



## 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 & Automation

Academic Year 2021-2022


Course Code	COURSE NAME	CO No	COURSE OUTCOME
21RA5141	Non-linear systems and control optimization for robotics	1	To introduce the need and concept of nonlinear system and optimizations for robotics
		2	To impart knowledge about different strategies adopted in the analysis of nonlinear systems for robotics engineering
		3	Apply constrained optimization to various physical systems. Implement optimal control algorithms to track the response of the system through a predefined trajectory
		4	To familiarize with the design of different types of nonlinear Robotics controllers
21RA5142	Robotics : Cyber Physical Systems	1	Ability to understand cyber-physical systems are and highlight the main challenges they currently face
		2	Ability to Enumerates several fields where cyber-physical systems are widely used.
		3	Gain a knowledge Ability to use and develop robotics algorithms and cyber physical systems
		4	Creates wider design analysis on RCPS and fabricate engineering systems that interact with humans and the environment and create sustainable solutions
21RA5143	IIoE 5.0 for Automation and Robotic systems	1	Describe IOT,IIOT
		2	Understand the opportunities, challenges brought about by Industry 4.0 and how organizations and individuals should prepare to reap the benefits
		3	Understand, design, and develop the real life IoT applications using off the shelf hardware and software
		4	Understand the concepts of Design Thinking
21EC5104	Artificial intelligence & Machine learning	1	To understand the concepts of Artificial Intelligence
		2	To understand the concepts of neural networks
		3	To elaborate machine learning methods

**M. SUMAN**

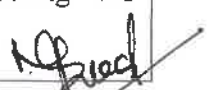
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		4	To understand the concepts of Fuzzy logic
21RA51A1	Robotics: Design of Sensors, Drives and Actuators	1	Acquire knowledge about the fundamental principles, Robot Sensors, and implementation strategies of Internal Sensors and Inertial Sensors.
		2	Provide solutions for Ultrasonic Sensors in Home, industry, Vision, Stereo Vision, and Proximity Sensors
		3	Understanding Robot Actuators and Industrial Robots, cooperative robotics Electrical actuators, automated kitchen, studying about various home automation.
		4	Fundamentals of Motors, DC Motors; understanding Functionality of the Harmonic Drive Justify the use of robots in DC and AC servo drives for axis motors
21RA51A2	Autonomous mobile Robot systems	1	Understand the basics of Autonomous Mobile Robots dynamics and design electronics complement those features.
		2	Understand Mobile robot kinematics and dynamics, Motion Control
		3	Examining the autonomous mobile robot Perceptions with algorithms.
		4	Design studies on embedded Automotive Electronics protocols, vehicle testing, and vibration.
21RA51A4	Swam Robotics Control Systems	1	Understand the principles and various Swam Robotics Control Systems
		2	Knowledge explore on multi-agent systems, Parallel, Scalable, Stable.
		3	Design concepts of Swam Robotics Control Systems and Creating Advanced behavior module.
		4	Analyze and Evaluate the Cooperative algorithms, earlier progress of swarm robotics algorithms, Features of swarm robotics algorithm
21RA51B1		1	Fundamentals of Micro and nano mechanics, Piezo Resistive Pressure sensors.

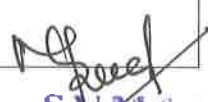
  
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	Automated Dynamic Analysis of MEMS sensors & actuators	2	Design of Actuators and calibration of different sensors
		3	Apply and analysis Optical encoder and tactile and proximity
		4	Apply and analysis Electro-pneumatic actuator, Electrical actuating systems and Piezoelectric actuator.
21RA51B2	Human Machine Interface & Brain Machine Interface	1	Understanding the basics of HMI: Asimov's Laws, GUI Design, Aesthetics, Developments in Bio-Chips, Heuristics.
		2	Understanding the HMI Technologies such as GMOS Models, CMN-GOMS, Fitts Laws, Hck-Hyman Laws, Norman's 7 Principles.
		3	Understanding the concept of Brainwaves & BMI
		4	Analyzing Humanoids & HMI/BMI Applications: Hierarchical Task] Analysis, Dialog Design, Use of FEM
21EC51B3	Computer Vision & Application	1	Implement fundamental image processing techniques required for computer vision.
		2	Apply Hough Transform for line, circle, and ellipse detections
		3	Apply 3D vision techniques. Implement motion related techniques; develop applications using computer vision techniques.
		4	Understands motion analysis. To study some applications of computer vision algorithms.
21EC51B1	LiDAR & RADAR System Control	1	Understand the Principles and design concepts of various LiDAR Systems and control Mechanisms.
		2	Study and analysis LiDAR Beam Steering and Optics System

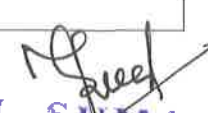
  
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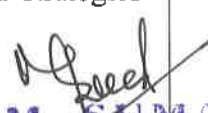
		3	Analyze an existing radar system, synthesize the information, and explain to an audience to establish the principle working CW radar, FM-CW radar
		4	Creating strong knowledge on algorithm for design radars in various autonomy control
21IE3149	SEMINAR	1	Enhancing verbal delivery, body language, power point skills, structuring the presentation, engaging audience, tone of presentation for the overall improvement of individual presentation skills.
21TS51A1	TECHNICAL SKILLING - I	1	Enhancing the system design and modeling capabilities through visualization of scientific theories and concepts while building and developing the capabilities of designing a new system by altering and implementing new algorithm and methods through visualization tools.
21RA5244	Advanced Robotic Wireless Sensor Networks	1	To know the Basic Robots Advancements and terminologies
		2	To impart knowledge in Advances in Robotic Kinematics
		3	Examining the Varieties of Robots & Advanced Robotics Heterogeneity (ARH)
		4	Understanding the Robotic Wireless Sensor Networks and Design project on various robots
21RA5247	Algorithms for Robotics Sensor Fusion	1	To expose the students to the concepts and techniques used in sensor data fusion
		2	To impart skills needed to develop and apply data fusion algorithms
		3	To expose the students, the state of the art in multi sensor/ source integration, target tracking and identification
		4	Gain a knowledge on sensor fusion algorithms with autonomous robots

  
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21RA5246	Microelectromechanical I Sensors and Actuators for Robotics	1	Ability to understand the operation of micro devices, micro systems and their applications
		2	Ability to design the micro devices, micro systems using the MEMS fabrication process.
		3	Gain a knowledge of basic approaches for various sensor design for robotics
		4	Gain a knowledge of basic approaches for various actuator design for robotics
21RA51C2	Autonomous mobile robots and Automotive Electronics Systems	1	Knowledge explore on Robot locomotion, and Types of locomotion, uncharted territories in the Universe.
		2	Design of mobile robot kinematics and dynamics, holonomic and nonholonomic constraints.
		3	Development of passive/active sensors and mobile robots like global positioning system.
		4	Apply and analysis of path planning algorithms based on A-star, Dijkstra
21RA51C1	Adaptive motion control systems for automation and robotics	1	Understand the Principles and design concepts of various adaptive control Mechanisms.
		2	Understand the Principles and design concepts of Autonomous Tracked Robots
		3	Understand the Principles and design concepts of Motion Vision and Motion estimation
		4	Understand the Principles and design of Optimization for Motion Control Systems


  
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21RA51C2	FPGA-Based Wireless System Design	1	Software Defined Radio (SDR)
		2	Analysis of FPGA Speed, Area & Power
		3	Advanced Encryption Standards & High-Level Design
		4	FPGA for Wireless System
21RA51C3	Signal Processing for Robotics	1	Basics classification of signals & types Characterization, typical Signal Processing operations
		2	Construction of manipulators, advantages and disadvantages of various kinematic structures.
		3	Design Feedback systems, encoders Kinematics, homogeneous coordinate solution of the inverse kinematic problem.
		4	Apply and analysis Programming Language: Mobile robots, walking devices. Robot reasoning.
21RA51C4	Cloud Robotics and Automation	1	Automation principles and strategies, Methods of Work part Transport.
		2	Control Functions, Automation for Machining Operations and Assembly Systems and Line Balancing.
		3	Storage System Performance, Automated Storage/Retrieval Systems, Carouse
		4	Sensor Technologies for Automated Inspection and Analytical Models.
21RA51D1	Optimization algorithms for autonomous systems	1	Develop Machine Learning based Optimization models for various problem specific solutions.
		2	Apply evolutionary programming and strategies in engineering aspects.

  
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		3	Design Mathematical Models of Genetic Algorithms fitness functions.
		4	Apply and analysis of advanced autonomous optimization techniques.
21RA51D2	Automotive Electronics & Avionics	1	Understand the fundamentals of comprehensive knowledge on automotive electronics.
		2	Explore and conjugate the emerging technologies utilized to assist the Autonomous Vehicles.
		3	Communication and Navigation of automated vehicle using vehicle intelligence
		4	Acquire the basic knowledge on aviation technology.
21RA51D3	Design of automation systems and Assistive Robotic systems	1	Acquire knowledge about the fundamental principles, hierarchy level, architecture, functions, and implementation strategies of Distribution Automation Systems (DAS) and Distribution Management Systems (DMS).
		2	Provide solutions for Automation in Home, industry, Advanced Research Laboratories
		3	Understanding industrial robots and robotics arms, cooperative robotics arms, automated kitchen, studying about various home automation.
		4	Study of the robot assistive technology; understanding the Human Activity Assistive Technology (HAAT) model. Understanding of the Assistive Robotic Manipulators (ARM) Justify the use of robots in rehabilitation.
21IE3250	TERM PAPER	1	Enhancing the skill sets in research by recognize and identifying problems, exploring/defining the problem by gathering information, formulation of the research objectives, addressing the problem through scientific process and methods.

  
Academic Professor I/C

  
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