COURSE OUTLINE

1. COURSE INFORMATION

SCHOOL	Chemical and Environmental Engineering		
DEPARTMENT			
COURSE LEVEL	Graduate		
COURSE ID	**BEKA 300**	**SEMESTER**	Winter
COURSE TITLE	Climate Change and GHG Emissions		

COURSE MODULES *in the case of credits being awarded in distinct parts of the course eg. Lectures, Laboratory Exercises, etc. If credit units are awarded uniformly for the whole course, indicate the weekly hours of teaching and the total number of credits.*	**INSTRUCTION HOURS PER WEEK**	**CREDITS**
Lectures	3	9
Laboratories		
Tutorial Exercises		
Total	3	
Add rows if needed. The teaching organization and teaching methods used are described in detail in (4).		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skills Development*	Background
PREREQUISITES:	Basic knowledge in calculus
INSTRUCTION/EXAM LANGUAGE:	English
THE COURSE IS OFFERED TO ERASMUS STUDENTS:	Yes
COURSE URL:	EURECA-PRO LMS Moodle URL: https://moodle.eurecapro.tuc.gr/course/view.php?id=84

2. LEARNING OUTCOMES

Learning Outcomes

The learning outcomes of the course describe the specific knowledge, skills and competences of an appropriate level that students will acquire after successfully completing the course.

Refer to Appendix A.

- *Description of the Level of Learning Outcomes for each course of study in line with the European Higher Education Area Qualifications Framework*
- *Descriptive Indicators of Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Annex B*
- *Learning Outcomes Writing Guide*

Upon successful completion of this course the students will acquire new knowledge and specific skills on the following subjects:

- Will have knowledge of the basic characteristics of the Earth's atmosphere (structure, density, temperature lapse rate, pressure and energy balance).
- Will have knowledge of the composition of the atmosphere
- Will have knowledge of the impact of the greenhouse effect to the temperature balance of the planet.
- Will have knowledge of the basic characteristics of particulate matter (density, chemical properties, size and sources).
- Will be capable to use the basic principles of the Eulerian and Lagrangian air quality models to calculate the concentration of pollutants in air.
- Will be able to apply Gaussian models for the calculation of air pollutants concentration.
- Will have knowledge to use simple models for calculating the carbon foot print from houses and

industrial facilities
- Will be able to apply simple climate models for the calculation of GHG levels and emissions
- Will have knowledge of the air quality and climate legislation concerning gaseous and particulate matter pollutants.

General Competencies/Skills

Considering the general competencies that the graduate must have acquired (as listed in the Diploma Supplement and below), which one(s) the course enhances?

Search, analysis and synthesis of data and information, using the necessary technologies
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Respect for diversity and multiculturalism
Respect for the natural environment
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Exercise criticism and self-criticism
Promoting free, creative and inductive thinking

- Adaptation ability
- Decision making
- Respect of the Environment
- Advance free, creative and causative thinking

3. COURSE SYLLABUS

The course aims to the analysis and formulation of design criteria for the application of measures for the reduction of greenhouse gas (GHG) emissions in the atmosphere. It is also formulates the calculation of GHG emissions from anthropogenic and natural sources. Air pollutants and aerosols are also studied together with mathematical dispersion models, as well as, climatic models. In addition, the energy balance in Earth is studied using mathematical models. Finally, the course includes a number of laboratory exercises.

Syllabus

1st week: Atmospheric structure and composition
2nd week: Air pollutants
3rd week: Radiation in the atmosphere. Greenhouse effect
4th week: Energy balance and climate
5th week: Emissions of gaseous components and aerosols. Air pollution dispersion
6th week: Atmospheric chemistry and climate
7th week: Atmospheric aerosols and effects on visibility and climate
8th week: Climate Characteristics
9th week: Single cell models. Climate models
10th week: GHG pollutants
11th week: Formulation of an emission inventory
12th week: Project for the calculation of the Carbon dioxide in the atmosphere
13th week: Project for the calculation of the Carbon footprint

4. TEACHING and LEARNING METHODS – ASSESSMENT

LECTURE METHOD *Face to face, distance learning, etc.*	Face to face in conjunction with distance learning
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in Teaching, in Laboratory Exercises, in Communication with students*	Use of ICT in Teaching and Laboratory Exercises

TEACHING ORGANISATION *Describe in detail the way and methods of teaching.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Literature review & analysis, Tutoring, Practice (Placement), Clinical Exercise, Artistic Lab, Interactive teaching, Educational visits, Project work, project, etc.* *The student's study hours for each learning activity and the hours of non-guided study according to the ECTS principles are mentioned.*	***ACTIVITY***	***Workload per semester (in Hours)***
	Lectures	39
	Tutorials	
	Lab assignments	10
	Projects	41
	Autonomous study	135
	Course Total (25 hours' workload/ECTS credit)	***225***
ASSESSMENT METHODS *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, Public Presentation, Laboratory Assignment, Clinical Examination of Patients, Artistic Interpretation, Other* *Well defined student assessment criteria are mentioned. Mention whether and how the students can access them.*	1. Lab reports (10%) 2. Written assignments (20%) 3. Project (35%) 4. Final exam (35%)	

5. DIGITIZATION (use of tools & software)

- European GHGCalculator
- BoxModel_CO2
- Sgec_tool

6. RECOMMENDED INTERNATIONAL LITERATURE

1. Seinfeld J. H. and Pandis, S. N. Atmospheric Chemistry and Physics John Wiley & Sons (2006).
2. IPCC Fifth Assessment Report(http://www.ipcc.ch/report/ar5/wg1).
3. Mihalis Lazaridis. First Principles of Meteorology and Air Pollution. Springer (2010).

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