COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Mechanical Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	EN2400	**SEMESTER**	9th
COURSE TITLE	Industrial Pollution Abatement Technology		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	5	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialized general knowledge, skills development*	General background
PREREQUISITE COURSES:	There are no prerequisite courses. It is recommended that students who are interested in attending the course have completed successfully the following courses: Engineering Chemistry, Thermodynamics I & II, Fluid Mechanics I & II, Transport Processes
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek, English (for ERASMUS students)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (tutoring)
COURSE WEBSITE (URL)	https://www.mie.uth.gr/?page_id=18484&lang=en

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

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

By the end of the course, the student will be able to do the following:

1. To understand the connection between the energy sector and the degradation of the environment with emphasis on the climate change, ozone depletion and the causes of smog.
2. To explain and calculate the statistics of a given aerosol size distribution and properties of gas (pressure, solubility and ideal gas law).
3. To understand the various mechanisms responsible for the particulate matter collection (inertia, gravity, impaction, diffusion and electrical migration) and decide for the best technique to be used.
4. To understand the major collection mechanism for a given gas compound, e.g. VOC, NOx, SO2 (absorption, adsorption, chemical reaction, combustion, catalytic reaction).
5. To explain the strategies for NOx and SO2 removal and the mechanisms employed.
6. To calculate the collection efficiency of a given pollution control system and evaluate various parameters that affect the collection efficiency and cost.
7. To select and design the most appropriate air pollution control system for a given particulate or gaseous emission scenario.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Independent work (homeworks)
- Team work (project)
- Project planning and management
- Promoting creative and inductive thinking
- Respect for the natural environment

(3) SYLLABUS

- Definitions, background, overview of thermodynamics, design of an environmental process
- Energy and Environment, Air pollution, gaseous pollutants, particulate matter.
- Climate change, ozone depletion, acid deposition, photochemical smog.
- Sources and impacts of air pollution.
- Control and collection of particulate matter from stationary sources - technologies design: cyclones, electrostatic precipitators, baghouses, particle scrubbers
- Auxiliary equipment: hoods, ducts, fans
- VOC emissions control: VOC combustion plants, gas adsorption (theory, design), adsorption.
- Control of sulfur and nitrogen oxides from constant emissions.
- Examinations in the form of seminars: The role of water, Introduction to the quality and treatment of industrial water, Wastewater, production and characterization, Municipal / industrial waste treatment systems, Solid waste management.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY ***Face-to-face, Distance learning, etc.***	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	
TEACHING METHODS *The manner and methods of teaching are described in detail. Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non- directed study according to the principles of the ECTS*	

Activity	*Semester workload*
Lectures	55
Educational visits	5
Study and analysis	50
Homeworks	20
Project	20
Course total	150

STUDENT PERFORMANCE EVALUATION ***Description of the evaluation procedure*** *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, shortanswer questions, open- ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Assessment Language: Greek (English for ERASMUS students) Evaluation methods: (a) final exam (90%), including multiple choice test, Short Answer Questions and problem solving (b) Homework (10%) (c) Completion and presentation of a team project (25%) The homework is returned corrected to the students. The students have the right to see their written exams on a specific day and time.

(5) **ATTACHED BIBLIOGRAPHY**

-Suggested bibliography:

- C.D. Cooper and F.C. Alley, Air Pollution Control - A Design Approach, Waveland Press Inc., 2002.
- N. de Nevers, Air Pollution Control Engineering, McGraw-Hill, New York, 1995.
- R.A. Corbitt, Standard Handbook of Environmental Engineering, McGraw-Hill, 1990.
- J. H. Seinfeld and S. N. Pandis, “Atmospheric Chemistry and Physics: From Air Pollution to Climate Change”. John Wiley and Sons, 1997.