MODULE DESCRIPTION FORM

ME502  SYSTEMS ENGINEERING 2

Module Registrar: Dr C Maddock  christie.maddock@strath.ac.uk
Taught To (Course): Cohorts for whom class is compulsory/optional

Other Lecturers Involved:  
Credit Weighting: 10  
Semester: 2

Assumed Prerequisites:  
ME501 Systems Engineering 1  
Optional class

Academic Level: 5

Module Format and Delivery (HOURS i.e. 1 credit = 10hrs of study):

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Tutorial</th>
<th>Laboratory</th>
<th>Groupwork</th>
<th>External</th>
<th>Online</th>
<th>Project</th>
<th>Assignment</th>
<th>Private Study</th>
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Educational Aim

This class will follow on directly from ME501 Systems Engineering 1. The aim is to use advanced modelling and control design techniques appropriate for complex engineering systems, understanding both the underlying theory, and the practical application of modelling dynamics systems and developing control laws through the use of Matlab/Simulink.

Learning Outcomes

On completion of the module the student is expected to be able to:

LO1 understand the principles of feedback control system design;
LO2 understand in detail about stability and performance of control systems;
LO3 understand the fundamentals of state-space design and optimal control systems;
LO4 have applied their knowledge to the design of practical control systems.

Syllabus

The module will teach the following:

- Stability of engineering systems, frequency response design methods, design of state variable feedback systems, robust control and systems under uncertainty, estimator and observer design, system error signal and error analysis, performance of feedback control systems, steady-state response, time-domain specifications.

Assessment of Learning Outcomes

Criteria

For each of the Module Learning Outcomes the following criteria will be used to make judgements on student learning:

For LO1 and LO3, the student should demonstrate an understanding of feedback control systems by being able to:
C1: develop a mathematical model using analytical equations for a physical system in both the time domain and frequency domain,
C2: derive transfer functions for open and closed loop feedback control systems,
C3: understand the terms and definitions used in the field.

For LO2, the student should be able to:
C1: determine the stability of the system by a number of different methods,
C2: analyse the output of a system using a number of common metrics, and understand the impact this has on the system operation and performance,

For LO3:
C1: the student should be able to calculate a control law.

For LO4:
C1: the student should demonstrate the ability to simulate the performance of a system using computer simulation tools,
C2: the student should demonstrate an understanding of how different controllers work.
The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

### 12 Principles of Assessment and Feedback

(On Learning & Teaching web pages: [www.strath.ac.uk/learnteach/informationforstaff/staff/assessfeedback/12principles/](http://www.strath.ac.uk/learnteach/informationforstaff/staff/assessfeedback/12principles/))

Formal, summative feedback will be provided by the return of marks with comments to students after assessment of the assignment and group project.

Informal feedback will be provided at regular tutorial and laboratory sessions primarily through verbal discussion with individuals or groups on tutorial exercises attempted by students (note: to receive this feedback students should participate in these tutorials but attendance is not mandatory).

### Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>L/Outcomes</th>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Month(s)</td>
<td>Duration</td>
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<tr>
<td>LO 1-3</td>
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Indicate which learning outcomes (LO1, LO2 etc) are to be assessed by exam/coursework/project as required.

<table>
<thead>
<tr>
<th>Coursework / Submissions deadlines:</th>
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<tbody>
<tr>
<td>Coursework assignment: Week 8</td>
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<td>Group project: Week 12</td>
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<th>Resit Assessment Procedures:</th>
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<tr>
<td>2 hr examination in August diet</td>
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**PLEASE NOTE:**

Students need to gain a summative mark of 50% to pass the module. Students who fail the module at the first attempt will be re-examined during the August diet. This re-examination will consist entirely of an exam.

### Recommended Reading

**** Purchase essential; *** Purchase recommended; ** Highly recommended reading; * Simply for reference (do NOT purchase)

**** “Modern Control Systems – 12th Ed” by Bishop and Dorf, Addison Wesley

** “Feedback Control of Dynamic Systems” by G Franklin, J Powell and A Emani-Naeini

### Additional Student Feedback

(Please specify details of when additional feedback will be provided)

Session: 2014/15

Approved:

Course Director Signature: [Signature]

Date of Last Modifications: 05 September 2014
# Module Timetable

**Module Code:** ME502  
**Module Title:** Systems Engineering 2

**Brief Description of Assessment:**
1 individual assignment (IA) = 50%  
1 group project = 50%

**Assessment Timing:**
Indicate on the table below the start/submission dates for each assignment/project and the timing of each exam/assessment(s).

### Semester One
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### Semester Two
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Exam Period:
- Week 14