COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Mechanical Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	MY3100	**SEMESTER**	8th
COURSE TITLE	The Finite Element Method		

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 and Exercises	5	6
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*	Specialization of general knowledge
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (tutoring)
COURSE WEBSITE (URL)	https://mie.uth.gr/?page_id=18345

(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 is addressed to undergraduate students (6th semester) and refers to the solution of Mechanics problems with the Finite Element Method. The target of the course is the introduction to the Finite Element Method and its application to problems of deformable bodies and structural mechanics, also in related boundary-value problems (e.g. heat transfer or potential flow). Emphasis is given to applications and programming techniques. After the successful completion of this course, the students should

- Know the basic features of the Finite Element Method, for the solution of boundary-value problems
- Be able to apply the Finite Element Method for the solution of basic boundary-value problems in 1D and 2D, through computer programming of the method
- Validate the numerical solution they found, by comparing with the analytical solution of the problem found in previous courses.

To follow this course, the student is required to have the basic knowledge of Linear Algebra, Mathematical Analysis, Numerical Analysis, Statics and Strength of Materials.

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*

Respect for difference and multiculturalism *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment ……*	*Adapting to new situations* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *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
- Showing professional and ethical responsibility
- Production of new research ideas

(3) SYLLABUS

- Discrete systems
- Continuous systems
- Introduction to numerical methods
- Finite elements in one-dimensional problems
- Two-dimensional boundary-value problems
- Finite elements in two-dimensional rpoblems
- Finite elements with higher-order shape functions – isoparametric elements
- Programming of the finite element method

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY ***Face-to-face, Distance learning, etc.***	Classroom Lectures
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of computer technology for the exercises of the course (computer programming) and for communication purposes (e-mails)
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	70
Exercises	30
Independent Study	50
Course total (25 hours per credit unit)	***150***

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.*	*I. Final exam (80%):* *II. Exercises (20%)* *The evaluation criteria are disclosed to the student in the beginning of the semester, and are stated in the website of the course.*

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Class notes (in Greek)

1. *Σ. Α. Καραμάνος (2002), Η Μέθοδος Των Πεπερασμένων Στοιχειών, Σημειώσεις Μαθήματος, Εκδόσεις Π.Θ., Βόλος.*

Bibliography in Greek

2. *Χριστόφορος Γ. Προβατίδης (2017), Πεπερασμένα στοιχεία στην ανάλυση κατασκευών, Εκδόσεις Τζιόλα, Αθήνα, 2017*
3. *Μ. Παπαδρακάκης (2001), Ανάλυση Φορέων με την Μέθοδο των Πεπερασμένων Στοιχειών, Εκδόσεις Παπασωτηρίου, Αθήνα.*
4. *Γ. Τσαμασφύρος και Ε. Θεοτόκογλου (2005), «Η Μέθοδος των Πεπερασμένων Στοιχείων», Εκδόσεις Συμμετρία, Αθήνα.*

Bibliography in English

5. *K. J. Bathe, "Finite Element Procedures", Prentice-Hall Inc., New Jersey, 1996.*
6. *T. R. J. Hughes, "The Finite Element Method – Linear Static & Dynamic Finite Element Analysis", Dover ed., 2000 (υπάρχει στην βιβλιοθήκη του ΠΘ).*
7. *O. C. Zienkiewicz, R. L. Taylor, "The finite element method", 4th ed., London; New York: McGraw - Hill, 1994, 2 volumes (υπάρχει στην βιβλιοθήκη του ΠΘ).*
8. *R. D. Cook, D. S. Malkus, M. E. Plesha, "Concepts and applications of finite element analysis", 3rd ed., New York; Chichester: Wiley , 1989 (υπάρχει στην βιβλιοθήκη του ΠΘ).*
9. *J. N. Reddy, "An Introduction to the Finite Element Method", Second Edition, New York: McGraw - Hill, 1993 (υπάρχει στην βιβλιοθήκη του ΠΘ).*

- Related academic journals:

- *Finite Elements in Analysis and Design*
- *Computer Methods in Applied Mechanics & Engineering*
- *Computational Mechanics*
- *International Journal for Numerical Methods in Engineering*