COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Naval Architecture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	NAOME1232	**SEMESTER**	5th
COURSE TITLE	**HEAT TRANSFER**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS (ECTS)**
Lectures		4	4
COURSE TYPE *general background, specialbackground, specialized general knowledge, skills development*	Special background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/NA213/		

(2) COURSE GOALS / LEARNING OUTCOMES

The aim of the course is to educate the student in order to be able to understand and solve Heat Transfer problems. After the completion of the course, the student will be able to:

- Know the three heat transfer modes (conduction, convection, diffusion) and understand their basic principles and governing laws.
- Apply the appropriate governing equations in the analysis of basic heat transfer problems.
- Perform steady-state heat transfer calculations in simple and complex geometries, involving combination of heat transfer modes.
- Perform basic calculations for the sizing and rating problems of heat exchangers.

(3) COURSE CONTENT / SYLLABUS

Lectures:

- Introduction to heat transfer, thermophysical properties of materials, heat conductivity, heat transfer modes.
- Conduction, Fourier's law, thermal resistance, one-dimensional conduction in simple and composite-layer plane, cylindrical and spherical geometries, critical and optimum insulation thicknesses. Extended heat transfer surfaces, fins and their efficiency. Introduction to transient heat conduction.
- Convection, forced and natural. Hydraulically and thermally fully developed flow. Velocity

and temperature boundary layer, laminar and turbulent flow, Reynolds, Prandtl and Nusselt numbers. Forced convection over plane, cylindrical and spherical geometries, in transverse flow around bundle of tubes, internal flow convection in ducts. Natural convection around bodies, Grashof number. Combined forced and natural convection.

- Radiation, black body, laws of Planck, Stefan-Boltzmann, Wien, Kirchoff, radiation properties of surfaces, coefficients of emission, absorption, reflection and permeability, grey body, radiation heat transfer, surface view coefficient.
- Conjugate heat transfer problems. Heat exchangers, classification. Calculation of geometry for given performance (sizing). Calculation of performance for given geometry (rating). Logarithmic Mean Temperature Difference (LMTD), NTU method.

(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*	

Activity	*Workload (hours)*
Lectures	52
Homework assignments	26
Individual study	39
Course total	***117***

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*	Evaluation: Written examination (100%). Alternatively, percentage of the final mark could be obtained by means of an assignment or a project presentation.

(5) ATTACHED BIBLIOGRAPHY

1. Holman J. P., 2009, Heat Transfer, McGraw – Hill (10th edition).
2. Incropera F. P., Dewitt D. P., Bergman T. L., Lavine A. S., 2006, Introduction to Heat Transfer, John Wiley & sons, Inc. (5th edition).
3. Kakaç Σ., Liu H., Pramuanjaroenkij A., Heat Exchangers: Selection, Rating, and Thermal Design, Third Edition, CRC Press, 2012.