Koneru Lakshmaiah Education Foundation
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Department of Electronics and Communication Engineering

Program: M. Tech – Robotics and Automation

Academic Year: 2024 – 2026

Course Code	Course Name	CO No	CO Description
23MT5004	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.
23RA5101	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
23RA5102	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
23RA5103	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
23EC5101	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.
23IE5201	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.
23UC5201	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.
23RA52C2	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.
23RA5205	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
23RA5204	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.
23IE5201	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.

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		4	Analyze and interpret data using relevant data analysis methods to address the research question
23IE5247	TERM PAPER	1	Examining the Approach to Accessing Research Articles from Sci/Scopus Database
		2	Acquiring Data from Journals and Conducting Presentations
23IE6150	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.
23IE6250	*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
23RA52B1	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
23RA52C1	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
23RA52B2	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
23RA253M2	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.
23RA52D1	SWARM ROBOTICS CONTROL SYSTEMS	1	Apply the principles and various Swam Robotics Control Systems for direction study

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		2	Apply multi-agent systems, parallel, scalable, stable for different types of tasks
		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
23RA52D2	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-ordinator Prof/c

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