COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Business		
ACADEMIC UNIT	Department of Financial and Management Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**MH0111**	SEMESTER	3rd
COURSE TITLE	Strength of Materials		

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 and labs	5	4.5
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, specialised general knowledge, skills development*	Engineering background, specialised knowledge, skills development
PREREQUISITE COURSES:	Statics
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	

(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 is addressed to undergraduate students and aims to allow students to:

- **Develop a high level of understanding of the fundamental principles of applied mechanics and the modeling of force systems in engineering statics.**
- **Demonstrate an integrated understanding of engineering statics principles through applications involving problem solving and through creation of design solutions to engineering scenarios.**
- **Work cooperatively with others to facilitate a collegial atmosphere conducive to learning for all students in the class.**
- **Prepare for and attend each class by reading the assigned sections before class, completing homework before class, and actively participating in class.**

Upon successful completion of this course, the students should be able to do

the following:

- **Prepare appropriate free body diagrams.**
- **Solve 2-D and 3-D particle and rigid body equilibrium problems.**
- **Solve problems involving moments.**
- **Solve problems involving friction.**
- **Calculate shear and bending moment diagrams in beams.**

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
Production of new research ideas
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
……
Others…
…….

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Respect for the natural environment
- Adapting to new situations
- Decision-making
- Working independently
- Team work
- Production of free, creative and inductive thinking
- Criticism and self-criticism

(3) SYLLABUS

Class 1: Overview of Mechanics of Materials
- External loads / equivalent forces / centroids
- Types of support reactions
- Equations of equilibrium
- Free body diagrams: internal forces
- Free body diagrams: (internal forces and support reactions)
- Shear and moment diagrams

Class 2: Definition of stress
- Definition/derivation of stress (3 normal and 3 shear stress)
- Definition/derivation of normal stress
- Tensile stress/strain diagrams
- Plastic deformation
- Ductile and brittle fracture

Class 3: Tensile and compression mechanical behaviour
- Modulus of elasticity (Young's moduli)
- Mechanical property definitions for yield stress, ultimate strength, etc
- Hooke's law
- Poisson ratio
- Thermal stresses and deformations

Class 4: Shear

- Definition/derivation of shear stress
- Shear force/shear areas in simple connections
- Allowable Stress/Factors of Safety

Class 5: Torsion

- Introduction to torsion / Torsion of shafts
- Derivation of shear strain
- Torsion formula
- Derivation / Definition of polar moment of inertia
- Absolute maximum shear stress

Class 6: Beam bending

- General review of beams
- Axial shear and bending moment diagrams
- Moments of inertia of a cross-section
- Centroids of areas; general equations, "composite" areas, axes of symmetry
- Moments of inertia of an area (2nd moment of area): Ix, Iy, Iz = J (polar moment of inertia)

Class 7: Beam bending

- Graphical method for constructing shear and moment diagrams
- Review of bending deformation of a straight, prismatic, homogeneous beam subjected to pure bending
- The "flexure formula"
- Examples of beam bending

Class 8: Beam bending

- The "flexure formula"
- Examples of beam bending

Class 9: Deflections of Beams and Shafts

- The elastic curve and how to draw it
- Displacement and slope by integration
- Examples of slope and displacement using the integration Method

Class 10: Combined Loadings

- Review of principle of superposition (is valid if);
- The loading must be linearly related to the stress or displacement
- The loading must not significantly change the original geometry of the member
- State of stress caused by combined loadings

Class 11: Mechanical behaviour of metallic materials

- Creep
- Fatigue

Class 12: Mechanical behaviour of metallic materials

- Fatigue with the presence of cracks / notches
- Hardness

Class 13: Mechanical behaviour of metallic materials

- Impact
- Effect of corrosion exposure on the life cycle of a material

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face teaching and lab
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	**Use of eClass in delivering notes and presentations**
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	39
Lab	26
Bibliography study	80
Fomrulation of laboratory topics	40
Tests	20
Course total	***205***

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.*	Grading will be determined on three exams: two mid-term exams covering the first 60 % of the topics of the course (30 % each) while the final exam covers the rest 40 % of the topics. The students that fail the course will be re-examined in September at the whole topic of the course (100 %). The course grade will be calculated as follows: (1st Mid-term exam x 30 %) + (2nd Mid-term exam x 30 %) + (Final exam 40 %) = (Total 100 %) Exam in September covers the whole topic of the course 100 %

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography: Mechanics of Materials 5th Edition by Ferdinand Beer, E. Russell Johnston Jr., Brian DeWolf and David Mazurek, ISBN-10: 0077221400, McGraw-Hill Science/Engineering/Math; 5 edition (May 8, 2008)

- Related literature:

- *Mechanics of materials by R. C. Hibbeler, 8th edition, Pearson Prentice Hall, 2011, ISBN 0136022308,*
- *Mechanics of Materials by James M. Gere and Barry J. Goodno, 8th edition, 2012, Cencage Learning, ISBN: 1111577730*