Chemical Process Engineering

1. GENERAL			
SCHOOL	Faculty of Sciences in collaboration with Faculty of Engineering, Aristotle University of Thessaloniki		
DEPARTMENT	Materials Science and Engineering		
LEVEL OF STUDIES	ISCED level 7 (5-year Integrated Master's programme) ISCED level 6 (4-year BSc programme)		
COURSE CODE	**MSEN 504**	**SEMESTER**	5th Semester
COURSE TITLE	**Chemical Process Engineering**		
TEACHING ACTIVITIES Lectures, tutorials/problem sessions, laboratory/computer exercises (where applicable), case studies and guided self-study.		**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
		4	6
COURSE TYPE	Background / General knowledge / Scientific area		
PREREQUISITES	No prerequisities		
TEACHING AND EXAMINATION METHODS	English		
COURSE OFFERED TO ERASMUS STUDENTS	Yes.		
COURSE URL	https://elearning.auth.gr/course/view.php?id=xxxxx		

2. LEARNING OUTCOMES	
Learning Outcomes	This course focuses on the design and operation of industrial processes employed to transform and/or utilize raw or synthetic materials into functional products by applying principles from physics, chemistry, math, and biology. It focuses on unit operations (e.g. reactions, separations), material selection for equipment, and process design for efficiency, safety, and sustainability, bridging fundamental science with large-scale production for diverse sectors. More specifically, by the end of this course the students will be able to: • Understand the role of thermodynamics and transport phenomena (heat and mass transfer) in material development and processing, for example: ✓ Effect of external and internal mass transfer in reaction engineering and fuel cell systems ✓ The role of thermodynamics and diffusion in crystallization • Analyze and design and operation of basic physicochemical processes that involve the applications of different types of materials including:

	✓ Heterogeneous catalytic reactors ✓ Fixed bed adsorbers and membranes for gas separations ✓ Fuel cells ✓ Controlled release systems for biomedical applications
General Skills	• Searching, analyzing and synthesizing data and information • Decision-making • Independent work • Teamwork • Generate new research ideas • Project planning and management emphasizing materials science • Promoting free, creative and inductive thinking • Modeling and solving real-world problems • Working in a multidisciplinary environment

3. COURSE CONTENT
• Basic principles and definitions • General mass and heat balances in macroscopic systems • Mass transfer in microscopic systems: the diffusion equation • Process systems engineering in selected applications: ✓ Heterogeneous reaction engineering ✓ Fixed bed adsorption and membrane technology for gas separations ✓ Crystallization and filtration ✓ Fuel cell systems Biomedical applications: Controlled drug release

4. LEARNING & TEACHING METHODS - EVALUATION	
Teaching method	Face-to-face.
Use of ICT	Use of ICT in Course Teaching, Use of ICT in Communication with Students Description: Use of Information and Communication Technologies (ICT) in teaching the course with tools of modern distance learning (ZOOM) and asynchronous education (eclass). Use of learning aids based on ICT: Excel, Word, Power Point Use of ICT in student assessment: Electronic grading (eclass, universis). • Use of ICT in communication with students: eclass, email, ZOOM.

<table>
<tr><td>Teaching organization</td><td>The supervised and unsupervised workload per activity is indicated below (total workload complies with ECTS standards).
<table>
<tr><th>Activity</th><th>Workload/semester (hours)</th></tr>
<tr><td>Lectures</td><td>52</td></tr>
<tr><td>Tutorials / problem sessions</td><td>13</td></tr>
<tr><td>Bibliographic Research and analusis</td><td>83</td></tr>
<tr><td>Final written exam</td><td>2</td></tr>
<tr><td>Total</td><td>150</td></tr>
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<tr><td>Student evaluation</td><td>Assessment Language: English
Assessment Methods:
Short Answer Questions,
Essay Development Questions,
Problem Solving
Written exams</td></tr>
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5. SUGGESTED BIBLIOGRAPHY
Course Bibliography
"Perry's Chemical Engineer's Handbook" Don W. Green, Marylee Z. Southard, (McGraw Hill, 9th Edition), ISBN: 0-07-142294-3 "Transport Processes and Separation Process Principles" Christie Geankoplis, (Prentice Hall, 4th Edition), ISBN: 013101367X "Heterogeneous Reactor Design" Hong Lee, (Butteworths, 4th Edition), ISBN: 0-409-95073-4
Additional bibliography for study
Teaching material slides