COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Mechanical Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	MY0601	**SEMESTER**	7th
COURSE TITLE	Introduction to Plasticity		

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	5	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialized general knowledge, skills development*	Specialized general knowledge
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://www.mie.uth.gr/?page_id=18383&lang=en

(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*

Upon successful completion of the course it is expected that the student is able to

- understand basic concepts of mechanical behavior of metals in the plastic range
- carry out basic calculations of plasticity of mechanical engineering components.

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
Adapting to new situations
Decision-making
Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project planning and management
Respect for difference and multiculturalism
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
……
Others…
…….

Working independently
Project planning and management
Production of free, creative and inductive thought

(3) SYLLABUS

Introduction: Micromechanisms of plastic deformation in metals, polymers and geomaterials.
Yield criteria: The general form of the yield criterion in isotropic materials. Yield criteria independent of hydrostatic stress. Geometric interpretation of the yield criterion in principal stress space, the π-plane.
The plastic flow rule: Description of hardening. The postulates of Drucker and Il'iushin, plastic work. Convexity of the yield surface. The normality rule ("associated" flow rule). The Prandtl-Reuss equations.
Solution of elastoplastic problems: Beam bending, torsion, unloading and calculation of residual stresses. Hollow cylinder under internal pressure. Combination of tension and torsion, dependence of solution on the loading path.
Limit analysis: Statically admissible stress fields and kinematically admissible velocity fields. Stress and velocity discontinuities. The theorems of limit analysis. Examples. Application to plane-strain problems, the "trapezoidal" stress field.
Slip line fields: The general method of solution of a system of first order quasi-linear equations of two variables. Plane deformation of a rigid perfectly plastic continuum. The hyperbolicity of the governing equations and the calculation of the "characteristics" (slip lines). Discontinuous stresses and velocities. Properties of the slip lines. Examples of simple slip line fields. Numerical methods for the determination of slip line fields.
Applications to metal forming: Analysis of extrusion, drawing and rolling.

(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*	Parts of the course material are presented using ICT	
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	60
	Laboratory Exercises	30
	Study	60
	Course total	***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.*	Language of evaluation: Greek Methods of evaluation: Final Exams

(5) ATTACHED BIBLIOGRAPHY

-Suggested bibliography:

- N. Aravas, «Theory of Plasticity», Class Notes, University of Thessaly Press.
- J. Lubliner, «Plasticity Theory», Macmillan Publishing Company, 1990.
- R. Hill, «The Mathematical Theory of Plasticity», Oxford University Press, 1998.
- L. M. Kachanov, «Foundations of the Theory of Plasticity», Dover Publications, 2004.
- W. Johnson and P. B. Mellor, «Engineering Plasticity», Ellis Horwood, 1983.