COURSE OUTLINE

1. GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MINERAL RESOURCES ENGINEERING		
LEVEL OF STUDIES	*Undergraduate*		
COURSE CODE	MRE502	**SEMESTER**	5th
COURSE TITLE	Steel Structures Design		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	2	5
Laboratory or Tutorials	2	
Overall	4	

COURSE TYPE	General Background -Scientific Area
PREREQUISITE COURSES:	Mechanics - Structures (MRE204) Mechanics - Strength of Materials (MRE302)
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	

2. LEARNING OUTCOMES

Learning outcomes

The course is a basic introductory course in the field of Steel Structures Design. The material of the course aims to acquaint students theoretically and practically with the development in technology and Steel Structures Design. To learn the basic principles of steel structure design and developments in matters of regulations and specifications according to Eurocodes.

Upon successful completion of the course students will have the ability to:

- Recognize the design framework of structural steel projects.
- Understand the basic design concepts of structural steel frames.
- Calculate structural elements made of steel in strength and bending, as well as their means of connection joints.
- Understand the characteristics, the behavior of deformation stresses, and the mechanical properties of the various grades of structural steel used in structural members and connections in relation to EN standards and Eurocode 3.
- Understand the provisions of Eurocode 1 for actions, understand the provisions of Eurocode 3 for members in tension and design structural members made of tension steel, understand the provisions of Eurocode 3 for bending beams and design steel beams in bending and shear, understand the provisions of Eurocode 3 for connections and design bolted and welded connections, and understand the provisions of Eurocode 3 for members in axial load and design columns for flexural bending due to axial compressive load and torsional bending.
- Shape the load-bearing structure of a steel structure and can suggest ways to absorb the vertical and horizontal actions (wind) acting on the steel structure. Use Euler buckling theory.
- Understand the drawings and details of the design of a steel structure and be able to organize the process of its construction.
- Measure quantities (Bill of Quantities) of materials of steel works, be able to prepares itemization lists and the take off sheets for the costs of a steel construction and be able to plan the stages of construction.

General Competences

The course contributes to the acquisition of the following skills:

- Applying knowledge in practice,
- Researching, Analyzing & Synthesizing Data & Information using necessary technologies,
- Literature Review and Bibliographic data and information acquisition from Eurocodes,
- Design of members of steel structures.
- Promotion of free, creative and inductive thinking through the systematic application of the provisions of Eurocode 3 with the help of knowledge of statics and strength of materials for proper design in terms of safety, servicability and economy.

3. SYLLABUS

Theory: Introduction-Structural steel. Regulatory design framework to Eurocodes. Actions/loading. Resistance of members to tension-compression-shear-bending and complex stresses. Stability of structural members and frames. Means of connections/joints, bolting, welding.
Tutorial exercises: Solving exercises in matters of dimensioning and control of strength and stability of structural members. Solving exercises for bolted and welded joints.

More details:

- ✓ Advantages and disadvantages of steel structures. Section properties, description of steel. Forms of steel sections.
- ✓ Steel structures (generally for steel members, structural steels, deformation-stress behavior, standards, Eurocode 3).
- ✓ Provisions of Eurocode 1 for actions in constructions.
- ✓ Tension members (limit state of strength (ULS) as a design criterion, actual and active cross section).
- ✓ Connection design (connections/joints and connection means, bolted connections, welded connections).
- ✓ Beam bending (design with marginal strength as a design criterion, bending displacement, shear).
- ✓ Column design (Flexural bending due to axial compressive load, equivalents of members in compression, lateral torsional bending-LTB).
- ✓ Strength of steel sections in combined stress.
- ✓ Member stability control, without lateral bracing, in compression and biaxial bending, flexural and lateral torsional bending.
- ✓ Connection formation, beam-column, beam-beam and column-foundation moment connections/joints.
- ✓ Earthquake resistant design of steel buildings, ULS/SLS design, construction devices.
- ✓ Examples of steel structures. Conception of the frame, education of a bearing structure, study and implementation (Site set-up, mobilization and construction).

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	In the classroom and in the laboratory (Face-to-face). Webinars. Tutorials. Laboratory demonstrations. Possibility of distance lectures if required via Zoom Cloud Meeting.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Presentation of lectures using PC (presentations, experimental videos, etc.). Support of learning process through the electronic platform eLearning and electronic communication with students (Online announcements and comments, forum, email etc.). Self-assessment questionnaires in the eLearning environment of the course and asynchronous training platform - eclass. Assistance in completing assignments through result files for each individual student.
TEACHING METHODS	

Activity	***Semester Workload***
Lectures	75
Tutorial - exercise solutions integrated in lectures	15
Individual assignments on laboratory exercises & theory (Coursework) and application exercises	10
Independent Home Study	
Overall Course Set (20 hours of workload per credit unit)	***100***

STUDENT PERFORMANCE EVALUATION	• Attendance - Participation in the class • Weekly coursework assignments, problems to be solved at home. • Progress tests (20-30%). • Final examination on all syllabus (70-100%) that will be used for the overall assessment of the students in combination with the results of coursework , progress tests and participation.

5. SUGGESTED BIBLIOGRAPHY

- I. Vagias, I. Ermopoulos, G. Ioannidis, Design of Steel Structures, Klidarithmos Publications, 2006.
- I. Vagias, I. Ermopoulos, G. Ioannidis, Iron Constructions, Volume I, Key Number Publications, 2005. ISBN 960-209-872-4 ATHENS 13899.
- Eurocode 3, Design of Steel Structures, Part 1-1: General Rules and Rules for Buildings, EN 1993-1-1, 2005 Eurocode 3, Design of Steel Structures, Part 1-8: Design of Nodes, EN 1993-1-8 , 2005.
- Androic, Dujmovic and Dzeda, Eurocode Examples 3. Calculations and Dimensioning of Steel Structures. Giourdas Publications.
- Kounadis, A., Iron constructions behavior and analysis (volumes I & II). Symeon Publications.
- Charalambos K. Baniotopoulos. Steel Constructions (Design Principles in the Context of Eurocode 3) Ziti Publications ISBN: 978-960-456-184-7 2009 THESSALONIKI 11063.
- LRFD Code. Load and Resistance Factor Design Specification for structural steel buildings. American Institute of Steel Construction Inc.