Module Registrar: Dr M Wheel  
marcus.wheel@strath.ac.uk

Taught To (Course): Cohorts for whom class is compulsory

Other Lecturers Involved: Dr T Comlekci

Credit Weighting: 20 (ECTS 10)

Semester: 1 & 2

Assumed Prerequisites: ME305 Dynamics III, 16327 Structural Mechanics III

Compulsory class

Academic Level: 4

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>Assignments</th>
<th>Private Study</th>
<th>Total</th>
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<td>24</td>
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Educational Aim

The aims of this module are twofold:-

to develop the students’ ability to apply analytical techniques to the solution of engineering problems where dynamic behaviour is important

to provide practical experience in designing lightweight structures to ensure that they have sufficient strength and stiffness to prevent failure, particularly by buckling, when in service. This experience will be obtained by undertaking an aerospace themed or similar design, construct and test activity.

Learning Outcomes

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

LO1 apply vector methods to determine the dynamic behaviour of particles and bodies in 3 dimensional motion

LO2 understand the concept of generalised co-ordinates, virtual displacements and virtual work and apply Lagrange's equations to obtain equations of motion for multi-degree of freedom systems, analyse lumped parameter systems to determine natural frequencies, mode shapes and forced response, and derive governing equations for the vibration of continuous systems obtain their natural frequencies and mode shapes

LO3 gain an understanding of the structural failure modes that are specific to lightweight structures

LO4 acquire practical experience in designing, constructing and testing a structure of this type that satisfactorily precludes such failures

Syllabus

The module will teach the following:

Fundamentals of the analytical approach to the behaviour of dynamic systems.


Students, working in groups, will construct a standard specification BMFA (British Model Flying Assn.) Arrow class indoor aeromodel or similar lightweight structure. Its operational and structural performance will then be assessed. The design of the model will then be progressively modified to enhance performance and the expected enhancement measured through further testing. Through this exercise students will gain the knowledge and experience summarized in the learning outcomes.
Assessment of Learning Outcomes

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

LO1 will be assessed by performance in the mid semester class test (20%). The test will assess the understanding of particle and rigid body kinematic motion through the ability to analyse problems involving both 2 and 3 dimensional motion.

LO2 will be assessed by performance in the end of module examination (30%). The exam will assess the understanding of the motion of both discrete and continuous systems by problems involving the derivation and solution of the equations of motion of such systems by a variety of such methods.

Note that due to the integrated approach adopted in delivering LO3 and LO4 these are not assessed independently.

LO3 & LO4 25% of the assessment will be awarded for the measured increase in structural and in flight performance of the model and 25% for the final report explaining the basis of design modifications that result in increased performance.

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/)

Please state briefly how these are incorporated in this module.

LO1 & LO2
Formative feedback will be provided at tutorial sessions primarily through individual or group discussion of work prepared in advance by students (note:- to receive this feedback students should participate in these tutorials but attendance is not mandatory)

Summative feedback will be provided by the return of examination marks to students after assessment (note:- in accordance with University policy exam scripts will not be returned to students and no individual or collective discussion of exam performance will be facilitated).

LO3 & LO4
Formative feedback will be provided at weekly laboratory and open (optional, unassessed) testing sessions through individual and group discussion.

Summative feedback will be provided by (i) performance measured at the three compulsory assessed testing sessions timetabled (ii) mark awarded for the group report submitted upon completion of the class.

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

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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<tbody>
<tr>
<td>Number</td>
<td>Month(s)</td>
<td>Duration</td>
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<tr>
<td>2</td>
<td>sem1 wk6/7 Jan</td>
<td>1.25hr 2hr</td>
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L/Outcomes

LO1 and LO2

LO3 and LO4

LO3 and LO4

Indicate which learning outcomes (LO1, LO2 etc) are to be assessed by exam/coursework/project as required.
Resit Assessment Procedures:
LO1 & LO2: 2hr examination in August diet.
LO3 & LO4: Submission of additional coursework(s) prior to commencement of the August exam diet, if first is unsatisfactory.

PLEASE NOTE:
Students need to gain a summative mark of 40% to pass the module. Students who fail the module at the first attempt will be re-examined. This re-examination will consist of exam / coursework (as outlined above).

Recommended Reading

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


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

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<th>Time</th>
<th>Room No</th>
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Session: 2014/15

Approved:

Course Director Signature: [Signature]

Date of Last Modifications: 12 September 2014
**MODULE TIMETABLE**

**Module Code:** ME414  
**Module Title:** Advanced Mechanics and Dynamics

**Brief Description of Assessment:**
- 1.25hr class test in week 6 or 7 of semester 1 (20%)
- 2hr final exam during end of semester 1 exam diet (30%)
- 2x flight duration assessments (25%)
- final group report (25%)

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

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<thead>
<tr>
<th>Semester One</th>
<th>WK1</th>
<th>WK2</th>
<th>WK3</th>
<th>WK4</th>
<th>WK5</th>
<th>WK6</th>
<th>WK7</th>
<th>WK8</th>
<th>WK9</th>
<th>WK10</th>
<th>WK11</th>
<th>WK12</th>
<th>Exam Period</th>
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<td>Class Test (1.25hr)</td>
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<td>Exam (2hr)</td>
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<td>Flight Assessment</td>
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<td>Final Report</td>
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