MODULE SPECIFICATION

Part 1: Information			
Module Title	Robotic Systems		
Module Code	UFMFJA-30-2	Level	Level 5
For implementation from	2019-20		
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 2019-20		
Excluded Combinations	None		
Co- requisites	None		
Module Entry requirements	None		

Part 2: Description

Overview:
Pre-requisites: students must complete UFMFJ3-30-1 Introduction to Electronics for Robotics

Educational Aims: After learning about the components of robots in the first year, students need to understand more of how robot systems are designed. This module focuses on two things:

The mechanics and dynamics of robot bodies; how to make robots move efficiently and accurately to achieve desired aims.

The architectures and algorithms that enable us to build complicated machines that respond to stimuli in a timely, intelligent fashion.

In addition to Learning Outcomes, the educational experience may explore, develop, and practise but not formally discretely assess the following:

Group working

Outline Syllabus: 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.

In the second semester, 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.

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: Contact Hours:

Lectures : 24 hours

Practical / Facilitated Group Work : 48 hours

Self-directed learning : 150 hours

Summative assessment : 78 hours

Total hours : 300

Scheduled Learning.
Sessions will include lectures and facilitated group work or practical sessions. In the first semester students will work towards accomplishing a variety of tasks in controlling robot manipulators. In the second semester, they will work in small groups to present a design portfolio outlining your 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 two pieces of coursework, again dealing with the material covered in the first and second semesters.

Component A consists of three assessments:

A computer-based open-book Exam in which students will use Matlab to solve a kinematics problem.

An exam of two hours duration on the topics covered in the first semester.

An exam of two hours duration on the topics covered in the second semester.

Component B consists of two assessments:

An individual report of not more than 2000 words based upon practical work in robot mechanics.

A group report of not more than 4000 words based upon the coursework in robot systems. This group report 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.

Additionally, there will be opportunities for formative assessment (which does not contribute to the module mark). As new topics are introduced week by week, students have the opportunity to practice these techniques and skills associated with these topics in practical sessions, and feedback is given on their work from the preceding week.

Second Assessment Opportunity:
Students who fail either or both of Components A and B will have an opportunity to sit an exam and/or complete a report. Each of these assessments will cover all the material covered in the module.

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Report - Component B		25 %	Group report (4000 words)
Report - Component B		25 %	Individual report (2000 words)
Examination - Component A		15 %	Computer-based open book exam (1 hour)
Examination - Component A		15 %	Exam (2 hours)
Examination - Component A	✓	20 %	Exam (2 hours)
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Written Assignment - Component B		50 %	Coursework
Examination - Component A		15 %	Computer-based open book exam (1 hour)
Examination - Component A	✓	35 %	Exam (2 hours)

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][SW][Frenchay][4yrs] BEng (Hons) 2018-19

Robotics [Sep][FT][Frenchay][3yrs] BEng (Hons) 2018-19