YEDİTEPE UNIVERSITY

FACULTY OF ENGINEERING

COURSE DESCRIPTION FORM2019/2020-2

COURSE INFORMATON				
Course Code	**MSN 533**	**Course Title**	**Nanomaterials for Enegy Conversion and Storage**	
Semester	*Credits*	*ECTS*	*C +P + L Hour*	Prerequisites
2	**3**	**10**	**3 + 0 + 0**	**-**

Language of Instruction	**Course Level**	**Course Type**
English	Graduate	Elective
Course Coordinator	Prof. Dr. Taner Akbay	
Instructors	Prof. Dr. Taner Akbay	
Assistants	Res. Assist. Burcu Üçok	
Goals	This course will focus on advanced electrochemical energy conversion and storage systems including fuel cells, lithium-ion batteries, and supercapacitors; Hydrogen storage; Advanced thermal storage . Through the journey in this course, students are anticipated to understand why and how these systems are advantageous in renewable energy applications.	
Content	Systematic knowledge about different types of nanomaterials for energy storage and conversion. Knowledge about limitations, existing issues and wider aspect concerning commercialization of novel techniques, including the impact on environment, safety and economy.	
Contribution of the Course to the Professional Education	Ability to understand the basic techniques for energy conversion and storage.	

Course Learning Outcomes	**Program Learning Outcomes**	**Teaching Methods**	**Assessment Methods**
Ability to write effective reports and comprehend written reports, prepare design and production reports,	7a	2	C,D
Ability to make effective presentations,	7c	2	C,D

Teaching Methods:	1: Lecture by instructor, 2: Lecture by instructor with class discussion, 3: Problem solving by instructor, 4: Use of simulations, 5: Problem solving

	assignment, 6: Reading assignment, 7: Laboratory work, 8: Term research paper, 9: Presentation by guest speaker, 10: Sample Project Review, 11: Interdisciplinary group working, 12: ...
Assessment Methods:	A: Written exam, B: Multiple-choice exam C: Take-home quiz, D: Experiment report, E: Homework, F: Project, G: Presentation by student, H: ...

COURSE CONTENT

Week	Topics	Study Materials
1	Introduction to energy harvesting, conversion and storage materials	Lecture Notes
2	Structure and properties of bulk materials and their surfaces	Lecture Notes
3	Fundamentals of energy harvesting	Lecture Notes
4	Electronic and band structure of semiconductors	Lecture Notes
5	Semiconductor junctions	Lecture Notes
6	Hetero- homo- and Schottky junctions	Lecture Notes
7	Electronic band alignment and band bending	Lecture Notes
8	Materials for energy harvesting by photovoltaics	Lecture Notes
9	Materials for energy conversion by fuel cells	Lecture Notes
10	Materials for energy storage by rechargeable batteries	Lecture Notes
11	Materials for energy storage by supercapacitors	Lecture Notes
12	Discussion on individual term assignments	-
13	Discussion on individual term assignments	-
14	Student presentations	-
15	Student presentations	-

RECOMMENDED SOURCES

Lecture Notes	Notes and presentation slides
Additional Resources	Open literature

MATERIAL SHARING

Documents	Lecture Notes
Assignments	Individual Term Project
Exams	Student Presentations

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Term Presentations	1	60
Final Report	1	40
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		60
Total		**100**

COURSE CATEGORY	Expertise/Field Courses

COURSE'S CONTRIBUTION TO PROGRAM OUTCOMES		
No	Program Learning Outcomes	check ✓
1a	Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline,	
1b	Ability to use theoretical and applied knowledge in these areas in complex engineering problems.	
2a	Ability to identify, formulate, and solve complex engineering problems,	
2b	Ability to select and apply proper analysis and modeling methods for this purpose.	
3a	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result,	
3b	Ability to apply modern design methods for this purpose.	
4a	Ability to devise, select and use modern techniques and tools needed for analyzing and solving complex problems encountered in engineering practice.	
4b	Ability to employ information technologies effectively.	
5a	Ability to design experiments for investigating complex engineering problems or discipline specific research questions,	
5b	Ability to conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or discipline specific research questions.	
6a	Ability to work efficiently in intra-disciplinary teams,	
6b	Ability to work efficiently in multi-disciplinary teams,	
6c	Ability to work individually.	✓
7a	Ability to communicate effectively in Turkish, both orally and in writing,	
7b	Knowledge of a minimum of one foreign language,	✓

7c	Ability to write effective reports and comprehend written reports, prepare design and production reports,	✓
7d	Ability to make effective presentations,	✓
7e	Ability to give and receive clear and intelligible instructions.	
8a	Recognition of the need for lifelong learning, ability to access information, ability to follow developments in science and technology,	
8b	Ability to continue to educate him/herself.	
9a	Consciousness to behave according to ethical principles and professional and ethical responsibility.	
9b	Knowledge on standards used in engineering practice.	
10a	Knowledge about business life practices such as project management, risk management, change management.	
10b	Awareness in entrepreneurship and innovation.	
10c	Knowledge about sustainable development.	
11a	Knowledge about the global and social effects of engineering practices on health, environment, and safety,	
11b	Knowledge about contemporary issues of the century reflected into the field of engineering.	
11c	Awareness of the legal consequences of engineering solutions.	

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course duration (lectures)	14	3	42
Off-the-classroom study (prep., and review)	14	6	85
Presentation	1	3	3
Off-the-classroom study for presentation	1	60	60
Off-the-classroom study for the final exam	1	60	60
Total Work Load			249
Total Work Load / 25 (h)			9,96
ECTS Credit of the Course			10

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Prepared by: Prof. Dr. Taner Akbay	Preparation date: 01.09.2020