



## MODULE SPECIFICATION

### Faculty of Engineering

Last Update: 28 April 2018

**1. Module Title**

Mechanics of Materials

**2. Module Code**

EM2103

**3. Number of credits**

10

**4. Level**

2

**5. Semester**

3

**6. Pre-requisites for admission to the module**

Normal progression rules

**7. Module Coordinator**

Judha Purbolaksono

**8. Aims**

This module provides the students with the means of analyzing various solid mechanics problems and loaded structures by the determination of stresses and deformations.

**9. Summary of Contents**

The module covers the following topics:

- **Review on force analysis:** structure free body diagram; axial and shear loads; centric and eccentric loadings; bending and torsion; support reactions; internal forces; shear and bending diagrams.
- **Concept of stress:** normal stress, shear stress, stresses in an oblique plane, bearing stress; state of stress; factor of safety; allowable stress; impact of stress on design.
- **Axial loading:** axial deformation; stress and strain relationships in ductile and brittle materials; failure modes; stress concentrations; statically indeterminate members; thermal stress; plastic deformations; residual stress.
- **Pure bending:** stress distribution; deformation and strain due to bending; beam section properties; bending in composite members; stress concentrations; plastic deformations; residual stress; design for bending.
- **Torsion:** stress distribution; deformation and strain due to torsion; failure modes; stress concentrations; statically indeterminate members; plastic deformations; residual stress.; stresses in non-circular and thin-walled hollow members.
- **Transverse loading:** shear load on a member element; shearing stress in a member; shearing stress and unsymmetrical loading in thin-walled members.
- **Combined stresses:** transformation of plane stress; Mohr's circle; principal and maximum shearing stresses; yield criterion; fracture criterion; stresses in thin-walled pressure vessels; design of transmission shafts.

- **Deflection of Beams:** deformation under transverse loading; elastic curve equation; statically indeterminate beams; superposition method; maximum deflection; the use of deflection formulae.
- **Columns:** stability of structures; Euler formula; end-support conditions; Secant formula; design of columns; under centric and eccentric loadings.

#### 10. Module Intended Learning Outcomes (MILOs)

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

No.	MILOs	Weightage (%)
1	Calculate the support reactions and internal forces of a system member under different loadings.	20
2	Determine the stresses and deformations at a given point of a component under axial load, transverse load, bending or torsion	20
3	Evaluate the stresses developed in mechanical components subjected to combined loadings.	20
4	Assess suitability of material and section properties of a mechanical member for a given loading.	20
5	Apply principles of solid mechanics to solve design problems.	20

#### 11. Teaching and Learning Activities (TLAs)

MILO No.	TLAs	Functions	Hours/Week
1-5	Lectures	To provide concepts, theories, methods of analysis and application, and design principles and procedures.	2
1-5	Tutorials	To provide problem examples and design problems.	2

#### 12. Assessment Tasks/Activities

MILO No.	Type of Assessment Tasks/Activities	Weightage (%)
1 – 5	University examination	60
1 – 4	3 Assignments	15
1 - 5	2 Mini projects	25

##### 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 marks of 40% and a minimum of 30% 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 required to attend all lectures and tutorials.

#### 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	Economic, Legal, Social and Ethical Contexts					✓
6	Engineering Practice					✓
7	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
45-49	D	
40-44	E	Marginal
0-39	F	Fail

## 16. Resources

### Primary texts

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	Pearson	978-0134321240
2	Beer, F.P., Johnston, E.R., DeWolf, J.T. and Mazurek, D.F.	2014	Mechanics of Materials	7	McGraw-Hill	978-0073398235

Note:  
Module specification valid for Intake 2017 onwards.