Semester:	7			
Course Code:	MI5040			
Course Name:	Robotics and Autonomous Systems			
Credit Value:	3 (Notional hours:150)			
Pre-requisites:	ME3010			
Core/ Optional:	Optional			
Hourly Breakdown	**Lecture hrs**	**Tutorial hrs**	**Practical class hrs**	**Independent Learning & Assessment hrs**
	30	6	12	102

Course Aim: To enhance students' knowledge on the structure, assembly, kinematics, dynamics and control of robots and autonomous systems so that they will be able to learn and practice implementing controllers and programming robots.

Intended Learning Outcomes:

- **Describe** the structure, mechanism, design of robotic systems and their programming and control strategies.
- **Solve** problems on dynamics, kinematic and simulations of robot applications.
- **Design** of mechanisms and controllers used in robotic applications to achieve position and velocity controls
- **Analyze** the performance and behaviors of the robotic system.

Course Content:

Introduction to Robotics and Autonomous Systems

Basic concepts in robotics, classification and structure, sensors and actuators in robotic systems, autonomous systems

Manipulator Kinematics

Link description, Mechanisms and design, Joint space and Cartesian space, Kinematic Analysis and, Coordinate Transformations, Jacobian: Velocities and forces

Manipulator Dynamics

Acceleration of a rigid body, Mass distribution, Newton's equation, Euler's equation, Structure of Manipulator dynamic equation

Trajectory Planning

Joint space and Cartesian space, Cubic polynomials, Path generation, via points and parabolic

blends

Autonomous Mobile Robots

Locomotion and kinematics, open loop and closed loop control, trajectory following, perception and localization

Manipulator Control

Feedback and Closed-loop control, Control law partitioning, Trajectory following control, Modeling and control of a single joint, Industrial robot controllers

Teaching/ Learning Methods:

Classroom lectures, tutorial discussions, practical classes, in-class assignments, project-based learning, formative assessments, small group discussion classes

Assessment Strategy:

Continuous Assessment 50%	**Final Assessment** 50%		
Details: Quizzes - 0% Mid Semester Examination- 0% Other Laboratory work – 10% Mini Projects/Tutorials/Assignments - 40%	Theory (%) 50	Practical (%) ……	Other (%) (specify) …… …..

Recommended Reading:

- Siegwart, R., & Nourbakhsh, I.R., (2005). Introduction to Autonomous Mobile Robots, Prentice-Hall of India.
- Craig, J.J., (2005). Introduction to Robotics, Mechanics and Control, (3 ed.), Pearson: Prentice-Hall.