ETY 502. PHYSICAL METALLURGY I

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING			
ACADEMIC UNIT	DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	**ETY 502**		**SEMESTER**	**5^{o}**
COURSE TITLE	PHYSICAL METALLURGY I			
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			4	4
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:	NO			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	-			
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/enrol/index.php?id=2394			

(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 consists the first fundamental introductory course of the Physical Metallurgy field. The course aims to the understanding of the fundamental knowledge and the substantial issues and terms concerning the structure and properties of metallic materials and especially of those of a single phase system. The phenomena and mechanisms that are related with the microstructure and its interrelation with the mechanical response are discussed in details. The course is the first step for gaining further knowledge in the area of metallic materials such as: a) special and industrial alloys, b) manufacturing and shaping processes, c) performance and degradation under different environmental conditions.

Upon the completion, the undergraduate student is capable of:

1) Understanding the fundamental principles governing the manufacturing, shaping, control and properties of the single phase metallic materials.
2) Recognising the importance of the microstructures and the mechanical properties of the metallic materials so that a constructive material selection process can be adopted.

3) Predicting a material response under various servicing conditions.
4) Designing the appropriate processes for receiving the optimum properties.

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

1) Working independently
2) Team Work
3) Production of new research ideas
4) Working in an interdisciplinary environment
5) Production of free, creative and inductive thinking

(3) SYLLABUS

1) Introduction: Classification of metallic materials. Processing selection
2) Atomic structure: Atomic electron configuration. Metal groups. Chemical and physical bonding. Crystallographic planes and directions.
3) Crystal structure imprefections: Point, linear, planar, volume defects. Grain size measurement. Microscopy analysis techniques.
4) Dislocations movement: Slip systems. Plastic deformation. Edge dislocation movement, screw dislocation movement, mixed dislocations, Dislocation density. The role of dislocations. Plastic deformation of polycrystalline and single crystal materials. The role of imprefections.
5) Strengthening mechanisms in metals and alloys: Grain size strengthening, solid solution strengthening, strain hardening.
6) Shape forming processes: Bulk and sheet forming processes.
7) Annealing: stages, mechanisms and control.
8) Introduction to mechanical properties and destructive testing: Tensile test, impact test, hardness test.

(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*	-
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,*	

Activity	***Semester workload***
Lectures	52
Self-study	48

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*		
	Course total	***100h***
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 METHOD OF EVALUATION: (i) Final written examination (ii) Exercises	

(5) ATTACHED BIBLIOGRAPHY

Introduction to Physical Metallurgy (volume 1), A. Lekatou, S. Lekatos, (ISBN: 978-960-86109-8-9, Theodorides Publ., Ioannina, 2008

- *Physical Metallurgy, G.N. Chaidemenopoulos, (ISBN: 960-418-117-3), Tziolas Publ. Thessaloniki, 2007*
- *Science and Technology of Materials, W. Callister (greek edition), (ISBN: 960-8050-90-1), Tziolas Publ., 5th Edition, Thessaloniki, 2004*