



MODULE SPECIFICATION

Faculty of Engineering

Last Updated (28th April 2018)

1. Module Title

Advanced Solid Mechanics

2. Module Code

EM5108

3. Number of credits

15

4. Level

5

5. Semester

1

6. Pre-requisites for admission to the module

Normal entry requirements

7. Module Coordinator

Dr Judha Purbolaksono

8. Aims

This module provides the students with the essential aspects in mechanical behaviour of materials and structures through state-of-the-art methods and interpretations of solutions to engineering mechanics and design problems.

9. Summary of Contents

The module covers the following topics.

- **Stress analysis:** force analysis, axial load, torsion, bending, shear transverse, statically indeterminate members, superposition method, inelastic stress condition, residual stresses, state of stress caused by combined loadings, theories of failure, thin-walled structures.
- **Design of beams, shafts and columns:** fully stresses beams, singularity functions, stress concentration, shaft design, Newton-Raphson method, deflections, Euler and Secant formulae, instability under concentric and eccentric loadings, inelastic buckling.
- **Computational mechanics:** basic concept of computational modelling, type of solid elements, finite element modelling, solution techniques, interpretation of results.
- **Problems under varying stresses:** fatigue, fracture mechanics, high temperature creep, remaining useful lives.

10. Module Intended Learning Outcomes (MILOs)

Upon successful completion of this module, students will be able to:

No.	MILOs	Weightage (%)
1	Determine the support reactions and internal forces of multforce members of a mechanical system under combined loadings.	20
2	Determine the state of stress at given points of a loaded component.	20
3	Manage suitable roles of material and section properties in designing solid members of an engineering mechanics system.	20
4	Construct a suitable finite element model for a given solid mechanics problem.	20
5	Predict yielding and fracture of materials under varying stresses and useful life of components due to fatigue/crack growth or/and creep.	20

11. Teaching and Learning Activities (TLAs)

MILO No.	TLAs	Functions	Hours/Week
1-5	Lecture	To provide concepts, theories, methods of analysis and application, and design principles and procedures.	2
1-5	Tutorial	To provide problem examples and design problems.	1
1-5	Laboratory sessions	To gain experiences and competences in solving solid mechanics problems using finite element method	2

12. Assessment Tasks/Activities

MILO No.	Type of Assessment Tasks/Activities	Weightage (%)
1-5	University Examination	50
1-4	Class Test	10
1-5	2 Mini Projects	20
1-5	3 Assignments	20

Assessment Criteria:

Assessment components of the module shall be University Examination and Coursework. To achieve a pass in the module students must obtain a minimum overall mark of 50% and a minimum of 40% in each assessment component.

Resit: Students eligible for resit shall be assessed according to the programme area Examination Board recommendation.

13. Attendance Requirements

Students are expected to attend all lectures, tutorials and lab sessions.

14. Contribution to Programme Intended Learning Outcomes

PILO		MILO No.				
		1	2	3	4	5
1	Science & Mathematics	✓	✓	✓	✓	✓
2	Engineering Analysis	✓	✓	✓	✓	✓
3	Design	✓		✓	✓	✓
4	Advanced Design				✓	✓
5	Engineering Practice Knowledge		✓	✓	✓	✓
6	Engineering Practice					✓
7	Ethical, Economic & Social			✓		
8	Management, Legal & Environmental			✓		
9	General Skills	✓			✓	✓

15. Grading of Student Achievement

Marks (%)	Grades	Grade Definition
85-100	A+	Excellent
75-84	A	
70-74	B+	Very Good
65-69	B	
60-64	C+	Good
55-59	C	
50-54	D	Satisfactory
0-49	F	Fail

16. Resources

Primary text

No	Name of Author(s)	Year of Publication	Title of Book	Edition	Publisher's Name	ISBN
1	Hibbeler, R.C.	2017	Mechanics of Materials	10 th	Pearson	978-0134321240
2	Dowling, N.E.	2013	Mechanical Behavior of Materials	4 th	Pearson	978-0131395077
3	Logan, D.L.	2011	A First Course in the Finite Element Methods	5 th	CL Engineering	978-0495668251

Secondary texts

No	Name of Author(s)	Year of Publication	Title of Book	Edition	Publisher's Name	ISBN
1	Ugural, A.C. and Fenster, S.K.	2012	Advanced Mechanics of Materials and Applied Elasticity	5 th	Pearson	978-0137079209
2	Madenci, E.; Guven, I.	2006	The Finite Element Method and Applications in Engineering Using ANSYS®	1 st	Springer	978-1489975508