

Advanced Solid Mechanics

Module Code:	MAE7013-B
Academic Year:	2018-19
Credit Rating:	20
School:	Department of Mechanical and Energy Systems Engineering
Subject Area:	Mechanical and Automotive Engineering
FHEQ Level:	FHEQ Level 7 (Masters)

Pre-requisites:

Co-requisites:

Contact Hours

Type	Hours
Lectures	12
Practical classes and	24
Tutorials	12
Directed Study	152

Availability Periods

Occurrence	Location/Period
BDA	University of Bradford / Semester 1 (Sep - Jan)

Module Aims

To extend knowledge of Solid Mechanics in the context of modern mathematical analysis. To develop understanding of stresses and strains while emphasising their parallels. To introduce large deformations and more general material behaviour. To demonstrate the methods for implementing advanced theory numerically within finite element analyses. To give examples of applications of these numerical techniques.

Outline Syllabus

Stress analysis: 3D equilibrium equations, the stress tensor, transformations and principal directions. Strain analysis: large deformations, deformation gradient tensors, rigid body

rotations and principal directions. Analogies between stress and strain analysis. Constitutive relationships: linear, nonlinear, strain energy functions, elastic-plastic behaviour and flow rules. Applications of the finite element technique. Case studies.

Module Learning Outcomes

On successful completion of this module, students will be able to...

- 1 Analyse stress and strain at arbitrarily large deformations as tensor quantities.
- 2 Apply analytically a set of material models in current use
- 3 Use a commercial FEM package to create models of stressed bodies.
- 4 Use the commercial FEM package to implement large deformation, nonlinear analyses using some of the material models covered in learning outcome 2.

Learning, Teaching and Assessment Strategy

Analytical material: A combination of lectures and problems classes. In the latter, students attempt problems in class and are given individual guidance.

Numerical material: Introduced by online tutorials. Followed by hands-on use of FEM package. Students receive assistance and feedback during class.

The analytical material is assessed via the closed book examination. The numerical FEM work is assessed via the computer-based class test. Formative assessment is via in-class guidance.

Mode of Assessment

Type	Method	Description	Length	Weighting	Final Assess'
Summative	Examination - closed book	4 questions from 6	2 hours	50%	Yes
Summative	Classroom test	Computer based using FEM software. Answer 2 compulsory questions	2 hours	50%	Yes

Legacy Code (if applicable)

ENG4307D

Reading List

To view Reading List, please go to [rebus:list](#).