



Course Syllabus (Academic Year 2021)

School of Interdisciplinary Studies, Kanchanaburi Campus, Mahidol University

1) **Course No. and Title:** KAED 121 Engineering Materials

Credit (study hours): 3(3-0-6)

2) **Program Name:** Bachelor of Engineering in Environmental Engineering and Disaster Management

3) **Course Module:** Major Required Courses

Pre/co-requisite: No

4) **Class Semester:** 1st Semester 2nd Semester Academic Year 2021

5) **Class Schedule & Venue:**

➤ 9.00-12.00 on Wednesday for the 2nd Year Bachelor students, Mahidol University Kanchanaburi Campus (Offline), Google classroom, Webex and Moodle

➤ 13.00-16.00 on Friday for the 1st Year Bachelor students, Mahidol University Salaya Campus (Offline), Google classroom, Webex and Moodle

6) **Class Coordinator:** Dr. Luksanaree Maneechot

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7) **Course Description**

Crystallinity and non-crystallinity of materials, imperfections in crystal structure, meaning and testing of materials properties, equilibrium phase diagram and its applications, macro and microstructures, properties and applications of metals, ceramics, plastic, polymers, asphalt, wood, concrete and composites, introduction to fracture, corrosion and degradation of materials; case studies on materials selection.

8) **Course Objectives / Course Learning Outcomes (CLOs)**

No	Objectives / CLOs	Expected Skills / Knowledge			PLOs
		Specific (S)	Generic (G)	Knowledge (K)	
1	To understand types of engineering materials including advanced materials used in various applications	S1	G1, G2	K1	1
2	To understand characteristics, and analyze engineering properties,	S2	G1	K1, K2	1

	including applications of engineering materials				
3	To understand atomic crystal structure of materials including heat treatment and diffusion process	S3	G1	K1, K3	1
4	To understand phase and phase equilibrium and interpret phase diagram of metal systems for their applications	S4	G1	K1, K4	1
5	To understand production process of engineering materials including corrosion and degradation of materials	S5	G1	K1, K5	1
6	Ability to select suitable materials for applications in production process especially in environmental engineering work	S6	G1	K1-K5	1

Specific Competences

- S1 Understand type of engineering materials
- S2 Analyze properties of materials, particularly mechanical properties
- S3 Understand differences of various atomic crystal structure of materials
- S4 Interpret phase diagram of material systems
- S5 Explain production process of different type of engineering materials
- S6 Select suitable engineering materials for production process

Generic Competence

- G1 Systematic thinking, problem solving, and analytical skills
- G2 Life-long learning and technology updating

Knowledge Competence

- K1 Material chemistry and physics
- K2 Characteristics and properties of materials
- K3 Atomic crystal structure of materials
- K4 Phase and phase diagram
- K5 Production process of materials

9) Class Instructor List

9.1 Dr. Luksanaree Maneechot Instructor and project advisor

10) Course Outline

Week	Date	Contents	CLOs	Teaching & Learning method	Instructors
1	5/1/2022	Introduction to engineering materials	1	Course Syllabus and Lecture	LM
2	12/1/2022	Atomic Structure and Interatomic Bonding	1, 2	Lecture and Activity/Assignment	LM
3	19/1/2022	The Structure of Crystalline Solids	1, 2	Lecture and Activity/Assignment	LM
4	26/1/2022	Imperfections in Solids and Diffusion	1, 2, 3	Lecture and Activity/Assignment	LM
5	2/2/2022	Mechanical Properties of Metals	1, 2, 3	Lecture and Activity/Assignment	LM
6	9/2/2022	Dislocations and Strengthening Mechanisms	1, 2	Lecture and Activity/Assignment	LM
7	18/2/2022 (13.00-16.00)	Phase Diagrams	1, 2	Lecture and Activity/Assignment	LM
8	23/2/2022	Phase Transformations: Development of Microstructure and Alteration of Mechanical Properties		Lecture and Activity/Assignment	
9	Mid-term exam (28/2/2022-4/3/2022)				
10	2/3/2022	Ferrous, non-ferrous metals, and alloys	1, 2	Lecture and Activity/Assignment	LM
11	9/3/2022	Structures and Properties of Ceramics	1, 2	Lecture and Activity/Assignment	LM
12	16/3/2022	Structures and Properties of Polymers	1, 2	Lecture and Activity/Assignment	LM
13	23/3/2022	Composites and construction materials, Corrosion and degradation of materials	1, 2	Lecture and Activity/Assignment	LM
14	8/4/2022 (13.00-16.00)	Electrical, magnetic and optical properties of materials	1, 2	Lecture and Activity/Assignment	LM
15	20/4/2022	Thermal and chemical properties of materials	1, 2, 4	Lecture and Activity/Assignment	LM
16	27/4/2022	Case studies on material selection and design in environmental engineering	1, 2, 4	Group Presentation	LM
17	Final exam (2/5/2022-15/5/2022)				

11) Course Assessment

No.	Methods / Activities	Regulations	CLOs	Week	Weight Distribution (%)
1	Class participation	Submitting assignments in time and 80% of ontime-attendences		All	15
2	Mid-term exam		1, 2, 3	1-7	35
3	Presentation			All	15
4	Final Exam		1, 2, 4	9-16	35

12) Grading System

Grade	Score
A	≥ 80
B	75-79.99
B+	70-74.99
C+	65-69.99
C	60-64.99
D+	55-59.99
D	50-54.99
F	< 50

13) References

W.D. Callister, D.G. Rethwisch (2014) Materials Science and Engineering: An Introduction, John Wiley & Sons Inc., 9th Edition.

W.D. Callister, D.G. Rethwisch (2015) Fundamentals of Materials Science and Engineering: An Integrated Approach, John Wiley & Sons Inc, 5th Edition.

D.R. Askeland, P.P. Fulay, W.J. Wright (2016) The Science and Engineering of Materials, Cengage Learning, 7th Edition.

W.D. Callister (2548) วัสดุศาสตร์และวิศวกรรมวัสดุพื้นฐาน (Materials Science and Engineering: An Introduction, 6th Edition) แปลและเรียบเรียงโดย สุวรรณชัย พงษ์สุกิจวัฒน์, เอกสิทธิ์ นิสารัตนพร, มาวิน สุประคิมฐ ณ อุษยา, กอบบุญ หล่อทองคำ, ราชาย เหลืองวรานันท์ และปฐมมา วิสุทธิพิทักษ์กุล. กรุงเทพฯ: สำนักพิมพ์ที่อป.