



# THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

## *Department of Metallurgical and Materials Engineering*

### MME 201– SCIENCE OF MATERIALS

#### COURSE PARTICULARS

**Course Code:** MME 201

**Course Title:** SCIENCE OF MATERIALS

**No. of Units:** 3

**Course Duration:** Two hours of theory and one hour of tutorial per week for 15 weeks.

**Status:** Compulsory

**Course Email Address:** NIL

**Course Webpage:** NIL

**Prerequisite:** NIL

#### COURSE INSTRUCTORS

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#### COURSE DESCRIPTION

This course is a compulsory course designed for students in engineering disciplines to acquire quality knowledge in the area of materials science and engineering. Materials are the bedrock of Engineering. Therefore it is important that all students in the various discipline of engineering be fortified with adequate knowledge of the course. The course shall span through structure-property-application relationship of materials with respect to mechanical behaviour of materials, electrical properties of materials, optical and magnetic properties of materials, materials and their interference with the environment among others.

## COURSE OBJECTIVES

The objectives of this course are to:

- expose the students to the different classes of materials
- teach the students the relevance of material properties to its applications.
- teach the students the importance of science of materials concepts with reference to engineering discipline.

## COURSE LEARNING OUTCOMES / COMPETENCIES

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

*(Knowledge based)*

- explain the structure-property-application relationships of engineering materials;
- determine the mechanical, electrical, magnetic and optical properties of materials;
- select materials for cryogenic and elevated temperature applications;
- explain the behaviour of different materials in corrosive environment; and
- classify materials into their groups.

*(Skills)*

- select appropriate materials for specific engineering application based on the properties exhibited by the materials

## GRADING SYSTEM FOR THE COURSE

This course will be graded as follows:

Class Attendance	10%
Assignment	10%
Test(s)	20%
<u>Final Examination</u>	<u>60%</u>
<b><u>TOTAL</u></b>	<b><u>100%</u></b>

## GENERAL INSTRUCTIONS

**Attendance:** It is expected that every student will be in class for lectures and also participate in all exercises. Attendance records will be kept and used to determine each person's qualification to sit for the final examination. In case of illness or other unavoidable cause of absence, the student must communicate as soon as possible with any of the instructors, indicating the reason for the absence.

**Academic Integrity:** Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances are prohibited. You are not allowed to make copies of another person's work and submit it as your own; that is plagiarism. All cases of academic dishonesty will be reported to the University Management for appropriate sanctions in accordance with the guidelines for handling students' misconduct as spelt out in the Students' Handbook.

**Assignments and Group Work:** Students are expected to submit assignments as scheduled. Failure to submit an assignment as at when due will earn you zero for that assignment. Only under extenuating circumstances, for which a student has notified any of the instructors in advance, will late submission of assignments be permitted.

**Code of Conduct in Lecture Rooms and Laboratories:** Students should turn off their cell phones during lectures. Students are prohibited from engaging in other activities (such as texting, watching videos, *etc.*) during lectures. Food and drinks are not permitted in the laboratories and workshops.

## READING LIST

<sup>1,2,3,4</sup> Williams . D. Callister, (2005): Materials Science and Engineering, 7<sup>th</sup> edition, John Wiley and Sons Publishers, USA

### **Legend**

- 1- Available in the University Library
- 2- Available in Departmental/School Libraries
- 3- Available on the Internet.
- 4- Available as Personal Collection
- 5- Available in local bookshops.

## COURSE OUTLINE

Week	Topic	Remarks
1	Introduction to science of materials	The students will be sensitized on the philosophy and objectives behind the study of science of materials
2&3	Structure of Engineering Materials <ul style="list-style-type: none"> <li>• structure of matter</li> <li>• Crystal imperfection</li> <li>• Physical properties of materials</li> </ul>	
4&5	Mechanical properties of engineering materials <ul style="list-style-type: none"> <li>• Engineering and True Stress-Strain Curves</li> <li>• Ultimate Tensile Strength</li> <li>• Ductility</li> <li>• Impact Strength</li> </ul>	Students should be able to understand the significance of true stress and true strain and how it differs from engineering stress and engineering strain.
6& 7	Mechanical properties of engineering materials <ul style="list-style-type: none"> <li>• Hardness</li> <li>• Creep</li> <li>• Fatigue Behaviour</li> </ul>	
8& 9	Electrical properties of engineering materials <ul style="list-style-type: none"> <li>• Conductivity</li> <li>• Semi-conductivity</li> <li>• Super-conductivity</li> </ul> Optical and Magnetic properties of engineering materials	Students would be exposed to engineering materials with good electrical properties
		MID-SEMESTER TEST I
10& 11	Stability of materials in service environment <ul style="list-style-type: none"> <li>• Corrosive media and Nuclear Applications</li> </ul> Subzero and elevated temperature irradiation	
12	<ul style="list-style-type: none"> <li>• Basic criteria for the selection of materials for engineering applications</li> </ul>	

13&14	Engineering properties of wood, concrete, ceramic, polymers, ferrous and nonferrous metals and alloys	
15	REVISION	This is the week preceding the final examination. At this time, evaluation will be done to assess how far the students' expectations for the course have been met.