COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
DEPARTMENT	DEPARTMENT OF CHEMISTRY		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	EN20	**SEMESTER**	8th Semester
COURSE TITLE	Computational Methods in Materials Science		

TEACHING ACTIVITIES *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.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	3
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Background
PREREQUISITES:	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass2.emt.duth.gr/courses/CHEM_H122/

(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.

At the end of this course, students will be able to:
1. Understand computational methods for simulating physical phenomena.
2. Apply the appropriate computational methods depending on the application.
3. Interpret the results of the calculations.

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

At the end of the course, students will have further developed the following general skills:
1. Decision making
2. Working in an interdisciplinary environment
3. Production of new research ideas
4. Promoting free, creative, and inductive thinking

(3) COURSE CONTENT

Introduction to the Finite Element Method, Finite Element Models, Material Models/Contact Models, Elastic Behavior - Hooke's Law, Elastoplastic (nonlinear) Behavior, Heat Transfer, Thermomechanical Models, Thermoelectric Models, Fluid Flow in Pipes, Fluid-Solid Interaction, Micromechanical Models

(4) LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & 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.*	**Activity** / **Workload/semester** Lectures: 39 Bibliographic research & analysis: 36 Total: 75
STUDENT EVALUATION *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*	**Student evaluation languages** Greek **Method (Formative or Concluding)** Summative **Student evaluation methods** Written Exam with Problem Solving **Rate** **100**

(5) SUGGESTED BIBLIOGRAPHY

1. Ανάλυση Πεπερασμένων Στοιχείων, Moaveni S., ISBN: 978960330735-8, ΚΩΔΙΚΟΣ ΕΥΔΟΞΟΥ: 12347118
2. Μέθοδος Πεπερασμένων Στοιχείων για Μηχανικούς, S. Rao, ISBN:9789603307914, ΚΩΔΙΚΟΣ ΕΥΔΟΞΟΥ: 86053569
3. Υπολογιστική Μηχανική, Γεώργιος Σταυρουλάκης, ISBN: 978-960-603-502-9, ΚΩΔΙΚΟΣ ΕΥΔΟΞΟΥ: 320349
4. The Finite Element Method and Applications in Engineering Using ANSYS [electronic resource], Erdogan Madenci; Ibrahim Guven, ISBN:9781489975508, ΚΩΔΙΚΟΣ ΕΥΔΟΞΟΥ: 73267264