

## COURSE OUTLINE

### 1. GENERAL

<b>SCHOOL</b>	School of Engineering		
<b>DEPARTMENT</b>	Environmental Engineering		
<b>LEVEL OF STUDIES</b>	Level 7		
<b>COURSE CODE</b>	<b>E7ΥΠ</b>	<b>SEMESTER</b>	<b>3th</b>
<b>COURSE TITLE</b>	TRANSPORT PHENOMENA		
<b>TEACHING ACTIVITIES</b> <i>If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.</i>	<b>TEACHING HOURS PER WEEK</b>	<b>ECTS CREDITS</b>	
	4	5	
<i>Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.</i>			
<b>COURSE TYPE</b> <i>Background, General Knowledge, Scientific Area, Skill Development</i>	Background, General Knowledge, Skill Development		
<b>PREREQUISITES:</b>			
<b>TEACHING &amp; EXAMINATION LANGUAGE:</b>	Greek		
<b>COURSE OFFERED TO ERASMUS STUDENTS:</b>			
<b>COURSE URL:</b>	<a href="https://eclass.duth.gr/courses/TMC268/">https://eclass.duth.gr/courses/TMC268/</a>		

### 2. LEARNING OUTCOMES

#### Learning Outcomes

*Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.*

The aim of the course is to understand the mechanisms of Heat and Mass Transfer, through the analysis of the Fundamental Principles and Laws governing phenomena, in order to approach the solution of problems, which are presented in practice and concern the specialty of environmental engineer.

After the successful completion of the course students will be able to:

- know and describe mathematically the mechanisms of heat and mass transfer
- understand the similarities and differences of transport mechanisms
- know and mathematically describe the principles of energy and mass conservation
- solve energy and mass transfer problems

#### General Skills

*Name the desirable general skills upon successful completion of the module*

*Search, analysis and synthesis of data and information,  
ICT Use*

*Adaptation to new situations*

*Decision making*

*Autonomous work*

*Teamwork*

*Working in an international environment*

*Working in an interdisciplinary environment*

*Production of new research ideas*

*Project design and management*

*Equity and Inclusion*

*Respect for the natural environment*

*Sustainability*

*Demonstration of social, professional and moral responsibility and sensitivity to gender issues*

*Critical thinking*

*Promoting free, creative and inductive reasoning*

Search, analysis and synthesis of data and information, with the use of the necessary technologies.  
Critical thinking.  
Autonomous work.

### 3. COURSE CONTENT

1. Introductory course – Basic concepts
2. Heat transfer mechanisms
3. Thermal resistor networks I (Flat geometry)
4. Thermal resistor networks II (Cylindrical and spherical geometry)
5. Heat transfer from fin surfaces
6. Basic principles of heat convection
7. Analysis of Heat Exchangers – Method of Average Logarithmic Difference
8. Analysis of Heat Exchangers – Method of Effectiveness
9. Special applications of heat exchangers
10. Heat transfer by radiation
11. Mass transfer mechanisms
12. Specific diffusion mass transfer applications
13. Specific mass transfer applications by convection

### 4. LEARNING & TEACHING METHODS - EVALUATION

<b>TEACHING METHOD</b> <i>Face to face, Distance learning, etc.</i>	Face to face	
<b>USE OF INFORMATION &amp; COMMUNICATIONS TECHNOLOGY (ICT)</b> <i>Use of ICT in Teaching, in Laboratory Education, in Communication with students</i>	Use of ICT in Teaching and in Communication with students	
<b>TEACHING ORGANIZATION</b> <i>The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research &amp; analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.  The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.</i>	<b>Activity</b>	<b>Workload/semester</b>
	Lectures	52
	Bibliographic research & analysis	98
	<b>Total workload</b>	<b>150</b>
<b>STUDENT EVALUATION</b> <i>Description of the evaluation process  Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others  Please indicate all relevant information about the course assessment and how students are informed</i>	<p>First evaluation process</p> <p>1<sup>st</sup> Written Exam (based on the 5 first lectures – 40%)</p> <p>2<sup>nd</sup> Written Exam (based on the 8 last lectures – 60%)</p> <p>Second evaluation process</p> <p>Final exam at the end of Semester (100%)</p>	

## 5. SUGGESTED BIBLIOGRAPHY

1. Bird, R.B., Stewart, W.E. and Lightfoot, E.N. (2007). Transport Phenomena (Revised Second Edition ed.). John Wiley & Sons. [ISBN978-0-470-11539-8](#).
2. Brodkey R.S., Hershey H.C., (1988). Transport Phenomena - A Unified Approach. McGraw-Hill. ISBN 960-7219-14-7
3. Bergman T.L., Lavine A.S., Incropera F.P., Dewitt D.P. (2011) Fundamentals of Heat and Mass Transfer. John Wiley & Sons. ISBN 13 978-0470-50197-9
4. [Yunus A. Cengel](#) (2002) Heat Transfer: A Practical Approach. McGraw-Hill. ISBN 13: 978-0072458930

## ANNEX OF THE COURSE OUTLINE

### Alternative ways of examining a course in emergency situations

<b>Teacher (full name):</b>	Costas ELMASIDES
<b>Contact details:</b>	<a href="mailto:kemasid@env.duth.gr">kemasid@env.duth.gr</a>
<b>Supervisors: (1)</b>	NO
<b>Evaluation methods: (2)</b>	Written or oral examination with distance learning methods
<b>Implementation Instructions: (3)</b>	<p>In the e-class field "assignments", the subjects of exams will be posted according to the schedule of the examination. It will be possible to answer on A4 pages. Each A4 page will include the following:</p> <ul style="list-style-type: none"> <li>• Name</li> <li>• Registration Number</li> <li>• Date</li> <li>• Signature</li> <li>• Page Count</li> </ul> <p>The A4 pages, which will be used to solve the issues, will be taken a picture and posted as a file in the "Tasks" field of e-class where the subjects were posted, no later than 2 hours after the start of the examination. Within this time the questions should be answered and posted in the e-class. Before the exam will be sent via eclass link of teams with which each student can meet the teacher for questions and clarifications regarding the subjects of the examination.</p> <p>If necessary, an oral examination may follow. on a day and time set by the teacher.</p>

(1) Please write YES or NO

(2) Note down the evaluation methods used by the teacher, e.g.

- *written assignment* or/and exercises
- written or oral examination with distance learning methods, provided that the integrity and reliability of the examination are ensured.

(3) In the **Implementation Instructions** section, the teacher notes down clear instructions to the students:

a) in case of **written assignment and / or exercises**: the deadline (e.g. the last week of the semester), the means of submission, the grading system, the grade percentage of the assignment in the final grade and any other necessary information.

b) in case of **oral examination with distance learning methods**: the instructions for conducting the examination (e.g. in groups of X people), the way of administration of the questions to be answered, the distance learning platforms to be used, the technical means for the implementation of the examination (microphone, camera, word processor, internet connection, communication platform), the hyperlinks for the examination, the duration of the exam, the grading system, the percentage of the oral exam in the final grade, the ways in which the inviolability and reliability of the exam are ensured and any other necessary information.

c) in case of **written examination with distance learning methods**: the way of administration of the questions to be answered, the way of submitting the answers, the duration of the exam, the grading system, the percentage of the written exam of the exam in the final grade, the ways in which the integrity and reliability of the exam are ensured and any other necessary information.

There should be an attached list with the Student Registration Numbers only of students eligible to participate in the examination.