a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM207E01	*Semester*	7
Course title	**Surface engineering**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		2	4.0
Laboratory exercises		2	
Course type		Knowledge deepening/consolidation	
Course category		Compulsory Elective for Direction 2	
Prerequisite courses		-	
Language of instruction and examinations		Greek	
Is the course offered to Erasmus students		No	
Course website (url)		http://triblab.puas.gr	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Recognize the parts of engineering assemblies that are subjected to surface mechanical loading, in order to calculate and re-design them for optimizing the performance of the integrated mechanical system.
- Select the suitable surface modification technique per bearing type, in order to assure its safe and long operation.
- Use knowledge from the field of fluid mechanics in order to reliably solve problems of lubrication.
- Make good use of knowledge from the fields of mathematics, statistics and numerical analysis, in order to develop algorithms for the prediction of safe operation of tribo-systems.

b2. General competences

Upon completion of the course, the students would develop, also, general competences, concerning:

- Search, extraction, analysis and synthesis of scientific data and knowledge, using screening of large scientific databases.
- Decision making capabilities on the suitable lubricant and surface modification technique selection for a given engineering application.
- 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

The knowledge offered in the course concerns:

- Clarification of basic concepts, like the tribo-system's definition, its main operating parameters and the critical materials' volumetric and surface properties affecting its operation.
- Surface micro-geometry (roughness) analysis and measurement.
- Assessment of the mechanical loading effects on surface and sub-surface layers of conjugated, non-moving bodies (Elasto-static theory).

- Movement deceleration mechanisms of bodies in contact (Friction) that increase energy requirements.
- Surface degradation mechanisms during relative motion of conjugate bodies (Wear) that cause mass losses.
- Special topics on the action of solid, liquid and hybrid lubricants targeted to facilitate motion, without crucial dimensional change of bodies, leading to minimization of energy and mass loss.
- Special topics on technological applications of bearing journals and their calculation.
- Surface modification techniques for enhancing the surface properties of tribo-elements.

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	*Activity*	*Semester workload*
	Lectures	26
	Tutorials	
	Laboratory exercises	26
	Computational exercises	26
	Individual work	52
	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

1. Williams, J. (2005). *Engineering Tribology*. Cambridge University Press.
2. Zum Gahr, K.-H. (1987). *Microstructure and Wear of Materials*. Elsevier Ltd.
3. Holmberg, K. and Matthews A. (1998). *Coatings Tribology*. Elsevier Ltd.
4. Basu,B. and Kalin, M. (2011). *Tribology of Ceramics and Composites*. John Wiley & Sons Inc.