2023
TP-153

Course Specification
(Bachelor)

Course Title:	Materials Science & Engineering
Course Code:	211-MEC-3
Program:	Bachelor of Science in Engineering
Department:	Mechanical Engineering
College:	College of Engineering
Institution:	Najran University
Version:	1.0
Last Revision Date:	02/27/2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: 3					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Third Year \ Level 5					
4. Course general Description:					

Introduction: Brief review of modern atomic concepts in Physics & Chemistry, Atomic Models, Crystallography & Imperfections, Unit cell & Bravais Lattices, Common Crystal Structures, Atomic Packing Factor, Defects & Dislocations. Mechanical Properties & Testing: Stress Strain Diagram, Ductile & Brittle Materials, Strength, Hardness, Fracture, Fatigue, Creep, Different Types of Materials Testing, Non Destructive Testing. Ferrous Materials: Iron & Steel in brief, Steel Alloys, Heat Treatment Processes, Time Temperature Transformation Curves, Non-Ferrous Materials. Magnetic Properties of Materials, Dia, Para and Ferro Magnetic Materials, Soft & Hard Magnetic Materials, Electric Properties, Energy Band Gap, P-N Junction and Transistors. Ceramics: Structure, Properties and Applications of Ceramics, Mechanical & Electrical Behaviour of Ceramics, Composite Materials in brief, Corrosion and its Control

5. Pre-requirements for this course (if any)**:**

101-CHEM-3(General Chemistry)

6. Co-requisites for this course (if any)**:**

NIL

7. Course Main Objective(s):

1. Identify the atomic structure in the modern atomic models.
2. Describe the mechanical properties of the materials and their behaviour in different loading conditions.
3. Defend the behaviour of ferrous and non-ferrous materials and their alloys at different temperatures.

4. Select materials according to the varying magnetic and electrical properties in the different working environments.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	15
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Classify various materials and its uses**	**1**	**TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based**	**Test performance evaluation -Evaluation of participation in discussion and**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Conducting quizzes from each chapter TS:5 – Giving more example programs in the lecture TS: 6 – Discussion with the students in the class hours	group assignments
1.2	Understand the properties of materials	7	TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Giving more assignment from each chapter TS:5 – Giving more example programs in the lecture TS: 6 – Discussion with the students in the class hours	-Test performance evaluation -Evaluation of participation in discussion and group assignments
...				
2.0	**Skills**			

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.1	Tell opinion and justify problems solving, reasoning for each problem solved,	2	TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Conducting quizzes from each chapter TS:5 – Giving more example programs in the lecture TS: 6 – Discussion with the students in the class hours	•Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions •Quizzes
2.2	Review equations & principles and Reasoning in solving a problem step by step	6	TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Conducting quizzes from each chapter TS:5 – Giving more example programs in the lecture	Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions •Quizzes

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			TS: 6 – Discussion with the students in the class hours	
...				
3.0	Values, autonomy, and responsibility			
3.1	Work in a group and independently	5	TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Conducting midterm and Final Exam from each chapter TS:5 – Giving more example programs in the lecture TS: 6 – Discussion with the students in the class hours	Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions •Quizzes
3.2	Manage resources, time and other members of the group	3	TS:1-Interactive lectures using PowerPoint slides TS: 2 – Associating the topics in each chapter with the CLO. TS:3 – Conducting midterm and Final Exam from each chapter	Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			TS:4 – Giving more example programs in the lecture TS: 5 – Discussion with the students in the class hours	•Quizzes
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction, Importance of Materials Engineering, Classification of materials	6
2.	Molecular bonding, Properties and microstructure, Crystal geometry Atomic Movement and rearrangement	6
3.	Properties of Materials, Elastic and Plastic behavior, Stress strain diagrams	6
4.	Phase diagrams and solid phase solutions, Iron carbon Diagram Disorder in solids	6
5.	Applications of Metals, Classifications, Manufacturing processes	6
6.	Corrosion and failure	5
7.	Applications of Ceramics, Classifications, Manufacturing processes	5
8.	Applications of Polymers and composites, Classifications, Manufacturing processes	5
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	1-10	10%
2.	Quizzes	1-10	10%
3.	Mid-term	4 & 8	20%
4.	labs	1-10	10%
5.	Final exam	15	50%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	**Materials science and engineering: An introduction" 9th Edition W. D. Callister, Jr John Wiley & Sons, New York, 2013**
Supportive References	**Elements of Materials Science and Engineering, 6th Edition L. H. Van Vlack, Pearson Education, 2008 2.Materials Science & Engineering by V. Raghavan, Prentice Hall of India, 2015 3.Materials Science by G. K. Narula, K. S. Narula and V. K. Gupta, Tata McGraw Hills Publications, 1994**
Electronic Materials	**Online custom books**
Other Learning Materials	**NA**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Classrooms and laboratories**
Technology equipment (projector, smart board, software)	--
Other equipment (depending on the nature of the specialty)	--

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Program Leaders and Peer Reviewer	Direct, Indirect
Effectiveness of Students assessment	Students & Faculty	Direct and Indirect
Quality of learning resources	Students & Faculty	Direct and Indirect
The extent to which CLOs have been achieved	Students & Faculty	Direct and Indirect
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	DEPARTMENT OF MECHANICAL ENGINEERING
REFERENCE NO.	
DATE	02/27/2024