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| **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** |

**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**

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| **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** |

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| **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:** | | | **33** | **22** | |

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| **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 |
| 24UETVE201 | 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 IV** | | | | | | |
| **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** | |

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| **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 Hrs:** | | | **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** | |

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| **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** | | | | | | | **29** | | | **16** | | | | |

**SEMESTER-III**

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| **24UADOE201** | | | | | **Renewable Energy Systems** | | | | | | | | | | | | | **L/T/P/C** | | | |
| **3/0/0/2** | | | |
| **Nature of Course** | | | | | Theory | | | | | | | | | | | | | | | | |
| **Prerequisites** | | | | | Physics | | | | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | | | | | |
| 1. | | To explore and analyze the principles of energy, its various forms, and the current and future energy landscape, with a focus on the Indian energy scenario across different sectors and the potential of renewable energy sources. | | | | | | | | | | | | | | | | | | | |
| 2. | | To understand the role of energy and technology in achieving the Sustainable Development Goals | | | | | | | | | | | | | | | | | | | |
| 3. | | To explore the fundamentals of solar and wind energy conversion | | | | | | | | | | | | | | | | | | | |
| 4. | | To understand the principles, environmental impacts, and contributions of renewable technologies to rural development | | | | | | | | | | | | | | | | | | | |
| 5. | | To explore smart grid architecture, the role of ICT, energy management, and cybersecurity | | | | | | | | | | | | | | | | | | | |
| **Course Outcomes: Upon completion of the course, students shall have the ability to** | | | | | | | | | | | | | | | | | | | | | |
| CO1 | | Identify the potential of different renewable energy sources in India, considering geographical, climatic, and technological factors. | | | | | | | | | | | | | | | | [AP] | | | |
| CO2 | | Analyze the interconnections between different SDGs and the challenges in achieving them simultaneously. | | | | | | | | | | | | | | | | [A] | | | |
| CO3 | | Explain the fundamental principles, key components of solar and wind energy conversion and supporting the achievement of Sustainable Development Goals | | | | | | | | | | | | | | | | [U] | | | |
| CO4 | | Analyze the environmental and social considerations associated with various renewable systems, including their impact on ecosystems, communities, and sustainable resource management. | | | | | | | | | | | | | | | | [A] | | | |
| CO5 | | Analyze the critical role of Information and Communication Technology (ICT) in the operation, real-time monitoring, control, and automation. | | | | | | | | | | | | | | | | [A] | | | |
| **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** | 1 | **-** | 1 | **-** | | 1 | | **-** | 3 | | **-** | **-** | 3 | | **-** | 3 | 1 | | **-** | | **-** |
| **CO2** | 1 | **1** | 1 | 1 | | 1 | | 2 | 3 | | **-** | 3 | 3 | | **-** | 3 | 1 | | **-** | | **-** |
| **CO3** | 1 | 1 | 1 | 1 | | **-** | | **-** | 3 | | **-** | **-** | 3 | | **-** | 3 | 1 | | **-** | | **-** |
| **CO4** | 1 | 1 | 1 | 1 | | **-** | | **-** | 3 | | **-** | **-** | 3 | | **-** | 3 | 1 | | **-** | | **-** |
| **CO5** | 1 | 2 | 2 | 1 | | 1 | | 2 | 3 | | **-** | **-** | 3 | | **-** | 3 | 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** | | | **Model PR Exam** | | | |
| 3 | 0 | 0 | 3 | | 25 | | 25 | | | 20  (100 Scaled Down to 20) | | | | 30  (60 Scaled Down 30) | | | | | | 100 | |
| **Course Contents** | | | | | | | | | | | | | | | | | | | | | |
| **UNIT I** | | **Renewable Energy** | | | | | | | | | | | | | | | | **9 hrs.** | | | |
| Energy in the Universe, Energy on Earth, Renewable Energy, SI Metric System, Measuring Energy, Energy Thermodynamics, Measuring Electricity, Generating Electricity, Electricity Transmission.  Indian energy scenario in various sectors–domestic, industrial, commercial, agriculture, transportation and others – Present conventional energy status – Present renewable energy status-Potential of various renewable energy sources-Global energy status-Per capita energy consumption –Future energy plans | | | | | | | | | | | | | | | | | | | | | |
| **UNIT II** | | **Sustainable Development Goals (SDGs)** | | | | | | | | | | | | | | | | **9 hrs.** | | | |
| Introduction to the Sustainable Development Goals (SDGs) - Overview of the 17 SDGs, The role of energy in achieving SDGs, Smart grids and renewable energy contribute to SDGs, Detailed study of SDG 7, Case studies on achieving SDG 7 and SDG 13 through technology. | | | | | | | | | | | | | | | | | | | | | |
| **UNIT III** | | **Solar Energy and Wind Energy** | | | | | | | | | | | | | | | | **9 hrs.** | | | |
| Fundamentals of solar and wind energy conversion, Solar Energy - Solar Radiation , PV Cell Design, From PV Cells to Power Plants, PV Applications, PV Planning and Economics, Wind Energy- Wind Characteristics, Wind Power ,Wind Site Evaluation, Offshore Wind ,Wind Turbine Design, Wind Turbine Components. The role of solar and wind energy in reducing carbon emissions and supporting SDGs, Case studies on successful solar and wind energy projects. | | | | | | | | | | | | | | | | | | | | | |
| **UNIT IV** | | **Hydropower, Biomass Energy Systems, Geothermal Energy, and Emerging Technologies** | | | | | | | | | | | | | | | | **9 hrs.** | | | |
| Basic principles of hydropower and biomass energy, Environmental and social considerations in hydropower and biomass projects, Contributions of hydropower and biomass to rural development and energy access.  Introduction to geothermal energy and its applications, Overview of emerging renewable technologies: tidal, wave, and hydrogen energy, Potential of emerging technologies to contribute to future SDG targets | | | | | | | | | | | | | | | | | | | | | |
| **UNIT V** | | **Smart Grid Technologies** | | | | | | | | | | | | | | | | **9 hrs.** | | | |
| Smart grid architecture and components, Role of ICT in smart grids, Key challenges in smart grid implementation, Energy management systems (EMS), Monitoring and control of renewable energy systems, Cybersecurity in smart grids, Data management and analytics in smart grids, Exploration of how digital technologies and data science can support sustainable energy transitions. | | | | | | | | | | | | | | | | | | | | | |
| **Total Contact Hours:** | | | | | | | | | | | | | | | | | | **45 hrs.** | | | |
| **Text Book:** | | | | | | | | | | | | | | | | | | | | | |
| 1. Stephen Peake, “Renewable Energy: Power for a Sustainable Future”, OUP Oxford 4th edition, 2017, ISBN: 978-0198759751. 2. Robert Ehrlich., “Renewable Energy: A First Course", CRC Press, 3rd Edition, 2022, ISBN: 9780198759751 3. David JC MacKay , "Sustainable Energy - Without the Hot Air” , UIT Cambridge LTD, 2009, ISBN: 9780954452933 4. Bernd M. Buchholz, Zbigniew Styczynski, "Smart Grids: Fundamentals and Technologies in Electricity Networks", Springer Nature, 2014, ISBN:978-3642451195 | | | | | | | | | | | | | | | | | | | | | |

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| **Reference Book:** |
| 1. Tiwari.G.N, “Solar Energy–Fundamentals Design, Modelling and applications”, Alpha Science Intl Ltd, 2015, ISBN: 978-1680831962 2. Mehmet Kanoglu “Fundamentals and Applications of Renewable Energy”, Indian edition McGraw Hill Publication, First edition, 2020, ISBN: 978-9390385638 3. Twidell,J.W.&WeirA.,“Renewable Energy Resources”, EFN Spon Ltd., UK, 2015, ISBN: 9789352607112 4. Jefferson W. Tester, Elisabeth M. Drake, and Michael J. Driscoll, “Sustainable Energy: Choosing Among Options", MIT press, 2012, ISBN: 978-0262017473 |
| **Web References:** |
| 1. https://onlinecourses.nptel.ac.in/noc22\_ch27/preview 2. https://nptel.ac.in/courses/103103206 3. https://onlinecourses.nptel.ac.in/noc22\_hs61/preview |
| **Online Resources:** |
| 1. https://www.youtube.com/playlist?list=PLwdnzlV3ogoXUifhvYB65lLJCZ74o\_fAk 2. https://www.youtube.com/watch?v=UW4HYJ36q0Y 3. https://www.youtube.com/watch?v=GExTwRNkQBg |

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| **24UADMD201** | | | | | **ENGINEERING ECONOMICS ANALYSIS** | | | | | | | | | | | | | **L/T/P/C** | | | |
| **2/0/0/2** | | | |
| **Nature of Course** | | | | | Theory | | | | | | | | | | | | | | | | |
| **Prerequisites** | | | | | Nil | | | | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | | | | | |
| 1. | | To understand the basic concepts and principles of engineering economics. | | | | | | | | | | | | | | | | | | | |
| 2. | | To apply economic analysis techniques to evaluate the financial viability of engineering projects. | | | | | | | | | | | | | | | | | | | |
| 3. | | To learn cost estimation and control methods in engineering. | | | | | | | | | | | | | | | | | | | |
| 4. | | To develop skills in economic decision-making and investment analysis. | | | | | | | | | | | | | | | | | | | |
| 5. | | To understand the basic concepts and principles of engineering economics. | | | | | | | | | | | | | | | | | | | |
| **Course Outcomes: Upon completion of the course, students shall have the ability to** | | | | | | | | | | | | | | | | | | | | | |
| CO1 | | **Recognize** the importance of engineering economics from a strategic perspective | | | | | | | | | | | | | | | | [U] | | | |
| CO2 | | **Understand** and **apply** the principles of engineering economics in decision-making. | | | | | | | | | | | | | | | | [U] | | | |
| CO3 | | **Apply** the various techniques in engineering economics decisions making | | | | | | | | | | | | | | | | [U] | | | |
| CO4 | | **Analyze** and understand the advancements in Engineering Economics | | | | | | | | | | | | | | | | [AP] | | | |
| CO5 | | **Evaluate** and select projects based on economic feasibility | | | | | | | | | | | | | | | | [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** | 1 | 2 | 3 | - | | 2 | | 1 | 2 | | 2 | 3 | - | | 1 | 3 | 2 | | 3 | | - |
| **CO2** | 1 | 1 | 2 | 2 | | - | | - | 2 | | - | 2 | - | | 1 | 2 | 1 | | 2 | | 2 |
| **CO3** | 1 | 1 | 1 | 2 | | 1 | | 1 | - | | 3 | 2 | 2 | | 2 | - | 1 | | - | | 1 |
| **CO4** | 2 | - | 3 | 1 | | - | | 2 | 1 | | 2 | - | 1 | | 2 | 1 | 2 | | - | | 2 |
| **CO5** | 1 | 1 | 1 | 2 | | 1 | | 1 | 1 | | 3 | 2 | 1 | | 1 | 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** | | | **Capstone Model Assessment** | | | |
| 2 | 0 | 0 | 2 | | 10 | | 10 | | | 10 | | | | 20  (100 Scaled Down to 20) | | | | | | 50 | |
| **Course Contents** | | | | | | | | | | | | | | | | | | | | | |
| **UNIT I** | | **Introduction to Engineering Economics** | | | | | | | | | | | | | | | | **6 hrs.** | | | |
| Basic Economic Concepts -scope of engineering economics -Microeconomics vs. macroeconomics  Demand and supply analysis -time value of money -present worth and future worth - annuities, perpetuities, and gradients - interest formulas and their applications - economic equivalence -  concept of equivalence - nominal vs. effective interest rates -equivalence calculations for single cash flows and series of cash flows. | | | | | | | | | | | | | | | | | | | | | |

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| **Activities;** Choose a product or service and describe its market. Illustrate the demand and supply curves, and identify equilibrium price and quantity | | |
| **UNIT II** | **Cost Analysis and Estimation** | **6 hrs.** |
| Cost concepts and break-even analysis - fixed, variable, and total costs - cost-volume-profit analysis  break-even analysis and its applications -cost estimation techniques - types of cost estimates  cost indices and their use in estimating - learning curve theory and its applications - Life-Cycle Costing - significance of life-cycle costing - phases of the life cycle and associated costs - Methods to minimize life-cycle costs  **Activities**; Calculate the future value of an investment of different values for different period at an annual interest rate. | | |
| **UNIT III** | **Financial Analysis and Investment Decisions** | **6 hrs.** |
| Cash Flow Analysis - cash flow diagrams- developing cash flow statements- evaluating project cash flows- investment evaluation techniques - Net Present Value (NPV) -Internal Rate of Return (IRR) -Benefit-Cost Ratio (BCR) -Payback period -risk and Uncertainty in Economic Analysis -  Sensitivity analysis -Scenario analysis - Decision trees and expected monetary value.  **Activities;** Develop a cash flow statement for the project. | | |
| **UNIT IV** | **Depreciation and Taxation** | **6 hrs.** |
| Depreciation Methods - straight-line method - declining balance method -sum-of-the-years’-digits method-units of production method - after-tax economic analysis - taxation principles relevant to engineering economics - after-tax cash flows -depreciation and tax shields - replacement analysis  economic life of an asset-replacement versus retention decisions - evaluation of replacement alternatives  **Activities;** Compare the results and discuss which method provides the highest initial depreciation. | | |
| **UNIT V** | **Capital Budgeting and Project Feasibility** | **6 hrs.** |
| Capital budgeting process - steps in the capital budgeting process - identifying and evaluating investment opportunities - capital rationing - project feasibility studies - market analysis -technical feasibility - financial feasibility - environmental and social impact analysis - real-world engineering economic case studies - group projects and presentations - review and course summary  **Activities;** Identify a potential investment opportunity (e.g., launching a new product line). Outline the steps you would take in the capital budgeting process to evaluate this opportunity. | | |
| **Total Contact Hours:** | | **30 hrs.** |
| **Text Book:** | | |
| 1. Engineering Economic Analysis" by Donald G. Newnan, Jerome P. Lavelle, and Ted G. Eschenbach 2. Principles of Engineering Economic Analysis" by John A. White, Kenneth E. Case, and David B. Pratt. 3. Fundamentals of Engineering Economics" by Chan S. Park 4. Corporate Finance: Theory and Practice" by Aswath Damodaran, Wiley Series in Finance India, 2nd Edition, 2007. | | |
| **Reference Book:** | | |
| 1. Managerial Economics – concepts and cases”, V.L.Mote, Samuel Paul and G.S.Gupta, 2. Managerial Economics”, Yogesh Maheshwari, Fourth edition, PHI 2021. 3. Mechanical Estimating and Costing”, T.R.Banga and S.C.Sharma, 16th Edition, Khanna   Publishers, 2012. | | |

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| **Web References:** |
| 1. <https://online.stanford.edu/courses/cee146s-engineering-economics-and-sustainability> 2. <https://www.udemy.com/course/fundamentals-of-engineering-economics/?couponCode=OF52424> 3. <https://nptel.ac.in/courses/112107209> 4. https://www.unb.ca/cel/credit/online-courses/open-entry-courses/econ1073.html 5. https://pdhonline.com/courses/p107/p107\_new.htm |
| **Online Resources:** |
| 1. <https://tutorbin.com/subject/engineering-economics-homework-help> 2. <https://www.hzu.edu.in/engineering/engineering%20economy.pdf> 3. [https://learninglink.oup.com/access/newnan14e-student-resources#tag\_all-chapters](https://learninglink.oup.com/access/newnan14e-student-resources" \l "tag_all-chapters) 4. https://www.pearson.com/en-ca/higher-education/campaigns/mylab-engineering-with-pearson-etext.html https://www.wiley.com/en-us/network/education/instructors/teaching-strategies/implementing-an-engineering-economics-course-online-2 |

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| **24UADAE201** | | | | | **DevOps and Cloud** | | | | | | | | | | | | | **L/T/P/C** | | | |
| **2/0/2/2** | | | |
| **Nature of Course** | | | | | Theory and Programming | | | | | | | | | | | | | | | | |
| **Prerequisites** | | | | | Basic understanding of problem-solving methods, software development, and project management. | | | | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | | | | | |
| 1. | | To introduce the principles of Design Thinking, Agile Methodology, and DevOps. | | | | | | | | | | | | | | | | | | | |
| 2. | | To understand how these methodologies interact and complement each other in product development and software delivery. | | | | | | | | | | | | | | | | | | | |
| 3. | | To provide hands-on experience in applying Design Thinking, Agile, and DevOps practices. | | | | | | | | | | | | | | | | | | | |
| 4. | | To explore real-world applications of these methodologies in modern industry. | | | | | | | | | | | | | | | | | | | |
| 5. | | To enable students to work in cross-functional teams and apply iterative development practices effectively. | | | | | | | | | | | | | | | | | | | |
| **Course Outcomes: Upon completion of the course, students shall have the ability to** | | | | | | | | | | | | | | | | | | | | | |
| CO1 | | Understand the core principles of Design Thinking, Agile, and DevOps. | | | | | | | | | | | | | | | | [AP] | | | |
| CO2 | | Apply Agile methodologies and Scrum practices in real-world projects. | | | | | | | | | | | | | | | | [AP] | | | |
| CO3 | | Implement DevOps tools and CI/CD pipelines. | | | | | | | | | | | | | | | | [AP] | | | |
| CO4 | | Utilize Design Thinking for user-centered product development. | | | | | | | | | | | | | | | | [AP] | | | |
| CO5 | | Demonstrate collaboration in diverse, empowered teams using these methodologies. | | | | | | | | | | | | | | | | [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 | 3 | 2 | 1 | | - | | - | 2 | | - | - | 2 | | 1 | 3 | 3 | | 2 | | 2 |
| **CO2** | 3 | 2 | 3 | 2 | | 2 | | - | 3 | | 2 | 3 | 2 | | 2 | 2 | 3 | | 3 | | 3 |
| **CO3** | 3 | 3 | 3 | 2 | | 3 | | - | 3 | | - | - | 3 | | 2 | 2 | 3 | | 3 | | 3 |
| **CO4** | 3 | 3 | 2 | 1 | | 2 | | 1 | 2 | | 1 | 1 | 1 | | 2 | 3 | 3 | | 2 | | 2 |
| **CO5** | 2 | 3 | 2 | 2 | | 2 | | 1 | 3 | | 2 | 3 | 3 | | 2 | 3 | 3 | | 2 | | 3 |
| **Teaching -Learning & Assessment Scheme** | | | | | | | | | | | | | | | | | | | | | |
| **Learning Scheme** | | | **Credits** | | **Assessment Scheme** | | | | | | | | | **Summative Assessment** | | | | | | **Total** | |
| **Formative Assessment** | | | | | | | | | **End Semester Exam** | | | | | |
| **L** | **T** | **P** | **CIA-I** | | **CIA-II** | | | **Model PR Exam** | | | |
| 2 | 0 | 2 | 3 | | 25 | | 25 | | | 20  (100 Scaled Down to 20) | | | | 30  (60 Scaled Down 30) | | | | | | 100 | |
| **Course Contents** | | | | | | | | | | | | | | | | | | | | | |
| **UNIT I** | | **Design Thinking** | | | | | | | | | | | | | | | | **9 hrs.** | | | |
| **Introduction to Design Thinking:** What is Design Thinking, History and Evolution of Design Thinking, Why Design Thinking is important in problem-solving.  **IBM Design Thinking (IBM DS):** Introduction to IBM Design Thinking, Core principles: Focus on user outcomes, Restless reinvention, Diverse empowered teams What are Personas? Importance and creation.  **The IBM Loop:** The Observe, Reflect, and Make process, Application of the IBM Loop in iterative design.  **Hands-on Exercise:** Identify and create personas for a user-centric project, Apply the IBM Loop in solving a design problem. | | | | | | | | | | | | | | | | | | | | | |
| **UNIT II** | | **Agile Methodologies** | | | | | | | | | | | | | | | | **9 hrs.** | | | |
| **What is Agile?** Agile Manifesto and its guiding principles, Agile vs Waterfall: Key differences.  **Agile Frameworks:** Overview of Scrum, Kanban, XP, and Lean, Advantages and Disadvantages of Agile.  **Scrum in Practice**: Scrum Pillars and Roles (Scrum Master, Product Owner, Development Team), Scrum Artifacts (Product Backlog, Sprint Backlog, Burndown Chart), Scrum Ceremonies (Sprint Planning, Daily Scrum, Sprint Review, Sprint Retrospective).  **Scaling Agile**: LeSS, SAFe, Scrum@Scale  **Hands-on Exercise:** Create a Scrum project with sprint planning and backlog management, Compare Agile frameworks for a specific use case. | | | | | | | | | | | | | | | | | | | | | |
| **UNIT III** | | **Introduction to DevOps** | | | | | | | | | | | | | | | | **9 hrs.** | | | |
| **What is DevOps?** Understanding the business need for DevOps, DevOps vs Traditional IT and Agile, Core DevOps Principles and Lifecycle.  **Continuous Integration & Delivery (CI/CD):** Introduction to CI/CD pipeline, Tools for CI/CD: Git, Maven, Jenkins, Docker, Kubernetes (MiniKube).  **Hands-on Exercise:** Set up version control with Git, Build a simple CI/CD pipeline using Jenkins and Docker. | | | | | | | | | | | | | | | | | | | | | |
| **UNIT IV** | | **Infrastructure Automation with Ansible and Terraform** | | | | | | | | | | | | | | | | **9 hrs.** | | | |
| **Ansible Basics:** Installation, Playbooks, Inventory Management, Writing Ansible roles, managing variables and templates.  **Terraform Basics:** Infrastructure as Code (IaC) with Terraform, Managing Infrastructure using Terraform Configuration Files (.tf)  **Hands-on Exercise:** Write Ansible playbooks to automate a server setup, Use Terraform to deploy infrastructure to the cloud. | | | | | | | | | | | | | | | | | | | | | |
| **UNIT V** | | **Advanced DevOps Concepts and Future Trends** | | | | | | | | | | | | | | | | **9 hrs.** | | | |
| **Introduction to IBM Cloud and DevOps Toolchains:** IBM Cloud Continuous Delivery, Toolchains in IBM Cloud.  **GitOps and DevSecOps**: Introduction to GitOps principles, GitOps vs DevOps: Key differences, DevSecOps: Integrating security into DevOps.  **Hands-on Exercise:** Implement GitOps principles in a cloud environment, Set up a DevSecOps pipeline using IBM Cloud tools. | | | | | | | | | | | | | | | | | | | | | |
| **Total Contact Hours:** | | | | | | | | | | | | | | | | | | **45 hrs.** | | | |

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| **Lab Component** | | |
| **S.No.** | **Lab Exercise** | |
| 1. | Identify user needs and create personas for a food delivery app using Miro. | |
| 2. | Generate innovative ideas for user problems using brainstorming techniques on Miro. | |
| 3. | Design a low-fidelity clickable prototype of a product interface using Figma. | |
| 4. | Collect user feedback and iterate on the prototype design using Figma. | |
| 5. | Apply the IBM Loop to solve a delivery delay problem using Miro. | |
| 6. | Set up a Scrum project, manage sprints, and assign story points in Jira. | |
| 7. | Plan a sprint and prioritize backlog items using Jira or Trello. | |
| 8. | Create and analyze a burndown chart to track sprint progress in Jira. | |
| 9. | Conduct a sprint review and retrospective using Jira and Miro. | |
| 10. | Set up and manage a Kanban board with WIP limits using Trello or Jira. | |
| 11. | Set up a basic CI/CD pipeline to automate build, test, and deployment using Jenkins. | |
| 12. | Containerize a web application by creating a Dockerfile and running it as a container. | |
| 13. | Automate the configuration of a web server using Ansible playbooks. | |
| 14. | Deploy and manage a Kubernetes cluster using Minikube and kubectl. | |
| 15. | Set up continuous monitoring of infrastructure and create dashboards using Grafana and Prometheus. | |
| **Total Hours (Lab)** | | **30** |
| **Total Hours(30+30)** | | **60** |
| **Text Book:** | | |
| 1. **Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperBusiness, 2009.** 2. Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days" by Jake Knapp 3. Agile Estimating and Planning" by Mike Cohn 4. Site Reliability Engineering: How Google Runs Production Systems"by Niall Richard Murphy, Betsy Beyer, Chris Jones, and Jennifer Petoff | | |
| **Reference Book:** | | |
| 1. **Designing with the Mind in Mind: Simple Guide to Understanding User Interface Design Guidelines"** by Jeff Johnson 2. Implementing Lean Software Development: From Concept to Cash" by Mary and Tom Poppendieck 3. **Building Microservices: Designing Fine-Grained Systems"** by Sam Newman 4. **The Art of Scalability: Scalable Web Architecture, Processes, and Organizations for the Modern Enterprise"** by Martin L. Abbott and Michael T. Fisher | | |
| **Web References:** | | |
| 1. <https://www.interaction-design.org/> 2. https://digital.ai/learn/resources/?\_product=agility 3. <https://martinfowler.com/> 4. <https://www.agilealliance.org/resources/> 5. https://devops.com/ 6. <https://thenewstack.io/> | | |

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| **Online Resources:** |
| 1. https://www.futurelearn.com/courses/digital-skills-user-experience 2. <https://www.codecademy.com/resources/blog/kubernetes/> 3. <https://www.katacoda.com/> 4. https://www.ideou.com/ |

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| **24UETVE201-A** | | | | | **Foreign Language-1**  **Korean Language** | | | | | | | | | | | | | **L/T/P/C** | | |
| **0/0/4/4** | | |
| **Nature of Course** | | | | | Practical | | | | | | | | | | | | | | | |
| **Prerequisites** | | | | | English language | | | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | | | | |
| 1. | | To understand the basics of Koran Language and its pronunciation. | | | | | | | | | | | | | | | | | | |
| 2. | | To construct the simple statement in Korean Language. | | | | | | | | | | | | | | | | | | |
| 3. | | To comprehend simple Korean texts and engage in basic conversations using vocabulary and grammar. | | | | | | | | | | | | | | | | | | |
| 4. | | To understand spoken Korean and compose clear sentences and short passages Top of FormBottom of Form | | | | | | | | | | | | | | | | | | |
| **Course Outcomes: Upon completion of the course, students shall have the ability to** | | | | | | | | | | | | | | | | | | | | |
| CO1 | | To identify Hangeul characters, form syllables, and pronounce words  Accurately. | | | | | | | | | | | | | | | | **Remember** | | |
| CO2 | | To apply grammar and vocabulary of Korean Language to write the simple statements. | | | | | | | | | | | | | | | | **Apply** | | |
| CO3 | | To apply learned vocabulary and grammar to interact in basic conversation. | | | | | | | | | | | | | | | | **Apply** | | |
| CO4 | | To interpret spoken Korean and write clear sentences and short texts. | | | | | | | | | | | | | | | | **Analyze** | | |
| CO5 | | To apply Korean etiquette in role plays and analyze its effectiveness. | | | | | | | | | | | | | | | | **Analyze** | | |
| **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 | - | | - | - |
| **CO2** | - | - | - | - | | - | | - | - | | - | - | 2 | | - | 2 | - | | - | - |
| **CO3** | - | - | - | - | | - | | - | - | | - | - | 3 | | - | 2 | - | | - | - |
| **CO4** | - | - | - | - | | - | | - | - | | - | - | 2 | | - | 3 | - | | - | - |
| **CO5** | - | - | - | - | | - | | - | - | | 2 | 2 | 3 | | - | 3 | - | | - | - |
| **Teaching -Learning & Assessment Scheme** | | | | | | | | | | | | | | | | | | | | |
| **Learning Scheme** | | | **Credits** | | **Assessment Scheme** | | | | | | | | | **Summative Assessment** | | | | | **Total** | |
| **Formative Assessment** | | | | | | | | | **End Semester Exam** | | | | |
| **L** | **T** | **P** | **CIA PR-I** | | **CIA PR-II** | | | **Continuous Practical Assessment(TW)** | | | |
| 0 | 0 | 4 | 2 | | 25 | | 25 | | | 20  (100 Scaled Down to 20) | | | | 30  (60 Scaled Down 30) | | | | | 100 | |
| **Course Contents** | | | | | | | | | | | | | | | | | | | | |
| **UNIT I** | | **Introduction to Korean** | | | | | | | | | | | | | | | | **12 hrs.** | | |
| Introduction to Hangeul, simple vowels, complex vowels, basic consonants, double consonants, pronunciation, vocabulary, syllables, Patchim, pronunciation, sentence structure. | | | | | | | | | | | | | | | | | | | | |

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| **UNIT II** | | **Basic grammar and vocabulary** | **12 hrs.** | |
| Speech styles – formal, polite, informal, subject particles- 은/는,이/가, object particles을/를, tenses – present 아요/어요/해요 & past았어요/었어요/했어요, 있어요/ 없어요, Directions, (place)에 있어요, Negation 안/못, Number system(Sino-Korean number system, Native Korean number system, time, date, months, counting units, days, week), From – To 에서 – 까지 / Time부터/까지 | | | | |
| **UNIT III** | | **Reading and Speaking** | **12hrs.** | |
| Conversations - greetings, self-introduction, what is this?, please give me coffee, where is Seoul station, what is your phone number, where are you going?, I watch movie at the theatre, I didn’t go to school yesterday. | | | | |
| **UNIT IV** | | **Listening and Writing practice** | **12 hrs.** | |
| Self-introduction, how to ask and tell your birthday, how to take and plan appointments, do you have time?, what is your hobby?, tell reason, Practice typing in Hangeul script using both mobile and laptop keyboards. | | | | |
| **UNIT V** | | **Korean work culture and etiquettes** | **12 hrs.** | |
| Understanding hierarchy, respect and politeness, how to greet in a professional setting, basic meeting manners, using formal language, teamwork and respect for others, polite body language. | | | | |
| **Total Contact Hours:** | | | **60 hrs.** | |
| **Sr. No.** | **List of Experiments** | | | **Cos** |
|  | **Experiment 1: Making Korean Letters**   * Practice forming Korean syllables using vowels and consonants, then say them out loud. | | | **CO1** |
|  | **Experiment 2: Pronouncing Double Consonants**   * Learn how double consonants sound and practice saying them correctly. | | | **CO1** |
|  | **Experiment 3: Learning Basic Words**   * Write down 20 new Korean words and practice saying and remembering them. | | | **CO1** |
|  | **Experiment 4: Simple Sentence Building**   * Create simple sentences in Korean and see how different sounds affect the words. | | | **CO1** |
|  | **Experiment 5: Different Ways to Speak**   * Practice using formal, polite, and informal speech by creating short conversations. | | | **CO2** |
|  | **Using Particles in Sentences**   * Learn to use subject and object markers like 은/는, 이/가, and 을/를 in sentences. | | | **CO2** |
|  | **Working with Tenses**   * Practice changing sentences from present to past tense and vice versa. | | | **CO2** |
|  | **Counting and Time**   * Learn to count, tell time, and say dates using Korean number systems. | | | **CO2** |
|  | **Greetings and Introductions**   * Practice saying hello and introducing yourself in Korean. | | | **CO3** |
|  | **Asking About Objects**   * Practice asking "What is this?" and answering in Korean. | | | **CO3** |
|  | **Ordering Coffee**   * Role-play ordering something at a café, like coffee, in Korean. | | | **CO3** |

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|  | **Asking for Directions**   * Practice asking and giving directions, like finding Seoul Station. | **CO3** |
|  | **Listening to Introductions**   * Listen to people introducing themselves and write down key information. | **CO4** |
|  | **Making Plans**   * Practice asking about availability and scheduling appointments. | **CO4** |
|  | **Talking About Hobbies**   * Write and talk about your hobbies in Korean. | **CO4** |
|  | **Typing in Korean**   * Get familiar with typing in Korean on a phone and a computer. | **CO4** |
| **Reference Book:** | | |
| 1. Sogang Korean 1A student’s book by Kim Song-hee, Sogang University, 2022. 2. King Sejong Institute Korean 1 Beginner, King Sejong Institute Foundation, 2024. | | |
| **Online Resources:** | | |
| 1. **<https://www.coursera.org/learn/learn-korean>** 2. **<https://www.youtube.com/@talktomeinkorean>** 3. **<https://www.youtube.com/@LearnKoreaninIndia/videos>** | | |

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| **24UETVE201-B** | | | | | | **Foreign Language-1**  **German Language** | | | | | | | | | | | | | **L/T/P/C** | | | | |
| **0/0/4/4** | | | | |
| **Nature of Course** | | | | | | Practical | | | | | | | | | | | | | | | | | |
| **Prerequisites** | | | | | | English language | | | | | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | | | | | | | |
| 1. | | | Oral communication: student can create basic-level German oral communications using correct Spanish grammar, vocabulary, cultural material, and pronunciation presented in class. | | | | | | | | | | | | | | | | | | | | |
| 2. | | | Listening Skills: Students can listen and understand the basic conversation, small talks, brief announcements which were studies in the class sessions. | | | | | | | | | | | | | | | | | | | | |
| 3. | | | Reading Skills: Students are able to read and interpret the introductory sentences of the persons which were stated in their introduction. They can read the sign boards, commonly used vocabulary. | | | | | | | | | | | | | | | | | | | | |
| 4. | | | Written communication: student can create basic-level German written communications that correctly employ and incorporate the grammar, vocabulary, and cultural material presented in class. Top of FormBottom of Form | | | | | | | | | | | | | | | | | | | | |
| 5. | | | Cultural Competence: Acquire an understanding of German-speaking cultures, including traditions, social norms, and historical context, to better navigate and appreciate the cultural nuances of the language. | | | | | | | | | | | | | | | | | | | | |
| **Course Outcomes: Upon completion of the course, students shall have the ability to** | | | | | | | | | | | | | | | | | | | | | | | |
| CO1 | | | Understand basic greetings in the social context and express basic needs in day- to-day life. | | | | | | | | | | | | | | | | **[U]** | | | | |
| CO2 | | | Remembering, reading and writing of all characters, compound characters, basic numbers. Also count and understand them. | | | | | | | | | | | | | | | | **[R]** | | | | |
| CO3 | | | Apply, Execute and acquire basic personal and social information. | | | | | | | | | | | | | | | | **[AP]** | | | | |
| CO4 | | | Analyze sentences consisting of basic grammar patterns and particles. | | | | | | | | | | | | | | | | **[A]** | | | | |
| CO5 | | | Analyze the special verbs in the sentences and its relevant connection with the coherence of language. | | | | | | | | | | | | | | | | **[A]** | | | | |
| **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 | - | | | - | | - |
| **CO2** | - | | - | - | - | | - | | - | - | | - | - | - | | - | 1 | - | | | - | | - |
| **CO3** | - | | - | - | - | | - | | - | - | | 3 | - | 1 | | - | 1 | - | | | - | | - |
| **CO4** | - | | - | - | - | | - | | - | - | | - | - | 2 | | - | 1 | - | | | - | | - |
| **CO5** | - | | - | - | - | | - | | - | - | | - | - | 2 | | - | 1 | - | | | - | | - |
| **Teaching -Learning & Assessment Scheme** | | | | | | | | | | | | | | | | | | | | | | | |
| **Learning Scheme** | | | | **Credits** | | **Assessment Scheme** | | | | | | | | | **Summative Assessment** | | | | | | | **Total** | |
| **Formative Assessment** | | | | | | | | | **End Semester PR Exam** | | | | | | |
| **L** | **T** | | **P** | **CIA PR-I** | | **CIA PR-II** | | | **Continuous Practical Assessment(TW)** | | | |
| 0 | 0 | | 4 | 2 | | 25 | | 25 | | | (20)  (100 Scaled Down to 20) | | | | 30  (60 Scaled Down 30) | | | | | | | 100 | |
| **Course Contents** | | | | | | | | | | | | | | | | | | | | | | | |
| **UNIT I** | | | **Module I** | | | | | | | | | | | | | | | | **8 Hrs** | | | | |
| Introduction to Germany, Alphabets and Pronunciation rules, Greetings and Phrases, Numbers.  Vocabulary- Week days and Months. | | | | | | | | | | | | | | | | | | | | | | | |
| **UNIT II** | | | **Module II** | | | | | | | | | | | | | | | | **8 Hrs** | | | | |
| Grammer- Nouns, Articles (Definite and Indefinite), Negative Articles, Gender Personal Pronouns and Possessive Pronouns.  Vocabulary- Professions, Family Relations, School and College Stationaries and Common places. | | | | | | | | | | | | | | | | | | | | | | | |
| **UNIT III** | | |  | | | | | | | | | | | | | | | | **8 Hrs** | | | | |
| Time Representation and relevant vocabulary.  Grammer- Regular and Irregular Verbs, Modal Verbs and Special verb ‘Haben’ and ‘sein’. Sentence formation including vocabulary and special verb.  Vocabulary- Directions, Seasons, Food and Drinks. | | | | | | | | | | | | | | | | | | | | | | | |
| **UNIT IV** | | |  | | | | | | | | | | | | | | | | **8 Hrs** | | | | |
| Vocabulary- Modes of Transport, Colors, Clothes and Hobbies.  Grammer- Wh Question, framing of the sentence using Wh questions. | | | | | | | | | | | | | | | | | | | | | | | |
| **Total Contact Hours:** | | | | | | | | | | | | | | | | | | | **32 hrs.** | | | | |
| **Sr. No.** | | **List of Experiments** | | | | | | | | | | | | | | | | | | **COs** | | | |
|  | | To Know about Germany and Its Culture, More about it’s Cities, Places, Livelihood and Technological Advancements. | | | | | | | | | | | | | | | | | | CO3 | | | |
|  | | To study Alphabets and their Pronunciation, Umlauts, Diphthongs, and how to Pronounce compound words. | | | | | | | | | | | | | | | | | | CO1 | | | |
|  | | To know about the Basics and Advanced Phrases, commonly used greeting by German people in their day-to-day life. To learn the vocabulary of German Months and Weekdays. Get to know about the day time. | | | | | | | | | | | | | | | | | | CO2 | | | |
|  | | To study the German numbers from 1 to 1000.To know about pronunciation of the numbers and its representation in the daily conversations. | | | | | | | | | | | | | | | | | | CO1 | | | |
|  | | To study about the German Nouns and pronouns, definite and indefinite articles, negative articles. | | | | | | | | | | | | | | | | | | CO4 | | | |
|  | | To know the vocabulary of German Professions, Family Relations, components which are used in school and colleges and the most commonly visited places by the people. | | | | | | | | | | | | | | | | | | CO3  CO1 | | | |
|  | | To study the Personal and Possessive pronouns. Brief their usage in sentence formation. | | | | | | | | | | | | | | | | | | CO4 | | | |
|  | | To study and learn about the time representation in German. To know about the vocabulary related to the time such as clock, minute, second and hour. | | | | | | | | | | | | | | | | | | CO1  CO2 | | | |
|  | | To study about the verbs. All types of verbs- Regular verbs, Irregular verbs and Modal Verbs and their conjugation. | | | | | | | | | | | | | | | | | | CO4 | | | |
|  | | To study about the special verbs, ‘haben’ and ‘sein’ | | | | | | | | | | | | | | | | | | CO4 | | | |
|  | | To structure meaningful sentences in German by using proper Grammer and relevant vocabulary. | | | | | | | | | | | | | | | | | | CO4  CO1 | | | |
|  | | To know the vocabulary of Directions, German Seasons and German food and Drinks. Also get to know about their meal culture and eating habits. | | | | | | | | | | | | | | | | | | CO3  CO1 | | | |
|  | | To know about the vocabulary of the vehicles which we use for the transport purpose. | | | | | | | | | | | | | | | | | | CO3  CO1 | | | |

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|  | To study about the German Wh- Questions and framing the meaningful sentences using those. | CO4 |
|  | To know about the vocabulary of colors and teach them in context with the German components. For example, colors included in German flag and much more. | CO1  CO3 |
|  | To know about the vocabulary of clothes and hobbies. Also brief them which of the clothes German people wear more frequently and what hobbies German people bear. | CO1  CO3 |
| **Reference Book:** | | |
| 1. Netzwerk A1 Deutsch als Fremdesprache- Klett Publikation 2. Netzwerk Neu A1 Kurz buch und Arbeits buch – Klett Publikation. 3. Mit Erfolg Zum Goethe Zertifikat A1 Fit in Deutsch 1 | | |
| **Online Resources:** | | |
| 1. https://alison.com/courses/basic-german-language-skills revised/content?event=login 2. www.daad.de/german-language-course 3. DADO (Deutsche Akademie für Deutsche Online) 4. [www.deutschewelle.com](http://www.deutschewelle.com) 5. Duolingo.com | | |

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| **24UETPR201** | | | | | **Seminar** | | | | | | | | | | | | | **L/T/P/C** | | | |
| **0/0/4/4** | | | |
| **Nature of Course** | | | | | Practical | | | | | | | | | | | | | | | | |
| **Prerequisites** | | | | | Basic Communication, Reading skill and writing skill. | | | | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | | | | | |
| 1. | | To acquaint with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation. | | | | | | | | | | | | | | | | | | | |
| 2. | | To reframe the literature and present using multimedia and presentation skills. | | | | | | | | | | | | | | | | | | | |
| 3. | | To analyze and summarize the literature survey and prepare technical reports. | | | | | | | | | | | | | | | | | | | |
| **Course Outcomes: Upon completion of the course, students shall have the ability to** | | | | | | | | | | | | | | | | | | | | | |
| CO1 | | Acquaint with basic technical writing concepts and terms, such as  audience analysis, jargon, format, visuals, and presentation. | | | | | | | | | | | | | | | | Understand | | | |
| CO2 | | Reframe the literature and present using multimedia and presentation  skills. | | | | | | | | | | | | | | | | Apply | | | |
| CO3 | | Analyze and summarize the literature survey and prepare technical reports. | | | | | | | | | | | | | | | | Analyze | | | |
| **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** | **-** | **-** | **-** | **3** | | **2** | **-** | | **1** | **1** | **3** | **2** | | | **3** | **3** | **-** | | **-** | | **3** |
| **CO2** | **-** | **-** | **-** | **3** | | **2** | **-** | | **1** | **1** | **3** | **2** | | | **3** | **3** | **-** | | **-** | | **3** |
| **CO3** | **-** | **-** | **-** | **3** | | **2** | **-** | | **1** | **1** | **3** | **2** | | | **3** | **3** | **-** | | **-** | | **3** |
| **Teaching -Learning & Assessment Scheme** | | | | | | | | | | | | | | | | | | | | | |
| **Learning Scheme** | | | **Credits** | | **Assessment Scheme** | | | | | | | | | **Summative Assessment** | | | | | | **Total** | |
| **Formative Assessment** | | | | | | | | | **End Semester Exam**  **Final Seminar** | | | | | |
| **L** | **T** | **P** | **Progress-I** | | | **Progress-II** | | | | |  |
| 0 | 0 | 4 | 4 | | 25 | | | 25 | | | | |  | 50 | | | | | | 100 | |
| **Course Contents** | | | | | | | | | | | | | | | | | | | | | |
| **Context** | | | | | | | | | | | | | | | | | | | | | |
| * Each student will select a multidisciplinary topic in the area of Engineering and Technology preferably keeping track with recent technological trends and development beyond scope of syllabus avoiding repetition in consecutive years. * The topic must be selected in consultation with the institute guide. * Each student will make a seminar presentation using audio/visual aids for duration of 20-25 minutes and submit a seminar report prepared in Latex only. * Seminar Log book should be compulsorily maintained. * Seminar should make the student attain skills like:  1. Gathering of literature in a specific area in a focused manner. 2. Effectively summarizing the literature to find state-of-the-art in the proposed area. 3. Identifying scope for future work. 4. Reporting literature review and proposed work in a scientific way using good English. | | | | | | | | | | | | | | | | | | | | | |

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| **Guidelines for Seminar Work Evaluation:** |
| A panel of examiners along with a guide will assess the seminar work. The evaluation of the end semester exam (Final Seminar Presentation) shall base upon the following points-   1. Contents- 15 Marks 2. Delivery- 15 Marks 3. Relevance and interest in the topic creates- 10 Marks 4. Ability to involve the spectators- 5 Marks 5. Question answer session- 5 Marks   Note: Student will prepare a seminar report as per the template given by the department. They should prepare and public review papers based on their seminar work and publish/present it in a suitable journal/conference.   * Seminar report must be presented during the presentation. |
| **Text Book:** |
| 1. Rebecca Stott, Cordelia Bryan, Tory Young, “Speaking Your Mind: Oral Presentation and Seminar Skills (Speak-Write Series)”, Longman, ISBN-13: 978-0582382435. 2. Johnson-Sheehan, Richard, “Technical Communication”, Longman, ISBN 0-321-11764-6. 3. VikasShirodka, “Fundamental skills for building Professionals”, SPD, ISBN: 978-93-5213-146-5. |

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| **24UADPC201** | | | | | **Statistics for Data Science and Machine Learning** | | | | | | | | | | | | | **L/T/P/C** | | | |
| **3/0/0/3** | | | |
| **Nature of Course** | | | | | Theory | | | | | | | | | | | | | | | | |
| **Prerequisites** | | | | | Nil | | | | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | | | | | |
| 1. | | To learn basic concepts of statistics and various types of statistics | | | | | | | | | | | | | | | | | | | |
| 2. | | To gain the knowledge the about descriptive statistics methods | | | | | | | | | | | | | | | | | | | |
| 3. | | To gain the knowledge of inference statistical methods | | | | | | | | | | | | | | | | | | | |
| 4. | | To able to understand the concepts of hypothesis testing | | | | | | | | | | | | | | | | | | | |
| 5. | | To gain the knowledge about linear algebra operation | | | | | | | | | | | | | | | | | | | |
| **Course Outcomes: Upon completion of the course, students shall have the ability to** | | | | | | | | | | | | | | | | | | | | | |
| C01 | | Able to **understand** and fundamental statistical concepts | | | | | | | | | | | | | | | | [U] | | | |
| C02 | | Students will be able to **understand** Descriptive statistical concepts | | | | | | | | | | | | | | | | [U] | | | |
| C03 | | Students will be able to **understand**  Inferential statistical methods | | | | | | | | | | | | | | | | [U] | | | |
| C04 | | Students will be able to **understand and apply** hypothesis testing in real time problems | | | | | | | | | | | | | | | | [AP] | | | |
| C05 | | Students will be able to **understand and apply** exploratory data analysis | | | | | | | | | | | | | | | | [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 | 3 | 1 | 2 | | 2 | | - | - | | - | 2 | 1 | | 2 | 1 | 1 | | 1 | | 1 |
| **CO2** | 2 | 3 | 1 | 1 | | 1 | | - | - | | - | - | - | | 1 | 1 | 2 | | 2 | | 2 |
| **CO3** | 2 | 3 | 1 | 2 | | 2 | | - | - | | - | - | 2 | | 2 | 1 | 1 | | 1 | | 1 |
| **CO4** | 2 | 3 | 1 | 2 | | 1 | | - | - | | - | 2 | 1 | | - | - | 2 | | 2 | | 2 |
| **CO5** | 3 | 3 | 1 | 2 | | 2 | | - | - | | - | - | 2 | | 2 | 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**  **TH 1** | | **CIA**  **TH 2** | | | **Capstone model Assignment** | | | |
| 3 | 0 | 0 | 3 | | 25 | | 25 | | | 20 | | | | 60 Scaled Down 30 | | | | | | 100 | |
| **Course Contents** | | | | | | | | | | | | | | | | | | | | | |
| **UNIT I** | | **Introduction to Statistics** | | | | | | | | | | | | | | | | **9 hrs.** | | | |
| Statistics- Definition, Types, Descriptive Statistics, Inferential Statistics, Sampling Techniques, Correlation, Regression  **Case study:** Assume student’s marks statement and Employee detail identify the types of data and how specific filed are important. | | | | | | | | | | | | | | | | | | | | | |

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| **UNIT II** | **Descriptive Statistics** | **9 hrs.** |
| Descriptive Statistics: Measures of Central Tendency: Mean, Median and Mode, Measures of Dispersion: Standard Deviation, Variance, Range, IQR (Inter Quartile Range), Measure of Symmetricity/Shape: Skewness and Kurtosis  Case study: Assume the sales dataset and calculate the Measure of Central Tendency, and identify the IQR to find the outliers | | |
| **UNIT III** | **Inferential Statistics** | **9 hrs.** |
| Normal Distribution, Standard Normal Distribution, Student’s T Distribution, Statistics - Estimation, Estimating Population Proportions.  Case study: Assume sample data set using python program calculate the normal distribution and T Distributions | | |
| **UNIT IV** | **Hypothesis Testing** | **9 hrs.** |
| Hypothesis Testing a Proportion, Two Tailed, Hypothesis Testing a Mean (Left Tailed),Hypothesis Testing a Mean (Two Tailed),ANOVA Test, Chi-Square Test, Applications of Hypothesis Testing  Case study:Assume sample dataset using python programming calculate Anova Test, Chi-Square Test. | | |
| **UNIT V** | **Exploratory Data Analysis** | **9 hrs.** |
| Data Processing, Feature Selection, Supervised Learning, Unsupervised Learning, Case study on EDA for HR ,Telecom, Healthcare, Banking | | |
| **Total Contact Hours:** | | **45 hrs.** |
| **Text Book:** | | |
| 1. Elements of Statistical Learning" by Trevor Hastie, Robert Tibshirani, and Jerome Friedman. 2. Gareth James , Daniela Witten , Trevor Hastie , Robert Tibshirani , An Introduction to Statistical Learning: with Applications in1st ed. 2013, Corr. 7th printing 2017 3. Statistics by-Robert S. Witte and John S. Witte, Wiley Publication,11th Edition,2010 | | |
| **Reference Book:** | | |
| 1. Trevor Hastie , Robert Tibshirani , Jerome Friedman , The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Second Edition (Springer Series in Statistics) 2nd Edition. 2. Larry Wasserman, All of Statistics: A Concise Course in Statistical Inference (Springer Texts in Statistics) First Edition. 3. Dimitri P. Bertsekas , John N. Tsitsiklis ,Introduction To Probability 2nd Edition. 4. Hossein Pishro-Nik (Author),Introduction to Probability, Statistics, and Random Processes. | | |
| **Web References:** | | |
| 1. https://www.w3schools.com/ai/ai\_tensors.asp 2. https://www.datacamp.com/tutorial/unveiling-the-magic-of-statistical-machine-learning 3. https://www.w3schools.com/statistics/statistics\_descriptive\_statistics.php 4. https://byjus.com/maths/difference-between-parametric-and-nonparametric/ | | |
| **Online Resources:** | | |
| 1. Coursera Course on Introduction to statistics <https://www.coursera.org/learn/stanford-statistics> 2. Coursera Course on Basics of Statistics <https://www.coursera.org/learn/basic-statistics> | | |

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| **24UADPC202** | | | | | **Java Programming** | | | | | | | | | | **L/T/P/C** | | | |
| **3/0/2/4** | | | |
| **Nature of Course** | | | | | Theory and Practical | | | | | | | | | | | | | |
| **Prerequisites** | | | | | Basic understanding of computers and programming concepts | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | | |
| 1. | | To understand common Java libraries, operators, and decision statements. | | | | | | | | | | | | | | | | |
| 2. | | To Understand the concepts of control statements and their role in building complex ML  systems. | | | | | | | | | | | | | | | | |
| 3. | | To introduce Java string libraries for developing memory efficient applications. | | | | | | | | | | | | | | | | |
| 4. | | To Utilize Java streams to develop concise and efficient in AI applications. | | | | | | | | | | | | | | | | |
| 5. | | To introduce java event handler for interactive programming. | | | | | | | | | | | | | | | | |
| **Course Outcomes: Upon completion of the course, students shall have the ability to** | | | | | | | | | | | | | | | | | | |
| CO1 | | **Apply** Java Programming Fundamental Concepts For Application  Development. | | | | | | | | | | | | | [AP] | | | |
| CO2 | | **Apply** Java control statements for user friendly application development. | | | | | | | | | | | | | [AP] | | | |
| CO3 | | **Develop** efficient application using Java string. | | | | | | | | | | | | | [A] | | | |
| CO4 | | **Apply** Java stream to make the code more concise and efficient. | | | | | | | | | | | | | [AP] | | | |
| CO5 | | **Apply** Java event handler to controls the event and decides what should  happen if an event occurs in the code. | | | | | | | | | | | | | [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** | 3 | 3 | 2 | 2 | | 1 | | 1 | - | - | 1 | 1 | 1 | 1 | 2 | 2 | | - |
| **CO2** | 3 | 3 | 2 | 2 | | 1 | | - | - | - | 1 | 1 | 1 | 1 | 1 | 1 | | 1 |
| **CO3** | 3 | 2 | 3 | 3 | | 1 | | - | - | - | 1 | 1 | - | 1 | 2 | 1 | | - |
| **CO4** | 3 | 2 | 3 | 3 | | 1 | | - | - | - | 1 | 1 | - | 1 | 2 | 1 | | - |
| **CO5** | 3 | 3 | 2 | 2 | | 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** | | **Model PR Exam** | | |
| 3 | 0 | 2 | 4 | | 25 | | 25 | | 20 | | | 60 Scaled Down 30 | | | | | 100 | |
| **Course Contents** | | | | | | | | | | | | | | | | | | |
| **UNIT I** | | **Introduction to Java Programming** | | | | | | | | | | | | | **9hrs** | | | |
| **Introduction to Java:** Java Architecture- JVM, JRE & JDK, Keywords, Features of Java, Console input and output statements, variables and Identifiers, Scope of Variables, Data types, Type Conversion, Comments, Command Line Arguments, Access Modifiers **Operators** - Unary Operator- Arithmetic Operator- Shift Operator - Relational Operator - Bitwise Operator - Logical Operator - Ternary Operator and Assignment Operator. **Decision Statements** - if Statements, if-else Branching, switch Statements.  **Case Study**: Library Management System  **Scenario:** A university library wants to modernize its book management system. They need a software solution to keep track of books, borrowers, and transactions efficiently. | | | | | | | | | | | | | | | | | | |

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| **UNIT II** | **Control Statements** | **9hrs** | |
| **Looping Statements:** using for loop, using while Loops, Using do Loops.  **Jump Statements:** using break and continue, Unlabeled Statements, Labelled Statements. **Arrays:** Declaration, Instantiation and Initialization of Java Array, Types of Array - Single Dimension array, Multi- dimension array  **Case Study**: Flight Reservation System  **Scenario**: An airline company wants to upgrade its flight reservation system to handle a large volume of bookings efficiently | | | |
| **UNIT III** | **Strings** | **9hrs** | |
| Strings: String, String Builder, and String Buffer, The String Class, Important Facts About Strings and Memory, Important Methods in the String Class, The string Buffer and String Builder Classes, Important Methods in the string Buffer and String Builder Classes, File Navigation and I/O.  **Case Study**-: Banking application. **Scenario**: Develop an application for customer bank transaction management | | | |
| **UNIT IV** | **Streams** | **9hrs** | |
| **Streams**: Types of Streams, The Byte-stream I/O hierarchy, Character Stream Hierarchy, Random Access File class, The java.io.Console Class, Serialization, Dates, Numbers, and Currency,  Working with Dates, Numbers and Currencies, Parsing, Tokenizing, and Formatting, Locating Data via Pattern Matching, Tokenizing. Case Study: Online Shopping Platform. **Scenario:** An e-commerce company wants to revamp its online shopping platform to provide a seamless shopping experience for customers. | | | |
| **UNIT V** | **Event handling** | **9hrs** | |
| Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – introduction to Swing – Model-View-Controller design pattern – buttons – layout management – Swing Components – exception handling – exception Hierarchy – throwing and catching exceptions.**Case Study**-: Intelligent Personal Assistant  **Scenario**: A java Application for Intelligent Personal Assistant to kept records of all day-to-day activities. | | | |
| **Total Contact Hours:** | | **45hrs** | |
| **Lab Assignments:** | | | |
| **S. No** | **List of Experiments** | | |
| 1. | Implement a Java program to model a simple real-world scenario using classes and objects, such as a banking system or a student information system. | | |
| 2. | Implement a linked list data structure in Java and perform operations like insertion, deletion, and traversal. | | |
| 3. | Use Weka or similar library to build and train a simple machine learning model for classification tasks, such as predicting iris flower species based on petal and sepal  dimensions. | | |
| 4. | Create a web application using Java Servlets and JSP to manage a bookstore inventory, allowing users to search for books, add them to a shopping cart, and proceed to checkout. | | |
| 5. | Develop a web-based sentiment analysis tool using Java Servlets and JSP, where users can input text and get back the sentiment analysis result (positive, negative, or neutral). | | |
| 6. | Implement a multithreaded Java program to simulate a traffic intersection with multiple lanes, controlling the flow of vehicles using synchronized methods and locks. | | |
| 7**.** | Develop a concurrent web crawler in Java to crawl and index web pages from different domains simultaneously. | | |
| 8. | Use a Java library like Stanford NLP to perform advanced natural language processing tasks such as named entity recognition or sentiment analysis on text data. | | |
| 9. | Integrate external APIs (e.g., Google Maps API) into a Java web application to provide functionalities such as location-based services or route planning. | | |
| 10. | Develop a Java application to stream and process real-time data from a source such as Twitter's streaming API, performing tasks like sentiment analysis or topic modeling on incoming tweets. | | |
| **Projects:** | | | |
|  | Undertake a comprehensive AI project using Java, such as building a recommendation system for an e-commerce platform, a chatbot for customer support, or a predictive analytics tool for financial forecasting | | |
| **Total Hours (Lab)** | | | **30** |
| **Total Hours(45+30)** | | | **75** |
| **Text Book:** | | | |
| 1. Java: A Beginner's Guide" by Herbert Schildt (Latest Edition).   2. Data Structures and Algorithms in Java" by Robert Lafore (Latest Edition).  3. “Machine Learning in Java" by Bostjan Kaluza (2018)  4. Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig | | | |
| **Reference Book:** | | | |
| 1. Java: The Complete Reference" by Herbert Schildt (2024 Edition). 2. Java Programming 24-Hour Trainer" by Yakov Fain (2021 Edition) 3. Head First Java" by Kathy Sierra and Bert Bates (2021 Edition) 4. Java Concurrency in Practice" by Brian Goetz, Tim Peiperl’s, Joshua Bloch, Joseph 5. Bowbeer, David Holmes, and Doug Lea (2020 Edition) | | | |
| **Web References:** | | | |
| 1. <https://education.oracle.com/ko/java-developer-training-guide> 2. <https://www.w3schools.com/java/default.asp> 3. <https://www.oracle.com/java/technologies/java-technology-reference.html> 4. <https://www.oracle.com/java/technologies/> | | | |
| **Online Resources:** | | | |
| 1. <https://www.tutorialspoint.com/java/index.html> 2. <https://www.javatpoint.com/java-tutorial> 3. <https://www.coursera.org/specializations/java-programming> | | | |

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| **24UADPC203** | | | | | **Operating Systems** | | | | | | | | | | | | | **L/T/P/C** | | | |
| **3/0/0/3** | | | |
| **Nature of Course** | | | | | Theory | | | | | | | | | | | | | | | | |
| **Prerequisites** | | | | | Problem solving and Programming skills | | | | | | | | | | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | | | | | | | | | | | |
| 1. | | To identify the structure and functions of Operating System. | | | | | | | | | | | | | | | | | | | |
| 2. | | To experiment CPU scheduling policies, synchronization techniques and deadlock  Handling in real time problems. To describe the OS mechanisms to handle processes and  Threads. | | | | | | | | | | | | | | | | | | | |
| 3. | | To articulate Memory management schemes. | | | | | | | | | | | | | | | | | | | |
| 4. | | To study various operating system concurrency and security issues. | | | | | | | | | | | | | | | | | | | |
| 5. | | To discuss Device Management, I/O and File systems concepts. | | | | | | | | | | | | | | | | | | | |
| **Course Outcomes: Upon completion of the course, students shall have the ability to** | | | | | | | | | | | | | | | | | | | | | |
| CO1 | | **Understand** the basic concepts and operations of operating systems. | | | | | | | | | | | | | | | | [U] | | | |
| CO2 | | **Describe** the Process and thread concepts in operating systems for real  World problems. | | | | | | | | | | | | | | | | [U] | | | |
| CO3 | | **Apply** CPU scheduling algorithms, process synchronization  mechanisms and deadlock handling methods | | | | | | | | | | | | | | | | [A] | | | |
| CO4 | | **Apply** page replacement algorithms and do performance analysis. | | | | | | | | | | | | | | | | [A] | | | |
| CO5 | | **Illustrate** the concepts related to mass storage, I/O and file system. | | | | | | | | | | | | | | | | [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** | **2** | **2** | **1** | **1** | | **1** | | - | - | | - | - | - | | **1** | **2** | **2** | | - | | **2** |
| **CO2** | **2** | **2** | **3** | **2** | | **2** | | - | - | | - | - | - | | **1** | **2** | **2** | | - | | **2** |
| **CO3** | **2** | **3** | **3** | **3** | | **2** | | - | - | | - | - | - | | **1** | **2** | **3** | | - | | **2** |
| **CO4** | **2** | **3** | **3** | **3** | | **3** | | - | - | | - | - | - | | **1** | **2** | **3** | | - | | **2** |
| **CO5** | **1** | **2** | **3** | **2** | | **3** | | - | - | | - | - | - | | **1** | **2** | **2** | | - | | **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** | | | **Assignment** | | | |
| 3 | 0 | 0 | 3 | | 25 | | 25 | | | 20 | | | | 60 Scaled Down 30 | | | | | | 100 | |
| **Course Contents** | | | | | | | | | | | | | | | | | | | | | |
| **UNIT I** | | **Introduction to Operating System and Process Management (Process virtualization)** | | | | | | | | | | | | | | | | **9hrs** | | | |
| Introduction to operating systems, CPU and Memory virtualization, Design goals of operating  system, Process abstraction, Process creation, Process API, Process states, System calls for process  management (fork (), wait (), exec ()), Limited direct execution (Process switching, Restricted  Operations, Concurrency Issues), Necessity and Usage of threads, Thread creation, Uncontrolled  Scheduling, Inter-process communication.  **Case study: Inter Process Communication, Android Inter Process Communication.** | | | | | | | | | | | | | | | | | | | | | |

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| **UNIT II** | **Process Synchronization** | **9hrs** |
| Process execution mechanisms, Scheduling policies, Scheduling Metrics, FIFO, SJF, STCF, Priority, Round Robin, Multi-Level Feedback Queue (MLFQ), Changing and boosting priority, Issues with MLFQ, Scheduling proportional share and ticketing mechanism, Multiprocessor scheduling (Synchronization, Cache affinity, Single key scheduling, Multi queue scheduling), Challenges related to the Scheduling policies, Process Synchronization, Deadlocks, Deadlock in Multithreaded Applications, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Deadlock Recovery.  **Case study: Deadlock Detection in Windows10 operating system.** | | |
| **UNIT III** | **Main Memory Management** | **9hrs** |
| Main memory, Contiguous Memory Allocation, Dynamic Memory Allocation, Paging, Structure of  the Page Table Swapping, Segmentation, Memory allocation and free space management  algorithms, Virtual memory, Demand Paging, Copy On Write, Page Replacement Allocation of  Frames, Thrashing, VMS virtual memory systems.  **Case study : Acquiring live main memory contents in Windows 10.** | | |
| **UNIT IV** | **Concurrency and OS Security** | **9hrs** |
| Introduction to Concurrency, Locks, Lock based concurrent data structures, Condition  variables, Semaphores, Common concurrency problems, Event based concurrency, Operating  system security, Data integrity and protection, Availability, Authentication, Botnets and worms,  A Problem: Blocking System Calls, A Solution: Asynchronous I/O.  **Case study: Botnet Attacks against Linux Systems.** | | |
| **UNIT V** | **File Management, I/O and storage** | **9hrs** |
| File-System Interface, Creating, reading, and writing Files, Shared File Table Entries (Fork () and dup  ()), Removing File, Directory operation (Creation, Deletion, Read), File organization-inode, multilevel index, File System Structure, Directory implementation, Allocation Methods, Free Space Management. File system Internals: File Systems, File System mounting, Partitions and. MountingDisk free page management, File Sharing. I/O Systems: Overview, I/O Hardware. Mass Storage Structure: Overview, HDD Scheduling, HDD vs SSD, NVM Scheduling, Storage Device Management- Storage Attachment.  **Case study : Sun’s network file system (NFS), Andrew File System (AFS), Interplanetary File System (IPFS)** | | |
| **Total Contact Hours:** | | **45hrs** |
| **Text Book:** | | |
| 1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, “Operating System Concepts” 10th   Edition, John Wiley, 2018.   1. William Stallings, Operating Systems,“Internals and Design Principles”, 8th Edition, Pearson Publications, 2014. 2. Thomas Anderson and Michael Dahlin ,”[Operating Systems: Principles and Practice](http://recursivebooks.com/)”, 2nd edition, Recursive Books, 2014. | | |
| **Reference Book:** | | |
| 1. Andrew S. Tanenbaum, “Modern Operating Systems” 5th Edition, Pearson Education,2016 2. Randal E. Bryant and David R. O'Hallaron ,"Computer Systems: A Programmer's Perspective",3rd Edition,2015 3. Marshall Kirk McKusick and George V. Neville-Neil, "The Design and Implementation of the FreeBSD Operating System"2nd Edition, 2014. 4. Daniel P. Bovet and Marco Cesati, "Understanding the Linux Kernel",3rd Edition,2005. 5. D.M Dhamdhere, “Operating Systems: A Concept based Approach”, 3rd Edition, McGraw   Hill,2017.   1. Remzi H. Arpaci Dusseau and Andrea C. Arpaci Dusseau, “Operating Systems: Three Easy   Pieces”, Arpaci Dusseau Books, November, 2023 (Version 1.10) | | |
| **Web References:** | | |
| 1. <https://codex.cs.yale.edu/avi/os-book/OS9/> | | |
| 1. **Online Resources:** | | |
| 1. Coursera Course on Introduction to Operating Systems Specialization   <https://www.coursera.org/specializations/codio-introduction-operating-systems>   1. NPTEL Course Operating System Fundamentals   <https://archive.nptel.ac.in/courses/106/105/106105214/>   1. NPTEL Course on Introduction to Operating System <https://onlinecourses.nptel.ac.in/noc23_cs101/preview> | | |