هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title: Materials Science
Course Code: ME 2312
Program: Bachelor of Science in Mechanical Engineering
Department: Mechanical Engineering
College: College of Engineering
Institution: King Khalid University, Abha, Saudi Arabia
Version:10
Last Revision Date: 02-02-2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
2L + 2 Lab = 3Ch					
2. Course type					
A.	☐University	☐College	■Department	☐Track	☐Others
B.	■Required		☐Elective		
3. Level/year at which this course is offered: (3rd/2nd)					
4. Course general Description:					
Material science is a core mechanical engineering subject and a prerequisite for engineering student. This course give student the fundamental information about what are inside the material by this wat student can understand different processing of materials such as mechanical testing and also deformation of materials. The conventional method of classroom interaction between the teacher and student is essential for teaching this subject. At the same time, practical experiments are conducted. All these methods are being followed and any improvement in the implementation shall be made as per the feedback of students. The communication between the teacher and student is regularly maintained and learning material is also provided through blackboard to the students.					
5. Pre-requirements for this course (if any)**:**					
PHYS 1414 Physics 1 **CHEM 1413 General Chemistry**					
6. Pre-requirements for this course (if any)**:**					
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7. Course Main Objective(s):					
This course covers and concentrates on principles of material science such as atomic structure and interatomic bonding, the crystal structure of materials, theory of diffusion, imperfections in crystals, mechanical testing and evolution of materials, phase diagram and cooling curves of metals and alloys, iron-carbide diagram for steel and cast iron.					

2. Teaching mode(mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distancelearning		

3. Contact Hours(based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	30
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		60

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	Identify metallurgical properties of metals, polymers, ceramics, and alloys.	**[KLO 1]** Identify, formulate, solve complex engineering problems using principles of engineering sciences, mathematics, and natural sciences, and to validate the obtained solution.	**Lectures** **Tutorials** **Lab**	**Quizzes** **Midterms 1 & 2** **Final**
1.2	Describe equilibrium-phase diagrams	**[KLO 2]** Design solutions for complex engineering problems that meet specified needs with consideration for public health, safety, welfare, and environmental, sustainability, and economic factors, as well as other realistic constraints related to the design solution, while complying with relevant standards and design codes.	**Lectures** **Tutorials** **Lab**	**Quizzes** **Midterm 2** **Assignment** **Final**
1.3	Define theories of diffusion and explain	**[KLO 2]** Design solutions for complex engineering	**Lectures** **Tutorials**	**Quizzes** **Midterm 2**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	the imperfection of crystals	problems that meet specified needs with consideration for public health, safety, welfare, and environmental, sustainability, and economic factors, as well as other realistic constraints related to the design solution, while complying with relevant standards and design codes.	**Lab**	**Final**
...				
2.0	**Skills**			
2.1	Categorize the role of different thermal processing (heat treatments)	**[KLO 3]** Conduct investigations of complex engineering problems through developing and executing relevant experiments, and analyzing and interpreting data, supported by engineering judgment to achieve valid conclusions.	**Lectures** **Tutorials** **Lab**	**Quizzes** **Lab** **Assignment** **Final**
2.2				
...				
3.0	**Values, autonomy, and responsibility**			
3.1				
3.2				
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction	4
2.	Crystal structure	6
3.	Crystal imperfections	6
4.	Atomic diffusion	8
5.	Mechanical properties and behavior	12

6.	Phase diagram Iron-iron carbide diagram	14
7.	Principle of heat treatment	10
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm Exam 1	5-6	15%
2.	Midterm Exam 2	11-12	15%
3.	Quizzes and Assignment	2, 8, 12	20%
4.	Lab	Every week	10%
5.	Final exam	15	40%
6.	Total		100%

*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	William D. Callister Jr., David G. Rethwisch, " Materials Science and Engineering", Wiley 10th Edition (2020) ISBN-10: 1119721776 ISBN-13: 978-1119721772
Supportive References	V. Raghavan, Materials Science and Engineering: A First Course 6th Edition, Kindle Edition, PHI Learning (2015) ISBN-13: 978-8120324558 ISBN-10: 8120324552
Electronic Materials	Videos by instructor
Other Learning Materials	**Nil**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom with 45 seats Laboratory with 20 seats

Items	Resources
Technology equipment (projector, smart board, software)	LCD Projector Multimedia teaching aids speakers
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student and faculty	Indirect through surveys
Effectiveness of Students' assessment	Student and faculty	Indirect through surveys
Quality of learning resources	Student and faculty	Indirect through surveys (Student, faculty)
The extent to which CLOs have been achieved	Quality Committee	Direct through Rubrics
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Reviewed by Curriculum Committee Approved by Quality Committee
REFERENCE NO.	
DATE	**02-02-2024**