COURSE OUTLINE

1. GENERAL

SCOOL	ENVIRONMENT AND AGRICULTURAL ENGINEERING		
DEPARTMENT	NATURAL RESOURCES MANAGEMENT AND AGRICULTURAL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	178	SEMESTER	6th
COURSE TITLE	THERMODYNAMICS AND HEAT TRANSFER		

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	3	3
LABORATORY PRACTICES	2	2
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, specialised general knowledge, skills development	SPECIAL BACKGROUND
PREREQUISITECOURSES:	- APPLIED THERMODYNAMICS - PHYSICS - MATHEMATICS III
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (IN CLASSES OF MORE THAN 5 STUDENTS)
COURSE WEBSITE (URL)	ELECTRONIC NOTES AND PRESENTATIONS OF THE COURSE ARE AVAILABLE FOR THE STUDENTS OF THE SEMESTER AT THE ADDRESS, https://oeclass.aua.gr/eclass

2. 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*

This is a basic introductory course on thermodynamics and heat transfer.

The objectives of the course are to

- Present the basic principles of thermodynamics and heat transfer
- Analyse examples of real-world engineering applications so that the students understand how thermodynamics and heat transfer are related to practical engineering applications. Emphasis is given to bio-systems engineering applications (e.g. greenhouses, animal housing)

Students are guided through explanations of concepts, the use of practical examples and a series of laboratory exercises to acquire knowledge and develop the necessary skills necessary in subsequent courses on various scientific topics.

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, analysis and synthesis of data and information, using the necessary technologies	Project planning and management
Adapting to new situations - Making decisions	Respect for diversity and multiculturalism
Autonomous work - Group work	Respect for the natural environment
Work in an international environment	Demonstrating social, professional and ethical responsibility and sensitivity to gender issues
Work in an interdisciplinary environment	Exercise criticism and self-criticism
Generating new research ideas	Promotion of free, creative and inductive thinking

3. SYLLABUS

Theory:
Introductory concepts, definitions, units of measurement. First law of thermodynamics in closed and open systems. Energy analysis of open systems. Physical properties of materials. Ideal and real gases. Gas mixtures. Psychrometry. Second law of thermodynamics. Reversible and irreversible processes. Entropy and consequences of the 2nd law. Thermodynamics of irreversible processes. Transfer of heat, temperature, thermometers, amount of heat, calorimetry. Heat conduction, steady state and non-steady state, general equation of heat conduction, solution in one or more dimensions. Radiation heat transfer. Convection of heat. Combination of the three modes of heat transfer.
Laboratory work that includes:
Series of problems solved in the classroom. Demonstration experiments, such as determining the coefficient of thermal conductivity, the coefficient of convection, calculating the performance of heat exchangers, and studying radiation energy transfer.

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	Use of ICT in teaching and 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	

Activities	*Semester workload*
Lectures	75
Laboratories	50
Course total	*125*

ECTS	
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 students.	I. Written examination in the theory of the course, including: - Multiple-choice questions on the semester's syllabus. - A solution to an exercise if applicable. II. Written examination in the laboratory part of the course, including: - Development, judgment and multiple-choice questions on the semester syllabus.

5. ATTACHED BIBLIOGRAPHY

- E-NOTES
- Yunus A. Cengel – Micheal A. Boles. Thermodynamics: An Engineering Approach 8th Edition, McGraw-Hill Education, (2014)
- Datta, Ashim K.. Heat and Mass Transfer: A Biological Context, CRC Press; 2nd edition (2017)