COURSE OUTLINE

1. GENERAL INFORMATION

SCHOOL	MARITIME AND INDUSTRIAL STUDIES		
DEPARTMENT	INDUSTRIAL MANAGEMENT AND TECHNOLOGY		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΤΕΦΥΣ01-2	**SEMESTER OF STUDY**	1st
COURSE TITLE	INTRODUCTION TO PHYSICAL SCIENCES		

INDEPENDENT TEACHING ACTIVITIES *in case in which credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	4	5.5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail at section 4.		

COURSE TYPE *general background, special background, specialized general knowledge, skills development*	General background
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATION/ASSESSMENT:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.unipi.gr/courses/BDT229/

2. LEARNING OUTCOMES

LEARNING OUTCOMES

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each qualifications' cycle, according to the European Higher Education Area's Qualification Framework.*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and APPENDIX B*
- *Guidelines for writing Learning Outcomes*

The course is an introduction to physical sciences, scientific methodology and industrial production. The skills developed in the classroom are reinforced with case studies and exercises. The course consists of two (2) sections taught in parallel: section A΄ and section Β΄. Section A΄ introduces students to the basic concepts of chemical industrial production while Section Β΄ presents vector calculus and kinematics.

The main objective of the course is to provide students with basic knowledge that will help them in the technological courses of the curriculum. In particular, the course aims to familiarize students with: (a) basic principles and calculations in chemical engineering; (b) methods for determining critical parameters of physical and chemical processes to be used in modeling; (c) applying vectorial calculus to solving kinematics problems; (d) basic knowledge in curvilinear and relative motion.

Upon successful completion of the course, the students will be able to:

- Solve mass balance problems in physical and chemical processes

- Use basic principles of chemical thermodynamics - kinetic
- Solve chemical equilibrium problems
- Use basic methods (computational and physical simulation) to study electrochemical systems
- Use vector calculus in the analysis of dynamic systems
- Solve curvilinear and relative motion problems by vector analysis
- Use models for basic industrial processes

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aims

Search for, analysis and synthesis of data and information, by the use of technologies that are necessary according the case
Adapting to new situations
Decision-making
Independent work
Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research
Project planning and management
Respect for difference and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical consciousness, criticism and self-criticism
Development of free, creative and inductive thinking

- Search for, analysis and synthesis of data and information, by the use of technologies that are necessary according the case
- Adapting to new situations
- Decision-making
- Independent work
- Respect for difference and multiculturalism
- Social, professional and ethical responsibility and sensitivity to gender issues

2. COURSE CONTENT

The course includes Sections A΄ and B΄.

Section A΄: Basic concepts of chemical production.

Week	Topics
1st	Introduction: physical and chemical processes, concentration expressions, dilution-concentration of solutions, mixing solutions.
2nd	Chemical reactions: homogeneous and heterogeneous systems, collision theory, stoichiometric factors, simple reactions, overall reaction, endothermic and exothermic reactions.
3rd	Chemical kinetics: rate of raw materials conversion to products, 1st order reactions, speed of reaction, rate constant.
4th	Calysis and energy optimization: kinetic equation , Arrhenius equation, activation energy.
5th	Hydrogen potential (pH) of aqueous solutions: self-ionization of water, pH and pOH, pH scale.
6th	Chemical equilibrium: one-way and reversible equations, reaction yield, equilibrium constant.
7th	Chemical equilibrium and technoeconomic optimization.
8th	Mass balance: general balance equations, development of equations, problem solving.
9th	Mass balances applications in simple and complex systems with and without chemical reactions.
10th	Electrochemistry: metal dissolution tendency, electrochemical reactions, electrolysis, Faraday's laws.

11th	Corrosion: the phenomenon of corrosion, chemical reactions, model development, anticorrosion protective systems for metal surfaces.
12th	Thermodynamic study of chemical reactions: heat of reactions, Lavoiser-Laplace's law, Hess's law, heat of formation of species, combustion.
13th	Review exercises

Section B΄: Vector and Dynamics.

Week	Topics
1st	Basic vector calculus: vectors, scalars, fields.
2nd	Algebraic operations: addition and subtraction of vectors, equal vectors, examples and applications.
3rd	Vector analysis, examples and applications.
4th	Inner (dot) product, cross product, vector cross product, vector projection.
5th	Advanced applications of vector calculus.
6th	Dynamics: introductory concepts of kinematics and kinetics.
7th	Particle dynamics, example and applications.
8th	Motion of a rigid body, translational motion equations.
9th	Velocity and acceleration, applications in rectilinear and circular motion.
10th	Velocity and acceleration, applications in curvilinear motion.
11th	Relative motion: examples and applications.
12th	Advanced applications.
13th	Review exercises.

In addition, articles, audiovisual lecture material, web addresses, useful information and exercises are posted at eclass.

3. TEACHING METHODS - ASSESSMENT

<table>
<tr><td>TEACHING MODE
Face-to-face, in-class lecturing, on distance teaching and distance learning etc.</td><td>In-class lecturing</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY
Use of ICT in Teaching, Laboratory Education, Communication with students</td><td>Teaching: Lectures with audiovisual media, support of the learning process through the eclass platform
Communication with students: face-to-face at office hours, email, eclass</td></tr>
<tr><td>COURSE DESIGN
Description of teaching techniques, practices and methods:
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, clinical practice, Art Workshop, Interactive teaching, Educational visits, project, Essay writing, Artistic creativity, etc.

The study hours for each learning activity as well as the hours of non- directed study are given according to the principles of the ECTS</td><td>
<table>
<tr><th>Activity / Method</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>52</td></tr>
<tr><td>Study of bibliography</td><td>14</td></tr>
<tr><td>Exercises</td><td>31</td></tr>
<tr><td>Self-study of lecture and material and exercises</td><td>38</td></tr>
<tr><td>Counselling</td><td>0.5</td></tr>
<tr><td>Exams (written)</td><td>2</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total</td><td>137.5</td></tr>
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<tr><td>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS
Detailed description of the evaluation procedures:
Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice questionnaires, short- answer questions,</td><td>Language of exams: Greek

Assessment Methods: After the last lecture, the exam material is posted at eclass. The final course grade is formed by the written exams (50% from Section A΄ and 50% from Section B΄) taken in the examination period of the winter semester and, in case of failure, in the September resits.</td></tr>
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open-ended questions, problem solving, written work, Essay/report, oral exam, public presentation, laboratory work, art interpretation, other……etc *Evaluation criteria are specifically defined and given as well as if and where they are reported and accessible to students.*	The written examination includes problem solving / exercises. It is conducted with open books. The evaluation of students with special learning difficulties in writing and reading (as certified and qualified by a competent institution) is performed according to the relevant procedure decided by the Department Assembly. **Notification of the Assessment Criteria:** The evaluation criteria are made known during the first lecture and are clearly stated on the course website and e-class. The answers to the exam questions are posted at eclass after the exam date. Students have the opportunity to discuss their exam paper with the course instructor (at the posted office hours) after the announcement of the course grades.

4. SUGGESTED BIBLIOGRAPHY

-Suggested Bibliography :

- Book [18549047]: Chemical Processes in Chemical Technology [in Greek], A.T. Sdoukos, F.I. Pomonis

-Scientific Journals: not applicable

-Lecture Notes