



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR**

FIRST YEAR SECOND SEMESTER EXAMINATIONS

**FOR THE DIPLOMA
IN
ELECTRICAL AND ELECTRONICS ENGINEERING**

COURSE CODE: DME 057

COURSE TITLE: MATERIALS AND PROCESSES

DATE: Wednesday, 17th April, 2024

TIME: 8.00 a.m – 10.00 a.m

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.
QUESTION ONE CARRIES 30 MARKS AND ALL OTHERS 20 MARKS EACH.

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over. ►

QUESTION ONE (COMPULSORY): (30 marks)

1.1 Define the following terms:

(4 marks)

- (i) Crystal lattice
- (ii) Elastic modulus
- (iii) Ductility
- (iv) Alloy

1.2 Explain the primary differences between metallic, ceramic, and polymer materials in terms of their atomic/molecular structures, properties, and applications.

(10 Marks)

1.3 Discuss the significance of phase diagrams in material science. Provide an example of a binary phase diagram and explain its key features.

(8 Marks)

1.4 Describe the process of annealing in metals. How does it affect the microstructure and properties of the material?

(8 Marks)

QUESTION TWO: (20 marks)

2.1 **Compare** and **contrast** ferrous and non-ferrous alloys. Provide examples of each and discuss their applications in engineering.

(10 Marks)

2.2 Discuss the various types of defects that can occur in crystalline materials. How do these defects influence the mechanical properties of materials?

(10 Marks)

QUESTION THREE: (20 marks)

3.1 Explain the concept of stress and strain in materials. Differentiate between elastic and plastic deformation.

(10 Marks)

3.2 Describe the mechanisms of material strengthening. Include discussions on solid solution strengthening, grain size reduction, and precipitation hardening.

(10 Marks)

QUESTION FOUR: (20 marks)

4.1 Discuss the significance of polymers in material science. Describe the Structure-Property relationships in polymers and provide examples of common polymers and their applications. (10 Marks)

4.2 Explain the process of polymerization. **Compare** and **contrast** addition and condensation polymerization, providing examples of each. (10 Marks)

QUESTION FIVE: (20 marks)

5.1 Explain the concept of corrosion and its different forms. Discuss methods used to prevent corrosion in metals. (10 Marks)

5.2 Describe the principles and applications of composite materials. Provide examples of commonly used composite materials and their advantages over traditional materials. (10 Marks)

