

UNIVERSITY OF MADRAS
BACHELOR OF COMPUTER APPLICATIONS (BCA)
DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Year: III

Semester: VI

Robotics and Its Applications	320E6E
Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	
Credits 3	Lecture Hours: 5 per week
<p>Learning Objectives: (for teachers: what they have to do in the class/lab/field)</p> <ul style="list-style-type: none"> • To make the students familiar with the various drive systems of robots, sensors and their applications in robots • To introduce the parts of robots, basic working concepts and types of robots 	
<p>Course Outcomes: (for students: To know what they are going to learn)</p> <p>CO1: Describe the different physical forms of robot architectures CO2: Kinematically model simple manipulator and mobile robots CO3: Mathematically describe a kinematic robot system. CO4: Analyse manipulation and navigation problems using knowledge of coordinate frames,</p>	

Units	Contents
I	Introduction: Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.
II	Actuators and sensors: Types of actuators, stepper-DC-servo-and brushless motors-model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers-strain gauge-based force torque sensor-proximity and distance measuring sensors Kinematics of robots: Representation of joints and frames, frames transformation, homogeneous matrix, D-H matrix, Forward and inverse kinematics: two link planar (RR) and spherical robot (RRP). Mobile robot Kinematics: Differential wheel mobile robot
III	Localization: Self-localizations and mapping - Challenges in localizations – IR based localizations – vision-based localizations – Ultrasonic based localizations - GPS localization systems.
IV	Path Planning: Introduction, path planning-overview-road map path planning-cell decomposition path planning-potential field path planning-obstacle avoidance-case studies Vision system: Robotic vision systems-image representation-object recognition-and categorization-depth measurement- image data compression-visual inspection-software considerations
V	Application: Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications-nuclear applications-space applications-Industrial robots-artificial intelligence in robots-application of robots in material handling-continuous arc welding-spot welding-spray painting-assembly operation-cleaning-etc.

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Learning Resources:

Recommended Texts

1. Richard D. Klafter, Thomas Achmielewski and Mickael Negin, Robotic Engineering and Integrated Approach, Prentice Hall India-New Delhi-2001
2. Saeed B. Nikku, Introduction to robotics, analysis, control and applications, Wiley-India, 2nd edition 2011

Reference Books

1. Industrial robotic technology-programming and application by M.P. Groover et al, McGraw Hill 2008
2. Robotics technology and flexible automation by S.R. Deb, THH-2009

Web resources