B51RO Robotic Mechanical Systems

COURSE DETAILS
Course Code: B51RO
Full Course Title: Robotic Mechanical Systems
SCQF Level: 11
SCAF Credits: 15
Available as Elective: No

DELIVERY LEVEL
Undergraduate: Yes  Postgraduate Taught: Yes  Postgraduate Research: Yes
Additional Information:

COURSE AIMS

This course aims to

- provide advanced knowledge and skills in robot kinematics with the focus on the simulation of kinematic motion.
- provide advanced knowledge and skills for robot analysis and design with a focus on static analysis, dynamics and design
- introduce fundamental mechatronic design
- introduce recent advances in a current robotic topic

LEARNING OUTCOMES – SUBJECT MASTERY

On completion of this course, students will be able to:

- select and design appropriate architecture(s) of robots to satisfy the motion requirement for a number of applications.
- perform the motion analysis of robots.
- simulate the motion of robots using CAD software.
- formulate the instantaneous kinematic equations for a variety of robots
- identify singular configurations of robots
- formulate the static and dynamic equations for a variety of robots
- simulate the motion of robots as a whole using software
- design a robot, with a focus on the mechanical design, for specified applications from the mechatronic perspective
- apply recent advances in one of current robotic topics to analysis and design

LEARNING OUTCOMES – PERSONAL ABILITIES

On completion of this course, learners will be able to:

- design creatively the mechanical system of a robot or other mechatronic systems involving motion
- work effectively in a group
be aware of the importance of new technology, people and culture on overall business performance and their impact on upstream engineering process such as design.

### SYLLABUS

Classification of robots

- 3D modelling and motion simulation of robots
- Direct kinematics
- Inverse kinematics
- Workspace analysis
- Instantaneous kinematics
- Singularity
- Static analysis
- Dynamics
- Control
- Trajectory generation
- Simulation
- Robot design
- Repeatability and accuracy
- Recent advances in a current robotic topic

### COURSE RELATIONSHIPS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Level</th>
<th>Title</th>
<th>School</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>B50RO</td>
<td>10</td>
<td>Robotic Mechanical Systems</td>
<td>School of Eng &amp; Physical Sci</td>
<td>Excluded</td>
</tr>
</tbody>
</table>

### LOCATION AND ASSESSMENT METHODS

<table>
<thead>
<tr>
<th>Edi</th>
<th>SBC</th>
<th>Ork</th>
<th>Dub</th>
<th>Malay</th>
<th>IDL</th>
<th>COLL</th>
<th>ALP</th>
<th>OTH</th>
<th>Method</th>
<th>Weight</th>
<th>Exam Mins</th>
<th>Type</th>
<th>Diet</th>
<th>Synoptic Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Examination</td>
<td>50</td>
<td>120</td>
<td>Assessment</td>
<td>Semester 2</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Coursework</td>
<td>50</td>
<td>120</td>
<td>Assessment</td>
<td>Semester 2</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Examination</td>
<td>100</td>
<td>120</td>
<td>Reassessment</td>
<td>Semester 3</td>
<td></td>
</tr>
</tbody>
</table>