Co-funded by the Erasmus+ Programme of the European Union

EUROPEAN UNIVERSITY FOR CUSTOMISED EDUCATION

STUDY GUIDE

BIOINSPIRED ENERGY STORAGE DEVICES

Organised by

Poznan University of Technology

1. IDENTIFYING DATA.	
· Course Name.	*Bioinspired energy storage devices*
· Coordinating University.	*Poznan University of Technology [PUT]*
· Partner Universities Involved.	*Not applicable.*
· Course Field(s).	*Chemistry, electrochemistry, biomaterials, biopolymers, energy storage*
· Related Study Programme.	*None*
· ISCED Code.	*0531: Chemistry, 0512: Biochemistry, 0713: Electricity and energy, 0533: Physics*
· SDG.	*4, 7, 13*
· Study Level.	*Bachelor (B), Master (M)*

· Number of ECTS credits allocated.	*4*
· Mode of Delivery.	*"Online self-study"*
· Language of Instruction.	*English*
· Course Dates.	*18.11-16.12.2024*
· Schedule of the course.	*Lecture: 10, Laboratory: 10, Project: 10*
· Key Words.	*Electrochemistry, Energy storage, Biomaterials, Biopolymers*
· Catchy Phrase.	*When life gives you a lemon make an energy storage device.*

· Prerequisites and co-requisites.	*- Students should know the basic topics in physics, chemistry and biology concerning electricity (part of the topic will be recalled during the lectures)* *- Students should be able to pursue self-directed studying* *- Students should understand the need for further self-studying and the teaching of others (students)*
· Number of EUNICE students that can attend the Course.	*20*
· Course inscription procedure(s).	*Standard EUNICE procedure*

2. CONTACT DETAILS.	
· Department.	*Faculty of Chemical Technology*
· Name of Lecturer.	*Dr eng. Pawel Jezowski*
· E-mail.	*pawel.jezowski@put.poznan.pl*

· Other Lecturers.	*No*

3. COURSE CONTENT.

Lectures: Brief information about electrochemistry and electrochemical methods for entry-level students. The influence of biomimetics on the electrochemistry. Biopolymers and other biomaterials used in electrochemistry (discussing the preparation and properties of such materials). Bioinspired energy storage devices.

Laboratories: Preparation, from scratch, of the bioinspired energy storage device based on biopolymer.

Projects: Calculating and designing an energy storage device with biomaterials.

4. LEARNING OUTCOMES.

1. Students possess the necessary expertise in the areas of biomaterials and electrochemistry, enabling the formulation and solving of simple mathematical tasks associated with the topic - [K_W05]

2. Student knows the basic principles for controlling and measuring with the use of bioinspired electrochemical systems - [K_W06]

3. Student has competencies needed to work in an industrial environment and knows the rules of safety and health at work - [K_U10]

4. Student uses the basic regulations and respects the principles of safety-related work performed during the use of electrochemical equipment - [K_U28]

5. Student selects methods and techniques for electrical controlling of technological processes - [K_U32]

6. Student is able to properly identify priorities for implementation of the designated task - [K_K04]

7. Student is able to think and act in an entrepreneurial manner - [K_K06]

5. OBJECTIVES.

Explanation of basic principles related to energy storage and electricity. Mastering the basic knowledge about modern energy storage devices, measurements of physicochemical quantities, construction and obtaining different energy storage devices, principles of operation and application of basic energy storage devices as well as application of biomaterials in them. Understanding the principles of health and safety while working with energy storage devices.

6. COURSE ORGANISATION.

UNITS

	Lectures	Laboratories	Projects
1.	*Principles of electrochemical energy storage*	*Assembling of typical energy storage device*	*Introduction to the project regarding the bioinspired energy storage*
2.	*Types of energy storage devices*	*Preparation and characterization of bioinspired material for electrodes*	*Choosing the topic of the project, energy storage device and bioinspired*
3.	*Bioinspired materials for energy storage*	*Preparation and characterization of bioinspired material for separator*	*Where to find and how to collect the necessary data for the realization of the project?*
4.	*Construction of bioinspired energy storage devices*	Formation of electrodes for *bioinspired energy storage devices*	*Design of bioinspired energy storage device*
5.	*Pros and cons of biomaterials for energy storage*	*Construction of bioinspired energy storage devices*	*Characterization of the final product and how to perform the quantitative description?*

LEARNING RESOURCES AND TOOLS.

scientific articles, books, world-wide-web, PowerPoint presentations, short movies, think tanks, task-oriented exercise

PLANNED LEARNING ACTIVITIES AND TEACHING METHODS.

[List the most important learning activities for this course, e.g. lectures, group work, seminars, tutorials, etc]

7. ASSESSMENT METHODS, CRITERIA AND PERIOD.

1. Lecture 2. Laboratory 3. Project 4. Consultation with lecturer 5. Preparation for written assignments 6. Written assignments 7. Laboratory reports 8. Project report and presentation

OBSERVATIONS.

8. BIBLIOGRAPHY AND TEACHING MATERIALS.

Basic bibliography:

P. N. Bartlett, Bioelectrochemistry: Fundamentals, Experimental Techniques and Applications (ISBN: 978-0-470-84364-2)

R. C. Alkire, D. M. Kolb, J. Lipkowski, P. N. Ross, Bioelectrochemistry: Fundamentals, Applications and Recent Developments (ISBN: 978-3-527-64412-4)

Additional bibliography:

A. J. Bard, L. R. Faulkner, Electrochemical Methods (ISBN: 0-4710-4372-9)

P. Kumar, Bioelectrochemical Systems (ISBN: 978-9-811-56870-1)