|  |
| --- |
| **C:\Users\Admin\Downloads\FinalUniversityGolden-removebg-preview.png**  **Sanjivani University**  **SCHOOL OF ENGINEERING AND TECHNOLOGY** |
| **CURRICULUM**  **B. Tech. Computer Science and Engineering**  **Specialization in Artificial Intelligence and Data Science(AIDS)**  **Powered by IBM**  **Academic Year: 2024-2025**  **Semester I** |

**Vision at the Sanjivani University**

To emerge as a globally recognized university for excellence in Education, Research, Innovation, and Entrepreneurship in order to produce effective leaders for serving the society.

**Mission at the Sanjivani University**

* Providing state-of-the-art infrastructure, industry-centric curriculum, and education focusing on ethics and critical thinking.
* Promoting an innovative and research-oriented environment for fostering effective problem-solving and entrepreneurial development.
* Collaborating with National and International Industries and Higher Education Institutions for academics and research.
* Creating a conducive environment for a vibrant, happy, and responsible society by contributing to Institutional Social Responsibility (ISR) initiatives.

**Vision of Department of AIDS**

To be a global leader in quality education and center of excellence in advanced research, shaping industry-ready engineers who can tackle real-world challenges and lead innovations in Artificial Intelligence and data science

**Mission of Department of AIDS**

* To offer a transformative education in computer engineering focusing student become excel in cutting-edge technologies and develop lifelong learning.
* To train our professionals in industry demand skillset to enhance carrier development through industry connect.
* To instill societal safety, innovations, environment and ethical responsibilities in all professional activities.

**Program Outcomes (POs):**

* **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
* **Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics natural sciences and engineering sciences.
* **Design / Development of Solutions:** Design solution for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
* **Conduct Investigation of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
* **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
* **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
* **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
* **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
* Individual And Team Work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary setting.
* **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
* **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
* **Life-Long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**Program Specific Outcomes (PSOs):**

* **PSO 1:** Artificial Intelligence (AI) and Data Science graduates are ideally suited to lead in both industry and academia, owing to their specialized knowledge and advanced skill sets.
* **PSO 2:** Graduates will ability to cultivate skills for addressing and solving social and environmental challenges with ethical considerations, while executing multidisciplinary projects using advanced technologies and tools.
* **PSO 3:** Graduates will the ability to apply Artificial Intelligence and Data Science concepts across various engineering fields, leading to successful careers and entrepreneurial ventures with a focus on solving societal problems.

**Program Educational Outcomes (PEOs):**

* **PEO1:** Graduates will be prepared to advance the field of artificial intelligence and machine learning by developing innovative solutions and contributing to research and industry practices.
* **PEO2:** Graduates will be equipped with practical skills and hands-on experience to excel in diverse roles within the Artificial Intelligence and Data Science industries edge cutting technologies.
* **PEO3:** Graduates will encourage creativity, innovation, and entrepreneurship while equipping individuals with the knowledge and skills needed to analyze, design, test, and implement diverse software applications using artificial intelligence and machine learning.

**CREDIT DISTRIBUTION**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **B.Tech Computer Science and Engineering**  **Specialization in AIDS** | | | | | | | | | |
| **Category** | **I** | **II** | **III** | **IV** | **V** | **VI** | **VII** | **VIII** | **SU** |
| **BCS** | 10 | 4 | -- | -- | -- | -- | -- | -- | **14** |
| **ESC** | 8 | 4 | -- | -- | -- | -- | -- | -- | **12** |
| **AEC** | 2 | -- | 3 | -- | -- | -- | -- | -- | **5** |
| **VSEC** | 2 | 2 | -- | 4 | -- | -- | -- | -- | **8** |
| **CC** | -- | 4 | -- | -- | -- | -- | -- | -- | **4** |
| **MC** | -- | -- | -- | -- | -- | -- | -- | -- | **0** |
| **PCC** | -- | 6 | 10 | 11 | 9 | 8 | 4 | 4 | **52** |
| **IKS** | -- | 2 | -- | -- | -- | -- | -- | -- | **2** |
| **OEC** | -- | -- | 3 | 3 | 3 | -- | -- | -- | **9** |
| **MDM** | -- | -- | 2 | 2 | 4 | 3 | 3 | -- | **14** |
| **HSSM** | -- | -- | 0 | 0 | -- | -- | -- | -- | **0** |
| **VEC** | -- | -- | 2 | 2 | -- | -- | -- | -- | **4** |
| **PR** | -- | -- | 2 | -- | 0 | 2 | -- | -- | **4** |
| **PEC** | -- | -- | -- | -- | 6 | 9 | 9 | -- | **24** |
| **PW** | -- | -- | -- | -- | -- | -- | 6 | -- | **6** |
| **ELC** | -- | -- | -- | -- | -- | -- | -- | 12 | **12** |
| **Total** | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 16 | **170** |
| **Honor** | | | | 6 | 3 | 3 | 3 | 3 | **188** |
| **Double Minor** | | | | 6 | 3 | 3 | 3 | 3 | **188** |
| **Research** | | | | | | | 9 | 9 | **188** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **B. Tech Computer Science and Engineering (AIDS)** | | | | | |
| **SEMESTER I** | | | | | |
| **Course Code** | **Course** | **L/T/P** | **Contact**  **hrs/week** | **Credits** | **Category** |
| 24UADBS101 | Mathematics for Artificial Intelligence and Machine Learning-I | 3/1/0 | 4 | 4 | BSC |
| 24UETBS102 | Applied Science | 4/0/0 | 4 | 4 | BSC |
| 24UEDES101 | Application Development  Practices | 3/0/2 | 5 | 4 | ESC |
| 24UADES102 | Python Programming (IBM) | 3/0/2 | 5 | 4 | ESC |
| 24UETAE101 | Oral and Written Communication  Skills | 1/0/2 | 3 | 2 | AEC |
| 24UETVS101 | Design Thinking and Idea Lab | 0/0/4 | 4 | 2 | VSEC |
| 24UETBS103 | Applied Science Lab | 0/0/4 | 4 | 2 | BSC |
| 24UEDMC101 | Mandatory Course I  (Induction Program) | Three Weeks | | 1EC | MC |
| **Total:** | | | **29** | **22** | |
| **SEMESTER II** | | | | | |
| **Course Code** | **Course** | **L/T/P** | **Contact**  **hrs/week** | **Credits** | **Category** |
| 24UADBS104 | Mathematics for Artificial Intelligence and Machine Learning-II | 3/1/0 | 4 | 4 | BSC |
| 24UADPC101 | Fundamentals of AI/DS and Data Visualization with R, Watson (IBM) | 2/0/2 | 4 | 3 | PCC |
| 24UADPC102 | Object-Oriented Programming | 2/0/2 | 4 | 3 | PCC |
| 24UADEC103 | Data Structures and Algorithms | 3/0/2 | 5 | 4 | PCC |
| 24UETIK101 | Indian Knowledge System | 2/0/0 | 2 | 2 | IKS |
| 24UADVS102 | Tableau | 0/0/4 | 4 | 2 | VSEC |
| 24UETCC101 | NSS/YOGA/SPORTS | 0/0/8 | 8 | 4 | CC |
| 24UADMC102 | Mandatory Course II  (Environmental Sciences) | 0/0/2 | 2 | 1EC | MC |
| **Total Hrs:** | | | **33** | **22** | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **B. Tech Computer Science and Engineering (AIDS)** | | | | | | |
| **SEMESTER III** | | | | | | |
| **Course Code** | **Course** | | **L/T/P** | **Contact hrs/week** | **Credits** | **Category** |
| 24UADOE201 | Renewable Energy Systems  (Open Elective I) | | 3/0/0 | 3 | 3 | OEC |
| 24UADMD201 | Engineering Economics Analysis | | 2/0/0 | 2 | 2 | MDM |
| 24UADAE201 | **DevOps and Cloud (IBM)** | | 2/0/2 | 2 | 3 | AEC |
| 24UATVE201 | Foreign Language – Korean Language  German Language | | 0/0/4 | 4 | 2 | VEC |
| 24UATPR201 | Seminar | | 0/0/4 | 4 | 2 | PR |
| 24UADPC201 | Statistics for Data Science and Machine Learning | | 3/0/0 | 3 | 3 | PCC |
| 24UADPC202 | Java Programming | | 3/0/2 | 5 | 4 | PCC |
| 24UADPC203 | Operating Systems | | 3/0/0 | 3 | 3 | PCC |
| 24UADMC201 | Mandatory Course III (Soft Skill) | | 0/0/2 | 2 | 1EC | MC |
| **Total Hrs:** | | | | **30** | **22** | |
| **SEMESTER III** | | | | | | |
| **Course Code** | | **Course** | **L/T/P** | **Contact hrs/week** | **Credits** | **Category** |
| 24UADOE202 | | Open Elective II | 3/0/0 | 3 | 3 | OEC |
| 24UADPC204 | | Design and Analysis of Algorithms | 3/0/0 | 3 | 3 | PCC |
| 24UADPC205 | | Database Management System | 3/0/2 | 5 | 4 | PCC |
| 24UADPC206 | | **Business Intelligence with Cognos BI(IBM)** | 3/0/2 | 5 | 4 | PCC |
| 24UADVS201 | | Version Control System Tools | 0/0/4 | 4 | 2 | VSEC |
| 24UADVS202 | | Community Engagement  Mini Project I | 0/0/4 | 4 | 2 | VSEC |
| 24UATVE202 | | Foreign Language – Korean Language  German Language | 0/0/4 | 4 | 2 | VEC |
| 24UADMD202 | | Financial Management/  Corporate Law | 2/0/0 | 2 | 2 | MDM |
| 24UADMC202 | | Mandatory Course IV  (Sustainable Development Practices) | 0/0/2 | 2 | 1EC | MC |
| **Total Hrs:** | | | | **32** | **22** | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **B. Tech Computer Science and Engineering (AIDS)** | | | | | |
| **SEMESTER V** | | | | | |
| **Course Code** | **Course** | **L/T/P** | **Contact hrs/week** | **Credits** | **Category** |
| 24UADPC301 | Deployment Techniques Using MLOPS | 3/0/0 | 3 | 3 | PCC |
| 24UADPC302 | **Predictive Modelling Using SPSS (IBM)** | 2/0/2 | 4 | 3 | PCC |
| 24UADPC303 | Deep Learning with Keras and Tensor flow | 2/0/2 | 4 | 3 | PCC |
| 24UADOE301 | Open Elective III | 3/0/0 | 3 | 3 | OEC |
| 24UADPE301 | Professional Elective – I | 3/0/0 | 3 | 3 | PEC |
| 24UADPE302 | Professional Elective – II | 3/0/0 | 3 | 3 | PEC |
| 24UADMD301 | Principles of Management | 3/1/0 | 4 | 4 | MDM |
| **Total** | | | **24** | **22** | |
| **SEMESTER VI** | | | | | |
| **Course Code** | **Course** | **L/T/P** | **Contact hrs/week** | **Credits** | **Category** |
| 24UADPC304 | **Spark and Scala Fundamentals (IBM)** | 3/0/2 | 5 | 4 | PCC |
| 24UADPC305 | AWS and Azure Cloud Services | 3/0/2 | 5 | 4 | PCC |
| 24UADPE303 | Professional Elective – III | 3/0/0 | 3 | 3 | PEC |
| 24UADPE304 | Professional Elective – IV | 3/0/0 | 3 | 3 | PEC |
| 24UADPE305 | Professional Elective – V | 3/0/0 | 3 | 3 | PEC |
| 24UADMD302 | IPR and EDP | 3/0/0 | 3 | 3 | MDM |
| 24UADPR301 | Mini Project II | 0/0/4 | 4 | 2 | PR |
| **Total Hrs:** | | | **26** | **22** | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **B. Tech Computer Science and Engineering (AIDS)** | | | | | | | | | | | | | | | |
| **SEMESTER VII** | | | | | | | | | | | | | | | |
| **Course Code** | | | **Course** | | | **L/T/P** | | **Contact hrs/week** | | **Credits** | | | **Category** | | |
| 24UADPC401 | | | **Data Science Advanced Programming (IBM)** | | | 3/0/2 | | 5 | | 4 | | | PCC | | |
| 24UADPE401 | | | Professional Elective-VI | | | 3/0/0 | | 3 | | 3 | | | PEC | | |
| 24UADPE402 | | | Professional Elective-VII | | | 3/0/0 | | 3 | | 3 | | | PEC | | |
| 24UADPE403 | | | Professional Elective-VIII | | | 3/0/0 | | 3 | | 3 | | | PEC | | |
| 24UADMD401 | | | Research Methodology | | | 3/0/0 | | 3 | | 3 | | | MDM | | |
| 24UADPR401 | | | Project Phase-I /Internship | | | 0/0/12 | | 12 | | 6 | | | PR | | |
| **Total** | | | | | | | | **25** | | **22** | | | | | |
| **SEMESTER VIII** | | | | | | | | | | | | | | | | |
| **Course Code** | | | **Course** | | **L/T/P** | **Contact hrs/week** | | | **Credits** | | **Category** | | |
| 24UADPC402 | | | Natural Language Processing | | 3/0/2 | | 5 | | 4 | | PCC | | |
| 24UADEL401 | | | **Project Phase-II (IBM)** | | 0/0/24 | | 24 | | 12 | | ELC | | |
| **Total Hrs:** | | | | | | | | **29** | **16** | | | | |

**SEMESTER-I**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **24UADBS101** | | | | | **Mathematics for Artificial Intelligence and Machine Learning- I** | | | | | | | | | | | | **L/T/P/C** | | | |
| **3/1/0/4** | | | |
| **Nature of Course** | | | | | Theory | | | | | | | | | | | | | | | |
| **Prerequisites** | | | | | Mathematics | | | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | | | | |
| 1. | | To familiarize students with concepts and techniques of matrices and their applications such as translation, rotation. | | | | | | | | | | | | | | | | | | |
| 2. | | To be able to calculate characteristic polynomial, eigen values and eigen vectors of a given matrix. | | | | | | | | | | | | | | | | | | |
| 3. | | To be able to operate within a vector space using the concepts of basis and dimension of a vector space. | | | | | | | | | | | | | | | | | | |
| 4. | | To master the techniques of calculus in two and three variables, such as finding critical points. | | | | | | | | | | | | | | | | | | |
| 5. | | To understand the analogies between mathematical descriptions of different phenomena in physics and engineering, apply analytical methods and physically interpret the solutions. | | | | | | | | | | | | | | | | | | |
| **Course Outcomes: Upon completion of the course, students shall have the ability to** | | | | | | | | | | | | | | | | | | | | |
| CO1 | | **Determine** the solution of a system of linear equations with matrix method. | | | | | | | | | | | | | | | [AP] | | | |
| CO2 | | **Apply** the concept of eigen values and eigen vectors for  diagonalizable matrix. | | | | | | | | | | | | | | | [AP] | | | |
| CO3 | | **Calculate** basis and dimension of vector space. | | | | | | | | | | | | | | | [AP] | | | |
| CO4 | | **Calculate** Jacobian and extrema of functions using partial derivatives. | | | | | | | | | | | | | | | [AP] | | | |
| CO5 | | **Determine** solution of a first order differential equation appearing in  engineering problems. | | | | | | | | | | | | | | | [AP] | | | |
| **CO-PO Mapping** | | | | | | | | | | | | | | | | | | | | |
| Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs): | | | | | | | | | | | | | | | | | | | | |
|  | **PO1** | **PO2** | **PO3** | **PO4** | | **PO5** | | **PO6** | **PO7** | | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | | **PSO2** | | **PSO3** |
| **CO1** | 3 | 2 | - | - | | - | | - | - | | 1 | 1 | 1 | - | - | - | | - | | - |
| **CO2** | 3 | 2 | - | - | | - | | - | - | | 1 | 1 | 1 | - | - | - | | - | | - |
| **CO3** | 3 | 2 | - | - | | - | | - | - | | 1 | 1 | 1 | - | - | - | | - | | - |
| **CO4** | 3 | 2 | - | - | | - | | - | - | | 1 | 1 | 1 | - | - | - | | - | | - |
| **CO5** | 3 | 2 | - | - | | - | | - | - | | 1 | 1 | 1 | - | - | - | | - | | - |
| **Teaching -Learning & Assessment Scheme** | | | | | | | | | | | | | | | | | | | | |
| **Learning Scheme** | | | **Credits** | | **Assessment Scheme** | | | | | | | | **Summative Assessment** | | | | | | **Total** | |
| **Formative Assessment** | | | | | | | | **End Semester Exam** | | | | | |
| **L** | **T** | **P** | **CIA-I** | | **CIA-II** | | | **Continuous Assessment Tutorial -05** | | |
| 3 | 1 | 0 | 4 | | 25 | | 25 | | | 20  (100 Scaled Down to 20) | | | 30  (60 Scaled Down 30) | | | | | | 100 | |
| **Course Contents** | | | | | | | | | | | | | | | | | | | | |
| **Each unit will contain real-time applications using Python and GeoGebra.** | | | | | | | | | | | | | | | | | | | | |
| **UNIT I** | | **Matrices (CO1)** | | | | | | | | | | | | | | | **9 hrs.** | | | |
| Definition and types of matrices, elementary row and column operations, rank of a matrix, system of linear equations and its consistency, solving the system of linear equations, applications in Cryptography. **Hands-on: 1) Understanding Elementary Row and Column Operations**  **2) Application in Computer Graphics** | | | | | | | | | | | | | | | | | | | | |
| **UNIT II** | | **Eigen Values and Eigen Vectors (CO2)** | | | | | | | | | | | | | | | **9 hrs.** | | | |
| Characteristic equation, Eigen Values, Eigen values of different types of matrices, Eigen Vectors and their basic properties, Eigen Space, Diagonalization of a matrix.  **Hands-on: 1) Understanding Eigenvalues and Eigenvectors** | | | | | | | | | | | | | | | | | | | | |
| **UNIT III** | | **Vector Spaces (CO3)** | | | | | | | | | | | | | | | **9 hrs.** | | | |
| Vector Spaces, Examples of vector space, Subspaces, Examples of subspace, necessary and sufficient condition for subspace, Linear combination of vectors, Linear span, Linear dependence and independence of vectors, Basis and dimension of a vector space.  **Hands-on: 1) Understanding Vector Spaces and Subspaces** | | | | | | | | | | | | | | | | | | | | |
| **UNIT IV** | | **Partial derivatives and its Application (CO4)** | | | | | | | | | | | | | | | **9 hrs.** | | | |
| Partial derivatives, Euler’s theorem on homogeneous function, deductions from Euler’s theorem, composite functions (chain rule), Jacobian, Extrema of a function, necessary condition for maxima and minima, critical and saddle points.  **Hands-on: 1) Finding Extrema and Critical/Saddle Points using GeoGebra** | | | | | | | | | | | | | | | | | | | | |
| **UNIT V** | | **Differential Equations and its Application(CO5)** | | | | | | | | | | | | | | | **9 hrs.** | | | |
| Order and degree of differential equation, solution of differential equation, variable separable method, exact differential equations, equations reducible to exact, linear differential equations, Newton’s law of cooling. **Hands-on: 1) GeoGebra demonstrations for DE** | | | | | | | | | | | | | | | | | | | | |
| **Total Contact Hours:** | | | | | | | | | | | | | | | | | **45 hrs.** | | | |
| **Total Hours(45+15):** | | | | | | | | | | | | | | | | | **60hrs** | | | |
| **Text Book:** | | | | | | | | | | | | | | | | | | | | |
| 1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2023-24. 2. H. K. Das, Advanced Engineering Mathematics, S Chand, 2019. 3. Mathematics I Calculus and Linear Algebra [For Computer Science Engineering Branches] | AICTE Prescribed Textbook (English), 2022. | | | | | | | | | | | | | | | | | | | | |
| **Reference Book:** | | | | | | | | | | | | | | | | | | | | |
| 1. N. P. Bali and Manish Goyal, A Text Book of Engineering, Mathematics, 11/e, Lakshmi Publications, 2018. 2. D. C. Lay, S. R. Lay and J. J. MacDonald, Linear Algebra and its Applications, Pearson, 2016. 3. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill, 2017. 4. Paul Dawkins, Calculus III, Lamar University Texas, 2018. | | | | | | | | | | | | | | | | | | | | |
| **Web References:** | | | | | | | | | | | | | | | | | | | | |
| 1. <https://math.mit.edu/classes/18.03/sup/sup0.pdf> 2. http://tutorial.math.lamar.edu 3. https://bmsce.ac.in/Content/MAT/Typical\_Examples\_of\_UNIT-2.pdf | | | | | | | | | | | | | | | | | | | | |
| **Online Resources:** | | | | | | | | | | | | | | | | | | | | |
| 1. <https://onlinecourses.nptel.ac.in/noc24_ma93/preview> 2. <https://onlinecourses.nptel.ac.in/noc24_ma87/preview> | | | | | | | | | | | | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **24UETBS102** | | | | | **Applied Science** | | | | | | | | | | | | | **L/T/P/C** | | | |
| **4/0/0/4** | | | |
| **Nature of Course** | | | | | Theory | | | | | | | | | | | | | | | | |
| **Prerequisites** | | | | | Higher Secondary Basic Science | | | | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | | | | | |
| 1. | | To learn and comprehend the essentials of physics and its application in computer science. | | | | | | | | | | | | | | | | | | | |
| 2. | | To study the electrical properties and semiconductor physics of materials and apply in the engineering field. | | | | | | | | | | | | | | | | | | | |
| 3. | | To understand the basic parameters involved in water technology and water treatment methods for domestic use. | | | | | | | | | | | | | | | | | | | |
| 4. | | To learn the cause and management of electronic waste. | | | | | | | | | | | | | | | | | | | |
| 5. | | To study the basics of quantum computing, nanomaterials and applications. | | | | | | | | | | | | | | | | | | | |
| **Course Outcomes: Upon completion of the course, students shall have the ability to** | | | | | | | | | | | | | | | | | | | | | |
| CO1 | | Utilize the concepts of waves, semiconductor and ancient astronomical techniques in the field of engineering. | | | | | | | | | | | | | | | | [AP] | | | |
| CO2 | | Implement the knowledge of LASERS and fibre optics in engineering  field. | | | | | | | | | | | | | | | | [AP] | | | |
| CO3 | | Execute the acquired ideas on water treatment and analysis. | | | | | | | | | | | | | | | | [AP] | | | |
| CO4 | | Apply the gained knowledge in various environmental issues in sustainable development. | | | | | | | | | | | | | | | | [AP] | | | |
| CO5 | | Conceptualise the basics of quantum computing and nanoscience. Implement the concepts of physics in animation. | | | | | | | | | | | | | | | | [U] | | | |
| **CO-PO Mapping** | | | | | | | | | | | | | | | | | | | | | |
| Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs): | | | | | | | | | | | | | | | | | | | | | |
|  | **PO1** | **PO2** | **PO3** | **PO** | | **PO5** | | **PO6** | **PO7** | | **PO8** | **PO9** | **PO10** | | **PO11** | **PO12** | **PSO1** | | **PSO2** | | **POS3** |
| **CO1** | 3 | 2 | 1 | 2 | | 1 | | - | - | | 1 | 1 | 1 | | 1 | 1 | - | | **-** | | **-** |
| **CO2** | 3 | 2 | 1 | 2 | | 1 | | - | - | | 1 | 1 | 1 | | 1 | 1 | - | | **-** | | **-** |
| **CO3** | 3 | 2 | 1 | 2 | | 1 | | 3 | 3 | | 1 | 1 | 1 | | 1 | 1 | - | | **-** | | **-** |
| **CO4** | 3 | 2 | 1 | 2 | | 1 | | 3 | 3 | | 1 | 1 | 1 | | 1 | 1 | - | | **-** | | **-** |
| **CO5** | 3 | 2 | 1 | 2 | | 1 | | - | - | | 1 | 1 | 1 | | 1 | 1 | - | | **-** | | **-** |
| **Teaching -Learning & Assessment Scheme** | | | | | | | | | | | | | | | | | | | | | |
| **Learning Scheme** | | | **Credits** | | **Assessment Scheme** | | | | | | | | | **Summative Assessment** | | | | | | **Total** | |
| **Formative Assessment** | | | | | | | | | **End Semester Exam** | | | | | |
| **L** | **T** | **P** | **CIA-I** | | **CIA-II** | | | **Capstone model Assignment** | | | |
| 4 | 0 | 0 | 4 | | 25 | | 25 | | | 20 | | | | 60 Scaled Down 30 | | | | | | 100 | |
| **Course Contents** | | | | | | | | | | | | | | | | | | | | | |
| **UNIT I** | | **Introduction to Fundamental Physics (CO-1)** | | | | | | | | | | | | | | | | **12hrs** | | | |
| **Waves and Oscillation:** Types of Waves, Superposition of Waves, Standing Waves (Nodes and Antinodes) and Its Applications. **SHM:** Wave Equations, Simple Pendulum (Problems). **Electromagnetism:** Faraday’s Laws, Lenz’s Law, Biot-Savart Law, Physics of Divergence, Gradient, and Curl, Magnetic Field, Maxwell Equations (Qualitative). **Semiconductor Electronics:** Band theory of solids, Energy band diagram, **Semiconductor:** Properties, Type, P-N Junction diode and applications, I-V characteristics, P-N-P and N-P-N transistors, **Modern Physics:** Photoelectric Effect, Einstein’s Photoelectric equation, Photocell(working), Solar cell. **Ancient Astronomical Instruments:** Chakra, Dhanuryantra, Yasti and Phalak Yantra etc.  **Case Study:**  Simulate the behaviour of a simple electronic circuit using a circuit simulator  Prepare a presentation on a given topic and present in group.  Demonstrate a given concept through a model.  Scenario:- Apply concepts of waves and oscillation, electrodynamics, and semiconductor electronics to a real-world scenario. | | | | | | | | | | | | | | | | | | | | | |
| **UNIT II** | | **Optics and Introduction to Quantum Physics (CO-2)** | | | | | | | | | | | | | | | | **12hrs** | | | |
| **Light:** Properties of Light, Critical Angle, TIR , Classification of Optical Fibres, Attenuation and Fibre Losses, Light propagation through Fibres, Acceptance Angle and Numerical Aperture (NA), Applications, Fibre Optic Communication, Block Diagram. Laser Characteristics, Spatial and Temporal Coherence, Einstein Coefficient & Expression for Energy Density, Energy Level Diagram, Pumping Schemes, Components of Laser, He-Ne, Nd-YAG and Dye Laser and Its Applications. **Sensors:** Introduction, Hall Effect and Hall Sensor, Applications of Sensors. **Quantum Physics:** de’Broglie Hypothesis and Matter Waves, de’Broglie Wavelength, Phase Velocity and Group Velocity, Heisenberg’s Uncertainty Principle and Its Application.  **Case Study:**  Demonstrate given physical phenomenon through experiment.Video record it and share url.  Prepare  presentations on given topics and present in groups.  Simulate the given experimental setup by using Virtual Labs/XCos  Scenario:- Apply concepts of light, laser, and sensors to a real-world scenario, and understand the principles of quantum physics. | | | | | | | | | | | | | | | | | | | | | |
| **UNIT III** | | **Water Technology (CO-3)** | | | | | | | | | | | | | | | | **12hrs** | | | |
| **Water Technology:** Introduction; Hardness of Water- Cause, Types, Units, Disadvantages of Using Hard Water for Domestic and Industrial Purposes (Scale and Sludge Formation in Boilers, Caustic Embrittlement, Boiler Corrosion), Softening of Hard Water (Lime-Soda, Permutit and Ion-Exchange Processes), Internal Treatment Methods, Chemical Survey of Water- Analysis of Free Chlorine, Total Alkalinity, Total Hardness, Dissolved Oxygen, Biological Oxygen Demand, Numerical Based on Determination of Hardness, Specifications for Drinking Water (BIS & WHO Standards), Treatment of Water for Domestic Use (Desalination - Reverse Osmosis & Electrodialysis).  **Case Study:**  Conduct a survey (by using internet) on the water quality standards for groundwater found in various parts of India, and evaluate the criteria based on WHO/BIS guidelines.  Scenario:- Apply water quality analysis concepts to achieve the required survey results. | | | | | | | | | | | | | | | | | | | | | |
| **UNIT IV** | | **Management of Electronic Waste (CO-4)** | | | | | | | | | | | | | | | | **12hrs** | | | |
| **Management of Electronic Waste:** Overview of Electronic Waste, Sources of Electronic Waste, Various Types of Electronic Waste, Hazardous Materials Utilised in The Production of Electrical and Electronic Goods; Environmental Impact of Electronic Waste, Adverse Effect of Electronic Waste on Human Health, The Necessity of Electronic Waste Management, Recycling and Recovery of Electronic Waste: Various Methods of Recycling (Separation, Thermal Treatments), Hydrometallurgical Extraction, Pyrometallurgical Methods and Direct Recycling. Extraction of Nanogold from Electronic Trash. Participant Role in Electronic Waste Management.  **Case Study:**  Conduct a survey (by using internet) on different types of electronic wastes and their recycling/ recovery processes.  Scenario:- Ensure that the process of recycling and recovery is sustainable. | | | | | | | | | | | | | | | | | | | | | |
| **UNIT V** | | **Basics of Quantum Computing, Animation Physics and Nanotechnology (CO-5)** | | | | | | | | | | | | | | | | **12hrs** | | | |
| **Basics of Quantum Computing:** Introduction to Quantum Computing, Differences between Classical & Quantum Computing, Representation of qubit by Bloch sphere, Single qubit gates, Matrix representation of |0> and |1> States and their multiplication (Inner Product), Normalisation rule, Numerical Problems. **Physics of Animation:** Frames per Second, Size and Scale, Motion and Timing in Animations, The Odd rule, Motion Graphs, Examples of Character Animation: (Jumping, Walking: Strides and Steps, Numerical Problems.)  **Nanotechnology:** Introduction to Nanomaterials, Nanoparticles, Nanoclusters, Carbon Nanotubes (CNTs) and Nanowires. Synthetic Techniques of Nanomaterials, Characterization of Nanomaterials via Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM). Application of Nanomaterials (Biology, Medicine, IT and Electronics)  **Case Study:**  Study given animated figure from a Real-World. From Interactive 3D models of animations demonstrate the concept of motion and timing in animations.  Investigate the nanotechnology associated with nature.  Scenario:- Explain concepts of nanotechnology and physics of animation to a real-world scenario. | | | | | | | | | | | | | | | | | | | | | |
| **Total Contact Hours:** | | | | | | | | | | | | | | | | | | **60hrs** | | | |
| **Text Book:** | | | | | | | | | | | | | | | | | | | | | |
| 1. A Textbook of Engineering Physics, M N Avadhanulu, S Chand & Company Pvt. Ltd., (2014), ISBN: 978-8-121-90817-7 2. Applied Physics, Hari Har LAl, B. K. Sawhney, B.N. Dutta, P. K. Gupta, Tata McGraw Hill Publishing company limited, New Delhi, Volume II. 3. The Surya Siddhanta by Aryabhatta Baptist mission press, Calcutta. (1861) 4. Engineering Chemistry: Fundamentals and Applications, Shikha Agarwal, Cambridge University Press, (2016) ISBN: 978-1-107-47641-7 5. Handbook of Electronic Waste Management, Majeti Narasimha Vara Prasad, Meththika Vithanage, Anwesha Borthakur, Elsevier Publisher, (2019), ISBN: 978-0-128-17030-4 6. A textbook on Nanoscience and Nanotechnology, T. Pradeep, Tata McGraw Hill Education Private Limited, (2012), ISBN: 978-0-071-54829-8 7. Quantum Computation and Quantum Information, Michael A. Nielsen & Isaac L. Chuang, Cambridge Universities Press, (2010). ISBN: 978-0-511-97666-7 8. Physics for Animators, Michele Bousquet with Alejandro Garcia, CRC Press, Taylor & Francis, (2016). ISBN: 978-0-415-84297-6. | | | | | | | | | | | | | | | | | | | | | |
| **Reference Book:** | | | | | | | | | | | | | | | | | | | | | |
| 1. Principles of Engineering Physics, Cambridge University Press, (2018), ISBN:978-1-316-87694-7 2. Engineering Physics by Gupta and Gour, Dhanpat Rai Publications, (2016) (Reprint). ISBN:978-8-189-92822-3 3. Lasers and Non Linear Optics, B B Loud, New age international, (2011) edition. ISBN:978-8-122-40324-4 4. Concepts of Modern Physics, Aurthur Beiser, McGrawhill, 6th Edition, (2009), ISBN:978-0-071-00144-1 5. Information, Physics and Computation (Oxford Graduate Texts), (2009), M. Mézard, A. Montanari, ISBN:978-0-198-57083-7 6. Engineering Chemistry, K. Sesha Maheswaramma, Mridula Chugh, Pearson Education India, (2015), ISBN:978-8-131-77451-9 7. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, (2012), ISBN-13. 978-9380016757 8. An Introduction to Nanomaterials and Nanoscience, Asim K. Das, Madhu Das, CBS Publishers, (2022), ISBN: 978-9-385-91567-3 9. Engineering Chemistry, C. Baskar, S. Baskar, R.S. Dhillon, Wiley, (2012), ISBN: 978-8126532018 | | | | | | | | | | | | | | | | | | | | | |
| **Web References:** | | | | | | | | | | | | | | | | | | | | | |
| 1. NPTEL Quantum Computing : <https://archive.nptel.ac.in/courses/115/101/115101092> 2. Physics Simulation : <https://phet.colorado.edu/sims/html/plinko-probability/latest/plinko-probability_en.html> 3. NPTEL Nanotechnology Science and Applications <https://onlinecourses.nptel.ac.in/noc24_mm29/preview> 4. NPTEL Water and waste water treatment <https://onlinecourses.nptel.ac.in/noc23_ce12/preview> 5. NPTEL Electronic waste management <https://onlinecourses.nptel.ac.in/noc21_ce03/preview>   <https://ocw.mit.edu> | | | | | | | | | | | | | | | | | | | | | |
| **Online Resources:** | | | | | | | | | | | | | | | | | | | | | |
| 1. Virtual LAB : <https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham> 2. Virtual LAB : <https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1> 3. Virtual LAB : <https://virtuallabs.merlot.org/vl_physics.html> 4. Virtual LAB : <https://ee1-nitk.vlabs.ac.in/List%20of%20experiments.html> 5. Modelling & Simulation: <https://cloud.scilab.in/> 6. Modelling & Simulation: <https://www.compadre.org/osp/> | | | | | | | | | | | | | | | | | | | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **24UEDES101** | | **Application Development Practices** | **L/T/P/C** |
| **3/0/2/4** |
| **Nature of Course** | | Theory and Practical | |
| **Prerequisites** | | Nil | |
| **Course Objectives:** | | | |
| 1. | To learn various software development models. | | |
| 2. | To learn extreme programming and use of GITHUB to manage collaborative software  development. | | |
| 3. | To Learn simple web page development using HTML. | | |
| 4. | To design interactive web page development using CSS. | | |
| 5. | To understand the bootstrap process. | | |
| **Course Outcomes: Upon completion of the course, students shall have the ability to** | | | |
| CO1 | **Understand** fundamental software development concepts and tools. | | [U] |
| CO2 | **Utilize** methodologies and tools to develop and deploy applications. | | [A] |
| CO3 | **Apply** HTML knowledge for static web page development. | | [AP] |
| CO4 | **Apply** CSS knowledge for designing and implementing dynamic web page. | | [AP] |
| CO5 | **Apply** the java script for developing web sites. | | [AP] |
| **CO-PO Mapping** | | | |
| Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs): | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **POS3** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CO1** | 1 | 1 | 2 | 1 | | 2 | | - | - | - | 2 | 2 | | 2 | 2 | 1 | | **-** | | 2 |
| **CO2** | 1 | 1 | 3 | 1 | | 3 | | 2 | - | - | 2 | 3 | | 2 | 3 | 1 | | **-** | | 2 |
| **CO3** | 1 | 1 | 3 | 1 | | 2 | | - | - | - | 2 | 2 | | 2 | 2 | 1 | | **-** | | 2 |
| **CO4** | 1 | 1 | 3 | 1 | | 3 | | - | - | - | 2 | 2 | | 2 | 3 | 1 | | **-** | | 2 |
| **CO5** | 1 | 1 | 2 | 1 | | 3 | | - | - | - | 2 | 2 | | 2 | 2 | 1 | | **-** | | 2 |
| **Teaching -Learning & Assessment Scheme** | | | | | | | | | | | | | | | | | | | | |
| **Learning Scheme** | | | **Credits** | | **Assessment Scheme** | | | | | | | | **Summative Assessment** | | | | | | **Total** | |
| **Formative Assessment** | | | | | | | | **End Semester Exam** | | | | | |
| **L** | **T** | **P** | **CIA-I**  **(TH-1)** | | **CIA-II**  **(TH-2)** | | | **Model PR Exam** | | |
| 3 | 0 | 2 | 4 | | 25 | | 25 | | | 20 | | | 60 Scaled Down 30 | | | | | | 100 | |
| **Course Contents** | | | | | | | | | | | | | | | | | | | | |
| **UNIT I** | | **Software Development Model (CO-1)** | | | | | | | | | | | | | | | **9hrs** | | | |
| Introduction to software development process, Software engineering principles, requirements gathering and analysis, Overview of programming languages. Agile Software Development: Traditional Software Development Models, Agile methodology (Scrum, Kanban), DevOps practices, Comparison of methodologies.  **Case study:**  As a software development professional, you will run into all kinds of projects and situations within those projects. This Case study is designed to present you with a fictitious situation and ask you to recommend a software development approach suited to the situation. | | | | | | | | | | | | | | | | | | | | |
| **UNIT II** | | **Extreme Programming and GitHub (CO-2)** | | | | | | | | | | | | | | | **9hrs** | | | |
| The Rules of Extreme Programming, Extreme Programming (XP) – Principles, Extreme Programming (XP) – Key Terms, Introduction to Lean Software Development, Principles of Lean Software Development, What is Kanban? Introduction to Git - Getting a Git Repository, Recording Changes to the Repository, Viewing the Commit History, Undoing Things, Working with Remotes, Tagging, Git Aliases, Git Branching, Branches in a Nutshell, Basic Branching and Merging, Branch Management, Remote Branches, Rebasing. Introduction to GitHub – Introduction, Set up Git, Create a repository, GitHub Flow, Contribution to Projects, Communicating on GitHub.  **Case study:**  Imagine a scenario where a team of developers is working on a mobile application. Students will simulate this scenario by collaborating on a shared Git repository to develop a simple mobile app feature. They will create branches for different features, collaborate on code changes, resolve conflicts, and merge their changes back into the main branch. This case study will demonstrate the importance of version control in collaborative software development. | | | | | | | | | | | | | | | | | | | | |
| **UNIT III** | | **HTML (CO-3)** | | | | | | | | | | | | | | | **9hrs** | | | |
| Understand the structure of an HTML page, New Semantic Elements in HTML 5, Learn to apply physical/logical character effects, Learn to manage document spacing. Tables  - Understand the structure of an HTML table, Learn to control table format like cell spanning, cell spacing, and border. List - Numbered List, Bulleted List, Working with Links, Understand the working of hyperlinks in web pages, Learn to create hyperlinks in web pages, Add hyperlinks to list items and table contents. Image Handling - Understand the role of images in web pages, Learn to add images to web pages, Learn to use images as hyperlinks.  **Case study:**  Build a simple responsive website using HTML. | | | | | | | | | | | | | | | | | | | | |
| **UNIT IV** | | **Introduction to Cascading Style Sheets (CO-4)** | | | | | | | | | | | | | | | **9hrs** | | | |
| What CSS can do, CSS Syntax, Types of CSS. Working with Text and Fonts - Text Formatting, Text Effects, Fonts. CSS Selectors - Type Selector, Universal Selector, ID Selector, Class selector. Colors and Borders – Background, Multiple Background, Colors RGB and RGBA, HSL and HSLA, Borders, Rounded Corners, Applying Shadows in border, Implementing CSS3 in the "Real World" – Modernizr, HTML5 Shims, SASS, and Other CSS Preprocessors, CSS Grid Systems, CSS Framework  **Case study :**  Consider a scenario where a software company is tasked with maintaining an existing codebases that lacks proper documentation and has accumulated technical debt over time. Students will analyze the codebase, identify areas for improvement, and refactor the code to adhere to clean code principles. They will then write unit tests to ensure that the refactored code behaves as expected, demonstrating the importance of clean code and testing in software maintenance. | | | | | | | | | | | | | | | | | | | | |
| **UNIT V** | | **Bootstrap (CO-5)** | | | | | | | | | | | | | | | **9hrs** | | | |
| Introduction, Getting Started with Bootstrap, Bootstrap Basics, Bootstrap grid system, Bootstrap Basic Components, Bootstrap Components, Page Header, Breadcrumb, Button Groups, Dropdown, Nav & Navbars. JavaScript Essentials - Var, Let and Const keyword, Arrow functions, default arguments, Template Strings, String methods, Object de-structuring, Create, apply, prototype, bind method, Spread and Rest operator, Typescript Fundamentals, Types & type assertions, Creating custom object types, function types, Typescript OOPS - Classes, Interfaces, Constructor, Decorator & Spread Operators Race.  **Case study:**  Imagine a scenario where a team of developers is working on a web application that needs to be deployed to a cloud platform. Students will set up a CI/CD pipeline using tools like Jenkins or GitHub Actions to automate the build, test, and deployment process. They will deploy the application to a cloud platform (e.g., AWS, Heroku) and configure the pipeline to trigger automatic deployments whenever new changes are pushed to the repository. This case study will showcase the benefits of CI/CD in streamlining the software development lifecycle. | | | | | | | | | | | | | | | | | | | | |
| **Total Contact Hours:** | | | | | | | | | | | | | | | | | **45hrs** | | | |
| **Sr. No.** | | **List of Experiments** | | | | | | | | | | | | | | | | **CO** | | |
|  | | Gather application-specific requirements for assimilation into the RE  (Requirements engineering) model. | | | | | | | | | | | | | | | | **CO1** | | |
|  | | Select relevant process model to define activities and related tasks set for  assigned project. | | | | | | | | | | | | | | | | **CO1** | | |
|  | | Set up a Git repository and perform basic version control operations (commit,  push, pull, and merge). | | | | | | | | | | | | | | | | **CO2** | | |
|  | | Collaboratively work on a project using Git, branching, and merging. | | | | | | | | | | | | | | | | **CO2** | | |
|  | | Perform manual testing of a small software application and document test cases and results. | | | | | | | | | | | | | | | | **CO3** | | |
|  | | Write unit tests for a simple function or module using a testing framework (e.g., JUnit for Java, unittest for Python). | | | | | | | | | | | | | | | | **CO3** | | |
|  | | Refactor a piece of code to improve its readability, following clean code  principles. | | | | | | | | | | | | | | | | **CO4** | | |
|  | | Work on an agile project using Scrum or Kanban, with iterative development  sprints. | | | | | | | | | | | | | | | | **CO4** | | |
|  | | Set up a CI/CD pipeline using a tool like Jenkins or GitHub Actions for a  sample application. | | | | | | | | | | | | | | | | **CO5** | | |
|  | | Deploy a web application to a cloud platform (e.g., AWS, Heroku) using CI/CD pipelines. | | | | | | | | | | | | | | | | **CO5** | | |
|  | | **Total Hours (Lab)** | | | | | | | | | | | | | | | | **30** | | |
| **Total Hours(45+30)** | | | | | | | | | | | | | | | | **75** | | |

|  |
| --- |
| **Text Book:** |
| 1. Software Engineering: A Practitioner's Approach" by Roger S. Pressman (2019) 2. Jeff Sutherland, “Scrum the Art of Doing Twice the Work in Half the Time”, Random House Publisher, 1st Edition, 2014. 3. Scott Chacon, Ben Straub, “Pro GIT”, Apress Publisher, 3rd Edition, 2014. 4. Code Complete: A Practical Handbook of Software Construction" by Steve McConnell (2014). 5. Refactoring: Improving the Design of Existing Code" by Martin Fowler (2018). 6. The Art of Software Testing" by Glenford J. Myers, Corey Sandler, and Tom Badgett (2011). 7. Continuous Integration: Improving Software Quality and Reducing Risk" by Paul M. Duvall, Steve Matyas, and Andrew Glover (2007). |
| **Reference Book:** |
| 1. Robert C. Martin, “Agile Software Development, Principles, Patterns and Practices”, Prentice Hall, 2nd Edition, 2014. 2. Mike Cohn, “User Stories Applied: For Agile Software”, Addison Wesley, 2nd Edition, 2016. 3. Scrum: The Art of Doing Twice the Work in Half the Time" by Jeff Sutherland (2014). 4. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation" by Jez Humble and David Farley (2010). 5. Pro Git" by Scott Chacon and Ben Straub (2018). 6. Version Control with Git" by Jon Loeliger and Matthew McCullough (2016). 7. Jenkins: The Definitive Guide" by John Ferguson Smart (2011). 8. The Phoenix Project: A Novel About IT, DevOps, and Helping Your Business Win" by Gene Kim, Kevin Behr, and George Spafford (2013). |
| **Web References:** |
| 1. **https://www.agilealliance.org/** 2. **<https://www.scrum.org/>** 3. **<https://trello.com/>** 4. **<https://www.atlassian.com/agile/scrum>** 5. **<https://guides.github.com/>** 6. **https://git-scm.com/doc** |
| **Online Resources:** |
| 1. **<https://www.coursera.org/specializations/agile-development>** 2. **<https://nptel.ac.in/courses/106/105/106105182/>** 3. **<https://www.edx.org/learn/agile>** 4. **<https://www.w3schools.com/html/default.asp>** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **24UADES102** | | | | | **Python Programming** | | | | | | | | | | | | | **L/T/P/C** | | | |
| **3/0/2/4** | | | |
| **Nature of Course** | | | | | Theory and Practical | | | | | | | | | | | | | | | | |
| **Prerequisites** | | | | | Basic understanding of computers | | | | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | | | | | |
| 1. | | To provide foundational knowledge of Python programming and its syntax. | | | | | | | | | | | | | | | | | | | |
| 2. | | To develop problem-solving skills using Python through practical programming exercises. | | | | | | | | | | | | | | | | | | | |
| 3. | | To teach students to work with Python’s data structures and libraries for efficient data manipulation. | | | | | | | | | | | | | | | | | | | |
| 4. | | To introduce object-oriented programming concepts and their application in Python. | | | | | | | | | | | | | | | | | | | |
| 5. | | To enhance students' understanding of Python libraries for data manipulation and visualization. | | | | | | | | | | | | | | | | | | | |
| **Course Outcomes: Upon completion of the course, students shall have the ability to** | | | | | | | | | | | | | | | | | | | | | |
| CO1 | | **Write** and execute basic Python programs using fundamental programming constructs. | | | | | | | | | | | | | | | | [AP] | | | |
| CO2 | | **Utilize** Python’s built-in data structures to manage and manipulate data effectively | | | | | | | | | | | | | | | | [AP] | | | |
| CO3 | | **Develop** and use functions and modules to structure Python programs. | | | | | | | | | | | | | | | | [AP] | | | |
| CO4 | | **Handle** files and manage exceptions effectively and OOPs in Python. | | | | | | | | | | | | | | | | [AP] | | | |
| CO5 | | **Use** Python libraries for data analysis and visualization tasks. | | | | | | | | | | | | | | | | [AP] | | | |
| **CO-PO Mapping** | | | | | | | | | | | | | | | | | | | | | |
| Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs): | | | | | | | | | | | | | | | | | | | | | |
|  | **PO1** | **PO2** | **PO3** | **PO4** | | **PO5** | | **PO6** | **PO7** | | **PO8** | **PO9** | **PO10** | | **PO11** | **PO12** | **PSO1** | | **PSO2** | | **POS3** |
| **CO1** | 1 | 1 | 2 | 1 | | 2 | | - | - | | - | 2 | 2 | | 2 | 2 | 3 | | - | | 2 |
| **CO2** | 1 | 1 | 3 | 1 | | 3 | | 2 | - | | - | 2 | 3 | | 2 | 3 | 3 | | - | | 2 |
| **CO3** | 1 | 1 | 3 | 1 | | 2 | | - | - | | - | 2 | 2 | | 2 | 2 | 3 | | - | | 2 |
| **CO4** | 1 | 1 | 3 | 1 | | 3 | | - | - | | - | 2 | 2 | | 2 | 3 | 3 | | - | | 2 |
| **CO5** | 1 | 1 | 2 | 1 | | 3 | | - | - | | - | 2 | 2 | | 2 | 2 | 3 | | - | | 2 |
| **Teaching -Learning & Assessment Scheme** | | | | | | | | | | | | | | | | | | | | | |
| **Learning Scheme** | | | **Credits** | | **Assessment Scheme** | | | | | | | | | **Summative Assessment** | | | | | | **Total** | |
| **Formative Assessment** | | | | | | | | | **End Semester Exam** | | | | | |
| **L** | **T** | **P** | **CIA-I**  **TH-1** | | **CIA-II**  **TH-2** | | | **Model PR Exam** | | | |
| 3 | 0 | 2 | 4 | | 25 | | 25 | | | 20 | | | | 60 Scaled Down 30 | | | | | | 100 | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course Contents** | | | | |
| **UNIT I** | | **Getting Started with Python (CO-1)** | **9hrs** | |
| Introduction to Python: History and Features, Installation and Environment Setup, Basic Syntax, Variables, Data Types and Operators, Control Flow: Conditional Statements, Loops  **Hands-on: 1) Writing Basic Python Scripts**  **2) Using Variables and Operators** | | | | |
| **UNIT II** | | **Advanced Data Structures (CO-2)** | **9hrs** | |
| Lists and List Operations, Tuples, Sets, and Dictionaries: Definitions and Use Cases, Comprehensions: List, Dictionary, and Set Comprehensions  **Hands-on: 1) Working with Lists and Dictionaries**  **2) Practical Exercises with Data Structures** | | | | |
| **UNIT III** | | **Functions, Modules, Files & Exception Handling (CO-3)** | **9hrs** | |
| Reading from and Writing to Files, Exception Handling with try, except, finally,  **Hands-on: 1) Writing Functions and Utilizing Modules**  **2) File Operations in Python & Exception Handling** | | | | |
| **UNIT IV** | | **Object-Oriented Programming in Python (CO-4)** | **9hrs** | |
| Introduction to OOP: Classes and Objects, Inheritance, Polymorphism, and Encapsulation  **Hands-on: 1) Designing Classes and Creating Objects**  **2) Implementing Inheritance and Polymorphism** | | | | |
| **UNIT V** | | **Introduction to Python Libraries and Applications (CO-5)** | **9hrs** | |
| Introduction to NumPy: Arrays and Operations, Basics of Pandas: Data Frames and Series, Data Visualization with Matplotlib: Plots, Charts, and Graphs, Seaborn  **Hands-on: 1) Using NumPy and Pandas for Data Analysis**  **2)** **Developing Interactive Plots and Reports** | | | | |
| **Total Contact Hrs:** | | | **45hrs** | |
| **Sr. No.** | **List of Experiments** | | | **COs** |
|  | Installation of Python IDE and Hands-on with IDE   * Hello World Program: Write a program that prints "Hello, World!" to the console. * Simple Arithmetic Operations -Create a program that takes two numbers as input and performs basic arithmetic operations (addition, subtraction, multiplication, division). * User Input and Output - Write a program that takes a user’s name and age as input and prints a greeting message including their name and age**.** | | | **CO1** |
|  | **Assignments based on Control Structures**   * Write a program that checks whether a given number is even or odd. * Simple Calculator: Develop a calculator that performs addition, subtraction, multiplication, and division based on user input. * Grade Calculator: Create a program that takes the marks of a student and prints their grade based on predefined criteria. | | | **CO1** |
|  | **Assignment based on Loops and Iteration**   * Factorial Calculation: Write a program to calculate the factorial of a given number using both iterative and recursive methods. * Fibonacci Sequence: Generate and print the Fibonacci sequence up to a specified number of terms. * Prime Number Checker: Develop a program that checks whether a number is prime or not. Etc | | | **CO1** |
|  | **Assignment based on List and its Operations**   * Write a program that performs operations like adding, removing, and accessing elements in a list. Etc | | | **CO2** |
|  | **Assignment based Dictionary Operations**   * Develop a program that creates a dictionary, adds key-value pairs, and retrieves values based on keys etc | | | **CO2** |
|  | **Tuple Operations**   * Create a program that demonstrates basic tuple operations, including indexing and slicing**.** | | | **CO2** |
|  | **Assignments Based on Function:**   * **Reading and Writing Files:** Write a program that reads from a text file and writes the content to another file etc * **Basic Function Implementation:** Write a function to find the maximum of three numbers. * **Recursive Functions**: Implement a recursive function to compute the nth Fibonacci number. * **Function with Default Arguments:** Create a function that calculates the power of a number with default arguments | | | **CO3** |
|  | **CSV File Handling:**   * Create a program to read from and write to a CSV file etc | | | **CO3** |
|  | **Exception Handling**   * **Basic Exception Handling:** Write a program that handles division by zero and other potential errors using try-except blocks. * **Custom Exception:** Develop a custom exception class and use it in a program to handle specific errors. | | | **CO3** |
|  | **Assignments based on Object-Oriented Programming**   * **Class and Object Basics:** Define a class with attributes and methods**,** create objects, and demonstrate their usage. | | | **CO4** |
|  | * **Inheritance:** Implement a simple inheritance example where a derived class extends the functionality of a base class. | | | **CO4** |
|  | * **Polymorphism:** Demonstrate method overriding in a parent-child class relationship. | | | **CO4** |
|  | **Assignment Based on Library:**   * Understand and Import Libraries and Hands-on it | | | **CO5** |
|  | * **Numpy:** Use NumPy for array manipulation   e.g., matrix operations, statistical calculations etc. | | | **CO5** |
|  | * **Pandas:** Analyze datasets using Pandas (e.g., CSV files) to perform data cleaning, exploration, and visualization with Matplotlib | | | **CO5** |
| **Total Hours (Lab)** | | | | **30** |
| **Total Hours(30+45)** | | | | **75** |
|  | | | |  |
| **Text Book:** | | | | |
| 1. Mark Lutz, *Learning Python*, 5th Edition, O'Reilly Media, 2019. 2. Eric Matthes, *Python Crash Course: A Hands-On, Project-Based Introduction to Programming*, No Starch Press, 2019. 3. Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and I Python, 3rd Edition, O'Reilly Media, 2022. | | | | |
| **Reference Book:** | | | | |
| 1. Paul Barry, Head First Python: A Brain-Friendly Guide, O'Reilly Media, 2016.. 2. Charles Severance, Python for Everybody: Exploring Data in Python 3, 2nd Edition, University of Michigan, 2016. 3. Al Sweigart, Automate the Boring Stuff with Python, 2nd Edition, No Starch Press, 2019. | | | | |
| **Web References:** | | | | |
| 1. [Python Tutorials – Real Python](https://realpython.com/) 2. [3.12.4 Documentation (python.org)](https://docs.python.org/3/) 3. [Python Tutorial | Learn Python Programming - GeeksforGeeks](https://www.geeksforgeeks.org/python-programming-language-tutorial/) | | | | |
| **Online Resources:** | | | | |
| 1. [Python for Everybody | Coursera](https://www.coursera.org/specializations/python?msockid=2f1b0f298bcd66d11dd71b998a6567ac) 2. [Python Courses & Tutorials | Codecademy](https://www.codecademy.com/catalog/language/python) 3. [Learn Python Tutorials | Kaggle](https://www.kaggle.com/learn/python) | | | | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **24UETAE101** | | | **Oral and Written Communication Skills** | **L/T/P/C** | |
| **1/0/2/2** | |
| **Nature of Course** | | | Practical | | |
| **Prerequisites** | | | Basic English | | |
| **Course Objectives:** | | | | | |
|  | To identify and list various reading techniques, types of formal correspondence, speaking strategies, listening exercises, and essential grammar and vocabulary components. | | | | |
|  | To summarize the importance of reading, writing, speaking, and listening skills and their applications in workplace scenarios. | | | | |
|  | To apply reading strategies for comprehension, write formal emails and reports, engage in professional conversations, and use listening skills to understand and respond to different audio materials. | | | | |
|  | To analyze case studies to identify effective communication strategies and areas for improvement in professional settings. | | | | |
|  | To evaluate their own and others' communication practices through role plays, writing assignments, and listening exercises, providing constructive feedback. | | | | |
| **Course Outcomes: Upon completion of the course, students shall have the ability to** | | | | | |
| CO1 | | **Understand** different reading techniques, types of formal correspondence, speaking strategies, listening exercises, and essential grammar and vocabulary components. | | | [U] |
| CO2 | | **Apply** reading strategies for comprehension, write formal emails and reports, engage in professional conversations, and use listening skills to understand and respond to different audio materials. | | | [AP] |
| CO3 | | **Analyze** case studies to identify effective communication strategies and areas for improvement in professional settings. | | | [A] |
| CO4 | | **Evaluate** their own and others' communication practices through role plays, writing assignments, and listening exercises, providing constructive feedback. | | | [AP] |
| CO5 | | **Create** well-structured resumes, job application letters, technical reports, and proposals, and design effective communication strategies for professional use. | | | [AP] |
| **CO-PO Mapping** | | | | | |
| Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs): | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **POS3** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CO1** | - | - | - | - | - | 1 | 1 | 1 | 2 | 3 | 1 | 2 | - | 2 | - |
| **CO2** | - | - | - | - | - | 1 | 1 | 1 | 2 | 3 | 1 | 3 | - | 2 | - |
| **CO3** | - | - | - | - | - | 1 | 1 | 1 | 2 | 3 | 1 | 2 | - | 2 | - |
| **CO4** | - | - | - | - | - | 1 | 1 | 1 | 2 | 3 | 1 | 2 | - | 2 | - |
| **CO5** | - | - | - | - | - | 1 | 1 | 1 | 2 | 3 | 1 | 3 | - | 2 | - |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Teaching-Learning & Assessment Scheme** | | | | | | | | | |
| **Learning Scheme** | | | **Credits** | **Assessment Scheme** | | | **Summative Assessment** | | **Total** |
| **Formative Assessment** | | | **End Semester Exam** | |
| **L** | **T** | **P** | **CIA-I** | **CIA-II** | **Continuous Practical Assessment (TW)** |
| 1 | 0 | 2 | 2 | 25 | 25 | 20 (100 scaled down to 20) | (30)  60 Scaled Down 30 | | 100 |
| **Course Contents** | | | | | | | | | |
| **UNIT I** | | **Advanced Reading and Comprehension (CO1)** | | | | | | **3hrs** | |
| **Reading Techniques:** Skimming, scanning, and cloze reading, **Technical Reading**: Understanding technical articles and reading for detailed comprehension, including emails, letters, and advertisements, D**ata Interpretation**: Interpreting charts and graphs, table completion  **Verbal Reasoning**: Comprehending reviews and instant messages, enhancing verbal reasoning skills.  **Case Study:** Analyzing the Impact of Skimming, Scanning, and Technical Reading. | | | | | | | | | |
| **UNIT II** | | **Professional Writing Skills (CO2)** | | | | | | **3hrs** | |
| **Formal Correspondence**: Crafting formal letters (sales, quotations, clarification, orders, complaints, invitations), and effective email communication. **Documentation**: Writing minutes of meetings, professional reports, and proposals, **Career Documents**: Developing resumes and job application letters.  **Case Study:** Enhancing Professional Communication | | | | | | | | | |
| **UNIT III** | | **Speaking Skills (CO3)** | | | | | | **3hrs** | |
| **Conversational Speaking:** Initiating, maintaining, and closing conversations**. Deciphering Pictures and Mind Maps:** Using pictures and mind maps as conversation starters; discussing and interpreting visual information. **Answering Questions:** Responding to questions based on situational contexts; focusing on clarity, coherence, and appropriateness of responses. **Interactive Speaking:** Pronunciation challenges, intonation, stress, and rhythm. **Role Plays and Extempore:** Engaging in role plays and extempore speaking; organizing thoughts quickly and speaking confidently.  **Case Study:** Improving Conversational and Interactive Speaking Skills. | | | | | | | | | |
| **UNIT IV** | | **Listening Skills (CO4)** | | | | | | **3hrs** | |
| **Situational Listening**: Listening to various situational recordings, focusing on understanding the context and main ideas. **Listening to Experiences**: Hearing personal stories and experiences, practicing summarizing and discussing the content. **Short Extracts**: Listening to short audio or video extracts, identifying key points and details. **Interviews and TV News**: Listening to interviews and TV news segments, practicing note-taking and extracting relevant information. **Interactive Listening**: Focusing on techniques such as summarizing, paraphrasing, and asking clarifying questions, practicing listening for specific details in different types of audio materials, engaging in tasks that require identifying key information.  **Case Study:** Enhancing Listening Skills in Customer Support | | | | | | | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **UNIT V** | **Integrative Grammar and Vocabulary Development (CO5)** | **3hrs** | |
| **Grammar Essentials**: Parts of speech, verbs, modals, tenses, sentence formation, homonyms, homographs, and homophones, **Vocabulary Building**: Error analysis, synonyms and antonyms, word formation, collocations, technical vocabulary, analogies, and business vocabulary, **Writing Techniques**: Note-making, précis writing, essay writing, technical report writing, memo writing, letter writing, and email writing, **Listening and Speaking**: Distinguishing native and Indian English, listening to TED talks, podcasts, and speeches by prominent figures, engaging in classroom activities, and telephonic enquiries.  **Case Study:** Boosting Grammar and Vocabulary Proficiency | | | |
| **Total Contact Hours:** | | **15hrs** | |
| **Sr. No.** | **List of Experiments** | | |
|  | Impact of Communication and Its Nuances | | **CO1** |
|  | Enhancing Technical Reading Skills Through Integrated Reading Techniques | | **CO1** |
|  | Comprehensive Language and Communication Skills Laboratory | | **CO1** |
|  | Case Study | | **CO2** |
|  | Crafting Formal Letters and Effective Email Communication | | **CO2** |
|  | Writing Minutes of Meetings, Professional Reports, and Proposals; Developing Resumes and Job Application Letters | | **CO2** |
|  | Initiating, Maintaining, and Closing Conversations; Deciphering Pictures and Mind Maps | | **CO3** |
|  | Case Study | | **CO3** |
|  | Answering Questions and Interactive Speaking along with Role Plays and Extempore Speaking | | **CO4** |
|  | Situational Listening and Listening to Experiences | | **CO4** |
|  | Interactive Listening Techniques | | **CO4** |
|  | Case Study | | **CO4** |
|  | Grammar Essentials | | **CO5** |
|  | Using Advanced Skills in Everyday Life | | **CO5** |
|  | Case Study | | **CO5** |
| **Text Book:** | | | |
| 1. Technical Communication: English Skills for Engineers by Meenakshi Raman and Sangeeta Sharma (2008), Oxford University Press 2. Communication Skills by Sanjay Kumar & Pushp Lata (2018), Oxford University Press 3. Creative English for Communication by N. Krishnaswamy and T. Sriraman (3rd Edition), Macmillan India Limited. 4. A Course in Technical English by Dr.Praveen Sam and K N Shoba (2020), Cambridge University Press. | | | |
| **Reference Book:** | | | |
| 1. Business Correspondence and Report Writing by RC Sharma and Krishna Mohan (2017), McGraw Hill Education 2. English Grammar, Composition and Usage by NK Aggarwal and FT Wood (4th Edition), Macmillan Publishers India 3. Business Communication by S.M. Rai and Urmila Rai (2015), Himalaya Publishing House 4. Longman English Grammar Practice for Intermediate Self Study Edition with Key by L.G. Alexander (2022), Longman | | | |
| **Web References:** | | | |
| 1. <http://www.academiccourses.com/Courses/English/Business-English> 2. <https://www.bbc.co.uk/learningenglish/basic-vocabulary> 3. <https://www.teachingenglish.org.uk/professional-development/teachers/knowing-subject/articles/using-intonation> 4. <https://www.thebalancemoney.com/cover-letters-6265516> | | | |
| **Online Resources:** | | | |
| 1. <https://www.coursera.org/specializations/business-english> 2. <https://www.businessenglishresources.com/learn-english-for-business/student-section/practice-exercises-new/> 3. <https://www.esl-lab.com/> 4. <https://breakingnewsenglish.com/> | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **24UETVS101** | | | | | **Design Thinking and Idea Lab** | | | | | | | | | | | **L/T/P/C** | | | |
| **0/0/4/2** | | | |
| **Nature of Course** | | | | | Practical | | | | | | | | | | | | | | |
| **Prerequisites** | | | | | Nil | | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | | | |
| 1. | | To Introduce students to the principles of Design Thinking and the importance of challenging existing patterns for innovative problem-solving. | | | | | | | | | | | | | | | | | |
| 2. | | To Foster teamwork, positive thinking, and self-reflection through interactive and creative activities. | | | | | | | | | | | | | | | | | |
| 3. | | To develop students' ability to visualize long-term goals, create user personas, and map user journeys for better understanding of user needs. | | | | | | | | | | | | | | | | | |
| 4. | | To equip students with practical skills in ideation methods, mobile application design, and patent application processes. | | | | | | | | | | | | | | | | | |
| 5. | | To prototype solutions using appropriate tools. | | | | | | | | | | | | | | | | | |
| **Course Outcomes: Upon completion of the course, students shall have the ability to** | | | | | | | | | | | | | | | | | | | |
| C01 | | **Demonstrate** an understanding of Design Thinking principles and the ability  to identify and break existing patterns to develop innovative solutions. | | | | | | | | | | | | | | [AP] | | | |
| C02 | | **Exhibit** improved teamwork, positivity, and self-awareness through  participation in various activities designed to enhance these skills. | | | | | | | | | | | | | | [AP] | | | |
| C03 | | **Create** detailed user personas, empathy maps, and journey maps to inform  design decisions and improve user experiences. | | | | | | | | | | | | | | [AP] | | | |
| C04 | | **Apply** ideation techniques, design mobile applications using MIT App  Inventor, and understand the process of designing and applying for patents. | | | | | | | | | | | | | | [A] | | | |
| C05 | | **Propose** prototype solutions using appropriate tools. | | | | | | | | | | | | | | [A] | | | |
| **CO-PO Mapping** | | | | | | | | | | | | | | | | | | | |
| Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs): | | | | | | | | | | | | | | | | | | | |
|  | **PO1** | **PO2** | **PO3** | **PO** | | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | | **PO11** | **PO12** | **PSO1** | | **PSO2** | | **POS3** |
| **CO1** | 2 | 3 | -- | 2 | | 1 | 1 | 2 | 2 | 3 | 1 | | 1 | 2 | -- | | 1 | | 1 |
| **CO2** | 1 | -- | 2 | 2 | | 2 | 1 | 1 | 3 | 3 | 1 | | 1 | 3 | 2 | | 1 | | 1 |
| **CO3** | 1 | 3 | 1 | 3 | | 3 | 2 | 3 | 1 | 1 | 2 | | 1 | 3 | 2 | | -- | | -- |
| **CO4** | 2 | 2 | 3 | 3 | | 3 | 1 | 1 | 1 | 1 | 1 | | 3 | 3 | 3 | | 3 | | 3 |
| **CO5** | 3 | 1 | 3 | 3 | | 3 | 1 | 1 | 1 | 1 | 3 | | 3 | 3 | 3 | | 1 | | 2 |
| **Teaching -Learning & Assessment Scheme** | | | | | | | | | | | | | | | | | | | |
| **Learning Scheme** | | | **Credits** | | **Assessment Scheme** | | | | | | | **Summative Assessment** | | | | | | **Total**  (scaled up to 50 M) | |
| **Formative Assessment** | | | | | | | **End Semester Exam** | | | | | |
| **L** | **T** | **P** | **CIA-I**  **Evaluation-I** | | **CIA-II**  **Evaluation-II** | | **Model PR Exam** | | |
| 0 | 0 |  | 4 | | 25 Marks | | 25 Marks | | 20 Marks | | | 30 Marks | | | | | | 50 Marks | |
| **Course Contents** | | | | | | | | | | | | | | | | | | | |
| **Pr. No** | | **Title of experiment** | | | | | | | | | | | | | | **60 hrs** | | | |
| 1 | | Introduction of Design thinking and break the pattern activity. | | | | | | | | | | | | | | CO1 | | | |
| 2 | | Persona Identification: Creating personas of end-user to help in understanding the needs, goals, and pain points of the users. | | | | | | | | | | | | | | CO2, CO3 | | | |
| 3 | | Empathy map: mapping out what users say, think, feel, and do to gain deeper insights into their experiences. | | | | | | | | | | | | | | CO2, C03 | | | |
| 4 | | Affinity mapping: organize and categorize data and insights collected during the empathize stage into meaningful patterns.  **Pattern and Antipattern Identification: I**dentifying patterns and antipatterns helps in defining the problem by understanding common challenges and behaviours. | | | | | | | | | | | | | | CO1, CO2 | | | |
| 5 | | **Theory of Prioritization (Impact of AI)**  Prioritizing problems or features based on their impact, helping to define the key areas to focus on. | | | | | | | | | | | | | | CO1, CO2 | | | |
| 6 | | Visualization: Draw a poster to visualize ourselves in the next 4 year. Helps to implement the vision and goals set during the design thinking process. | | | | | | | | | | | | | | CO2, CO3 | | | |
| 7 | | Brainstorming: Generating a large number of ideas without judgment or criticism.  **Be Positive (Write 20 Positive words impacting your life)** | | | | | | | | | | | | | | CO2, CO3 | | | |
| 8 | | **Ideation Methods- Mind Map, SCAMPER, SIT**  - Using these ideation methods to brainstorm and generate a wide range of ideas. | | | | | | | | | | | | | | CO2, CO3 | | | |
| 9 | | **Brainstorming and 3 Box Method**  - Facilitating brainstorming sessions and using the 3 Box Method to organize and evaluate ideas. | | | | | | | | | | | | | | CO2, CO3 | | | |
| 10 | | **Design a Mobile Application using MIT App Inventor**  - Creating a prototype of a mobile application to test and iterate on the ideas generated. | | | | | | | | | | | | | | CO4, CO5 | | | |
| 11 | | **Journey Map**  - Mapping out the user’s journey to identify touchpoints and test how the solution fits into the user’s life. | | | | | | | | | | | | | | CO4, CO5 | | | |
| 12 | | **Design Patent Application**  - Working on a patent application can be seen as creating a prototype for protecting the innovative aspects of the idea. | | | | | | | | | | | | | | CO4, CO5 | | | |
| 13 | | **Toss the Goal (Balloon Activity)**  - A fun, engaging activity that can symbolize the launch and implementation phase, encouraging active participation and teamwork. | | | | | | | | | | | | | | CO4 | | | |
| 14 | | **Design an Autobiography**  - This activity can be used to test how well the designed solution aligns with the user's journey and goals. | | | | | | | | | | | | | | CO5 | | | |
| **Total Contact Hours:** | | | | | | | | | | | | | | | | **60hrs** | | | |
| **Text Book:** | | | | | | | | | | | | | | | | | | | |
| 1. Brown, Tim, “Change by Design: How Design Thinking Creates New Alternatives for Business and Society”, 1st Edition, Harper Business. 2. Liedtka, Jeanne, and Tim Ogilvie, “Designing for Growth: A Design Thinking Tool Kit for Managers”, 1st edition, Columbia Business School Publishing. 3. Kelley, Tom, and David Kelley, “Creative Confidence: Unleashing the Creative Potential Within Us All”, 1st edition, Crown Business | | | | | | | | | | | | | | | | | | | |
| **Reference Book:** | | | | | | | | | | | | | | | | | | | |
| 1. Martin, Roger L., “The Design of Business: Why Design Thinking is the Next Competitive Advantage”, 1st edition, Harvard Business Review Press. | | | | | | | | | | | | | | | | | | | |
| **Web References:** | | | | | | | | | | | | | | | | | | | |
| 1. [https://dschool.stanford.edu/resources/design-thinking-bootleg](https://dschool.stanford.edu/resources/design-thinking-bootleg%20) 2. <https://www.ideou.com/> | | | | | | | | | | | | | | | | | | | |
| **Online Resources:** | | | | | | | | | | | | | | | | | | | |
| 1. [https://www.coursera.org/courses?query=design%20thinking](https://www.coursera.org/courses?query=design%20thinking%20) | | | | | | | | | | | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **24UETBS103** | | | | | **Applied Science Lab** | | | | | | | | | | | | | **L/T/P/C** | | | |
| **0/0/4/2** | | | |
| **Nature of Course** | | | | | Practical | | | | | | | | | | | | | | | | |
| **Prerequisites** | | | | | Higher Secondary Basic Science | | | | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | | | | | |
| 1. | | To make the students gain practical knowledge to correlate with theoretical studies. | | | | | | | | | | | | | | | | | | | |
| 2. | | To achieve perfectness in experimental skills and to bring more confidence and ability in developing and fabricating engineering and technical equipment. | | | | | | | | | | | | | | | | | | | |
| 3. | | To apply ethical principles and to commit to professional ethics and responsibilities. | | | | | | | | | | | | | | | | | | | |
| 4. | | To develop communication skills and to discuss the basic principles of Engineering Physics and Chemistry in a group. | | | | | | | | | | | | | | | | | | | |
| 5. | | To function effectively as an individual and a team member. | | | | | | | | | | | | | | | | | | | |
| **Course Outcomes: Upon completion of the course, students shall have the ability to** | | | | | | | | | | | | | | | | | | | | | |
| CO1 | | **Utilize** working knowledge of fundamental Physics and basic electrical and or mechanical engineering principles to evaluate . | | | | | | | | | | | | | | | | [AP] | | | |
| CO2 | | **Utilize** working knowledge of fundamental Chemistry in engineering applications and technology. | | | | | | | | | | | | | | | | [AP] | | | |
| CO3 | | **Perform** experiments skill fully, record the data with more precision, interpret results and communicate effectively. | | | | | | | | | | | | | | | | [AP] | | | |
| CO4 | | **Report** the experimental work in stipulated time by following ethical principles. | | | | | | | | | | | | | | | | [AP] | | | |
| **CO-PO Mapping** | | | | | | | | | | | | | | | | | | | | | |
| Mapping of Course Outcomes to Program Outcomes (POs) & Program Specific Outcomes (PSOs): | | | | | | | | | | | | | | | | | | | | | |
|  | **PO1** | **PO2** | **PO3** | **PO** | | **PO5** | | **PO6** | **PO7** | | **PO8** | **PO9** | **PO10** | | **PO11** | **PO12** | **PSO1** | | **PSO2** | | **POS3** |
| **CO1** | 3 | 2 | - | - | | - | | - | - | | 1 | 3 | 2 | | - | - | - | | - | | - |
| **CO2** | 3 | 2 | - | - | | - | | - | - | | 1 | 3 | 2 | | - | - | - | | - | | - |
| **CO3** | 3 | - | - | 2 | | 1 | | - | - | | 2 | 3 | 3 | | - | 2 | - | | - | | - |
| **CO4** | - | - | 2 | - | | - | | - | - | | 1 | 3 | 2 | | 2 | 1 | - | | - | | - |
| **Teaching -Learning & Assessment Scheme** | | | | | | | | | | | | | | | | | | | | | |
| **Learning Scheme** | | | **Credits** | | **Assessment Scheme** | | | | | | | | | **Summative Assessment** | | | | | | **Total** | |
| **Formative Assessment** | | | | | | | | | **End Semester Exam** | | | | | |
| **L** | **T** | **P** | **CIA-I** | | **CIA-II** | | | **Continuous Practical Assessment** | | | |
| 0 | 0 | 4 | 2 | | 25 Marks | | 25Marks | | | 20 Marks  (100 Scaled Down 20 Marks) | | | | 30 Marks  (60 Scaled Down 30 M) | | | | | | 100 Marks | |

|  |  |  |
| --- | --- | --- |
| **Course Contents** | | |
| **Pr. No** | **Title of experiment** | **CO** |
| 1. | To determine Energy Band Gap (Forbidden Band Gap ) of  Semiconductor. | CO1, CO3 CO4 |
| 2. | To study Hall effect and determine Hall coefficient | CO1, CO3, CO4 |
| 3. | To determine No of lines/cm of grating using LASER | CO1, CO3, CO4 |
| 4. | To study effect of intensity of light on stopping potential(Virtual Lab) | CO1, CO3, CO4 |
| 5. | Solar cell characteristics | CO1, CO3, CO4 |
| 6. | To Measure Numerical aperture and attenuation constant of optical  Fibre | CO1, CO3, CO4 |
| 7. | Determination of hardness of water | CO2, CO3, CO4 |
| 8. | Determination of alkalinity in water | CO2, CO3, CO4 |
| 9. | Determination of pH in water sample | CO2, CO3, CO4 |
| 10. | Determination of TS, TDS and TSS in water Sample(Virtual Lab) | CO2, CO3, CO4 |
| 11. | Determination of chloride in water | CO2, CO3, CO4 |
| 12. | Determination of biological oxygen demand | CO2, CO3, CO4 |
| **Total Contact Hours:** | | **60hrs** |
| **Text Book:** | | |
| 1. A Textbook of Engineering Physics, M N Avadhanulu, S Chand & Company Pvt. Ltd., (2014), ISBN: 978-8-121-90817-7 2. R.K.Gaur and S.L.Gupta, Engineering Physics. Dhanpat Rai and Sons Publications, (2012). 3. Engineering Chemistry: Fundamentals and Applications, Shikha Agarwal, Cambridge University Press, (2016) ISBN: 978-1-107-47641-7 4. Dr. S.S.Daraand Dr. S.S.Umare, "A Text book of Engineering Chemistry,"12th ed. S. Chand Publication, (2010). ISBN:978-81-219-0359-9 | | |
| **Reference Book:** | | |
| 1. Lasers and Non Linear Optics, B B Loud, New age international, (2011) edition. ISBN:978-8-122-40324-4 2. Concepts of Modern Physics, Aurthur Beiser, McGrawhill, 6th Edition, (2009), ISBN:978-0-071-00144-1 3. Engineering Chemistry, K. Sesha Maheswaramma, Mridula Chugh, Pearson Education India, (2015), ISBN:978-8-131-77451-9 4. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, (2012), ISBN-13. 978-9380016757. | | |
| **Web References:** | | |
| 1. NPTEL Quantum Computing : <https://archive.nptel.ac.in/courses/115/101/115101092> 2. Physics Simulation : <https://phet.colorado.edu/sims/html/plinko-probability/latest/plinko-probability_en.html> 3. NPTEL Nanotechnology Science and Applications <https://onlinecourses.nptel.ac.in/noc24_mm29/preview> 4. NPTEL Water and waste water treatment <https://onlinecourses.nptel.ac.in/noc23_ce12/preview> 5. NPTEL Electronic waste management <https://onlinecourses.nptel.ac.in/noc21_ce03/preview> 6. <https://ocw.mit.edu> | | |
| **Online Resources:** | | |
| 1. Virtual LAB : https://virtuallabs.merlot.org/vl\_physics.html 2. Modelling & Simulation: https://cloud.scilab.in/ | | |