



## MODULE SPECIFICATION

### Faculty of Engineering

Last Updated 16<sup>th</sup> December 2017

1. **Module Title**  
Engineering Materials

2. **Module Code**  
EM1102

3. **Number of credits**  
10

4. **Level**  
1

5. **Semester**  
2

6. **Pre-requisites for admission to the module**  
Normal entry requirements.

7. **Module Coordinator**  
Professor Dr Zuruzi Bin Abu Samah

8. **Aims**  
The main aim of the module is to introduce students to the structure and properties of common engineering materials. Using this knowledge, students will be able to understand the inherent advantages and disadvantages of different classes of materials as well as the suitability of different materials for various manufacturing processes and engineering applications.

9. **Summary of Contents**

The module covers the following topics:

- **Atomic Structure and Interatomic Bonding:** Electronic configuration, bonding forces and energies, primary and secondary bonds.
- **Structure of Crystalline Solids:** Unit cells, metallic crystal structures, crystalline defects, polymorphism and allotropy, crystallographic directions and planes, linear and planar atomic densities, single and polycrystalline materials, anisotropy
- **Mechanical Properties of Materials:** stress-strain behavior, elastic properties of materials, tensile properties of materials, strengthening mechanisms
- **Failure of Materials:** Brittle and ductile fracture, fatigue properties, creep behavior
- **Phase diagram:** Definition and basic concepts, binary isomorphous and binary eutectic phase diagrams, eutectoid and peritectic reactions, iron-carbon phase diagram

## 10. Module Intended Learning Outcomes (MILOs)

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

No.	MILOs	Weightage (%)
1	Describe relationship between microstructure and properties of common engineering materials and apply this knowledge to solve engineering problem	30
2	Predict material properties from atomic arrangements in crystalline solids	25
3	Evaluate the mechanical properties of various engineering materials for materials selection to solve engineering problems	25
4	Apply phase diagrams and transformation diagrams to predict and modify microstructure	20

## 11. Teaching and Learning Activities (TLAs)

MILO No.	TLAs	Functions	Hours/Week
1 – 4	Lecture	Disseminate information / knowledge sharing, facilitate understanding and motivate inquiry for self-learning among students	2
1 – 4	Tutorial	Reinforce understanding through class discussion and problem solving	1
1 – 3	Laboratory	Gain experiential learning through hands-on application of knowledge	2 sessions (2 hr each)

## 12. Assessment Tasks/Activities

MILO No.	Type of Assessment Tasks/Activities	Weightage (%)
1 – 4	2 Assignments	20
1 – 2	1 class test	10
1 – 3	2 Laboratory reports	20
1 – 4	University examination	50

### 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.

**Reassessment:** Students eligible for reassessment shall be assessed according to the programme area examination board recommendation.

## 13. Attendance Requirements

Students are required to attend all lectures, tutorials and laboratory sessions.

#### 14. Contribution to Programme Intended Learning Outcomes

PILO		MILO No.			
		1	2	3	4
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 text

No	Name of Author(s)	Year of Publication	Title of Book	Edition	Publisher's Name	ISBN
1	William D. Callister	2016	Fundamentals of Materials Science and Engineering: An Integrated Approach	5th	Wiley	978-1-119-24925-2

### Secondary text

No	Name of Author(s)	Year of Publication	Title of Book	Edition	Publisher's Name	ISBN
1	D. R. H. Jones and M. F. Ashby	2011	Engineering Materials 1: An Introduction to Properties, Applications and Design	Fourth	Butterworth-Heinemann	978-0080966656

Note: Module specification valid for BEng Mechanical Engineering Intake 09 onwards.