

COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Naval Architecture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	NAOME1338	SEMESTER	6 th
COURSE TITLE	STEAM BOILERS, STEAM TURBINES, AND APPLICATIONS IN MARINE ENGINEERING		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS (ECTS)
Lectures		4	4
COURSE TYPE <i>general background, specialbackground, specialized general knowledge, skills development</i>	Specialized		
PREREQUISITE COURSES:	Thermodynamics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/ET153/		

(2) COURSE GOALS / LEARNING OUTCOMES

<p>The aim of the course is to educate the student in order to obtain the theoretical and practical knowledge concerning steam production technology, as well as its use for power production through steam turbines. After the completion of the course, the student should:</p> <ul style="list-style-type: none"> • Be aware of basic elements of steam production technology, corresponding boiler configurations, basic subsystems and related measurement devices. • Have the knowledge of power production by means of steam turbines and required auxiliary devices. • Know heat losses and be able to calculate efficiency of a steam boiler, as well as of a steam boiler-steam turbine plant.

(3) COURSE CONTENT / SYLLABUS

<p>Lectures:</p> <ul style="list-style-type: none"> • Water vaporization, steam boilers (classification, description, operational characteristics). • Combustion and related calculations in steam boilers, dew point of flue gases, fuels, burners and combustion systems (for compatible solid, liquid or gas fuels). • Energy calculations of a steam boiler, efficiency, heat losses. • Main systems (vaporizator, superheater, reheaters, preheaters) and auxiliary systems (pumps, fans, elements of steam network, instruments for monitoring, safety, control, measurement) of steam boilers. Boiler maintenance and water processing issues.

- Energy production by means of steam turbines, ideal and real Rankine cycles, modifications of Rankine cycle for efficiency enhancement, reference to alternative cycles (e.g. Binary and Organic Rankine Cycles).
- Classification and characteristics of steam turbines, condensers, cooling towers, energy calculations. Thermal efficiency of a steam boiler-turbine plant. Matching and cooperation of steam boiler and steam turbine. Load control, operation in partial loads.
- Applications of steam boilers and steam turbines in Marine Engineering (Marine boilers, energy systems in ships, cogeneration, combined cycle).

(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	<ul style="list-style-type: none"> • Support learning through the electronic e-class platform. 	
TEACHING METHODS <i>The manner and methods of teaching are described in detail.</i> <i>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.</i> <i>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</i>	Activity	Workload (hours)
	Lectures	44
	Laboratory demonstration	8
	Homework assignments	39
	Individual study	52
	Course total	143
STUDENT PERFORMANCE EVALUATION <i>Description of the evaluation procedure</i> <i>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</i>	Lectures: Written examination (100%). Alternatively, percentage of the final mark could be obtained by means of an assignment or project presentation.	

(5) ATTACHED BIBLIOGRAPHY

- E.B. Woodruff, H.B. Lammers, T.F. Lammers, "Steam Plant Operation", 7th Edition, Mc Graw Hill, 1998.
- D. Anarratone, "Steam Generators: description and design", Springer Verlag, 2008.
- V. Ganapathy, "Industrial Boilers and Heat Recovery Steam Generators: design, application and calculations", Marcel Dekker, 2003.
- Flanagan G.T.H., Marine boilers, Oxford : Newnes, 1990.