COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Mechanical Engineering		
LEVEL OF STUDIES	*Undergraduate*		
COURSE CODE	EN2300	**SEMESTER**	7
COURSE TITLE	Welding Engineering and Technology		

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, Practical 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*	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=18402

(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*

Objective: to introduce the student to the basic casting and welding techniques. The student should understand the basic principles for the design of cast engineering components and to prescribe the suitable welding method for metallic constructions. He should become able to perform calculations concerning the strength of weldments, the residual stresses and distortion of welded structures.

With the completion of the course the students will be able to:

- Understand the various welding processes
- Understand the development of residual stresses and distortions in welded structures
- Describe techniques for minimizing welding distortion and residual stresses
- Recognize weld microstructures
- Understand the evolution of microstructure in the weld metal and HAZ

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
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
……

Production of new research ideas	*Others…*
• Search, analysis and synthesis of data and information • Decision-making • Working independently Team work	

(3) SYLLABUS

- Introduction to welding
- Welding techniques (SMAW, GMAW-MIG, GTAW-TIG, SAW)
- Heat transfer during welding (Temperature distributions, cooling rate)
- Residual stresses in welding
- Distortion of welded structures
- The weld metal (solidification, problems related to the weld metal)
- The heat-affected zone (HAZ) – Problems in the HAZ: Cold cracking, sensitization
- Weld defects- Quality control of weldments and non-destructive testing
- Mechanical behavior of weldments: fracture and fatigue of welded structures

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY ***Face-to-face, Distance learning, etc.***	In class lectures.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Search the web for welding processes Spreadsheet calculations
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: 50 Homework: 50 Individual project: 50 ***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.*	Homework, lab project, individual project, mid-term exam, final exam. The mid-term and final exams are closed-book exams and include theoretical questions and problem solving.

(5) **ATTACHED BIBLIOGRAPHY**

- G.N. Haidemenopoulos, Introduction to Welding, Tziolas Publishing, 2023.
- R.W. Messler, Principles of Welding, Wiley VCH, 2004
- S. Kou, Welding Metallurgy (2nd edition), Wiley, 2003
- K. Masubuchi, Analysis of Welded Structures, Pergamon Press, 1980
- ASM Metals Handbook, Vol.6, Welding, Soldering and Brazing, ASM, USA, 9th edition, 1992.
- D. Brandon and W. Kaplan, Joining Processes, An Introduction, Wiley, 1997.
- J.F. Lancaster, Metallurgy of Welding, Chapman & Hall, 1993.