

a) General			
<i>School</i>	ENGINEERING		
<i>Academic unit</i>	MECHANICAL ENGINEERING		
<i>Level of studies</i>	Undergraduate		
<i>Course code</i>	MM208E03	<i>Semester</i>	8
<i>Course title</i>	Advanced welding technology		
<i>Independent teaching activities</i>	<i>Weekly teaching hours</i>		<i>ECTS</i>
Lectures	2		4.0
Laboratory exercises	2		
<i>Course type</i>	Knowledge deepening/consolidation		
<i>Course category</i>	Compulsory Elective for Direction 2		
<i>Prerequisite courses</i>	-		
<i>Language of instruction and examinations</i>	Greek		
<i>Is the course offered to Erasmus students</i>	No		
<i>Course website (url)</i>	http://triblab.puas.gr		
b) Learning outcomes and general competences			
b1. Learning outcomes			
<p>Upon successful completion of this course, the student will be able to:</p> <ul style="list-style-type: none"> - Solve thermal problems occurring during welding. - Suggest suitable welding procedures leading to minimization of distortion and tensile residual stresses, for given structure geometry and material grade. - Predict the microstructure of both the weld and the heat-affected zone, using scientific knowledge from the field of physical metallurgy. 			
b2. General competences			
<p>Upon completion of the course, the students would develop, also, general competences, concerning:</p> <ul style="list-style-type: none"> - Search, extraction, analysis and synthesis of scientific data and knowledge, using screening of large scientific databases. - Decision making capabilities on the selection of the appropriate welding technique. - Understanding the requirements for generic approaches in a worldwide environment. - Project planning and management. - Capability of performing individual- and team-working case studies. - Ability to conceive the multi-disciplinary character of various engineering applications. 			
c) Syllabus			
<p>Within the framework of the course the principles of fusion weld techniques and of non-destructive testing of the structure's quality are taught. Special emphasis is given to:</p> <ul style="list-style-type: none"> • Heat transfer phenomena in semi-infinite solids and finite sheets due to moving point heat sources. • Metallurgical transformations during solidification of liquid metals and cooling of alloys. • Internal stress fields developed within metallic materials under given boundary conditions. • Post-welding treatments aiming to avoid catastrophic failure of welded structures. <p>Successful attendance of earlier semester courses that cover basic knowledge is not formally required. However, given the topic's interdisciplinary nature, comprehension of phenomena governing the relevant mechanical applications requires knowledge of the controlling mechanisms on:</p>			

<ul style="list-style-type: none"> Steady and non-steady state heat transfer Influence of temperature distribution on the microstructure of metals and alloys Materials behavior under mechanical loading 		
d) Teaching and learning methods - Evaluation		
Delivery	Lectures of theory and laboratory exercises face-to-face, within the classroom.	
Use of information and communications technology	Teaching using ICT, Laboratory education using ICT and experimental devices, communication and electronic submission	
Teaching methods	<i>Activity</i>	<i>Semester workload</i>
	Lectures	26
	Tutorials	
	Laboratory exercises	26
	Computational exercises	
	Individual work	78
	Course total	130
Student performance evaluation	Theory: Intermediate assessment and written final examination. Laboratory: evaluation of practical skills and multiple-choice exams.	
e) Suggested bibliography		
<ol style="list-style-type: none"> Welding Handbook, 5 Volumes (1984). American Welding Society (AWS). Cary, H.B. (1979). Modern Welding Technology. Prentice-Hall Inc. Davies, A.C. (1984). The Science and Practice of Welding, 2 Volumes. Cambridge University Press. Masubuchi, K. (1980). Analysis of Welded Structures: Residual stresses, Distortion and their Consequences. Pergamon Press Ltd. Kou, S. (2003). Welding Metallurgy. John Wiley & Sons Inc. 		