COURSE OUTLINE

1. GENERAL INFORMATION

SCHOOL	MARITIME AND INDUSTRIAL STUDIES		
DEPARTMENT	INDUSTRIAL MANAGEMENT AND TECHNOLOGY		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΤΕΦΥΣ02-2	**SEMESTER OF STUDY**	2nd
COURSE TITLE	PROCESSES I		
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**
Lecture, Laboratory Exercises and Project			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*	Special 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/BDT233/		

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 aims to familiarize students with:

- The basic chemical processes and flow diagrams of representative manufacturing processes
- Scaling up from bench to pilot and industrial scale
- Scale economies and externalities in industrial combos
- Material and energy balances at steady and non-steady state conditions
- The chemical processes in environmental protection
- Material saving with recycling
- Energy saving with thermochemical and electrochemical systems
- The dynamic physicochemical systems, robustness, sensitivity, risk, economic and technical optimization
- The correlation between manufacturing parameters and product quality
- The optimization of production capacity
- Laboratory and simulation applications

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

- Solve mass balance problems at steady and non-steady state conditions
- Present basic processes in flow charts
- Solve chemical equilibrium problems
- Solve capacity optimization problems
- Problem solving in chemical production and environmental protection

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
- Team work
- Respect for difference and multiculturalism
- Environmental awareness
- Social, professional and ethical responsibility and sensitivity to gender issues
- Critical consciousness, criticism and self-criticism

2. COURSE CONTENT

The course includes lectures and laboratory.

Week	Topics
1st	Basic chemical processes and flow diagrams of representative manufacturing processes.
2nd	Scaling up from bench to pilot and industrial scale.
3rd	Scale economies and externalities in industrial combos.
4th	Material and energy balances at steady and non-steady state conditions.
5th	Chemical processes in environmental protection. Material saving with recycling.
6th	Energy saving with thermochemical and electrochemical systems.
7th	Dynamic physicochemical systems, robustness, sensitivity, risk, economic and technical optimization.
8th	Correlation between manufacturing parameters and product quality.
9th	Optimization of production capacity: methodology and applications.
10th	Batch reactor models and simulation.
11th	CFSTR models and simulation.
12th	PFR models and simulation.
13th	Review exercises

Laboratory: Simulation and optimization of processes using physical simulators in the Laboratory of Simulation of Industrial Processes

Week			Laboratory Syllabus
1st	5th	9th	Economic and technical optimization of CFST reactors in series
2nd	6th	10th	Adsorption column optimization. Aluminium anodizing optimization
3rd	7th	11th	Optimization of batch reactor for biomass processing
4th	8th	12th	PFR modeling and implementation in wastewater treatment.
13th			Rescheduled lab practice

Students also attend a laboratory training program in the Laboratory of Simulation of Industrial Processes in order to develop an intuitive and hands-on understanding of the concepts presented in the lectures, such as modeling of industrial processes, data analysis and decision making based on techno-economic criteria. The software used is MS EXCEL or equivalent (Open Office, etc.) as well as in house software. Students are trained in workshops with a rotation system. The workshop program is posted on the course website and eclass at the beginning of the semester.

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

3. TEACHING METHODS - ASSESSMENT

TEACHING MODE *Face-to-face, in-class lecturing, on distance teaching and distance learning etc.*	In-class lecturing / Laboratory teaching
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in Teaching, Laboratory Education, Communication with students*	**Teaching:** Lectures with audiovisual media, support of the learning process through the eclass platform **Laboratory Education:** Use of open access and in-house software for laboratory exercises **Communication with students:** face-to-face at office hours, email, eclass
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*	***Activity / Method*** — ***Semester Workload*** Lectures — 52 Laboratory exercises — 8 Project — 30 Self-study of lecture and lab material — 45 Counselling — 0.5 Exams (written) — 2 Course Total — ***137.5***
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, 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.*	**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 project (40%) and by the written exams (60%) taken in the examination period of the spring semester and, in case of failure, in the September resits. Higher-year students that resit the exam are graded 100% by the written exam. 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 [9722]: Chemical Industry Design [in Greek], D.S. Marinos- Kouris, Z.B. Maroulis
- Book [18549018]: Elements of Chemical Processes [in Greek], K.A. Matis, P. Mavros, K.S. Triantafillidis

-Scientific Journals: not applicable
-Lecture Notes
-Laboratory Workbook