COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
DEPARTMENT	DEPARTMENT OF CHEMISTRY		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	YN404	**SEMESTER**	4th Semester
COURSE TITLE	Chemical Technology		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
THEORY	4	7
LABORATORY EXERCISES	3	
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	General Background
PREREQUISITES:	NO
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass2.emt.duth.gr/courses/CHEM_E105/

(2) LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The purpose of the course is to teach students measurements and calculations in Chemical Technology, simple mass and energy balances, unit systems. To become familiar with the elements of fluid flow, heat transfer elements. To acquire basic knowledge of the treatment and use of water, and to be informed about the problems and their treatment in the chemical industry. Furthermore, the purpose of the course is for students to gain knowledge about the Treatment of Wastewater (municipal and industrial). Brief description of pumps. Through laboratory exercises and applications, the student will have the opportunity to move from theory to practice.

Upon successful completion of this course, students will have acquired the knowledge and skills for Chemical Technology. Thus, they will:

- have become familiar with the basic measurements and calculations in chemical technology, simple mass and energy balances and unit systems.
- have understood at a basic level some elements of fluid flow and heat transfer.
- can solve basic exercises and applications in previous teaching subjects and where necessary will be able to make the correct conversions of the corresponding units.
- know the use of water in the chemical industry, the main problems encountered and how to deal with them with the appropriate treatment method.
- know the methods of treating wastewater (industrial, but also municipal).
- know some basic elements of hygiene and safety in the chemical industry.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,	*Project design and management*
ICT Use	*Equity and Inclusion*
Adaptation to new situations	*Respect for the natural environment*
Decision making	*Sustainability*
Autonomous work	*Demonstration of social, professional and moral responsibility and*
Teamwork	*sensitivity to gender issues*
Working in an international environment	*Critical thinking*
Working in an interdisciplinary environment	*Promoting free, creative and inductive reasoning*
Production of new research ideas	

Is able to:

• Refer to sources, cross-reference and glean

• More specifically, the course content promotes the following skills:

- Search, analysis and synthesis of data and information, using the necessary technologies
- Promotion of free, creative and inductive thinking
- Work in an international environment
- Work in an interdisciplinary environment
- Autonomous work
- Teamwork
- Project planning and management
- Respect for diversity and multiculturalism
- Demonstration of social, professional and ethical responsibility and sensitivity to gender issues
- Decision-making
- Adaptation to new situations
- Respect for the natural environment

(3) COURSE CONTENT

THEORY

1. Introduction, Historical data, Contents of Chemical Technology
2. Dimensional analysis, Size scaling
3. Mass and energy balances, Problem solving methods, mass balances with recycling, combustion, chemical reactions
4. Principles of physical processes/separations
5. Distillation
6. Fluid flow, Fluids in motion and viscosity (momentum transfer)
7. Flow of incompressible Newtonian fluids in pipes, Fluid flow measurement.
8. Heat transfer by conduction, radiation, convection
9. Combination of thermal resistances
10. Water treatment in industry, Ion exchange, Softening, Adsorption, Removal of suspended solids, Membrane processes, Water recycling, Wastewater treatment, Characteristics, Pretreatment, Primary-Secondary-Tertiary purification
11. Gas absorption, Washing, Extraction
12. Heat exchangers, Boiling and condensation, Psychrometry
13. Filtration.

LABORATORY

1. Heat Transfer by Conduction
2. Heat Transfer by Convection
3. Heat Transfer by Radiation
4. Venturi Fluid Flow Meter
5. Energy Losses in Fluid Pipelines
6. Fluid Vein Momentum

7. Adsorption of Dissolved Pollutants (Liquid Phase) on Solid Materials 8. Advanced Physicochemical Oxidation Processes

(4) LEARNING & TEACHING METHODS - EVALUATION

<table>
<tr><td>TEACHING METHOD
Face to face, Distance learning, etc.</td><td>Face to face</td></tr>
<tr><td>USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT)
Use of ICT in Teaching, in Laboratory Education, in Communication with students</td><td>• Organization of the material in ppt slides.
• Support of the learning process through the electronic platform
• Communication via email.</td></tr>
<tr><td>TEACHING ORGANIZATION
The ways and methods of teaching are described in detail.
Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.</td><td>
<table>
<tr><th>Activity</th><th>Workload/semester</th></tr>
<tr><td>Theory lectures</td><td>52</td></tr>
<tr><td>Laboratory exercises</td><td>39</td></tr>
<tr><td>Independent theory study</td><td></td></tr>
<tr><td>Study of laboratory exercises and notes</td><td>48</td></tr>
<tr><td>Total</td><td>175</td></tr>
</table>
</td></tr>
<tr><td>STUDENT EVALUATION
Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others

Please indicate all relevant information about the course assessment and how students are informed</td><td>Student evaluation languages
Greek
Method (Formative or Concluding)
Summative
Student evaluation methods
Written Exam with Problem Solving
Rate
Laboratory (40% of the total course grade):
• 30% intermediate progress – multiple choice questions
• 70% Written final exam that includes solving problems from different sections of the course (notes are not allowed).</td></tr>
</table>

(5) SUGGESTED BIBLIOGRAPHY

- ΧΗΜΙΚΗ ΤΕΧΝΟΛΟΓΙΑ, Συγγραφείς: Ζαμπούλης Δ., Ζουμπούλης Α., Καραπάντσιος Θ., Μάτης Κ., Τριανταφυλλίδης Κ., ISBN: 978-960-418-356-2 ,ΚΩΔΙΚΟΣ ΕΥΔΟΞΟΥ: 22694251
- Βασικές αρχές και υπολογισμοί στη χημική μηχανική, 8η Έκδοση, Himmelblau D., Riggs J.
- ΕΡΓΑΣΤΗΡΙΑΚΕΣ ΑΣΚΗΣΕΙΣ ΧΗΜΙΚΗΣ ΤΕΧΝΟΛΟΓΙΑΣ, Γάλλιος Γ., Γκότσης Χρ., Ζαμπούλης Δ., Ζουμπούλης Α., Κώστογλου Μ., Λαζαρίδης Ν., Μάτης Κ., "Μαύρος Π., Σπαθής Π., Τριανταφυλλίδης Κ., ISBN: 978-960-418-194-0, ΚΩΔΙΚΟΣ ΕΥΔΟΞΟΥ: 18548857, ΕΤΟΣ ΕΚΔΟΣΗΣ: 2009, Εκδόσεις Τζιόλα