



Course Syllabus (Academic Year 2022)

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 Course
Pre/co-requisite : No
4. **Class Semester** : 1st Semester 2nd Semester Academic Year 2022
5. **Class Schedule & Venue** : 13.00-16.00 on Friday, Mahidol University Salaya Campus,
Onsite course (MUKA e-learning)
6. **Class Coordinator** : Dr. Watcharapol Wonglertarak
watcharapol.won@mahidol.ac.th, Tel 085 849 3199

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			
		Specific (S)	Generic (G)	Knowledge (K)	PLOs
8.1	Understand type of engineering materials including other smart and advanced materials used in various applications	S1	G1, G2	K1	1
8.2	Understand characteristics, and analyze engineering properties, including applications of engineering materials; atomic crystal structure of materials including heat treatment and diffusion process; production process of engineering materials including corrosion and degradation of materials	S2, S3, S4	G1	K1, K2, K3, K5	1
8.3	Understand phase and phase equilibrium and interpret phase diagram of metal systems for their applications	S5	G1	K4	1

No.	Objectives/CLOs	Expected Skills/ Knowledge			
		Specific (S)	Generic (G)	Knowledge (K)	PLOs
8.4	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 Explain production process of different type of engineering materials
- S5 Interpret phase diagram of material systems
- 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

Dr. Watcharapol Wonglertarak

Contact No. 085 849 3199

Email: watcharapol.won@mahidol.ac.th

10. Course Outline

Week	Date	Contents	CLOs	Teaching & Learning method	Instructor
1	13/1/2023	Introduction to engineering materials	8.1	Course Syllabus and Lecture	WW
2	20/1/2023	The Structure of Crystalline Solids	8.1, 8.2	Presentation, Activity, and Assignment	WW
3	27/1/2023	Mechanical Properties of Metals	8.1, 8.2	Presentation, Activity, and Assignment	WW
4	3/2/2023				
5	10/2/2023	Phase Diagrams	8.3	Presentation, Activity, and Assignment	WW
6	17/2/2023				
7	24/2/2023	Forming process of materials	8.1, 8.2	Presentation, Activity, and Assignment	WW

Week	Date	Contents	CLOs	Teaching & Learning method	Instructor
8	3/3/2023	Ferrous, non-ferrous metals, and alloys	8.1, 8.2	Presentation, Activity, and Assignment	WW
9	7-10/3/2023	Mid-term Examination			
10	17/3/2023	Structures and Properties of Ceramics	8.1, 8.2	Presentation, Activity, and Assignment	WW
11	24/3/2023	Structures and Properties of Polymers	8.1, 8.2	Presentation, Activity, and Assignment	WW
12	31/3/2023				
13	7/4/2023	Composites and construction materials, Corrosion and degradation of materials	8.1, 8.2	Presentation, Activity, and Assignment	WW
14	21/4/2023	Electrical, magnetic and optical properties of materials; Thermal and chemical properties of materials	8.1, 8.2	Presentation, Activity, and Assignment	WW
15	28/4/2023	Final project report and discussion	8.1-8.4	Presentation, Q&A	WW
16	1-12/5/2023	Final Examination			

11. Course Assessment

No.	Methods/Activities	Regulations	CLOs	Week	Weight Distribution (%)
1	Class participation and Class attention	Learner must attend the class more and 80% of course.	-	All	5
2	Quiz	Learner must be testing the knowledge of previous week	8.1, 8.2, 8.3, 8.4	All	10
3	Assignment	- Learner must practice the engineering skills via exercises and assignments form each topic. - The score will be evaluated according to the quality and details of work by instructors of those topics.	8.1, 8.2, 8.3, 8.4	All	10
4	Final project			15	15
5	Midterm Examination	The scope of exam will be cover topics of the 1 st -7 th week in this course.	8.1, 8.2, 8.3	9	30
6	Final Examination	The scope of exam will be cover topics of the 8 th -15 th week in this course.	8.2, 8.4	16	30
Total					100

12. Grading system

Grade	Score	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

1. W.D. Callister, D.G. Rethwisch (2013) Materials Science and Engineering: An Introduction, John Wiley & Sons Inc., 9th Edition.
2. W.D. Callister, D.G. Rethwisch (2012) Fundamentals of Materials Science and Engineering: An Integrated Approach, John Wiley & Sons Inc.
3. D.R. Askeland, P.P. Fulay, W.J. Wright (2011) The Science and Engineering of Materials, Cengage Learning, 6th Edition.
4. J. M. Allwood and J. M. Cullen (2015) Sustainable Materials Without the Hot Air, Green Books, UIT Cambridge.
5. W.D. Callister (2548) วัสดุศาสตร์และวิศวกรรมวัสดุพื้นฐาน (Materials Science and Engineering: An Introduction, 6th Edition) แปลและเรียบเรียงโดย สุวรรณชัย พงษ์สุกิจวัฒน์, เอกสิทธิ์ นิสารัตนพร, มาวิน สุประดิษฐ์ ณ ออยุธยา, กอบบุญ หล่อทองคำ, ธาชาย เหลืองวรานันท์ และปฐมมา วิสุทธิพิทักษ์กุล. กรุงเทพฯ: สำนักพิมพ์ท็อป. ณรงค์ศักดิ์ ธรรมโชติ (2558) วัสดุวิศวกรรม. กรุงเทพฯ ซีเอ็ดดูเคชั่น.
6. William F. Smith and Javad Hashemi. วัสดุวิศวกรรม (Foundations of Materials Science and Engineering 4/e แปลและเรียบเรียงโดย รศ.แมน อมรสิทธิ์ รศ.ดร.สมชัย อัครทิวา และ อ.ธรรมบุญ อุดมมัน. กรุงเทพฯ: สำนักพิมพ์แมครอ-ฮิล.