MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

ME414 (16415 sem1) ADVANCED MECHANICS AND DYNAMICS

Module Registrar: Dr Marcus Wheel **marcus.wheel@strath.ac.uk**	**Taught To (Course): Cohorts for whom class is compulsory / optional - y4 undergraduates MAE (ME414), EME (16415, optional)**		
Other Lecturers Involved: Dr T Comlekci; Dr R Hamilton, Prof D Nash;	**Credit Weighting: 20 (ECTS 10)**	**Semester: 1 & 2**	
Assumed Prerequisites: ME305 Dynamics III, 16327 Structural Mechanics III	**Compulsory / optional class**	**Academic Level: 4**	**Suitable for Exchange: Y**

Alternative codes and credit values for those taking only one semester:
Semester 1: 16415 Engineering Dynamics (10 Cr/ECTS 5)

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

Lecture	Tutorial	Laboratory	Groupwork	External	Online	Project	Assignments	Private Study	**Total**
20	40				20			120	200

Educational Aim

This module encompasses two main areas with their corresponding main aims as listed below:

1) The application of analytical techniques to the solution of important engineering dynamics problems. It aims to develop the student understanding and their ability to solve advanced dynamics problems related to machine dynamics and vibration. (ME414 &16415)
2) The deformation and failure of statically loaded engineering materials and structures and the analytical procedures that can be utilised to preclude such failures. This part aims to enhance the student understanding of the deformation and failure of statically loaded engineering materials and structures and the analytical procedures that can be utilised to preclude such failures. (ME414 only)

Learning Outcomes

On completion of the module the student is expected:

LO1 to be able to apply vector mechanics methods to determine the dynamic behaviour of systems of particles and bodies in 3 dimensional motion (ME414 &16415)

LO2 to be able to analyse lumped parameter systems to determine natural frequencies, mode shapes and forced response, and derive governing equations for the vibration of continuous systems and solve these to obtain their natural frequencies and mode shapes (ME414 &16415)

LO3 to have developed understanding of the possible deformation and failure modes of loaded engineering materials and structures (ME414 only)

LO4 to have acquired experience in applying analytical methods in order to design against excessive deformation and failure in materials and structures (ME414 only)

Syllabus

The module will teach the following:

Fundamentals of the analytical approach to the behaviour of dynamic systems. (ME414 &16415)

Kinematics of particles and systems of particles and rigid bodies in 3 dimensional motion. Angular momentum; momentum equations of motion. Vibration of single and multi-degree of freedom lumped parameter systems. Introduction to matrix methods for multi-degree of freedom system vibration. Eigenvalues/vectors; orthogonality. Modal

characteristics of vibrating systems. Vibration of continuous systems - longitudinal, torsional and bending. Gyroscopic motion. (ME414 &16415)

Behaviour of loaded materials and structures: (ME414 only)

Failure of materials and structures due to buckling, fracture, fatigue and plastic collapse. Deformation of plates and shells. (ME414 only)

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 & LO2 will be assessed by performance in the end of first semester examination (50%). The exam will assess the understanding of particle and rigid body kinematic motion and the vibration of discrete and continuous systems through the solution of a series of relevant problems. (ME414 &16415)

LO3 & LO4 will be assessed by performance in the end of second semester examination (50%). The exam will assess the understanding of material and structural excess deformation and failure and the means of mitigating these through the solution of a series of relevant problems. (ME414 only)

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

Principles of Assessment and Feedback
(within Assessment and Feedback Policy at: https://www.strath.ac.uk/staff/policies/academic/)

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 - exam scripts will not be returned to students and no individual or collective discussion of exam performance will be facilitated).

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

Examination				Coursework		Practical		Project	
Number	Month(s)	Duration	***Weighting***	Number	***Weighting***	Number	***Weighting***	Number	***Weighting***
1 1	Dec Apr/May	2hr 2hr	50% / 100% (16415) 50%						
* LO1 &LO2 (Dec); LO3 & LO4 (Apr/May)				*		*		*	

* ***L/Os:*** *Indicate which Learning Outcomes (L01, L02, etc) are to be assessed by exam/coursework/practical/project as required.*

Coursework / Submissions deadlines (*academic weeks*):
N/A

Resit Assessment Procedures:
ME414 (LO1, LO2, LO3 & LO4): 2hr examination in August diet.
16415 (LO1 & LO2): 1.25hr examination in August diet.

PLEASE NOTE:
Students must gain a summative mark of 40% to pass the module. Students who fail the module at the first attempt will be re-assessed during the August diet. This re-assessment will consist entirely of exam. No marks from any previous attempts will be transferred to a new resit attempt.

Recommended Reading

*****Purchase recommended **Highly recommended reading *For reference (do NOT purchase)**
** Vector Mechanics for Engineers – Dynamics" by Beer, Johnston & Clausen, McGraw Hill, 7th or 8th Edition (2004, 2007)

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

Date	Time	Room No
		Check timetable webpages for details

Session: 2020/21

Approved:

Course Director Signature: Dr Stuart Grey
Date of Last Modifications: 10 September 2020

(Updated August 2020)

MODULE TIMETABLE

Module Code:	**ME414 / 16415**	**Module Title:**	**Advanced Mechanics and Dynamics / Engineering Dynamics**

Brief Description of Assessment:

ME414: 2hour online open book exam in December exam period (50%) and 2hour exam in Apr/May exam period (50%)
16415: 2hour online open book exam in December exam period (100%)

Assessment Timing:-

Indicate on the table below the start/submission dates for each assignment/project and the timing of each exam/assessment using the dropdowns provided. Dropdowns can be left blank. Add extra notes below the dropdowns.

Please note: Timings can and will change, this should only be used as a guide.

Semester One	W&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Exam

Semester Two	C&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Exam