gain a broad understanding of text data. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO3 | Use appropriate descriptions, visualizations, and statistics to communicate the problems and their solutions.  Use NLP methods to analyse sentiment of a text document. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO4 | Analyze large volume text data generated from a range of real- world applications.  Use NLP methods to perform topic modelling. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| CO5 | Develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness.  Determine the framework in which artificial intelligence and the Internet of things may function, including interactions with people, enterprise functions, and environments. | | | | | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | |
| **Textbooks** | | | | | | | | | | | | |
| 1 | Daniel Jurafsky, James H. Martin, “Speech & language processing”, Pearson publications. | | | | | | | | | | | |
| 2 | Allen, James. Natural language understanding. Pearson, 1995. | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
| 1. | Pierre M. Nugues, “An Introduction to Language Processing with Perl and Prolog”,Springer | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | |
| 1. | https://en.wikipedia.org/wiki/Natural\_language\_processing | | | | | | | | | | | |
| 2. | https:/[/www.techtar](http://www.techtarget.com/searchenterpriseai/definition/natural-language-)g[et.com/searchenterpriseai/definition/natural-language-](http://www.techtarget.com/searchenterpriseai/definition/natural-language-) processing-NLP | | | | | | | | | | | |

**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 | 3 | 3 |
| **CO 4** | 3 | 2 | 3 | 3 | 2 | 3 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **Subject Name** | | | | **Category** | | | **L** | **T** | | | **P** | | **S** | **Credits** | **Marks** | | | | | |
| **CIA** | | **Exter nal** | | | **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. | | | | | | | | | | | | | | | | | | | | **15** | | |
| II | **Classical Encryption Techniques:** Symmetric cipher model – **Substitution Techniques:** Caesar Cipher – Monoalphabetic cipher – Play fair cipher – Poly Alphabetic Cipher – Transposition techniques –  Stenography | | | | | | | | | | | | | | | | | | | | **15** | | |
| III | **Block Cipher and DES:** Block Cipher Principles – DES – The Strength  of DES –**RSA:** The RSA algorithm. | | | | | | | | | | | | | | | | | | | | **15** | | |
| IV | **Network Security Practices**: IP Security overview - IP Security architecture – Authentication Header. **Web Security**: SecureSocket Layer and Transport Layer Security – Secure Electronic Transaction. | | | | | | | | | | | | | | | | | | | | **15** | | |
| V | Intruders – Malicious software – Firewalls. | | | | | | | | | | | | | | | | | | | | **15** | | |
| **TOTAL HOURS** | | | | | | | | | | | | | | | | | | | | | **75** | | |
| **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 cryptographic algorithms | | | | | | operations | | | | | of | | symmetric | | | | PO1, PO2, PO3, PO4, PO5, PO6 | | | | | |
| CO3 | Apply the different cryptographic cryptography | | | | | | operations | | | | | of | | public key | | | | PO1, PO2, PO3, PO4,  PO5, PO6 | | | | | |
| CO4 | Apply the various Authentication schemes to simulate different applications. | | | | | | | | | | | | | | | | | PO1, PO2,  PO3, PO4, PO5, PO6 | | | | | |
| CO5 | Understand standards | | various | Security | practices | | | and | | | System security | | | | | | | 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** | **Inst. Hours** | **Marks** | | | |
| **CIA** | | **External** | **Total** |
|  | **Big Data Analytics** | Core | 4 | - | - | - | | | 3 | 5 | 25 | | 75 | 100 |
| **Course Objective** | | | | | | | | | | | | | | |
| C1 | Understand the Big Data Platform and its Use cases, Map Reduce Jobs | | | | | | | | | | | | | |
| C2 | To identify and understand the basics of cluster and decision tree | | | | | | | | | | | | | |
| C3 | To study about the Association Rules, Recommendation System | | | | | | | | | | | | | |
| C4 | To learn about the concept of stream | | | | | | | | | | | | | |
| C5 | Understand the concepts of NoSQL Databases | | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | **No. of Hours** | | | **Course Objective** | | | |
| I | Evolution of Big data — Best Practices for Big data | | | | | | | 12 | | | C1 | | | |
|  | Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High- Performance Architecture — HDFS — MapReduce  and YARN — Map Reduce Programming Model | | | | | | |  | | | |  | | |
| II | Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters  — Diagnostics — Reasons to Choose and Cautions .- Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes?  Theorem — Naïve Bayes Classifier. | | | | | | | 12 | | | | C2 | | |
| III | Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association& finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid  Recommendation Approaches. | | | | | | | 12 | | | | C3 | | |
| IV | Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics | | | | | | | 12 | | | | C4 | | |
| V | NoSQL Databases : Schema-less Models?: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding —Hbase  — Analyzing big data with twitter — Big data for E- Commerce Big data for blogs — Review of Basic Data Analytic Methods using R. | | | | | | | 12 | | | | C5 | | |
|  | **Total** | | | | | | | **60** | | | |  | | |
| **Course Outcomes** | | | | | | | **Programme Outcomes** | | | | | | | |
| CO | On completion of this course, students will | | | | | |  | | | | | | | |
| 1 | Work with big data tools and its analysis techniques. | | | | | | PO1 | | | | | | | |
| 2 | Analyze data by utilizing clustering and classification algorithms. | | | | | | PO1, PO2 | | | | | | | |
| 3 | Learn and apply different mining algorithms and recommendation systems for large volumes of data. | | | | | | PO4, PO6 | | | | | | | |
| 4 | Perform analytics on data streams. | | | | | | PO4, PO5, PO6 | | | | | | | |
| 5 | Learn NoSQL databases and management. | | | | | | PO3, PO8 | | | | | | | |
| **Text Book** | | | | | | | | | | | | | | |
| 1 | AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012. | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1. | David Loshin, “Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph”, Morgan Kaufmann/El  sevier Publishers, 2013 | | | | | | | | | | | | | |
| 2. | EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley publishers, 2015. | | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| 1. | [https://www.simplilearn.com](https://www.simplilearn.com/) | | | | | | | | | | | | | |
| 2. | <https://www.sas.com/en_us/insights/analytics/big-data-analytics.html> | | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | S |  |  |  |  |  |  |  |
| **CO 2** | M | S |  |  |  |  |  |  |
| **CO 3** |  |  |  | S |  | S |  |  |
| **CO 4** |  |  |  | S | S | M |  |  |
| **CO 5** |  |  | S |  |  |  |  | S |

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | | | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | | **External** | **Total** |
|  | **Internet of Things** | Core | Y | - | - | - | | | 3 | 4 | 25 | | 75 | 100 |
| **Course Objective** | | | | | | | | | | | | | | |
| C1 | Use of Devices, Gateways and Data Management in IoT. | | | | | | | | | | | | | |
| C2 | Design IoT applications in different domain and be able to analyze their performance | | | | | | | | | | | | | |
| C3 | Implement basic IoT applications on embedded platform | | | | | | | | | | | | | |
| C4 | To gain knowledge on Industry Internet of Things | | | | | | | | | | | | | |
| C5 | To Learn about the privacy and Security issues in IoT | | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | **No. of Hours** | | | | **Course Objective** | | |
| I | IoT & Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics. | | | | | | | 12 | | | | C1 | | |
| II | M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. | | | | | | | 12 | | | | C2 | | |
| III | **:** IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views | | | | | | | 12 | | | | C3 | | |
| IV | IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and GasIndustry, Opinions on IoT Application and Value for Industry, Home Management | | | | | | | 12 | | | | C4 | | |
| V | Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security | | | | | | | 12 | | | | C5 | | |
|  | **Total** | | | | | | | **60** | | | |  | | |
| **Course Outcomes** | | | | | | | **Programme Outcomes** | | | | | | | |
| CO | On completion of this course, students will | | | | | |  | | | | | | | |
| 1 | Work with big data tools and its analysis techniques. | | | | | | PO1 | | | | | | | |
| 2 | Analyze data by utilizing clustering and classification algorithms. | | | | | | PO1, PO2 | | | | | | | |
| 3 | Learn and apply different mining algorithms and recommendation systems for large volumes of data. | | | | | | PO4, PO6 | | | | | | | |
| 4 | Perform analytics on data streams. | | | | | | PO4, PO5, PO6 | | | | | | | |
| 5 | Learn NoSQL databases and management. | | | | | | PO3, PO8 | | | | | | | |
| **Text Book** | | | | | | | | | | | | | | |
| 1 | Vijay Madisetti and Arshdeep Bahga, “Internet of Things: (A Hands-on Approach)”, Universities Press (INDIA) Private Limited 2014, 1st Edition. | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1. | Michael Miller, “The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World”, kindle version. | | | | | | | | | | | | | |
| 2. | Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, Apress Publications 2013, 1st Edition,. | | | | | | | | | | | | | |
| 3 | WaltenegusDargie, ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: | | | | | | | | | | | | | |
|  | Theory and Practice” 4..CunoPfister, “Getting Started with the Internet of Things”, O‟Reilly Media 2011 | | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| 1. | [https://www.simplilearn.com](https://www.simplilearn.com/) | | | | | | | | | | | | | |
| 2. | https:/[/www.javatpoint.com](http://www.javatpoint.com/) | | | | | | | | | | | | | |
| 3. | https:/[/www.w3schools.com](http://www.w3schools.com/) | | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | S |  |  |  |  |  |  |  |
| **CO 2** | M | S |  |  |  |  |  |  |
| **CO 3** |  |  |  | S |  | S |  |  |
| **CO 4** |  |  |  | S | S | M |  |  |
| **CO 5** |  |  | S |  |  |  |  | S |

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | **Total** | |
|  | **Human Computer Interaction** | Elective | - | Y | - | V | | 3 | 4 | 25 | 75 | 100 | |
| **Course Objective** | | | | | | | | | | | | | |
| C1 | To learn about the foundations of Human Computer Interaction. | | | | | | | | | | | | |
| C2 | To learn the design and software process technologies. | | | | | | | | | | | | |
| C3 | To learn HCI models and theories. | | | | | | | | | | | | |
| C4 | To learn Mobile Ecosystem. | | | | | | | | | | | | |
| C5 | To learn the various types of Web Interface Design. | | | | | | | | | | | | |
|  |  | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | | | | **No. of Hours** | | |
| I | **FOUNDATIONS OF HCI :**   * The Human: I/O channels – Memory * Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; * Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies | | | | | | | | | | 12 | | |
| II | **DESIGN & SOFTWARE PROCESS:**   * Interactive Design: * Basics – process – scenarios * Navigation: screen design Iteration and prototyping. * HCI in software process: * Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design | | | | | | | | | | 12 | | |
| III | **MODELS AND THEORIES:**   * HCI Models : Cognitive models:- Socio-Organizational issues and stakeholder requirements Communication and collaboration models-Hypertext, Multimedia and [WWW.](http://WWW/) | | | | | | | | | | 12 | | |
| IV | **Mobile HCI:**   * Mobile Ecosystem: Platforms, Application frameworks * Types of Mobile Applications: Widgets, Applications, Games * Mobile Information Architecture, Mobile 2.0, * Mobile Design: Elements of Mobile Design, Tools. - Case Studies | | | | | | | | | | 12 | | |
| V | **WEB INTERFACE DESIGN:** Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies | | | | | | | | | | 12 | |
|  | **Total** | | | | | | | | | | **60** | |
| **Course Outcomes** | | | | | | | **Programme Outcome** | | | | | |
| CO | On completion of this course, students will | | | | | |  | | | | | |
| 1 | Understand the fundementals of HCI. | | | | | | PO1 | | | | | |
| 2 | Understand the design and software process  technologies. | | | | | | PO1, PO2 | | | | | |
| 3 | Understand HCI models and theories. | | | | | | PO4, PO6 | | | | | |
| 4 | Understand Mobile Ecosystem, types of Mobile Applications, mobile Architecture and design. | | | | | | PO4, PO5, PO6 | | | | | |
| 5 | Understand the various types of Web Interface  Design. | | | | | | PO3, PO8 | | | | | |
| **Text Book** | | | | | | | | | | | | |
| 1 | Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ”Human -Computer  Interaction‖”, III Edition, Pearson Education, 2004 (UNIT I, II & III) | | | | | | | | | | | |
| 2 | Brian Fling, ―”Mobile Design and Development”, I Edition, O‘Reilly Media Inc., 2009(UNIT–IV) | | | | | | | | | | | |
| 3 | Bill Scott and Theresa Neil, ―Designing Web Interfaces‖, First Edition, O‘Reilly,  2009. (UNIT-V) | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
| 1. | Shneiderman, “Designing the User Interface: Strategies for Effective Human-Computer  Interaction”, V Edition, Pearson Education. | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | |
| 1. | https:/[/www.int](http://www.interaction-design.org/literature/topics/human-computer-interaction)e[raction-design.org/literature/topics/human-computer-interaction](http://www.interaction-design.org/literature/topics/human-computer-interaction) | | | | | | | | | | | |
| 2. | https://link.springer.com/10.1007/978-0-387-39940-9\_192 | | | | | | | | | | | |
| 3. | https://en.wikipedia.org/wiki/Human%E2%80%93computer\_interaction | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
|  |  |  |  |  |  |  |  |  |
| **CO 1** | **S** |  |  |  |  |  |  |  |
| **CO 2** | **S** | **S** |  |  |  |  |  |  |
| **CO 3** |  |  |  | **S** |  | **S** |  |  |
| **CO 4** |  |  |  | **S** | **S** | **S** |  |  |
| **CO 5** |  |  | **S** |  |  |  |  | **S** |

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | | | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | | **External** | **Total** |
|  | **Fuzzy Logic** | Elective | Y | - | - | V | | | 3 | 4 | 25 | | 75 | 100 |
| **Course Objective** | | | | | | | | | | | | | | |
| CO1 | To understand the basic concept of Fuzzy logic | | | | | | | | | | | | | |
| CO2 | To learn the various operations on relation properties | | | | | | | | | | | | | |
| CO3 | To study about the membership functions | | | | | | | | | | | | | |
| CO4 | To learn about the Defuzzification and Fuzzy Rule-Based System | | | | | | | | | | | | | |
| CO5 | To learn the concepts of Applications of Fuzzy Logic | | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | | **No. of Hours** | | | **Course Objective** | | |
| I | Introduction to Fuzzy Logic- Fuzzy Sets- Fuzzy Set Operations, Properties of Fuzzy Sets, Classical and Fuzzy Relations: Introduction-Cartesian Product of Relation-Classical Relations-Cardinality of Crisp Relation. | | | | | | | | 12 | | | C1 | | |
| II | Operations on Crisp Relation-Properties of Crisp Relations-Composition Fuzzy Relations, Cardinality of Fuzzy Relations-Operations on Fuzzy Relations- Properties of Fuzzy Relations-Fuzzy Cartesian Product  and Composition-Tolerance and Equivalence Relations, Crisp Relation | | | | | | | | 12 | | | C2 | | |
| III | Membership Functions: Introduction, Features of Membership Function, Classification of Fuzzy Sets, Fuzzification, Membership Value Assignments, Intuition, Inference, Rank Ordering. | | | | | | | 12 | | | | C3 | | |
| IV | Defuzzification: Introduction, Lambda Cuts for Fuzzy Sets, Lambda Cuts for Fuzzy Relations, Defuzzification Methods, Fuzzy Rule-Based System: Introduction, Formation of Rules, Decomposition of Rules, Aggregation of Fuzzy Rules, Properties of Set of Rules. | | | | | | | 12 | | | | C4 | | |
| V | Applications of Fuzzy Logic: Fuzzy Logic in Automotive Applications, Fuzzy Antilock Brake System-Antilock-Braking System and Vehicle Speed- Estimation Using Fuzzy Logic. | | | | | | | 12 | | | | C5 | | |
|  | **Total** | | | | | | |  | | | |  | | |
| **Course Outcomes** | | | | | | | **Programme Outcomes** | | | | | | | |
| CO | On completion of this course, students will | | | | | |  | | | | | | | |
| 1 | Understand the basics of Fuzzy sets, operation and  properties. | | | | | | PO1 | | | | | | | |
| 2 | Apply Cartesian product and composition on Fuzzy relations and usethe tolerance and Equivalence relations. | | | | | | PO1, PO2 | | | | | | | |
| 3 | Analyze various fuzzification methods and features  of membership Functions. | | | | | | PO4, PO6 | | | | | | | |
| 4 | Evaluate defuzzification methods for real time  applications. | | | | | | PO4, PO5, PO6 | | | | | | | |
| 5 | Design an application using Fuzzy logic and its Relations. | | | | | | PO3, PO8 | | | | | | | |
| **Text Book** | | | | | | | | | | | | | | |
| 1 | S. N. Sivanandam, S. Sumathi and S. N. Deepa-Introduction to Fuzzy Logic using MATLAB, Springer-Verlag Berlin Heidelberg 2007. | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1. | Guanrong Chen and Trung Tat Pham- Introduction to Fuzzy Sets, Fuzzy Logic and Fuzzy Control Systems | | | | | | | | | | | | | |
| 2. | Timothy J Ross , Fuzzy Logic with Engineering Applications | | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| 1. | <https://www.javatpoint.com/fuzzy-logic> | | | | | | | | | | | | | |
| 2. | <https://www.guru99.com/what-is-fuzzy-logic.html> | | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | S |  |  |  |  |  |  |  |
| **CO 2** | M | S |  |  |  |  |  |  |
| **CO 3** |  |  |  | S |  | S |  |  |
| **CO 4** |  |  |  | S | S | M |  |  |
| **CO 5** |  |  | S |  |  |  |  | S |

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

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Name** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | | **Total** |
| **SOFTWARE PROJECT MANAGEMENT** | | **4** | **0** | **0** | **-** | **3** | **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** |  | | | | | | | | | | |
| **LO4** | 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. | | | | | | | | | **12** | |
| 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. | | | | | | | | | **12** | |
| 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. | | | | | | | | | **12** | |
| 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. | | | | | | | | | **12** | |
| 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 | | | | | | | | | **12** | |
| **TOTAL** | | | | | | | | | | **60** | |
| **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) | | | | | | | | | | |

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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 eachPSO** | **13** | **11** | **10** | **13** | **13** | **12** |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | **Image Processing** | Elective | - | Y | - | - | 3 | 4 | 25 | 75 | 100 |
| **Course Objective** | | | | | | | | | | | |
| C1 | To learn fundamentals of digital image processing. | | | | | | | | | | |
| C2 | To learn about various 2D Image transformations | | | | | | | | | | |
| C3 | To learn about various image enhancement processing methods and filters | | | | | | | | | | |
| C4 | To learn about various classification of Image segmentation techniques | | | | | | | | | | |
| C5 | To learn about various image compression techniques | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | | | **No. of**  **Hours** | |
| I | **Digital Image Fundamentals:** Image representation - Basic relationship between pixels, Elements of DIP system -Applications of Digital Image Processing - 2D Systems - Classification of 2D Systems - Mathematical Morphology- Structuring Elements- Morphological Image Processing - 2D Convolution - 2D Convolution Through Graphical Method -2D  Convolution Through Matrix Analysis | | | | | | | | | 12 | |
| II | 2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform- Haar transform- Discrete Cosine Transform-  Karhunen-Loeve Transform -Singular Value Decomposition | | | | | | | | | 12 | |

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| III | Image Enhancement: Spatial domain methods- Point processing- Intensity transformations - Histogram processing- Spatial filtering- smoothing filter- Sharpening filters - Frequency domain methods: low pass filtering, high pass Filtering- Homomorphic filter. | | 12 |
| IV | Image segmentation: Classification of Image segmentation techniques - Region approach – Clustering techniques - Segmentation based on thresholding - Edge based segmentation - Classification of edges- Edge  detection - Hough transform- Active contour. | | 12 |
| V | Image Compression: Need for compression -Redundancy- Classification  of image- Compression schemes- Huffman coding- Arithmetic coding- Dictionary based compression -Transform based compression, | | 12 |
|  | **Total** | | **60** |
| **Course Outcomes** | | **Programme Outcome** | |
| CO | On completion of this course, students will |  | |
| 1 | Understand the fundamental concepts of digital image processing. | PO1 | |
| 2 | Understand various 2D Image transformations | PO1, PO2 | |
| 3 | Understand image enhancement processing  techniques and filters | PO4, PO6 | |
| 4 | Understand the classification of Image segmentation  techniques | PO4, PO5, PO6 | |
| 5 | Understand various image compression techniques | PO3, PO8 | |
| **Text Book** | | | |
| 1 | S Jayaraman, S Esakkirajan, T Veerakumar, Digital image processing ,Tata McGraw Hill, 2015 | | |
| 2 | Gonzalez Rafel C, Digital Image Processing, Pearson Education, 2009 | | |
| **Reference Books** | | | |
| 1. | 1. Jain Anil K , Fundamentals of digital image processing: , PHI,1988 | | |
| 2. | Kenneth R Castleman , Digital image processing:, Pearson Education,2/e,2003 | | |
| 3. | Pratt William K , Digital Image Processing: , John Wiley,4/e,2007 | | |
| **Web Resources** | | | |
| 1. | https://kanchiuniv.ac.in/coursematerials/Digital%20image%20processing%20-  Vijaya%20Raghavan.pdf | | |

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| --- | --- |
| 2. | <http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203>  rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf |
| 3. | <https://dl.acm.org/doi/10.5555/559707> |
| 4. | https:/[/www](http://www.ijert.org/image-processing-using-web-2-0-2).[ijert.org/image-processing-using-web-2-0-2](http://www.ijert.org/image-processing-using-web-2-0-2) |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | **S** |  |  |  |  |  |  |  |
| **CO 2** | **S** | **S** |  |  |  |  |  |  |
| **CO 3** |  |  |  | **S** |  | **S** |  |  |
| **CO 4** |  |  |  | **S** | **S** | **S** |  |  |
| **CO 5** |  |  | **S** |  |  |  |  | **S** |

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

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | | **Credits** | **Inst. Hours** | **Marks** | | | | | |
| **CIA** | | | **External** | **Total** | |
|  | **Information Security** | **Elective** | Y | - | - | - | | 3 | 4 | 25 | | | 75 | 100 | |
| **Course Objectives** | | | | | | | | | | | | | | | |
| CO1 | To know the objectives of information security | | | | | | | | | | | | | | |
| CO2 | Understand the importance and application of each of confidentiality, integrity, authentication and availability | | | | | | | | | | | | | | |
| CO3 | Understand various cryptographic algorithms | | | | | | | | | | | | | | |
| CO4 | Understand the basic categories of threats to computers and networks | | | | | | | | | | | | | | |
| CO5 | To study about the concepts of security in networks, web security | | | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | **No. of Hours** | | | | | **Course Objectives** | | | |
| 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 | | | | | CO1 | | | |
| 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 | | | | | CO2 | | | |
| 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 | | | | CO3 | | | |
| 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 | | | | CO4 | | | |
| 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 | | | | CO5 | | | |
|  | **Total** | | | | | | **60** | | | |  | | | |
| **Course Outcomes** | | | | | | | | | | | | | | |
| **Course Outcomes** | On completion of this course, students will; | | | | | | **Programme Outcomes** | | | | | | | |
| **CO1** | Understand network security threats, security  services, and countermeasures | | | | | | PO1 | | | | | | | |
| **CO2** | Understand vulnerability analysis of network  security | | | | | | PO1, PO2 | | | | | | | |
| **CO3** | Acquire background on hash functions; authentication; firewalls; intrusion detection techniques | | | | | | PO4, PO6 | | | | | | | |
| **CO4** | Gain hands-on experience with programming and | | | | | | PO4, PO5, PO6 | | | | | | | |
|  | simulation techniques for security protocols. | | | | | |  | | | | | | | |
| **CO5** | Apply methods for authentication, access control,  intrusion detection and prevention | | | | | | PO3, PO8 | | | | | | | |
| **Text Books**  **(Latest Editions)** | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | |
|  |  | | | | | | | | | | | | | |
| **References Books**  **(Latest editions, and the style as given below must be strictly adhered to)** | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| 1. | <https://www.geeksforgeeks.org/what-is-information-security/> | | | | | | | | | | | | | |
| 2. | [https://www.tutorialspoint.com/what-is-information-](https://www.tutorialspoint.com/what-is-information-security#%3A~%3Atext%3DInformation%20security%20is%20designed%20and%2Cdestruction%2C%20alteration%2C%20and%20disruption) [security#:~:text=Information%20security%20is%20designed%20and,destruction%2C%20](https://www.tutorialspoint.com/what-is-information-security#%3A~%3Atext%3DInformation%20security%20is%20designed%20and%2Cdestruction%2C%20alteration%2C%20and%20disruption) [alteration%2C%20and%20disruption](https://www.tutorialspoint.com/what-is-information-security#%3A~%3Atext%3DInformation%20security%20is%20designed%20and%2Cdestruction%2C%20alteration%2C%20and%20disruption). | | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | S |  |  |  |  |  |  |  |
| **CO 2** | M | S |  |  |  |  |  |  |
| **CO 3** |  |  |  | S |  | S |  |  |
| **CO 4** |  |  |  | S | S | M |  |  |
| **CO 5** |  |  | S |  |  |  |  | S |

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subje ct Code** | **Subject Name** | | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | **Extern al** | | **Total** |
|  | **ANALYTICS FOR SERVICE INDUSTRY** | | **Elect** | 4 | - | - | V- | 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. | | | | | | | | | | | | |
| **UNI T** | **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.ukessa](http://www.ukessays.com/essays/marketing/contemporary-issues-in-marketing-)y[s.com/essays/marketing/contemporary-issues-in-marketing-](http://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 |
| **Weightageof coursecontributedtoeachPSO** | 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** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | **Total** | |
|  | **Grid Computing** | Elective | - | Y | - | - | | 3 | 4 | 25 | 75 | 100 | |
| **Course Objective** | | | | | | | | | | | | | |
| C1 | To learn the basic construction and application of Grid computing. | | | | | | | | | | | | |
| C2 | To learn grid computing organization and their Role. | | | | | | | | | | | | |
| C3 | To learn Grid Computing Anotomy. | | | | | | | | | | | | |
| C4 | To learn Grid Computing road map. | | | | | | | | | | | | |
| C5 | To learn various type of Grid Architecture. | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | | | | **No. of 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 | | | | | | | | | | 12 | | |
|  | 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. | | | | | | | | | |  | |
|  | **Total** | | | | | | | | | | **60** | |
| **Course Outcomes** | | | | | | | **Programme Outcome** | | | | | |
| CO | On completion of this course, students will | | | | | |  | | | | | |
| 1 | To understand the basic elements and concepts of  Grid computing. | | | | | | PO1 | | | | | |
| 2 | To understand the Grid computing toolkits and  Framework. | | | | | | PO1, PO2 | | | | | |
| 3 | To understand the concepts of Anotomy of Grid  Computing. | | | | | | PO4, PO6 | | | | | |
| 4 | To understand the concept of service oriented  architecture. | | | | | | PO4, PO5, PO6 | | | | | |
| 5 | To Gain knowledge on grid and web service  architecture. | | | | | | PO3, PO8 | | | | | |
| **Text Book** | | | | | | | | | | | | |
| 1 | Joshy Joseph and Craig Fellenstein, Grid computing, Pearson / IBM Press, PTR, 2004. | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
| 1. | 1. Ahmer Abbas and Graig computing, A Practical Guide to technology and applications, Charles River Media, 2003. | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | |
| 1. | <https://en.wikipedia.org/wiki/Grid_computing> | | | | | | | | | | | |
| 2. | https://link.springer.com/chapter/10.1007/978-1-84882-409-6\_4 | | | | | | | | | | | |
| 3. | https:/[/www.redbooks.ibm.com/redbooks/pdfs/sg246778.pdf](http://www.redbooks.ibm.com/redbooks/pdfs/sg246778.pdf) | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | **S** |  |  |  |  |  |  |  |
| **CO 2** | **S** | **S** |  |  |  |  |  |  |
| **CO 3** |  |  |  | **S** |  | **S** |  |  |
| **CO 4** |  |  |  | **S** | **S** | **S** |  |  |
| **CO 5** |  |  | **S** |  |  |  |  | **S** |

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

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | | **Credits** | **Inst. Hours** | | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | **Cyber Forensics** | Elective | Y | - | - | - | | 3 | 4 | | 25 | 75 | 100 |
| **Course Objective** | | | | | | | | | | | | | |
| **C1** | Understand the definition of computer forensics fundamentals. | | | | | | | | | | | | |
| **C2** | To study about the Types of Computer Forensics Evidence | | | | | | | | | | | | |
| **C3** | Understand and apply the concepts of Duplication and Preservation of Digital Evidence | | | | | | | | | | | | |
| **C4** | Understand the concepts of Electronic Evidence and Identification of Data | | | | | | | | | | | | |
| **C5** | To study about the Digital Detective, Network Forensics Scenario, Damaging Computer  Evidence. | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | **No. of Hours** | | | | **Course Objective** | | |
| **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 Military Computer Forensic Technology–Types of Law Enforcement–Computer Forensic. Technology–Types of  Business Computer Forensic Technology. | | | | | | 12 | | | | C1 | | |
| **II** | **Computer Forensics Evidence and capture:** Data | | | | | | 12 | | | | C2 | | |
|  | 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. | | | | | |  | | |  | | | |
| **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. | | | | | | 12 | | | C3 | | | |
| **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. | | | | | | 12 | | | C4 | | | |
| **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. | | | | | | 12 | | | C5 | | | |
|  | **Total** | | | | | | **60** | | |  | | | |
| **Course Outcomes** | | | | | | | **Programme Outcomes** | | | | | | |
| **CO** | On completion of this course, students will | | | | | |  | | | | | | |
| **1** | Understand the definition of computer forensics fundamentals. | | | | | | PO1 | | | | | | |
| **2** | Evaluate the different types of computer forensics technology. | | | | | | PO1, PO2 | | | | | | |
| **3** | Analyze various computer forensics systems. | | | | | | PO4, PO6 | | | | | | |
| **4** | Apply the methods for data recovery, evidence collection and data seizure. | | | | | | PO4, PO5, PO6 | | | | | | |

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| --- | --- | --- |
| **5** | Gain your knowledge of duplication and preservation of digital evidence. | PO3, PO8 |
| **Text Book** | | |
| **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 Digital Crime”, TMH 2005. | |
| **Web Resources** | | |
| **1.** | [https://www.vskills.in](https://www.vskills.in/) | |
| **2.** | <https://www.hackingarticles.in/best-of-computer-forensics-tutorials/> | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | S |  |  |  |  |  |  |  |
| **CO 2** | M | S |  |  |  |  |  |  |
| **CO 3** |  |  |  | S |  | S |  |  |
| **CO 4** |  |  |  | S | S | M |  |  |
| **CO 5** |  |  | S |  |  |  |  | S |

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

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | | | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | | **External** | **Total** |
|  | **Pattern Recognition** | Specific  Elective | Y | - | - | - | | | 3 | 4 | 75 | | 25 | 100 |
| **Course Objective** | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | **No. of Hours** | | | | **Course Objective** | | |
| I | PATTERN RECOGNITION OVERVIEW: Pattern  recognition, Classification and Description-Patterns and feature Extraction with Examples-Training and Learning in PR systems-Pattern recognition Approaches | | | | | | | 12 | | | | CO1 | | |
| II | STATISTICAL PATTERN RECOGNITION: Introduction  to statistical Pattern Recognition-supervised Learning using Parametric and Non-Parametric Approaches. | | | | | | | 12 | | | | CO2 | | |
| 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 | | | | | | | 12 | | | | CO3 | | |
| 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. | | | | | | | 12 | | | | CO4 | | |
| V | NEURAL PATTERN RECOGNITION: Introduction to Neural Networks-Feedforward Networks and training by Back Propagation-Content Addressable Memory Approaches and Unsupervised Learning in Neural PR | | | | | | | 12 | | | | CO5 | | |
|  | **Total** | | | | | | | 60 | | | |  | | |
| **Course Outcomes** | | | | | | | **Programme Outcomes** | | | | | | | |
| CO | On completion of this course, students will | | | | | |  | | | | | | | |
| 1 | understand the concepts, importance, application and the process of developing Pattern recognition over view | | | | | | PO1 | | | | | | | |
| 2 | to have basic knowledge and understanding about parametric and non-parametric related concepts. | | | | | | PO1, PO2 | | | | | | | |
| 3 | To understand the framework of frames and bit images to animations | | | | | | PO4, PO6 | | | | | | | |
| 4 | Speaks about the multimedia projects and stages of requirement in phases of project. | | | | | | PO4, PO5, PO6 | | | | | | | |
| 5 | Understanding the concept of cost involved in multimedia planning, designing, and producing | | | | | | PO3, PO8 | | | | | | | |

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| **Text Book** | |
| 1 | Robert Schalkoff, “Pattern Recognition: Statistical Structural and Neural Approaches”, John wiley & sons. |
| 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. |
| **Reference Books** | |
| 1. | 1. Earl Gose, Richard johnsonbaugh, Steve Jost, “Pattern Recognition and Image Analysis”, Prentice Hall of India, Pvt Ltd, New Delhi. |
| **Web Resources** | |
| 1. | <https://www.geeksforgeeks.org/pattern-recognition-introduction/> |
| 2. | <https://www.mygreatlearning.com/blog/pattern-recognition-machine-learning/> |

**Mapping with Programme Outcomes:**

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|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | S |  |  |  |  |  |  |  |
| **CO 2** | M | S |  |  |  |  |  |  |
| **CO 3** |  |  |  | S |  | S |  |  |
| **CO 4** |  |  |  | S | S | M |  |  |
| **CO 5** |  |  | S |  |  |  |  | S |

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

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | |
| **CIA** | **External** | **Total** |
|  | **Artificial Intelligence** | Elective | - | Y | - | - | 2 | 2 | 25 | 75 | 100 |

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| --- | --- | --- | --- |
| **Course Objective** | | | |
| C1 | To learn various concepts of AI Techniques. | | |
| C2 | To learn various Search Algorithm in AI. | | |
| C3 | To learn probabilistic reasoning and models in AI. | | |
| C4 | To learn about Markov Decision Process. | | |
| C5 | To learn various type of Reinforcement learning. | | |
| **UNIT** | **Details** | | **No. of**  **Hours** |
| I | Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph  structures, State space representation, Search graph and Search tree | | 15 |
| II | Search Algorithms : Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search,  A\* algorithm, Game Search | | 15 |
| III | Probabilistic Reasoning : Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model. | | 15 |
| IV | Markov Decision process : MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable  MDPs. | | 15 |
| V | Reinforcement Learning : Passive reinforcement learning, direct utility  estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning | | 15 |
|  | **Total** | | **75** |
| **Course Outcomes** | | **Programme Outcome** | |
| CO | On completion of this course, students will |  | |
| 1 | Understand the various concepts of AI Techniques. | PO1 | |
| 2 | Understand various Search Algorithm in AI. | PO1, PO2 | |
| 3 | Understand probabilistic reasoning and models in  AI. | PO4, PO6 | |
| 4 | Understand Markov Decision Process. | PO4, PO5, PO6 | |
| 5 | Understand various type of Reinforcement learning | PO3, PO8 | |

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|  | Techniques. |  |
| **Text Book** | | |
| 1 | Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach” , 3rd Edition, Prentice Hall. | |
|  | Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill | |
| **Reference Books** | | |
| 1. | Trivedi, M.C., “A Classical Approach to Artifical Intelligence”, Khanna Publishing  House, Delhi. | |
| 2. | Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011 | |
| 3. | David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University Press 2010 | |
| **Web Resources** | | |
| 1. | NPTEL&MOOCcoursestitledArtificialIntelligenceandExpertSystems | |
| 2. | <https://nptel.ac.in/courses/106106140/> | |
| 3. | <https://nptel.ac.in/courses/106106126/> | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | **S** |  |  |  |  |  |  |  |
| **CO 2** | **S** | **S** |  |  |  |  |  |  |
| **CO 3** |  |  |  | **S** |  | **S** |  |  |
| **CO 4** |  |  |  | **S** | **S** | **S** |  |  |
| **CO 5** |  |  | **S** |  |  |  |  | **S** |

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

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | | | **Credits** | **Inst. Hours** | **Marks** | | | | |
| **CIA** | | **External** | **Total** | |
|  | **Robotics and its Applications** | Elective | Y | - | - | - | | | 2 | 2 | 25 | | 75 | 100 | |
| **Course Objective** | | | | | | | | | | | | | | | |
| C1 | To understand the robotics fundamentals | | | | | | | | | | | | | | |
| C2 | Understand the sensors and matrix methods | | | | | | | | | | | | | | |
| C3 | Understand the Localization: Self-localizations and mapping | | | | | | | | | | | | | | |
| C4 | To study about the concept of Path Planning, Vision system | | | | | | | | | | | | | | |
| C5 | To learn about the concept of robot artificial intelligence | | | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | | **No. of Hours** | | | **Course Objective** | | | |
| 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. | | | | | | | | 15 | | | CO1 | | | |
| II | Actuators and sensors :Types of actuators, stepper-DC-  servo-and brushless motors- model of a DC servomotor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers-strain gauge based force torque sensor- proximity and distance measuring sensors  Kinematics of robots: Representation of joints and frames, frames transformation, homogeneous matrix, D- H matrix, Forward and inverse kinematics: two link planar (RR) and spherical robot (RRP). Mobile robot Kinematics: Differential wheel mobile robot | | | | | | | | 15 | | | CO2 | | | |
| III | Localization: Self-localizations and mapping - Challenges in localizations – IR based localizations – vision based localizations – Ultrasonic based localizations - GPS localization systems. | | | | | | | 15 | | | | CO3 | | | |
| IV | Path Planning: Introduction, path planning-overview- road map path planning-cell decomposition path planning potential field path planning-obstacle avoidance-case studies  Vision system: Robotic vision systems-image representation-object recognition-and categorization- depth measurement- image data compression-visual inspection-software considerations | | | | | | | 15 | | | | CO4 | | | |
| V | Application: Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications-nuclear applications-space Applications-Industrial robots-artificial intelligence in robots-application of robots in material handling-  continuous arc welding-spot welding-spray painting assembly operation-cleaning-etc - | | | | | | | 15 | | | | CO5 | | | |
|  | **Total** | | | | | | |  | | | |  | | |
| **Course Outcomes** | | | | | | | **Programme Outcomes** | | | | | | | |
| CO | On completion of this course, students will | | | | | |  | | | | | | | |
| 1 | Describe the different physical forms of robot architectures. | | | | | | PO1 | | | | | | | |
| 2 | Kinematically model simple manipulator and mobile robots. | | | | | | PO1, PO2 | | | | | | | |
| 3 | Mathematically describe a kinematic robot system | | | | | | PO4, PO6 | | | | | | | |
| 4 | Analyze manipulation and navigation problems using knowledge of coordinate frames, kinematics, optimization, control, and uncertainty. | | | | | | PO4, PO5, PO6 | | | | | | | |
| 5 | Program robotics algorithms related to kinematics, control, optimization, and uncertainty. | | | | | | PO3, PO8 | | | | | | | |
| **Text Book** | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| 1. | [https://www.tutorialspoint.com/artificial\_intelligence/artificial\_intelligence\_r](https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.htm) [obotics.htm](https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.htm) | | | | | | | | | | | | | |
| 2. | <https://www.geeksforgeeks.org/robotics-introduction/> | | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | S |  |  |  |  |  |  |  |
| **CO 2** | M | S |  |  |  |  |  |  |
| **CO 3** |  |  |  | S |  | S |  |  |
| **CO 4** |  |  |  | S | S | M |  |  |
| **CO 5** |  |  | S |  |  |  |  | S |

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

**Annexure II**

## **Suggested topics in Skill Enhancement(SEC1-SEC8) Course**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Marks** | | | | |
| **CIA** | | **Exter nal** | | **Total** |
| SEC | | | **FUNDAMENTALS OF INFORMATION TECHNOLOGY** | SEC | 2 | - | - | I | 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](http://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html) | | | | | | | | | | | | |
| 3. | | https://[www.javatpoint.com/computer-fundamentals-tutorial](http://www.javatpoint.com/computer-fundamentals-tutorial) | | | | | | | | | | | | |
| 4. | | https://[www.tutorialspoint.com/computer\_fundamentals/index.htm](http://www.tutorialspoint.com/computer_fundamentals/index.htm) | | | | | | | | | | | | |
| 5. | | https://[www.nios.ac.in/media/documents/sec229new/Lesson1.pdf](http://www.nios.ac.in/media/documents/sec229new/Lesson1.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** | 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** | **Exter nal** | | **Total** |
| **SEC** | | | | **UNDERSTANDING INTERNET** |  | 2 | - | - |  | 2 | 25 | 75 | | 100 |
| **Learning Objectives** | | | | | | | | | | | | | | |
| LO1 | | | Knowledge of Internet medium | | | | | | | | | | | |
| LO2 | | | Internet as a mass medium | | | | | | | | | | | |
| LO3 | | | Features of Internet Technology, | | | | | | | | | | | |
| LO4 | | | Internet as source of infotainment | | | | | | | | | | | |
| LO5 | | | Study of internet audiences and about cyber crime | | | | | | | | | | | |
| **UNIT** | | | **Contents** | | | | | | | | | | **No. Of. Hours** | |
| I | | | The emergence of internet as a mass medium – the world of ‘world wide web’. | | | | | | | | | | **6** | |
| II | | | Features of internet as a technology. | | | | | | | | | | **6** | |
| III | | | Internet as a source of infotainment – classification based on content and style. | | | | | | | | | | **6** | |
| IV | | | Demographic and psychographic descriptions of internet ‘audiences’ – effect  of internet onthe values and life-styles. | | | | | | | | | | **6** | |
| V | | | Present issues such as cyber crime and future possibilities. | | | | | | | | | | **6** | |
| **TOTAL HOURS** | | | | | | | | | | | | | **30** | |
|  | | | | | | | | | | |  | | | |
| CO | | **Course Outcomes** | | | | | | | | |  | | | |
| CO1 | | Knows the basic concept in HTML Concept of resources in HTML | | | | | | | | | | | | |
| CO2 | | Knows Design concept. Concept of Meta Data  Understand the concept of save the files. | | | | | | | | | | | | |
| CO3 | | Understand the page formatting.  Concept of list | | | | | | | | | | | | |
| CO4 | | Creating Links.  Know the concept of creating link to email address | | | | | | | | | | | | |
| CO5 | | Concept of adding images  Understand the table creation. | | | | | | | | | | | | |
| **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:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | M | S | M |  |  | M |  | L |
| **CO 2** | S | M | S |  |  | M |  |  |
| **CO 3** |  | S | S |  | S |  | L |  |
| **CO 4** |  |  | S | L | M |  | M |  |
| **CO 5** |  |  |  | M |  | S | M | S |

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

**Multimedia Lab**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | | |
| **CIA** | **External** | | | **Total** |
| **SEC** | | **0** | **0** | **2** | **-** | **1** | **2** | **25** | **75** | | | **100** |
| **Learning Objectives** | | | | | | | | | | | | |
| **LO1** | Understands the basics of multimedia | | | | | | | | | | | |
| **LO2** | Acquire knowledge of image editing and animation techniques. | | | | | | | | | | | |
| **LO3** | Apply multimedia concepts to real world projects | | | | | | | | | | | |
| **Unit** | **Contents** | | | | | | | | | **No. of Hours** | | |
| I | GIMP’s Tools- Taking Advantage of Paths - Working with Layers and masks - Using Channels  Exercises:   1. Enlarge a Logo using path 2. Create an ink drawing using path 3. Replace Background of image using Channels | | | | | | | | | **6** | | |
| II | Manipulating Images: Transforming Images - Using The Image Tools - Adjusting Colors - Working with Text - Painting in Gimp: Creating new brushes - Enhancing Photos - Exploring Filters and Effects.  Exercises:   1. Design Front Cover for a Book. 2. Create a customized logo 3. Use clone tool to remove text from an image 4. Remove Red eye using Filter. | | | | | | | | | **6** | | |
| III | Using GIMP animation package - Managing the Frames of Image | | | | | | | | | **6** | | |
| IV | Flash: Introduction - Creating and Editing Objects - Color and Text. Animations: Frame- by- frame animation-Motion Tweening- Motion Guides   1. Creating Frame-by-frame Animation 2. Create a Motion Tween for Graphic and Text Object 3. Create a Motion guide Layer | | | | | | | | | | **6** | | |
| V | Shape Tweening - Masking - Interactivity: Adding Script to Buttons - Testing and Publishing.  Exercises:   1. Create a Shape Tween for Graphic Object 2. Create a Mask Layer 3. Adding buttons with Action Script | | | | | | | | | | **6** | | |
| TOTAL | | | | | | | | | | | **30** | | |
| CO | Course Outcomes | | | | | | | | | | | | |
| CO1 | Demonstrate understanding and use of multimedia fundamentals | | | | | | | | | | | | |
| CO2 | Implement appropriate techniques required for editing images and designing animated system | | | | | | | | | | | | |
| CO3 | Solve various design and implementation issues materialize on the development of multimedia systems | | | | | | | | | | | | |
| CO4 | Assess different Photo Editing, Video Editing and animation tools and select the appropriate tool based on the requirements | | | | | | | | | | | | |
| CO5 | Design and develop Multimedia Projects | | | | | | | | | | | | |
| **Textbooks** | | | | | | | | | | | | | |
|  | 1. Jason Van Gumster& Robert Shimonski (2010), “GIMP Bible”, Wiley, 2nd edition. 2. Chris Gover, 2010, “Flash CS5: The missing Manual”, 1st Edition, O‟ Reilly India. | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1 | Juan Manuel Ferreyra (2011), “GIMP 2.6 Cookbook”, PACK publishing Ltd. | | | | | | | | | | | | |
| 2 | Robert Reinhard (2003), “Macromedia Flash MX Bible”, Wiley Dreamtech India Pvt Ltd. | | | | | | | | | | | | |
| **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | |
| 1. | htt[ps://www.youtube.com/watch?v=T8NIK3RdoIc](http://www.youtube.com/watch?v=T8NIK3RdoIc) (Unit IV: Gimp Video Editing) | | | | | | | | | | | | |
| 2. | htt[ps://www.youtube.com/watch?v=Jz9WrbELGYA](http://www.youtube.com/watch?v=Jz9WrbELGYA) | | | | | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | M | S | M |  |  | M |  | L |
| **CO 2** | S | M | S |  |  | M |  |  |
| **CO 3** |  | S | S |  | M |  | L |  |
| **CO 4** |  |  | S | L | M |  | M |  |
| **CO 5** |  |  |  | M |  | S | M | S |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | | **S** | | **Credits** | **Inst.** | **Marks** | | | | |
| **CIA** | | **Exter nal** | **Total** | |
| SEC | **WEB DESIGNING** | - | Y | - | - | | - | | 2 | 2 | 25 | | 75 | 100 | |
| **Course Objective** | | | | | | | | | | | | | | | |
| C1 | Understand the basics of HTML and its components | | | | | | | | | | | | | | |
| C2 | To study about the Graphics in HTML | | | | | | | | | | | | | | |
| C3 | Understand and apply the concepts of XML and DHTML | | | | | | | | | | | | | | |
| C4 | Understand the concept of JavaScript | | | | | | | | | | | | | | |
| C5 | To identify and understand the goals and objectives of the Ajax | | | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | **No. of Hours** | | | | | | | **Course Objective** | | |
| I | HTML: HTML-Introduction-tag basics- page structure-adding comments working with texts, paragraphs and line break. Emphasizing test- heading and horizontal rules-list-font size, face and color-  alignment links-tables-frames. | | | | | 6 | | | | | | | C1 | | |
| II | Forms & Images Using Html: Graphics: Introduction-How to work efficiently with images in web pages, image maps, GIF animation, adding multimedia, data collection with html forms textbox, password, list box, combo box, text area, tools for  building web page front page. | | | | | 6 | | | | | | | C2 | | |
| III | XML & DHTML: Cascading style sheet (CSS)-what | | | | |  | | | | | | |  | | |
|  | is CSS-Why we use CSS-adding CSS to your web pages-Grouping styles-extensible markup language (XML). | | | | | 6 | | | | | | C3 | | |
| IV | Dynamic HTML: Document object model (DCOM)- Accessing HTML & CSS through DCOM Dynamic content styles & positioning-Event bubbling-data binding.  JavaScript: Client-side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition, | | | | | 6 | | | | | | C4 | | |
| V | Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations. | | | | | 6 | | | | | | C5 | | |
|  | **Total** | | | | | **60** | | | | | |  | | |
| **Course Outcomes** | | | | | | | | **Programme Outcome** | | | | | | |
| CO | On completion of this course, students will | | | | | | |  | | | | | | |
| 1 | Develop working knowledge of HTML | | | | | | | PO1, PO3, PO6, PO8 | | | | | | |
| 2 | Ability to Develop and publish Web pages using Hypertext Markup Language (HTML). | | | | | | | PO1,PO2,PO3,PO6 | | | | | | |
| 3 | Ability to optimize page styles and layout with Cascading Style Sheets (CSS). | | | | | | | PO3, PO5 | | | | | | |
| 4 | Ability to develop a java script | | | | | | | PO1, PO2, PO3, PO7 | | | | | | |
| 5 | An ability to develop web application using Ajax. | | | | | | | P02, PO6, PO7 | | | | | | |
| **Text Book** | | | | | | | | | | | | | | |
| 1 | Pankaj Sharma, “Web Technology”, SkKataria& Sons Bangalore 2011. | | | | | | | | | | | | | |
| 2 | Mike Mcgrath, “Java Script”, Dream Tech Press 2006, 1st Edition. | | | | | | | | | | | | | |
| 3 | Achyut S Godbole&AtulKahate, “Web Technologies”, 2002, 2nd Edition. | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| 1. | Laura Lemay, RafeColburn , Jennifer Kyrnin, “Mastering HTML, CSS &Javascript Web  Publishing”, 2016. | | | | | | | | | | | | | |
| 2. | DT Editorial Services (Author), “HTML 5 Black Book (Covers CSS3, JavaScript, XML,  XHTML, AJAX, PHP, jQuery)”, Paperback 2016, 2nd Edition. | | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| 1. | NPTEL & MOOC courses titled Web Design and Development. | | | | | | | | | | | | | |
| 2. | [https://www.geeksforgeeks.org](https://www.geeksforgeeks.org/) | | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | S |  | M |  |  | L |  | M |
| **CO 2** | S | M | L |  |  | M |  |  |
| **CO 3** |  |  | S |  | M |  |  |  |
| **CO 4** | S | M | M |  |  |  | L |  |
| **CO 5** |  | M |  |  |  | L | M |  |

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | | | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | | **External** | **Total** |
| SEC | **SoftwareTesting** | - | Y | - | - | - | | | 2 | 2 | 25 | | 75 | 100 |
| **Course Objective** | | | | | | | | | | | | | | |
| **C1** | To study fundamental concepts in software testing | | | | | | | | | | | | | |
| **C2** | To discuss various software testing issues and solutions in software unit test, integration and system testing. | | | | | | | | | | | | | |
| **C3** | To study the basic concept of Data flow testing and Domain testing. | | | | | | | | | | | | | |
| **C4** | To Acquire knowledge on path products and path expressions. | | | | | | | | | | | | | |
| **C5** | To learn about Logic based testing and decision tables | | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | **No. of Hours** | | | | **Course Objective** | | |
| **I** | Introduction: Purpose–Productivity and Quality in Software– TestingVsDebugging–Model for Testing–Bugs–Types of Bugs – Testing and Design Style. | | | | | | | 6 | | | | C1 | | |
| **II** | Flow / Graphs and Path Testing – Achievable paths – Path instrumentation Application Transaction FlowTesting Techniques. | | | | | | | 6 | | | | C2 | | |
| **III** | Data Flow Testing Strategies - Domain Testing:Domains and Paths – Domains and Interface Testing. | | | | | | | 6 | | | | C3 | | |
| **IV** | Linguistic –Metrics – Structural Metric – Path Products and Path Expressions.SyntaxTesting– Formats–Test Cases | | | | | | | 6 | | | | C4 | | |
| **V** | Logic Based Testing–Decision Tables–Transition Testing–States, State Graph, StateTesting. | | | | | | | 6 | | | | C5 | | |
|  | **Total** | | | | | | | **30** | | | |  | | |
| **Course Outcomes** | | | | | | | **Program Outcomes** | | | | | | | |
| **CO** | On completion of this course, students will | | | | | |  | | | | | | | |
| **1** | Students learn to apply software testing knowledge and engineering methods | | | | | | PO1 | | | | | | | |
| **2** | Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation. | | | | | | PO1, PO2 | | | | | | | |
| **3** | Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods. | | | | | | PO4, PO6 | | | | | | | |
| **4** | Have basic understanding and knowledge  of contemporary issues in software testing, such as component-based software testing problems | | | | | | PO4, PO5, PO6 | | | | | | | |
| **5** | Have an ability to use software testing methods and modern software testing tools for their testing projects. | | | | | | PO3, PO8 | | | | | | | |
| **Text Book** | | | | | | | | | | | | | | |
| **1** | B.Beizer,“SoftwareTestingTechniques”,IIEdn.,DreamTechIndia,NewDelhi,2003. | | | | | | | | | | | | | |
| **2** | K.V.K.Prasad,“SoftwareTestingTools”,DreamTech.India,NewDelhi,2005 | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| **1.** | I.Burnstein,2003,“PracticalSoftwareTesting”,SpringerInternationalEdn. | | | | | | | | | | | | | |
| **2.** | E. Kit, 1995, “Software Testing in the Real World: Improving the Process”,  PearsonEducation,Delhi. | | | | | | | | | | | | | |
| **3.** | R. Rajani,andP.P.Oak,2004,“SoftwareTesting”,TataMcgrawHill,New  Delhi. | | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| **1.** | <https://www.javatpoint.com/software-testing-tutorial> | | | | | | | | | | | | | |
| **2.** | <https://www.guru99.com/software-testing.html> | | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | S |  |  |  |  |  |  |  |
| **CO 2** | M | S |  |  |  |  |  |  |
| **CO 3** |  |  |  | S |  | S |  |  |
| **CO 4** |  |  |  | S | S | M |  |  |
| **CO 5** |  |  | S |  |  |  |  | S |

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | **Total** | |
| SEC | **PHP PROGRAMMING** | - | Y |  |  |  | | 2 | 2 | 25 | 75 | 100 | |
| **Course Objective** | | | | | | | | | | | | | |
| C1 | To provide the necessary knowledge on basics of PHP. | | | | | | | | | | | | |
| C2 | To design and develop dynamic, database-driven web applications using PHP version. | | | | | | | | | | | | |
| C3 | To get an experience on various web application development techniques. | | | | | | | | | | | | |
| C4 | To learn the necessary concepts for working with the files using PHP. | | | | | | | | | | | | |
| C5 | To get a knowledge on OOPS with PHP. | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | | | | **No. of**  **Hours** | | **Course**  **Objectives** |
| I | Introduction to PHP -Basic Knowledge of websites -Introduction of  Dynamic Website -Introduction to PHP -Scope of PHP -XAMPP and WAMP Installation | | | | | | | | | | 6 | | CO1 |
| II | PHP Programming Basics -Syntax of PHP -Embedding PHP in HTML -Embedding HTML in PHP.  Introduction to PHP Variable -Understanding Data Types -Using Operators -Using Conditional Statements -If(), else if() and else if  condition Statement. | | | | | | | | | | 6 | | CO2 |
| III | Switch() Statements -Using the while() Loop -Using the for() Loop PHP Functions.  PHP Functions -Creating an Array -Modifying Array Elements -  Processing Arrays with Loops - Grouping Form Selections with Arrays -Using Array Functions. | | | | | | | | | | 6 | | CO3 |
| IV | PHP Advanced Concepts -Reading and Writing Files -Reading Data  from a File. | | | | | | | | | | 6 | | CO4 |
| V | Managing Sessions and Using Session Variables -Destroying a Session -Storing Data in Cookies -Setting Cookies. | | | | | | | | | | 6 | | CO5 |
|  | **Total** | | | | | | | | | | **30** | | |
| **Course Outcomes** | | | | | | | **Programme Outcomes** | | | | | | |
| CO | On completion of this course, students will | | | | | |  | | | | | | |
| 1 | Write PHP scripts to handle HTML forms | | | | | | PO1,PO4,PO6,PO8. | | | | | | |
| 2 | Write regular expressions including modifiers, operators, and metacharacters. | | | | | | PO2,PO5,PO7. | | | | | | |
| 3 | Create PHP Program using the concept of array. | | | | | | PO3,PO6,PO8. | | | | | | |
| 4 | Create PHP programs that use various PHP library functions | | | | | | PO2,PO3,PO5,PO8. | | | | | | |
| 5 | Manipulate files and directories. | | | | | | PO3,PO5,PO6. | | | | | | |
| **Text Book** | | | | | | | | | | | | | |
| 1 | Head First PHP & MySQL: A Brain-Friendly Guide- 2009-[Lynn mighley](https://www.amazon.in/Lynn-Beighley/e/B001IGOUMY/ref%3Ddp_byline_cont_book_1) and [Michael](https://www.amazon.in/Michael-Morrison/e/B000AQ2H3C/ref%3Ddp_byline_cont_book_2) [Morrison.](https://www.amazon.in/Michael-Morrison/e/B000AQ2H3C/ref%3Ddp_byline_cont_book_2) | | | | | | | | | | | | |
| 2 | The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with  PHP and MySQL- [Alan Forbes](https://www.amazon.in/Alan-Forbes/e/B00BBPOUOA/ref%3Ddp_byline_cont_ebooks_1) | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1. | PHP: The Complete Reference-Steven Holzner. | | | | | | | | | | | | |
| 2. | [DT Editorial Services](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=DT%2BEditorial%2BServices&search-alias=stripbooks) (Author), “*HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)*”, Paperback 2016, 2ndEdition. | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | |
| 1. | Refer MOOC Courses like NPTEL and SWAYAM | | | | | | | | | | | | |
| 2. | <https://www.w3schools.com/php/default.asp> | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | S |  |  | S |  | M |  | L |
| **CO 2** |  | M |  |  | S |  | L |  |
| **CO 3** |  |  | M |  |  | L |  | S |
| **CO 4** |  | M | S |  | L |  |  | S |
| **CO 5** |  |  | S |  | L | M |  |  |

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | **External** | **Total** | |
| SEC | **OFFICE AUTOMATION** | - |  | Y | - | - | | 2 | 2 | 25 | 75 | 100 | |
| **Course Objective** | | | | | | | | | | | | | |
| C1 | Understand the basics of computer systems and its components. | | | | | | | | | | | | |
| C2 | Understand and apply the basic concepts of a word processing package. | | | | | | | | | | | | |
| C3 | Understand and apply the basic concepts of electronic spreadsheet software. | | | | | | | | | | | | |
| C4 | Understand and apply the basic concepts of database management system. | | | | | | | | | | | | |
| C5 | Understand and create a presentation using PowerPoint tool. | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | | | | **No. of Hours** | | |
| I | **Introductory concepts:** Memory unit– CPU-Input Devices: Key board, Mouse and Scanner.Outputdevices:Monitor,Printer.IntroductiontoOperatingsystems&itsfea  tures:DOS– UNIX–Windows. IntroductiontoProgrammingLanguages. | | | | | | | | | | 6 | | |
| II | **Word Processing:** Open, Save and close word document; Editing text – tools, formatting, bullets;SpellChecker - Document formatting – Paragraph alignment, indentation, headers and footers,numbering;printing– Preview,options,merge. | | | | | | | | | | 6 | | |
| III | **Spreadsheets:**Excel– opening,enteringtextanddata,formatting,navigating;Formulas– entering,handlingand copying;Charts–creating,formatting and printing,analysistables,preparationoffinancialstatements,introductiontodataa nalytics | | | | | | | | | | 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 datafiles; Understanding Programming environment in DBMS; Developing menu drive applicationsinquerylanguage(MS–Access). | | | | | | | | | | 6 | |
| V | **Power point:** Introduction to Power point - Features – Understanding slide typecasting & viewingslides – creating slide shows. Applying special object – including objects & pictures – Slidetransition– Animationeffects,audioinclusion,timers. | | | | | | | | | | 6 | |
|  | **Total** | | | | | | | | | | **30** | |
| **Course Outcomes** | | | | | | | **Programme Outcomes** | | | | | |
| CO | On completion of this course, students will | | | | | |  | | | | | |
| 1 | Possess the knowledge on the basics of computers and its  Components | | | | | | PO1,PO2,PO3,PO6,PO8 | | | | | |
| 2 | Gain knowledge on Creating Documents, spreadsheet and  presentation. | | | | | | PO1,PO2,PO3,PO6 | | | | | |
| 3 | Learn the concepts of Database and implement the Query  in Database. | | | | | | PO3,PO5,PO7 | | | | | |
| 4 | Demonstrate the understanding of different automation  tools. | | | | | | PO3,PO4,PO5,PO7 | | | | | |
| 5 | Utilize the automation tools for documentation,  calculation and presentation purpose. | | | | | | PO4,PO6,PO7,PO8 | | | | | |
| **Text Book** | | | | | | | | | | | | |
| 1 | PeterNorton,“IntroductiontoComputers”–TataMcGraw-Hill. | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | |
| 1. | Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, “Microsoft 2003”, Tata McGrawHill. | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | |
| 1. | <https://www.udemy.com/course/office-automation-certificate-course/> | | | | | | | | | | | |
| 2. | <https://www.javatpoint.com/automation-tools> | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | M | S | M |  |  | M |  | L |
| **CO 2** | S | M | S |  |  | M |  |  |
| **CO 3** |  | S | S |  | M |  | L |  |
| **CO 4** |  |  | S | L | M |  | M |  |
| **CO 5** |  |  |  | M |  | S | M | S |

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

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Inst. Hours** | **Marks** | | | |
| **CIA** | | **External** | **Total** |
| SEC | **Quantitative Aptitude** | - | Y | - | - | - | 2 | | 2 | 25 | | 75 | 100 |
| **Course Objective** | | | | | | | | | | | | | |
| C1 | To understand the basic concepts of numbers | | | | | | | | | | | | |
| C2 | Understand and apply the concept of percentage, profit & loss | | | | | | | | | | | | |
| C3 | To study the basic concepts of time and work, interests | | | | | | | | | | | | |
| C4 | To learn the concepts of permutation, probability, discounts | | | | | | | | | | | | |
| C5 | To study about the concepts of data representation, graphs | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | | **No. of Hours** | | **Course Objective** | | |
| I | Numbers-HCF and LCM of numbers-Decimal fractions- Simplification-Squareroot and cuberoots - Average- problems on Numbers. | | | | | | | | 6 | | CO1 | | |
| II | Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion-partnership- Chainrule. | | | | | | | | 6 | | CO2 | | |
| III | Time and work - pipes and cisterns - Time and Distance   * problems on trains -Boats and streams - simple interest * compound interest - Logarithms - Area-Volume and surfacearea -races and Gamesofskill. | | | | | | | | 6 | | CO3 | | |
| IV | Permutation and combination-probability-True Discount-Bankers Discount – Height and Distances- Oddmanout & Series. | | | | | | | | 6 | | CO4 | | |
| V | Calendar - Clocks - stocks and shares - Data representation - Tabulation - BarGraphs-Piecharts- Linegraphs. | | | | | | | | 6 | | CO5 | | |
|  | **Total** | | | | | | | | **60** | |  | | |
| **Course Outcomes** | | | | | | | | | **Programme Outcome** | | | | |
| CO | On completion of this course, students will | | | | | | |  | | | | | |
| 1 | understand the concepts, application and the problems of numbers | | | | | | | PO1 | | | | | |
| 2 | To have basic knowledge and understanding about percentage, profit & loss related processings | | | | | | | PO1, PO2 | | | | | |
| 3 | To understand the concepts of time and work | | | | | | | PO4, PO6 | | | | | |
| 4 | Speaks about the concepts of probability, discount | | | | | | | PO4, PO5, PO6 | | | | | |
| 5 | Understanding the concept of problem solving involved in stocks & shares, graphs | | | | | | | PO3, PO8 | | | | | |
| **Text Book** | | | | | | | | | | | | | |
| 1 | “QuantitativeAptitude”,R.S.AGGARWAL.,S.Chand&CompanyLtd., | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | |
| 1. |  | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | |
| 1. | <https://www.javatpoint.com/aptitude/quantitative> | | | | | | | | | | | | |
| 2. | <https://www.toppr.com/guides/quantitative-aptitude/> | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | S |  |  |  |  |  |  |  |
| **CO 2** | M | S |  |  |  |  |  |  |
| **CO 3** |  |  |  | S |  | S |  |  |
| **CO 4** |  |  |  | S | S | M |  |  |
| **CO 5** |  |  | S |  |  |  |  | S |

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | | | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | | **External** | **Total** |
| SEC | **Multimedia Systems** | - | Y | - | - | - | | | 2 | 2 | 25 | | 75 | 100 |
| **Course Objective** | | | | | | | | | | | | | | |
| **C1** | Understand the basics of Multimedia | | | | | | | | | | | | | |
| **C2** | To study about the Image File Formats,Sounds Audio File Formats | | | | | | | | | | | | | |
| **C3** | Understand the concepts of Animation and DigitalVideoContainers | | | | | | | | | | | | | |
| **C4** | To study about the Stage of Multimedia Project | | | | | | | | | | | | | |
| **C5** | Understand the concept of OwnershipofContentCreatedforProjectAcquiringTalent | | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | **No. of Hours** | | | | **Course Objective** | | |
| **I** | Multimedia Definition-Use Of Multimedia- Delivering Multimedia- Text:About Fonts and Faces  - Using Text in Multimedia -Computers and Text Font Editing and DesignTools- HypermediaandHypertext. | | | | | | | 12 | | | | C1 | | |
| **II** | Images: Plan Approach - Organize Tools - Configure Computer Workspace -Making Still Images - Color - Image File Formats. Sound: The Power of Sound - DigitalAudio-MidiAudio-Midivs.DigitalAudio- MultimediaSystemSounds Audio File Formats - Vaughan's Law of Multimedia Minimums - Adding SoundtoMultimediaProject | | | | | | | 12 | | | | C2 | | |
| **III** | Animation:The Power of Motion-Principles of Animation-Animation by Computer - Making Animations that Work. Video: Using Video - Working with Video and Displays- DigitalVideoContainers-ObtainingVideo Clips – ShootingandEditingVideo | | | | | | | 12 | | | | C3 | | |
| **IV** | Making Multimedia: The Stage of Multimedia Project - The Intangible Needs -The Hardware Needs - The Software Needs - An Authoring Systems Needs-  MultimediaProductionTeam. | | | | | | | 12 | | | | C4 | | |
| **V** | PlanningandCosting:TheProcessofMakingMultimedi a-Scheduling-Estimating - RFPs and Bid Proposals. Designing and Producing - Content andTalent:AcquiringContent- OwnershipofContentCreatedforProject- AcquiringTalent | | | | | | | 12 | | | | C5 | | |
|  | **Total** | | | | | | | **60** | | | |  | | |
| **Course Outcomes** | | | | | | | **Programme Outcomes** | | | | | | | |
| **CO** | On completion of this course, students will | | | | | |  | | | | | | | |
| **1** | understand the concepts, importance, application and the process of developing multimedia | | | | | | PO1 | | | | | | | |
| **2** | to have basic knowledge and understanding about image related processings | | | | | | PO1, PO2 | | | | | | | |
| **3** | To understand the framework of frames and bit images to animations | | | | | | PO4, PO6 | | | | | | | |
| **4** | Speaks about the multimedia projects and stages of requirement in phases of project. | | | | | | PO4, PO5, PO6 | | | | | | | |
| **5** | Understanding the concept of cost involved in multimedia planning, designing, and producing | | | | | | PO3, PO8 | | | | | | | |
| **Text Book** | | | | | | | | | | | | | | |
| **1** | TayVaughan,"Multimedia:MakingItWork",8thEdition,Osborne/McGraw-  Hill,2001. | | | | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | | | | |
| **1.** | RalfSteinmetz&KlaraNahrstedt"MultimediaComputing,Communication&Applica  tions",PearsonEducation,2012. | | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | |
| **1.** | <https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/> | | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | S |  |  |  |  |  |  |  |
| **CO 2** | M | S |  |  |  |  |  |  |
| **CO 3** |  |  |  | S |  | S |  |  |
| **CO 4** |  |  |  | S | S | M |  |  |
| **CO 5** |  |  | S |  |  |  |  | S |

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

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | | **Inst. Hours** | **Marks** | | | | |
| **CIA** | | | **External** | **Total** |
| SEC | **Biometrics** | - | Y | - | - | - | 2 | | 2 | 25 | | | 75 | 100 |
| **Course Objectives** | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | **No. of Hours** | | | | **Course Objectives** | | | |
| I | **Introduction**: What is Biometrics, History,Types of biometric Traits, General architecture of biometric systems, Basic working of biometric matching, Biometric system error and performance measures, Design of biometric system, Applications of biometrics, Biometrics versus traditional authentication methods.  **Face Biometrics:** Introduction, Background of Face Recognition, Design of Face Recognition System,  Neural Network for Face Recognition, Face Detection in Video Sequences, Challenges in Face Biometrics, .7 Face Recognition Methods, Advantages and Disadvantages. | | | | | | 6 | | | | CO1 | | | |
| II | **Retina and Iris Biometrics:** Introduction, Performance of  Biometrics, Design of Retina Biometrics, Design of Iris | | | | | | 6 | | | | CO2 | | | |
|  | Recognition System, Iris Segmentation Method , Determination of Iris Region, Determination of Iris Region, Applications of Iris Biometrics, Advantages and Disadvantages  **Vein and Fingerprint Biometrics:** Introduction, Biometrics Using Vein Pattern of Palm, Fingerprint Biometrics, Fingerprint Recognition System, Minutiae Extraction, Fingerprint Indexing, Experimental Results, Advantages and Disadvantages. | | | | | | |  | | | |  | | | |
| 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.  **Multimodal Biometrics:** Introduction to Multimodal Biometrics , Basic Architecture of Multimodal Biometrics, Multimodal Biometrics Using Face and Ear, Characteristics and Advantages of Multimodal Biometrics, Characteristics and Advantages of Multimodal Biometrics. | | | | | | | 6 | | | | CO3 | | | |
| IV | **WatermarkingTechniques:** 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, Image Watermarking Techniques, Watermarking Algorithm, Experimental Results, Effect of Attacks on Watermarking Techniques, Attacks on Spatial Domain Watermarking. | | | | | | | 6 | | | | CO4 | | | |
| 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, Radio Frequency Identification (RFID) Biometrics, DNA Biometrics, Comparative Study of Various Biometric Techniques.  **Biometric Standards:** Introduction, Standard Development Organizations, Application Programming Interface (API), Information Security and Biometric Standards, Biometric Template Interoperability. | | | | | | | 6 | | | | CO5 | | | |
|  | **Total** | | | | | | | **30** | | | |  | | | |
| **Course Outcomes** | | | | | | | | | | | | | | | |
| **Course Outcomes** | On completion of this course, students will; | | | | | | | | | | | | | | |
| **CO1** | To understand the basic concepts and the functionality of the Biometrics, Face Biometrics, Types, Architecture and  Applications. | | | | | | | PO1, PO3, PO6, PO8 | | | | | | | |
| **CO2** | To know the concepts Retina and Iris Biometrics and Vein  and Fingerprint Biometrics. | | | | | | | PO1,PO2,PO3,PO6 | | | | | | | |
| **CO3** | To analyse the Privacy Enhancement and Multimodal Biometrics. | | | | | | | PO3, PO5 | | | | | | | |
| **CO4** | To get analyticalidea on Watrmarking Techniques | | | | | | | PO1, PO2, PO3, PO7 | | | | | | | |
| **CO5** | To Gain knowledge on Future scope of Biometrics,and  Study of various Biometric Techniques. | | | | | | | PO2, PO6, PO7 | | | | | | | |
| **Recommended Text** | | | | | | | | | | | | | | | |
| 1. | Biometrics: Concepts and Applications by G.R Sinha and SandeepB.Patil , Wiley, 2013 | | | | | | | | | | | | | | |
| **References Books** | | | | | | | | | | | | | | | |
| 1. | Guide to Biometrics by Ruud M. Bolle , SharathPankanti, Nalinik.Ratha, Andrew W.Senior, Jonathan H. Connell , Springer 2009 | | | | | | | | | | | | | | |
| 2. | Introduction to Biometrics by Anil k. Jain, Arun A. Ross, KarthikNandakumar | | | | | | | | | | | | | | |
| 3. | Hand book of Biometrics by Anil K. Jain, Patrick Flynn, ArunA.Ross. | | | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | | | |
| 1. | <https://www.tutorialspoint.com/biometrics/index.htm> | | | | | | | | | | | | | | |
| 2. | <https://www.javatpoint.com/biometrics-tutorial> | | | | | | | | | | | | | | |
| 3. | [https://www.thalesgroup.com/en/markets/digital-identity-and-](https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/inspired/biometrics)  [security/government/inspired/biometrics](https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/inspired/biometrics) | | | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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|  | | **PO 1** | | **PO 2** | | **PO 3** | | **PO 4** | | **PO 5** | | **PO 6** | | **PO 7** | | **PO 8** | |
| **CO 1** | | S | |  | | M | |  | |  | | L | |  | | M | |
| **CO 2** | | S | | M | | L | |  | |  | | M | |  | |  | |
| **CO 3** | |  | |  | | S | |  | | M | |  | |  | |  | |
| **CO 4** | | S | | M | | M | |  | |  | |  | | L | |  | |
| **CO 5** | |  | | M | |  | |  | |  | | L | | M | |  | |

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| **ENTERPRISE RESOURCE PLANNING** | | | | | | | | | | | | |
| SEC | **Enterprise Resource Planning** | - | Y | - | - | - | 4 | 4 | 25 | | 75 | 100 |
| **Course Objectives** | | | | | | | | | | | | |
| CO1 | To understand the basic concepts, Evolution and Benefits of ERP. | | | | | | | | | | | |
| CO2 | To know the need and Role of ERP in logical and Physical Integration. | | | | | | | | | | | |
| CO3 | Identify the important business functions provided by typical business software such  as enterprise resource planning and customer relationship managemen | | | | | | | | | | | |
| CO4 | To train the students to develop the basic understanding of how ERP enriches the  business organizations in achieving a multidimensional growth | | | | | | | | | | | |
| CO5 | To aim at preparing the students technological competitive and make them ready to  self-upgrade with the higher technical skills | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | **No. of Hours** | | | **Course Objectives** | | |
| 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 | | | CO1 | | |
| 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, ERP’s Role in Logical and Physical Integration. Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Man- agement (PLM), LAP, Supply chain Management. | | | | | | 6 | | | CO2 | | |
| III | ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications. Cloud and Open Source, Quality Management, Material Management, Financial Module, CRM and Case Study. | | | | | | 6 | | | CO3 | | |
| 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 | | | CO4 | | |
| 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 | | | CO5 | | |
|  | **Total** | | | | | | **30** | | |  | | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | |
| **CIA** | **External** | **Total** |

|  |  |  |
| --- | --- | --- |
| **Course Outcomes** | | |
| **Course**  **Outcomes** | On completion of this course, students will; | |
| **CO1** | Understand the basic concepts of ERP. | PO1, PO2, PO6 |
| **CO2** | Identify different technologies used in ERP | PO2, PO3, PO8 |
| **CO3** | Understand and apply the concepts of ERP Manufacturing  Perspective and ERP Modules | PO1, PO3, PO7 |
| **CO4** | Discuss the benefits of ERP | PO2, PO6 |
| **CO5** | Apply different tools used in ERP | PO1, PO3, PO8 |
| **Reference Text :** | | |
| 1. | Enterprise Resource Planning – Alexis Leon, Tata McGraw Hill. | |
| **References :** | | |
| 1. | Enterprise Resource Planning – Diversified by Alexis Leon, TMH. | |
| 2. | Enterprise Resource Planning – Ravi Shankar & S. Jaiswal , Galgotia | |
| **Web Resources** | | |
| 1. | <https://www.tutorialspoint.com/management_concepts/enterprise_resource_pla>[nning.htm](https://www.tutorialspoint.com/management_concepts/enterprise_resource_planning.htm) | |
| 2. | <https://www.saponlinetutorials.com/what-is-erp-systems-enterprise-resource->[planning/](https://www.saponlinetutorials.com/what-is-erp-systems-enterprise-resource-planning/) | |
| 3. | <https://www.guru99.com/erp-full-form.html> | |
| 4. | <https://www.oracle.com/in/erp/what-is-erp/> | |

**Mapping with Programme Outcomes:**

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|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | M |  | L |  |  | M |  |  |
| **CO 2** | M | S |  |  | L | M |  |  |
| **CO 3** |  | L | M |  |  |  |  | M |
| **CO 4** |  |  |  | M |  | L | M |  |
| **CO 5** | M |  | L |  | M |  |  | S |

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

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **O** | **Credits** | | **Inst. Hours** | **Marks** | | | |
| **CIA** | | **External** | **Total** |
| SEC | **Organizational Behaviour** | - | Y | - | - | - | 2 | | 2 | 25 | | 75 | 100 |
| **Learning Objectives** | | | | | | | | | | | | | |
| CLO1 | To have extensive knowledge onOB and the scope of OB. | | | | | | | | | | | | |
| CLO2 | To create awareness of Individual Benaviour. | | | | | | | | | | | | |
| CLO3 | To enhance the understanding of Group Behaviour | | | | | | | | | | | | |
| CLO4 | To know the basics of Organisaitonal Culture and Organisational Structure | | | | | | | | | | | | |
| CLO5 | To understand Organisational Change, Conflict and Power | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | | **No. of Hours** | | | **Learning Objectives** | | |
| 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) | | | | | | | 6 | | | CLO1 | | |
| 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- | | | | | | | 6 | | | CLO2 | | |

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|  | 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 Judgements; Factors; Linking perception to individual decision making: |  |  |
| 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); | 6 | CLO3 |
| 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 | 6 | CLO4 |
| 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. | 6 | CLO5 |
|  |  | **30** |  |
|  | | | |
| **Course**  **Outcomes** | On Completion of the course the students will | **Program Outcomes** | |
| **CO1** | To define OrganisationalBehaviour, Understand the  opportunity through OB. | PO1, PO2, PO6, PO7 | |
| **CO2** | To apply self-awareness, motivation, leadership and learning  theories at workplace. | PO2,PO4. PO5, PO6 | |
| **CO3** | To analyze the complexities and solutions of group  behaviour. | PO1, PO2, PO4, PO5,  PO6 | |
| **CO4** | To impact and bring positive change in the culture of the  organisaiton. | PO2, PO3, PO4 PO5,  PO8 | |
| **CO5** | To create a congenial climate in the organization. | PO1, PO2, PO5 PO6,  PO8 | |
| **Reading List** | | | |
| 1. | [NeharikaVohra Stephen P. Robbins, Timothy A. Judge](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=Neharika%2BVohra%2BStephen%2BP.%2BRobbins%2C%2BTimothy%2BA.%2BJudge&search-alias=stripbooks) , *Organizational Behaviour*,  Pearson Education, 18th Edition, 2022. | | |
| 2. | Fred Luthans, *Organizational Behaviour*, Tata McGraw Hill, 2017. | | |

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| 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%3Ddp_byline_cont_ebooks_1) [Allison Shearsett,](https://www.amazon.in/s/ref%3Ddp_byline_sr_ebooks_2?ie=UTF8&field-author=Allison%2BShearsett&text=Allison%2BShearsett&sort=relevancerank&search-alias=digital-text) [Rachael Collinson,](https://www.amazon.in/s/ref%3Ddp_byline_sr_ebooks_3?ie=UTF8&field-author=Rachael%2BCollinson&text=Rachael%2BCollinson&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. |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | S |  |  |  |  |  |  |  |
| **CO 2** | M | S |  |  |  |  |  |  |
| **CO 3** |  |  |  | S |  | S |  |  |
| **CO 4** |  |  |  | S | S | M |  |  |
| **CO 5** |  |  | S |  |  |  |  | S |

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

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| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | | **Credits** | **Inst. Hours** | **Marks** | | | |
| **CIA** | | **External** | **Total** |
| SEC | **Simulation and Modeling** | Specific Elective | Y | - | - | - | | 2 | 2 | 25 | | 75 | 100 |
| **Course Objectives** | | | | | | | | | | | | | |
| CO1 | Generates computer simulation technologies and techniques, lays the groundwork for students to comprehend computer simulation requirements, and implements and tests a variety of simulation and data analysis libraries and programmes. This course focuses on what is required to create simulation software environments rather than just simulations  using pre-existing packages | | | | | | | | | | | | |
| CO2 | Discuss the concepts of modelling layers of critical infrastructure networks in society. | | | | | | | | | | | | |
| CO3 | Create tools for viewing and controlling simulations and their results. | | | | | | | | | | | | |
| CO4 | Understand the concept of Entity modelling, Path planning | | | | | | | | | | | | |
| CO5 | To learn about the Algorithms and Modelling. | | | | | | | | | | | | |
| **UNIT** | **Details** | | | | | | **No. of Hours** | | | | **Course Objectives** | | |
| I | Introduction To Modeling & Simulation – What is  Modeling and Simulation? – Complexity Types – Model | | | | | | 6 | | | | CO1 | | |
|  | Types – Simulation Types – M&S Terms and Definitions Input Data Analysis – Simulation Input Modeling – Input Data Collection - Data Collection Problems - – Input Modeling Strategy - Histograms -Probability Distributions - Selecting a Probability Distribution. | | | | | |  | | | |  | | |
| 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 – Introduction -Types of Simulation With Respect to Output Analysis - Stochastic Process and Sample Path - Sampling and Systematic Errors - Mean, Standard Deviation and Confidence Interval - Analysis of Finite- Horizon Simulations - Single Run - Independent Replications - Sequential Estimation – Analysis of Steady-State Simulations - Removal of Initialization Bias (Warm-up Interval) - Replication-Deletion Approach - Batch-Means Method . | | | | | | 6 | | | | CO2 | | |
| 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 - Arithmetic and Logical Relationships - Discrete-Event Modeling Approaches – Event- Scheduling Approach – Process Interaction Approach. | | | | | | 6 | | | | CO3 | | |
| 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) – SISO RPR FOM Behavior Modeling – | | | | | | 6 | | | | CO4 | | |
|  | General AI Algorithms - Decision Trees - Neural Networks - Finite State Machines - Logic Programming - Production Systems – Path Planning - Off-Line Path Planning - Incremental Path Planning - Real-Time Path Planning – Script Programming -Script Parsing - Script Execution. | | | | | |  | | | |  | | |
| V | Optimization Algorithms – Genetic Algorithms – Simulated Annealing Examples: Sensor Systems Modeling – Human Eye Modeling – Optical Sensor Modeling – Radar Modeling. | | | | | | 6 | | | | CO5 | | |
|  | **Total** | | | | | | **30** | | | |  | | |
| **Course Outcomes** | | | | | | | | | | | | | |
| **Course Outcomes** | On completion of this course, students will; | | | | | | **Programme Outcomes** | | | | | | |
| **CO1** | Introduction To Modeling & Simulation, Input Data  Analysis and Modeling. | | | | | | PO1 | | | | | | |
| **CO2** | Random Variate and Number Generation. Analysis of  Simulations and methods. | | | | | | PO1, PO2 | | | | | | |
| **CO3** | Comparing Systems via Simulation | | | | | | PO4, PO6 | | | | | | |
| **CO4** | Entity Body Modeling, Visualization, Animation. | | | | | | PO4, PO5, PO6 | | | | | | |
| **CO5** | Algorithms and Sensor Modeling. | | | | | | PO3, PO8 | | | | | | |
| **Text Books** | | | | | | | | | | | | | |
| 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. | | | | | | | | | | | | |
| **References Books** | | | | | | | | | | | | | |
| 1. | Andrew F. Seila, Vlatko Ceric, Pandu Tadikamalla, “Applied Simulation Modeling”,  Thomson Learning Inc., 2003. | | | | | | | | | | | | |
| **Web Resources** | | | | | | | | | | | | | |
| 1. | <https://www.tutorialspoint.com/modelling_and_simulation/index.htm> | | | | | | | | | | | | |
| 2. | <https://www.javatpoint.com/verilog-simulation-basics> | | | | | | | | | | | | |

**Mapping with Programme Outcomes:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** |
| **CO 1** | S |  |  |  |  |  |  |  |
| **CO 2** | M | S |  |  |  |  |  |  |
| **CO 3** |  |  |  | S |  | S |  |  |
| **CO 4** |  |  |  | S | S | M |  |  |
| **CO 5** |  |  | S |  |  |  |  | S |

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

**VIRTUAL REALITY**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Subject Code** | | | | **L** | **T** | **P** |  | **S** | **Credits** | **Inst. Hours** | **Marks** | | | |
|  | **CIA** | **External** | | **Total** |
| **SEC** | | | | **2** | **-** | **-** |  | **-** | **2** | **2** | **25** | **75** | | **100** |
|  | **Learning Objectives** | | | | | | | | | | | | | |
| **LO1** | |  | To provide knowledge on basic principles of virtual & augmented reality | | | | | | | | | | | |
| **LO2** | |  | To have the ability to use its technology as a platform for real-world applications. | | | | | | | | | | | |
| **Unit** | |  | **Contents** | | | | | | | | | | **No. of Hours** | |
| **I** | |  | Virtual Reality: The Three I’s of VR – History – Early commercial VR Technology – Components of a VR System –Input Devices: Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces | | | | | | | | | | **6** | |
| **II** | |  | Output Devices: Graphics Displays – Sound Displays – Haptic Feedback - Computer Architecture for VR: The Rendering Pipeline- PC Graphics Architecture - VR Programming: Toolkits and Scene Graphs – Traditional and Emerging Applications of VR | | | | | | | | | | **6** | |
| **III** | |  | Augmented Reality: Introduction – Augmented Reality Concepts: Working Principle of AR –Concepts related to AR- Ingredients of an Augmented Reality Experience | | | | | | | | | | **6** | |
| **IV** | |  | Augmented Reality Hardware– Augmented Reality Software– Software to create content for AR Application – Tools and Technologies | | | | | | | | | | **6** | |
| **V** | |  | Augmented Reality Content: Introduction- Creating Content for Visual, Audio, and other senses – Interaction in AR - Mobile Augmented Reality: Introduction – Augmented Reality Applications Areas- Collaborative Augmented Reality | | | | | | | | | | **6** | |
|  | **TOTAL** | | | | | | | | | | | | **30** | |
| **CO** | |  | **Course Outcomes** | | | | | | | | | | | |
| **CO1** | |  | Outline the basic terminologies, techniques and applications of VR and AR | | | | | | | | | | | |
| **CO2** | |  | Describe different architectures and principles of VR and AR systems | | | | | | | | | | | |
| **CO3** | |  | Use suitable hardware and software technologies for different varieties of virtual and augmented reality applications | | | | | | | | | | | |
| **CO4** | |  | Analyze and explain the behavior of VR and AR technology relates to human perception and cognition | | | | | | | | | | | |
| **CO5** | |  | Assess the importance of VR/AR content and interactions to implement for the real-world problem | | | | | | | | | | | |
|  | **Textbooks** | | | | | | | | | | | | | |
| **1.** | |  | Grigore C. Burdea and Philippe Coiffet, “Virtual Reality Technology”, Wiley Student Edition , Second Edition (Unit I: Chapter 1,2 & Unit II: Chapter 3,4,6,8 & 9) | | | | | | | | | | | |
| **2.** | |  | [Alan B. Craig](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Alan+B.+Craig%22)(2013), “Understanding Augmented Reality: Concepts and Applications”(Unit III: Chapter 1, 2, Unit IV : Chapter 3, 4 & Unit V: Chapter 5,6,8) | | | | | | | | | | | |
| **3.** | |  | Jon Peddie (2017), “Augmented Reality: Where We Will All Live”, Springer, Ist Edition (Unit IV: Chapter 7 (Tools & Technologies) | | | | | | | | | | | |
|  | **Reference Books** | | | | | | | | | | | | | |
|  | |  | [Alan Craig](https://www.pdfdrive.com/search?q=Alan+Craig) & [William R. Sherman](https://www.pdfdrive.com/search?q=William+R.+Sherman) & [Jeffrey D. Will](https://www.pdfdrive.com/search?q=Jeffrey+D.+Will), Morgan Kaufmann(2009), “Developing Virtual Reality Applications: Foundations of Effective Design”, Elsevier( Morgan Kaufmann Publishers) | | | | | | | | | | | |
|  | |  | Paul Mealy (2018), “Virtual and Augmented Reality”, Wiley | | | | | | | | | | | |
|  | |  | [Bruno Arnaldi](https://www.pdfdrive.com/search?q=Bruno+Arnaldi) & [Pascal Guitton](https://www.pdfdrive.com/search?q=Pascal+Guitton) & [Guillaume Moreau](https://www.pdfdrive.com/search?q=Guillaume+Moreau)(2018), “Virtual Reality and Augmented Reality: Myths and Realities”, Wiley | | | | | | | | | | | |
|  | **NOTE: Latest Edition of Textbooks May be Used** | | | | | | | | | | | | | |
|  | **Web Resources** | | | | | | | | | | | | | |
|  | |  | http://msl.cs.uiuc.edu/vr/ | | | | | | | | | | | |
|  | |  | http://www.britannica.com/technology/virtual-reality/Living-in -virtual-worlds | | | | | | | | | | | |
|  | |  | <https://mobidev.biz/blog/augmented-reality-development-guide> | | | | | | | | | | | |

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| **MAPPING TABLE** | | | | | | |
| **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 of course contributed to each PSO** | **15** | **14** | **11** | **15** | **15** | **10** |

**COMPUTER GRAPHICS**

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| **Subject Code** | | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | | | |
| **CIA** | **External** | | **Total** |
| **SEC** | | **2** | **-** | **-** | **VI** | **2** | **2** | **25** | **75** | | **100** |
| **Learning Objectives** | | | | | | | | | | | | |
| **LO** | To analyze the various components of a graphics system and to familiarize the building approach of graphics system components and algorithms related to them | | | | | | | | | | | |
| **Unit** | **Contents** | | | | | | | | | **No. of Hours** | | |
| **I** | A survey of computer graphics – Overview of Graphics Systems: Video display devices: Refresh Cathode Ray tubes, Raster-scan display, Random-scan display, Color CRT Monitors, Direct-view Storage tubes, Flat Panel Display – Raster scan systems- Random scan systems - Input Devices. | | | | | | | | | 6 | | |
| **II** | Output Primitives: Points and lines - Line Drawing Algorithm: DDAAttributes of Output Primitives: Line Attributes-Curve Attributes- Color and Grayscale levels – Area Fill Attributes-Character Attributes. | | | | | | | | | 6 | | |
| **III** | Two-dimensional Geometric Transformations: Basic Transformations – Matrix Representations – Homogeneous coordinates-Two-Dimensional Viewing: Viewing Pipeline Clipping Operations | | | | | | | | | 6 | | |
| **IV** | Graphical User Interfaces and Interactive Input Methods: The User dialogue - Input of graphical data. Three-dimensional concepts: Three-Dimensional Display methods – Three-Dimensional Geometric and Modeling Transformations: Translation, Rotation, Scaling, and Other | | | | | | | | | 6 | | |
| **V** | Visible- Surface Detection Methods– Color Models and Color Applications: Properties of light – Intuitive Color Concepts – RGB color model – YIQ color model – Computer Animation: Design of Animation Sequences – Motion Specifications | | | | | | | | | 6 | | |
| TOTAL | | | | | | | | | | 30 | | |
| **CO** | Course Outcomes | | | | | | | | | | | |
| **CO1** | Explain different graphics systems with its applications and computer animation  basics with design | | | | | | | | | | | |
| **CO2** | Outline the computer graphics core concepts including viewing, clipping,  modeling and transformation in two and three dimensions | | | | | | | | | | | |
| **CO3** | Select various algorithms for drawing and filling objects | | | | | | | | | | | |
| **CO4** | Apply geometric transformations on graphics objects, clipping methods and its  transformation to graphics display device | | | | | | | | | | | |
| **CO5** | Assess the projections and visible surface detection techniques for display of 3D  scene on 2D screen | | | | | | | | | | | |
| Textbooks | | | | | | | | | | | | |
| **1.** | Donold Hearn, M.Pauline Baker (2004), ―Computer Graphics - C Version‖ - Second Edition, Pearson Education. | | | | | | | | | | | |
| Reference Books | | | | | | | | | | | | |
|  | W.M.Newmann and R.F.Sproull (1979), ―Principles of Interactive Computer Graphics‖, McGrow Hill. | | | | | | | | | | | |
|  | Foley, Van Dan, Feiner, Hughes (2000), ―Computer Graphics‖ - Addison Wesley. | | | | | | | | | | | |
| NOTE: Latest Edition of Textbooks May be Used | | | | | | | | | | | | |
| Web Resources | | | | | | | | | | | | |
| **1** | https://www.dgp.toronto.edu/~hertzman/418notes.pdf | | | | | | | | | | | |
| **2** | http://www.tutorialspoint.com/computer\_graphics/computer\_graphics\_tutorial.pdf | | | | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- |
| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **1** | **2** | **1** | **1** |
| **CO2** | **3** | **2** | **1** | **2** | **1** | **1** |
| **CO3** | **3** | **3** | **1** | **2** | **1** | **1** |
| **CO4** | **3** | **3** | **1** | **2** | **1** | **1** |
| **CO5** | **3** | **3** | **1** | **2** | **1** | **1** |
| **Weightage of course contribute d to each PO/PSO** | **15** | **13** | **5** | **10** | **5** | **5** |