Description: Robotics and Machine Vision

Subject  Cat-Nbr  Class  Term  Mode  Units  Campus
ENG  4406  14632  2, 2002  WEB  1.00  TWMB

Academic Group:  FOENS
Academic Org:  FOES02
HECS Band:  2
ASCED Code:  030799

STAFFING
Examiner: John Billingsley
Moderator: Paul Wen

PRE-REQUISITES
Pre-requisite: ELE2103

SYNOPSIS
Robotics and machine vision are specialised aspects of mechatronics, the fusion of digital control with electronics and mechanisms to realise an application of value to manufacturing and other industries. Mechatronic control system design requires the ability to embrace nonlinearities in both the system and the controller. Kinematic methods are taught for the design and analysis of robot manipulators and similar mechanisms. Aspects of control theory cover modelling and synthesis of nonlinear controllers such as the saturating drives demanded for real life actuator systems. The vision syllabus ranges over the variety of image acquisition systems now available, leading on to methods of image analysis. Image filtering and edge detection are compared with more pragmatic methods and examples are taken from research outcomes such as the vision guidance system now being implemented on agricultural tractors.

OBJECTIVES
On completeion of this course, students should be able to:
- kinematics and positional control of articulated manipulators;
- design techniques for controlling mechanical systems;
- basics of machine vision concepts applicable to robotics.
TOPICS

<table>
<thead>
<tr>
<th>Description</th>
<th>Weighting (%)</th>
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<tbody>
<tr>
<td>1. Kinematics and inverse kinematics for robots</td>
<td>35.00</td>
</tr>
<tr>
<td>2. Control for robots</td>
<td>25.00</td>
</tr>
<tr>
<td>3. Robot programming principles</td>
<td>5.00</td>
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<tr>
<td>4. Introduction to sensing for robots</td>
<td>10.00</td>
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<tr>
<td>5. Machine vision for robots</td>
<td>25.00</td>
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</table>

TEXT and MATERIALS required to be PURCHASED or ACCESSED:

Books can be ordered by fax or telephone. For costs and further details use the ‘Book Search’ facility at http://bookshop.usq.edu.au by entering the author or title of the text.

MATLAB Student Edition, Version 5 or later.

Tran-Cong, T. Dynamics for Engineering Students, USQ Publication,

STUDENT WORKLOAD REQUIREMENTS

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment</td>
<td>40</td>
</tr>
<tr>
<td>Directed Study</td>
<td>52</td>
</tr>
<tr>
<td>Examinations</td>
<td>3</td>
</tr>
<tr>
<td>Private Study</td>
<td>60</td>
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ASSESSMENT DETAILS

<table>
<thead>
<tr>
<th>Description</th>
<th>Marks Out of</th>
<th>Wtg(%)</th>
<th>Required</th>
<th>Due Date</th>
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</thead>
<tbody>
<tr>
<td>ASSIGNMENT 1</td>
<td>250.00</td>
<td>25.00</td>
<td>Y</td>
<td>20 Sep 2002</td>
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<tr>
<td>ASSIGNMENT 2</td>
<td>250.00</td>
<td>25.00</td>
<td>Y</td>
<td>25 Oct 2002</td>
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<td>3 HOUR CLOSED EXAMINATION</td>
<td>500.00</td>
<td>50.00</td>
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</tbody>
</table>

(see note 3)

NOTES:

3. Student Administration will advise students of the dates of their examinations during the semester.

OTHER REQUIREMENTS

1. In order to complete this course successfully, a student must normally obtain 50% of the marks in the individual assessments.
Grading scheme: HD: normally 90% overall and 90% in examination; A: normally 80% overall and 80% in examination; B normally 65% overall and 65% in examination.

A minimum standard of communication skills must be demonstrated in order for a passing grade to be achieved.

The due date for an assignment is the date by which a student must submit the assignment to the USQ. The onus is on the student to provide proof of the submit date, if requested by the Examiner.

Students must retain a copy of each item submitted for assessment. This must be produced within five days if required by the Examiner.

In accordance with University's Assignment Extension Policy (Regulation 5.6.1), the examiner of a course may grant an extension of the due date of an assignment in extenuating circumstances.

If students submit assignments after the due date without prior approval then a penalty of up to 20% of the total marks for the assignment will apply for each working day late.

In the event that a due date for an assignment falls on a local public holiday in their area, such as a Show holiday, the due date for the assignment will be the next day. Students are to note on the assignment cover the date of the public holiday for the Examiner's convenience.

The Faculty of Engineering and Surveying will NOT accept submission of hand written or typed assignments by facsimile, e-mail or computer diskette. Students in remote locations who do not have regular access to postal services may be given special consideration.

The final grades for students will be assigned on the basis of the aggregate of the marks obtained for each of the assessments in the course.

A closed examination is an examination where the candidates are allowed to bring only writing and drawing instruments into the examination.

The Faculty of Engineering and Surveying does not offer supplementary examinations.

Students who have undertaken all of the required assessments in a course but who have failed to meet some of the specified objectives of a course within the normally prescribed time may be awarded the temporary grade: IM (Incomplete - Make up). An IM grade will only be awarded when, in the opinion of the examiner, a student will be able to achieve the remaining objectives of the course after a period of non-directed personal study.

Students who, for medical, family/personal, or employment-related reasons, are unable to complete an assignment or to sit for an examination at the scheduled time may apply to defer an assessment in a course. Such a request must be accompanied by appropriate supporting documentation. One of the following temporary grades may be awarded IDS (Incomplete - Deferred Examination; IDM (Incomplete Deferred Make-up; IDSM (Incomplete Deferred Examination and Make-up).