B37VR Robotics group project

COURSE DETAILS
Course Code: B37VR
Full Course Title: Robotics group project
SCQF Level: 7
SCAF Credits: 30
Available as Elective: No

DELIVERY LEVEL
Undergraduate: Yes  Postgraduate Taught: No  Postgraduate Research: No

Additional Information:
Course being delivered at the specified campus(es) and also by collaborative partner - Ocean University of China on BEng Robotics programme

COURSE AIMS
Provide experience of high level programming of robots
Provide early practical experience of different robot motion characteristics
Provide experience of developing run time software

Provide experience of setting up calibrating and using sensors in a robotic system

Provide experience of group work and leadership to achieve high level goals in a relatively unsupervised or directed

Provide practical working knowledge of the C high-level programming language

Provide practical working experience in an Integrated Development Environment.

Instil good practise in software writing from flowchart to completion and de-bugging

Develop software engineering skills through integration of student’s code into a larger programme.

Introduce an awareness of the C language being used to target embedded system hardware.

Encourage students to learn to program using problem –based, curiosity driven learning

Encourage students to learn to program with interesting and varied examples.

LEARNING OUTCOMES – SUBJECT MASTERY
On completion of this course, students will be able to
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Understand the relevance of design to writing software
Be able to debug a faulty piece of code
Appreciate the need for code testing
Be competent in using program tools
Program a low degree of freedom (DOF) robot to carry out basic robotic tasks, such as navigation, perception, trajectory generation/adaptation D4pm, EP4pm
Address basic issues of embedded programming on a robot
Understand basic sources of error in specific robot motion objectives D3pm, ET6pm
Understand issues with sensor setup, calibration and use
Self study in robotics texts to identify techniques and methods of relevance
Applying strategies for appropriate selection of relevant information from a wide source and large body of knowledge
Exercise some initiative and independence in carrying out defined activities

LEARNING OUTCOMES – PERSONAL ABILITIES

Develop technical report writing
Work in teams: organise work to adhere to deadline and deliverable requirements; set up peer-based quality assurance "check/amend and counter-check" routine.

- Work with peer groups to discuss problems and identify solution
- Use of ICT tools (Excel, Word) and mathematical models (in Excel) to develop simulations of real robot, validate code and communicate outcomes of experiments.

SYLLABUS

Introduction to a high level programming language; Program structure and simple I/O; Assignments

maths and precedence; Conditional branching; Looping structures; Functions and their role in design
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1D/2D arrays; I/O using files;

An introduction to a modular design approach; Code debug strategies

Limits to arithmetic accuracy

Introduction of Integrated Development Environments to program code on a computer and a microcontroller

Notions of cross-compilation

Problem-Based robotic programming.

Mobile robot navigation

Sensing and actuation based on the environment

Path finding

Obstacle avoidance

Multi DOF motion programming and movement

The assessments are based staged reports and meetings with academic staff and laboratory assistants.

Final assessment involves the submission of a project technical report and practical demonstrations.

COURSE RELATIONSHIPS

N/A

LOCATION AND ASSESSMENT METHODS

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Assessment is based on practical exercises, demonstrations and reports
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