Module Code	ZA-2203			
Module Title	Robotic Systems			
Degree/Diploma	Bachelor of Digital Science			
Type of Module	Major Core			
Modular Credits	4	**Total Student Workload**	10	hours/week
		Contact Hours	4	hours/week
Prerequisite	ZZ-1101 Mathematical Methods for the Sciences or equivalent knowledge of mathematics ZZ-1102 Programming Fundamentals or equivalent programming knowledge			
Anti-requisite	None			

Aims

To introduce students to basics of modelling and control of robot systems and train them to develop planning and control software modules for robots like manipulators.

Learning Outcomes

On successful completion of this module, a student will be expected to be able to:

Lower order:	20%	- Report different areas and applications of robotics - Describe different components of a robotic system
Middle order:	30%	- Review setup of robotic system middleware, robotic simulators and environments - Identify the layers of robot control - Design forward and inverse kinematics for robot manipulators
Higher order:	50%	- Compute kinematics and dynamics of rigid bodies in task-spaces - Implement optimal control theory and alternative approaches in robot systems - Perform approximate methods to robot control - Implement grasping and manipulation methods for robot tasks

Module Contents

- Introduction to robotics field, types, components (hardware, software), applications and challenges
- Robotic system middleware, robot models, simulators, and environments
- Configuration spaces and coordinate transformations
- Robot manipulators and forward kinematics, Denavit-Hartenberg notation
- Inverse kinematics, velocity kinematics, approximate/neural methods
- Dynamics of rigid bodies, task-space dynamics
- Control theory, feedback control, force control
- Alternatives to optimal control
- Grasping, affordances, grasp control and ML approaches to grasping and manipulation

Assessment	Formative Assessment	Interactive quizzes and feedback
	Summative Assessment	Examination: 30%
		Coursework: 70% - One class test (10%) - Two assignments (20%) - One lab test (15%) - One project (25%)