GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Mechanical Engineering		
LEVEL OF STUDIES	*Undergraduate*		
COURSE CODE	MY3500	**SEMESTER**	8th
COURSE TITLE	Material Selection in Engineering Design		

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*	Special background
PREREQUISITE COURSES:	MY0400 Mechanics - Statics, MY0700 Physical Metallurgy, MY0600 Materials Technology
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://mie.uth.gr/?page_id=18446&lang=en

Learning outcomes

By engineering design we mean the process for the translation of an idea or a market need into detailed information for the fabrication of an engineering product. Every stage of engineering design requires decisions for material selection for the manufacturing of the product. The number of materials the engineer has in his disposal is enormous, something between 80000 and 100000 materials. Although standardization has led to a decrease in the number of materials, the continuing appearance of new materials with new properties and applications widens the field of selection.

The aim of this course is to train students in a materials selection process during engineering design. With a series of lectures and case studies the student will be able to apply the method for the selection of material, shape and process for the development of engineering products.

General Competences

- Working independently.
- Decision making
- Team work
- Production of free, creative and inductive thought.
- Search analysis and synthesis of collected data and information

SYLLABUS

1. The definition and the stages of engineering design.
2. The methodology of materials selection.
3. An example case study.
4. Materials and their properties.
5. Material selection maps.
6. Sources of materials property data.
7. The objective function and performance indices.
8. Inelastic and multiple constraints.
9. Performance maximizing crieteria.
10. Correlations between materials and shape.
11. Performance indices with shape factors.
12. Effect of processing in engineering design.
13. Review of processing of materials.
14. Process selection maps.
15. Failure of materials.
16. The role of failure analysis in engineering design.
17. Energy and environmental criteria in materials selection.
18. New materials and innovation.

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, Course support material is provided through the online platform, UTH e-Class
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*	<table><tr><th>*Activity*</th><th>*Semester workload*</th></tr><tr><td>Lectures</td><td>70h</td></tr><tr><td>Laboratory Exercises</td><td>35h</td></tr><tr><td>Exercises</td><td>45h</td></tr><tr><td>***Total***</td><td>***150h***</td></tr></table>
STUDENT PERFORMANCE EVALUATION ***Description of the evaluation procedure*** *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires,*	Language of evaluation: Greek Methods of evaluation: Student assessment is based on a set of written individual assignments (30%), a set of laboratory individual assignments (20%) and a written final exam (50%).

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.*	

ATTACHED BIBLIOGRAPHY

-Suggested bibliography:

- *G.N. Haidemenopoulos and A. Katsamas, Introduction to Materials Technology, Notes, University of Thessaly Publications, 2004. (in Greek).*
- *M.F. Ashby, Materials Selection in Mechanical Design, 5th edition, Elsevier, 2016.*
- *M.F. Ashby, H. Schercliff, D. Cebon, Materials: Engineering, Science, Processing and Design, 4th edition, Elsevier,2019.*
- *M.F. Ashby, K. Johnson, Materials and Design, Butterworth-Heinemann, 2002.*
- *Materials Selection and Design, ASM Handbook, Vol.20, ed. G.E. Dieter, ASM international, 1997.*
- *N.A. Waterman, M.F. Ashby, The Elsevier Materials Selector, Elsevier Science Publishers, 1991 (3 Volume series).*

-Suggested bibliography:

- *M. F. Ashby, "Multy-objective optimization in material design and selection", Acta Mater, 2000, 48, 359-369.*
- *S. K. Maiti, L. J. Gibson and M. F. Ashby, "Deformation and energy absorption diagrams for cellular solids", Acta Metall., 1984, 32, 1963-1975.*
- *M. F. Ashby and Y. J. M. Brechet, "Designing hybrid materials", Acta Mater, 2003, 51, 5801-5821.*
- *C. H. Caceres, "Economical and Environmental Factors in Light Alloys Automotive Applications", Metallurgical and Materials Transactions A, 2007, Vol 38a, 1649-1662.*