COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Naval Architecture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	NAOME1217	**SEMESTER**	3rd
COURSE TITLE	**THERMODYNAMICS**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS (ECTS)**
Lectures	4	4

COURSE TYPE *general background, specialbackground, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (Italian)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/NAFP111/ http://ocp.teiath.gr/courses/NAFP_UNDER110

(2) COURSE GOALS / LEARNING OUTCOMES

The aim of the course is to understand the basic principles and fundamentals of thermodynamics. During the course the students will be familiarized with the description and application of the physical concepts of work, heat, inner energy, temperature, entropy, the laws of thermodynamics and the use of tables and diagrams.

(3) COURSE CONTENT / SYLLABUS

1. Fundamental Concepts and Definitions : Terminology, definition and scope, microscopic and macroscopic approaches. Engineering Thermodynamics: Definition, some practical applications of engineering thermodynamics. System (closed system) and Control Volume (open system).
2. Ideal and real gases. Differences between ideal and real gases, equation of state for ideal gases, real gases. Van der Waal's equation of state, other equations of state.
3.The First Law of Thermodynamics. Basic concepts : system, state, equilibrium, process. Quasi –equilibrium processes. Equation of state.
4. Heat and Work: changing the state of a system. Zeroth law of thermodynamics. Work. The first law of thermodynamics and its corollaries: adiabatic, steady, throttling of a gas, quasi-static expansion of gas, transient filling of a tank. Enthalpy. Specific heats. Conservation of mass and energy in control volume form. Engineering cycles: properties of cycles, work and efficiency, general presentation of cycles, Carnot cycle, refrigerator and heat pump, Otto cycle, Diesel cycle, Joule cycle, Sabathe cycle.
5. The Second Law of Thermodynamics, Reversible processes, The second law of thermodynamics: statements and related concepts. Entropy changes in an ideal gas. Calculation of entropy change in basic processes.
6. Power cycles : Introduction, Practical Rankine Cycle, Reheat Cycle (continuation of

Rankine cycle), Regenerative Cycle. Mollier and Ts-diagrams.

(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	• Support learning through the electronic e-class platform.
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*	
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*	Final written examination : 80% Evaluation of individual work : 20%

Activity	***Workload (hours)***
Lectures	39
Exercises to understand problems resolution	13
Personal study	65
Course total	**117**

(5) ATTACHED BIBLIOGRAPHY

1. Thermodynamic (theory and exercises) , G Hatzikonstandis, UNIWA 2019
2. TERMODINAMICA E TRASMISSIONE DI CALORE, Y. Cangel & M. Boles, McGraw-Hill Education
3. Thermodynamics, ZEMANSKY, HOEPLI 2002
4. Fundamentals of Engineering Thermodynamics, MORAN & SHARPIRO, J. Wiley & Sons 2006