MODULE SPECIFICATION

Part 1: Information			
Module Title	Robotic Systems		
Module Code	UFMFJA-30-2	Level	Level 5
For implementation from	2020-21		
UWE Credit Rating	30	ECTS Credit Rating	15
Faculty	Faculty of Environment & Technology	Field	Engineering, Design and Mathematics
Department	FET Dept of Engin Design & Mathematics		
Module type:	Standard		
Pre-requisites	Introduction to Robotics and Electronics 2020-21		
Excluded Combinations	None		
Co- requisites	None		
Module Entry requirements	None		

Part 2: Description
Overview: In this module students will learn about robot systems are designed. The module focuses on two aspects of this activity: The mechanics and dynamics of robot bodies; how to make robots move efficiently and accurately to achieve desired aims. The architectures and algorithms and techniques that enable us to build complicated machines that respond to stimuli in a timely, intelligent fashion. **Educational Aims:** The aim of this module is to build upon work covered at level 4 so that students confidently understand the engineering design process as applied to robotic systems. **Outline Syllabus:** The module consists of two sections. Section 1. Students will learn about kinematics and dynamics in mobile robots and in robot manipulators. Topics will include: Forward and Inverse kinematics solutions for manipulators with more than 4 degrees of freedom, Denavit Hartenberg notations.

Manipulator trajectories, velocities and static forces.

Dynamics basics, Manipulator dynamics, Newton Euler and Lagrange methods.

Control techniques for manipulators.

Section 2.
In addition, students will learn about the software systems used in robots to address the problems found in building these complex machines. Topics will include:

The problems which face robot builders. A variety of architectural approaches to solve these problems; where they differ and where they are similar. For example, Deliberative, Reactive, Behavioural, Hybrid, Agent-based.

Some software engineering methods which can be applied to the problems of designing robots, with an introduction to object-oriented modelling and UML and a brief introduction to project management methodologies.

Some methods of addressing navigation, localisation and route planning using symbolic representations.

Adaptation, and learning on robotic platforms. Why these mechanisms may be difficult to implement in commercial systems.

Students' explorations of these topics will be supported by the use of tools such as Matlab and UML-based design tools.

Teaching and Learning Methods:

Scheduled Learning.
Sessions will include lectures and facilitated group work or practical sessions. In section 1 students will work towards accomplishing a variety of tasks in controlling robot manipulators. In section 2, they will work in small groups to present a design portfolio outlining a proposed robotic solution to a real-world problem.

Independent learning includes hours engaged with essential reading, case study preparation, assignment preparation and completion etc. Students will be expected to spend about 150 hours outside of the scheduled time in these activities. We will help students form study groups for mutual support as they tackle the material.

Part 3: Assessment

The module will be assessed in two components. Component A contains two exams, and deals with the material covered in the first and second semesters respectively. Component B comprises a group coursework portfolio, again dealing with the material covered in the first and second semesters.

Component A consists of two assessments:

A computer-based open-book Exam in which students will use Matlab to solve some kinematics and related problems.

A written exam on the software, architecture and AI topics covered in section 2.

Component B consists of a group coursework portfolio:

A report of not more than 2000 words based upon practical work in section 1.

A report of not more than 2000 words based upon the coursework in section 2.

This portfolio will contain individual sections which enable each student's performance to be assessed, and individual marks for group sections will recognise the relative work of the group members.

The resit will be assessed in two components. Component A contains two exams, and deals with the material covered in the first and second semesters respectively. Component B comprises an individual report, again dealing with the material covered in the first and second semesters.

Component A consists of two assessments:

A computer-based open-book Exam in which students will use Matlab to solve some kinematics and related problems.

An exam on the software, architecture and AI topics covered in section 2.

Component B consists of an individual report covering elements from sections 1 and 2. (2000 words)

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Examination (Online) - Component A		25 %	Computer-based open book exam (2 hours)
Examination (Online) - Component A	✓	25 %	Online Exam
Report - Component B		50 %	Group work portfolio (4000 words)
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Examination (Online) - Component A	✓	25 %	Online Exam
Examination (Online) - Component A		25 %	Computer-based open book exam
Written Assignment - Component B		50 %	Coursework

Part 4: Teaching and Learning Methods

Learning Outcomes

On successful completion of this module students will achieve the following learning outcomes:

Module Learning Outcomes	**Reference**
Demonstrate knowledge and understanding of theories and techniques required to design robot systems and control their movement in a purposeful and efficient manner to achieve desired goals	MO1
Show skills in applying this knowledge in solving novel problems in the design or control of robots	MO2
Demonstrate familiarity with commonly used tools and techniques to enable the efficient solution of mechanics and design problems	MO3
Demonstrate management of information through finding, assessing and using technical literature and other information sources	MO4

Contact Hours

Independent Study Hours:

	Independent study/self-guided study	228
	Total Independent Study Hours:	228
	Scheduled Learning and Teaching Hours:	
	Face-to-face learning	72
	Total Scheduled Learning and Teaching Hours:	72
	Hours to be allocated	300
	Allocated Hours	300
Reading List	*The reading list for this module can be accessed via the following link:* https://uwe.rl.talis.com/modules/ufmfja-30-2.html	

Part 5: Contributes Towards
This module contributes towards the following programmes of study: Robotics [Sep][FT][Frenchay][3yrs] BEng (Hons) 2019-20 Robotics [Sep][SW][Frenchay][4yrs] BEng (Hons) 2019-20 Automation and Robotics Engineering {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2018-19 Robotics {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2018-19 Robotics {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2018-19 Automation and Robotics Engineering {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2018-19