ETY607 – Heat Transfer

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ETY607	**SEMESTER**	6
COURSE TITLE	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 / Case Studies	4	4
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialized general knowledge, skills development*	special background
PREREQUISITE COURSES:	NO
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	http://users.uoi.gr/vkalpak

(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 aims at the following learning outcomes

- Sufficient theoretical knowledge to understand the basic mechanisms of heat transfer in solids and fluids at macroscopic scale and treat with analytical solutions of fundamental 1-d problems
- Acquainting with relevant technological problems and developing the ability to solve analytically a few 1-d steady-state and transient heat flow problems of practical interest.
- The skill of modelling simple practical heat transfer problems, i.e., analyzing a problem of the real world, selecting the appropriate PDE, as well as the initial and boundary conditions, that is, constructing a mathematical model which corresponds to a given practical problem.
- The skill of solving simple 2-d steady-state and transient heat transfer problems using the pdetool of MATLAB.

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…*
	…….

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Working independently
- Production of free, creative and inductive thinking
- Transforming a practical problem into a corresponding mathematical and computational one

(3) SYLLABUS

What is heat and how is transformed. First low of thermodynamics. Heat transfer with conduction, convection and radiation. Fourier law and heat conduction equation. Boundary conditions for solving the heat conduction equation. 1-d heat conduction in a steady-state temperature field. Analytical solutions for heat conduction through orthogonal cylindrical and spherical walls. Thermal resistance for conduction and convection. Applications to multilayer materials and insulation problems. Transient heat conduction. Application to lumped systems. Fourier law and heat conduction in 2-d and 3-d problems. Numerical solution with the aid of pdetool of MATLAB. Examples of 2-d steady-state and transient heat transfer problems.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face in the class
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	The theoretical part of the course is mainly carried out on the blackboard. Occasionally, PC and video projector are used for the presentation of 2-d graphics. The lab exercises are carried out in the computer laboratory of the department in teams of two or three persons.
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	***Semester workload***
Lectures	39
Laboratory practice	13
Reports	25
Non-directed study	23
Course total	100

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.*	The language of evaluation is Greek. The evaluation is based mainly on the final written exam and occasionally (up to 15%) on reports concerning the laboratory exercises.

(5) ATTACHED BIBLIOGRAPHY

Suggested bibliography:

- Heat Transfer, X. Kakatsios, (Kleidarithmos), Athens 2002 (in Greek)
- Heat Transfer. A practical Approach, Yunus Cengel, (Tziolas), Thessaloniki, 2005 (translated in Greek)