COURSE OUTLINE

1. COURSE INFORMATION

SCHOOL	Chemical and Environmental Engineering		
DEPARTMENT			
COURSE LEVEL	Postgraduate		
COURSE ID		**SEMESTER**	Spring
COURSE TITLE	Advanced Studies on Energy Efficiency and Environmental Quality in the Built Environment		

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	
Laboratories		
Tutorial Exercises		
Total	3	9
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*	Specialization
PREREQUISITES:	
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=85

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*

After completing this course the student will be able to:

- Analyse the key technologies that contribute to improving the energy efficiency of buildings, districts, and urban built environments.
- Calculate the energy demand and energy consumption of buildings and communities.
- Comprehend the role of built environment in sustainable development goals.
- Identify the main challenges in buildings and living spaces related projects.
- Practise in real case studies examples.
- Use available tools and technologies for the reduction of the energy demand in the built environment.

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

- Research, analysis and synthesis of data and information, using the necessary technologies
- Adapting to new situations
- Decision-making
- Autonomous work
- Teamwork
- Production of new research ideas
- Project design and Management
- Respect for the natural environment
- Promoting free, creative, and inductive thinking
- Written communication
- Initiative
- Time Management
- Problem Solving

3. COURSE SYLLABUS

Content: The course aims to analyze, design, and evaluate the key technologies that contribute to improving the energy efficiency of buildings, districts and urban built environments. In addition, the course aims to analyze the environmental quality parameters indoors and in outdoor areas. Thermal comfort, visual comfort and indoor air quality is presented.

Course Material per Week (13 weeks):

Week 1: Energy needs in buildings, communities, and cities. Modern challenges for the built environment
Week 2: Indoor Environmental Quality in Buildings - Part 1: Thermal Comfort
Week 3: Indoor Environmental Quality in Buildings - Part 2: Air Quality and Ventilation / Air Conditioning Systems
Week 4: Indoor Environmental Quality in Buildings - Part 3: Visual comfort and lighting
Week 5: Smart Buildings and Integrated Energy Design - Definitions and Examples
Week 6: Buildings Certification LEED and BREEAM Standards
Week 7: Zero Energy Communities and Intelligent Energy Systems
Week 8: Energy planning in the urban environment and urban heat island phenomenon
Week 9: Presentations of work progress
Week 10: Smart cities and energy infrastructure - Part 1: Definitions
Week 11: Smart cities and energy infrastructure - Part 2: Examples
Week 12: Case Study Analysis
Week 13: Presentations

4. TEACHING and LEARNING METHODS – ASSESSMENT

LECTURE METHOD *Face to face, distance learning, etc.*	Face to face; hybrid (on-site and online)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in Teaching, in Laboratory Exercises, in Communication with students*	

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	30.0
	Tutorials	
	Lab assignments	45.0
	Projects	30.0
	Autonomous study	100.0
	Literature review	20.0
	Course Total (25 hours' workload/ECTS credit)	***225.0***
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.*	Project (100%)	

5. DIGITIZATION (use of tools & software)

6. RECOMMENDED INTERNATIONAL LITERATURE

1. Kampelis, N., Kolokotsa, D. Smart Zero-energy buildings and communities for smart grids (2022) Smart Zero-Energy Buildings and Communitiesfor Smart Grids, pp. 1-289. ISBN: 978-1-119-90219-5Wiley-ISTE.
2. Kolokotsa, D., Kampelis, N., Mavrigiannaki, A., Gentilozzi, M., Paredes, F., Montagnino, F.M., Venezia, L. Integration of energy storage in smartcommunities and smart grids (2022) Smart Zero-Energy Buildings and Communities for Smart Grids, pp. 221-262.
3. Kolokotsa, D., Pignatta, G., Ulpiani, G. Nearly Zero-Energy and Positive-Energy Buildings: Status and Trends (2022) Technologies for IntegratedEnergy Systems and Networks, pp. 239-273.

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