COURSE OUTLINE

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	ELECTRICAL AND COMPUTER ENGINEERING DEPT.		
LEVEL OF STUDIES	MASTER LEVEL		
COURSE CODE	**ENE_APP-203**	**SEMESTER**	**2**
COURSE TITLE	ENERGY ECONOMICS		

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	2	
Tutorial/Seminars	1	
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (4).	3	6

COURSE TYPE *general background, special background, specialised, general knowledge, skills development*	Special Background, Specialised
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek, Lectures can also be given in English language in case foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.uop.gr/courses/3475/

(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*

The course "Energy Economics" provides the students with a deep understandingof the concepts related to the operation of the Power System and the Electricity Markets.

The fundamental economic dispatch problem is modelled and solved analytically, followed by an introduction to linear programming for modelling problems such as the planning and integration of thermal and hydroelectric plants.Similarly, the students are introduced to methods for simulatingtheelectricity market and wind generation usingopen-source software tools in course seminars.

The course also aims tointroduce the students to typical methodologies for electricity demand forecasting, as well as to issues related to energy exchanges and to the concept of energy communities.

Learning Outcomes

Upon successful completion of the course, the student will be able to demonstrate the following learning outcomes:

At the knowledge level:

1. Understand fundamental concepts of modern electricity systems and electricity markets.
2. Understand the differences between electricity markets and other markets, the concepts of demand and supply curves and the market clearing process.
3. Studyfundamental techniques for modelling problems related to the operation of power systems.
4. Studyfundamental forecasting methodologies for electricity load forecasting.

At the skill level:

1. To formulate and solve the problem of economic dispatch.
2. To formulate and solve linear programming problems related to the short-term scheduling of thermal and hydroelectric plants, and market clearing.
3. To use wind generation models.
4. Apply forecasting techniques to real electricity consumption data.

At the level of abilities:

1. Understand and solve complex problems related to the electricity markets and the operation of power systems.
2. Generalise the knowledge acquired and use it to solve functionally similar problems that they haven't yet encountered.

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…*
	…….

- Working autonomously
- Team work
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Production of new research ideas

(3) SYLLABUS

1. Introduction to Electricity Power System operation

2. Electricity Markets

3. Electricity Generation

4. Economic Dispatch

5. Electricity pricing, flexibility, and demand side management

6. Introduction to linear programming

7. Planning and scheduling of thermal power plants 8. Planning and schedulingof hydroelectric plants 9. Modelling of Wind generation 10. Modelling and simulation of electricity markets 11. Load models and forecasting methods 12. Energy exchanges and support schemes for Renewable Energy Sources 13. Decentralised markets and energy communities

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	In lecture
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Teaching using ICT for supporting the learning process through the e-class electronic platform, and use of Open-Source Software for the seminars and assignments.
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*	(see table below)
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer 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*	**Evaluation language**: **Greek**. **Evaluation Method:** Written examination (short answer questions, multiple choice questions, problem-solving): 60%. Short assignments and a course project onshort-term scheduling andelectricity market simulation: 40%.

Activity	*Semester workload*
Lectures	26
LaboratoryExercises (in Lab)	14
Assignments	30
Course Project	30
Lecture & bibliography study	50
Course Total	***150***

students.	

(5) ATTACHED BIBLIOGRAPHY

Gan, Deqiang, Donghan Feng, and Jun Xie. *Electricity markets and power system economics*. CRC Press, 2013.

Kirschen, Daniel S., and Goran Strbac. *Fundamentals of power system economics*. John Wiley & Sons, 2018.

Söder, Lennart, and Mikael Amelin. *Efficient operation and planning of power systems*. (2011).

Boyd, S. &Vandenberghe, L., 2008. *Convex optimization*. s.l.:Cambridge University press.

A. J. Wood and B. C. Wollenberg, *Power Generation, Operation and Control*, John Wiley & Sons, 1996.

Taylor, James W., and Patrick E. McSharry. "Univariate Methods for Short-Term Load Forecasting." *Advances in electric power and energy systems: Load and price forecasting* (2017): 17-40.