**Koneru Lakshmaiah Education Foundation**
(Category -1, Deemed to be University estd. u/s. 3 of the UGC Act, 1956)
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Department of Electronics and Communication Engineering

Program: M. Tech – Robotics and Automation

Academic Year: 2025 – 2027

| Course Code | Course Name | CO No | CO Description |
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| 25MT5004 | TRANSFORMATION TECHNIQUES, RANDOM VARIABLES & STOCHASTIC PROCESSES | 1 | Apply Mathematical models of random phenomena and solve probabilistic problems. |
| | | 2 | Analyze different types of random variables and compute statistical parameters of the random variables. |
| | | 3 | Apply random processes in the time domain and model time varying linear systems. |
| | | 4 | Analyze random processes in frequency domains and model spectral characteristics of LTI systems. |
| 25RA5101 | ROBOTICS: CYBER PHYSICAL SYSTEMS | 1 | To understand cyber-physical systems, exploring the main challenges and they currently face |
| | | 2 | To understand and enumerates several fields where cyber-physical systems are widely used |
| | | 3 | Apply to Gain a knowledge Ability to use and develop robotics algorithms and cyber physical systems |
| | | 4 | Analyze wider design analysis on RCPS and fabrication engineering systems that interact with humans and the environment and create sustainable solutions |
| | | 5 | Analyze the Simulation practice on Robotics Cyber-Physical Systems |
| 25RA5102 | IIOE 4.0 FOR AUTOMATION AND ROBOTIC SYSTEMS | 1 | Understand the basics of IOT, IIOT and their importance in automation and robotics. |
| | | 2 | Apply the concepts learnt to Robotic industry IoT Devices and Industrial Data Acquisition |
| | | 3 | Apply the Cognitive Sensors and IoT4.0 and design studies on machine to machine based IOT |
| | | 4 | Apply mathematical Modeling and Design for IIOT, able to analyze and solve the design issues on Siemens based Melds Mendix IOT Devices |
| | | 5 | Analyze and use Simulink toolboxes, like the Arduino Support Package and ThingSpeak, to model, simulate, and deploy IoT systems |
| 25RA5103 | ALGORITHMS FOR *ROBOTICS SENSOR FUSION* | 1 | Apply the concepts and techniques used in sensor data fusion |
| | | 2 | Apply data fusion algorithms for identity declaration estimation |
| | | 3 | Apply the concept of sensor fusion for decentralized and scalable estimation |
| | | 4 | Apply the concept of trees, graphs and function to determine object tracking and estimation |
| | | 5 | Analyze sensor fusion algorithms to achieve optimization |
| 25EC5101 | ARTIFICIAL INTELLIGENCE & MACHINE LEARNING | 1 | Apply the possibilities offered by AI in finding solutions to domain-independent engineering problems and examine the fundamental blocks for building AI-based computer searches. |
| | | 2 | Analyze machine learning approaches for clustering and classification by demonstrating architecture formulations, learning algorithms, and performance measurements. |

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| | | 3 | Analyze and reconfigure the dimensionality of datasets for training and interpret numerically. |
| | | 4 | Apply optimization algorithms and estimate unknown phenomena. |
| | | 5 | Experiment and design AI models on multiple datasets by providing discriminative analysis of the evaluation metrics. |
| 25IE5201 | ESSENTIALS OF RESEARCH DESIGN | 1 | Analyze the steps involved in research and articulate appropriate Research Questions |
| | | 2 | Analyze appropriate methods for Data collection |
| | | 3 | Apply the data in tabular/Graphical form and prepare data for analysis |
| | | 4 | Analyze statistical modelling to optimize the data, prepare the data for publishing. |
| 25UC5201 | PROFESSIONAL COMMUNICATION SKILLS | 1 | To develop the skill of contextual Vocabulary and Critical Reading |
| | | 2 | To demonstrate different types of personal and professional skills and apply them for growth in professional zone. |
| | | 3 | Apply the concepts of Mathematical Principles to solve problems on Arithmetic, Algebra & Geometry to improve problem solving ability. |
| | | 4 | Apply the concepts and using Logical thinking to solve problems on verbal & Non-Verbal Reasoning to develop Logical thinking skills. |
| 25RA5204 | COMPUTER VISION & ROBOTICS APPLICATIONS | 1 | Apply fundamentals of image processing algorithms and thereby facilitating better interpretation and analysis of visual data. |
| | | 2 | Apply deep network methods and techniques for image classification to discern complex patterns and variations in the image data. |
| | | 3 | Apply autoencoders for image segmentation and measure performace metrics of various algorithms. |
| | | 4 | Develop an appreciation for various issues in the design of computer vision and object recognition systems with analysis. |
| | | 5 | Evaluate the develop computer vision algorithms, data preprocessing, model training, and evaluation. |
| 25RA5205 | AUTONOMOUS MOBILE ROBOTS AND AUTOMOTIVE ELECTRONICS | 1 | Apply the Mobile Robots Locomotion, Kinematics, and Dynamics |
| | | 2 | Apply the Mobile Robots Motion Control and Perception |
| | | 3 | Apply the Autonomous Mobile Robot Localization, planning, and navigation |
| | | 4 | Apply the Electronic protocols and Functional Testing for Automotive Vehicles |
| | | 5 | Apply the Mobile Robots path planning Simulation |
| 25RA5204 | ADVANCED ROBOTIC WIRELESS SENSOR NETWORKS | 1 | Apply fundamental robot developments and terminology in the fabrication of a robot. |
| | | 2 | Apply to share skills in the field of Advances in Robotic Kinematics |
| | | 3 | Apply the Analysis of Robot Varieties and Advanced Robotics Heterogeneity (ARH) |
| | | 4 | Apply and use the robotic wireless sensor networks project for a variety of robots. |
| | | 5 | Analyse and be able to undertake experimental research on robotic systems and confirm using appropriate simulators. |
| 25IE5201 | ESSENTIALS OF RESEARCH DESIGN | 1 | Analyze existing research to identify a focused and answerable research question or develop a well-defined hypothesis |
| | | 2 | Evaluate different research designs based on their strengths and weaknesses in relation to the chosen research question and data needs. |
| | | 3 | Apply appropriate data collection methods considering the chosen research design and data characteristics. |
| | | 4 | Analyze and interpret data using relevant data analysis methods to address the research question |

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| 25IE5247 | TERM PAPER | 1 | Examining the Approach to Accessing Research Articles from Sci/Scopus Database |
| | | 2 | Acquiring Data from Journals and Conducting Presentations |
| 25IE6150 | DISSERTATION (PART-1) | 1 | Identify and articulate research problems within their field of study, demonstrating an understanding of current research gaps. |
| | | 2 | Design and execute research methodologies, employing relevant techniques for data collection, analysis, and interpretation. |
| | | 3 | Demonstrate advanced critical thinking skills, analyzing research findings within the context of existing literature to draw meaningful conclusions. |
| 25IE6250 | DISSERTATION (PART-2) | 1 | Demonstrate a comprehensive understanding of a chosen research topic and its significance in the broader field. |
| | | 2 | Apply appropriate research methodologies to address research questions |
| | | 3 | Analyze and interpret data effectively, drawing meaningful conclusions |
| 25RA2E01 | ROBOTICS: DESIGN OF SENSORS, DRIVES AND ACTUATORS | 1 | Acquire knowledge about the fundamental principles, RobotSensors, and implementation strategies of Internal Sensors andInertial Sensors |
| | | 2 | Provide solutions for Ultrasonic Sensors in Home, industry,Vision, Stereo Vision, and Proximity Sensors |
| | | 3 | Apply the knowledge on Robot Actuators and Industrial Robots,cooperative robotics Electrical actuators to form an automatedkitchen |
| | | 4 | Apply the fundamentals of Motors, DC Motors, andFunctionality of the Harmonic Drive to design a simple robot |
| | | 5 | Synthesize various DESIGN OF SENSORS, DRIVES AND ACTUATORS |
| 25RA3E01 | HUMAN MACHINE INTERFACE & BRAIN *MACHINE INTERFACE* | 1 | Apply Normans model to Human Machine Interface |
| | | 2 | Apply different GOMS models, Fitts Laws for improving the Human Machine Interaction |
| | | 3 | Apply the concepts of Brainwaves for Bain Machine Interface |
| | | 4 | Analyze different methodologies for HMI/BMI Applications |
| 25RA2E02 | AUTONOMOUS MOBILE ROBOT SYSTEMS | 1 | Apply the basic mechanical and electrical systems concerning robots locomotion and manipulation. |
| | | 2 | Apply the mathematical models and computational and motion control methods to mobile robotic systems. |
| | | 3 | Apply the sensor systems related to state measurements, navigation and localization. |
| | | 4 | Analyse the A-star, Dijkstra algorithm for planning the required path. |
| | | 5 | Analyse the path planning for the multiple robots |
| 25RA2E03 | DESIGN OF AUTOMATION SYSTEMS AND ASSISTIVE ROBOTIC SYSTEMS | 1 | Acquire and apply knowledge about the fundamental principles, hierarchy level, architecture, functions to implementation strategies of Distribution Automation Systems (DAS) and Distribution Management Systems (DMS). |
| | | 2 | Apply solutions for design of Automation in Home, industry, Advanced Research Laboratories. |
| | | 3 | Apply the learnt technologies for working of industrial robots, robotics arms, cooperative robotics arms, automated kitchen. |
| | | 4 | Analyse robot assistive technology, Human Activity Assistive Technology (HAAT) model, and current international safety standards for robotic assistive technologies. |
| 25RA3E02 | SWARM ROBOTICS CONTROL SYSTEMS | 1 | Apply the principles and various Swam Robotics Control Systems for direction study |
| | | 2 | Apply multi-agent systems, parallel, scalable, stable for different types of tasks |

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| | | 3 | Apply concepts of Swam Robotics Control Systems and Creating Advanced behavior module |
| | | 4 | Apply the Cooperative algorithms, earlier progress of swarm robotics algorithms, Features of swarm robotics algorithm for navigate and control swarm Movements effectively |
| 25RA3E03 | SIGNAL PROCESSING FOR ROBOTICS | 1 | Apply the Foundation categories of signals and kinds of Characterization, standard Signal Processing in Robotics |
| | | 2 | Apply manipulator construction, the benefits and drawbacks of different kinematic structures applications. |
| | | 3 | Apply encoders and feedback systems and a homogeneous?coordinate solution to the?inverse kinematic issue in kinematics. |
| | | 4 | Apply the Programming Language for Mobile robots, walking devices. Robot reasoning. |

Co-Ord Prof-I/C

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