(B) Course information in English

General course information:

Course title:	**ELASTOPLASTIC STRUCTURAL ANALYSIS**	**Course code:**	CE07_S06
Credits:	5	**Work load (hours):**	142
Course level:	Undergraduate ☒	Graduate ☐	
Course type:	Mandatory ☒	Selective ☐	
Course category:	Basic ☐	Orientation ☒	
Semester:	8th	**Hours per week:**	4

Course objectives (capabilities pursued and learning results):

The main objective is the analysis and the design of frame structures with the theory of plasticity. For that, the lectures first concern the theory of plasticity in frame members. In the sequel, the problem of the determination of the collapse mechanism for frame structures is studied. The problem of plastic design with min weight is also studied. Finally, the methods of plastic analysis with linear programming are studied and the students are also introduced to the matrix formulation of plastic analysis and plastic design problems. The results are the familiarization of students with the theory of plasticity and the comprehension of the methods of plastic analysis and plastic design of frame structures.

Prerequisites:

- Mechanics II
- Structural Analysis II
- Structural Analysis III

Instructor's data:

Name:	Olympia Panagouli
Level:	Assistant Professor
Office:	
Tel. – email:	24210 74146
Other tutors:	-

Specific course information:

Week No.	Course contents	Hours	
		Course attendance	**Preparation**
1	Theory of plasticity for frame members. Calculation of the ultimate moment capacity and the shape coefficient for different cross sections.	**4**	**2**
2	Calculation of the elastoplastic boundary in beams with rectangular cross section.	**4**	**2**
3	Influence of shear forces to the ultimate moment capacity of the rectangular cross section.	**4**	**2**
4	Influence of axial forces to the ultimate moment capacity of the rectangular cross section.	**4**	**2**
5	Loading - Unloading and calculation of residual stresses.	**4**	**2**
6	Elastoplastic methods: The "step by step" method for the calculation of the displacements and the collapse load of the structure.	**4**	**2**
7	Classical methods of plastic analysis. Theorems of plasticity.	**4**	**2**
8	Determination of collapse mechanism and calculation of the corresponding collapse load through the combination of independent mechanisms for frame structures.	**4**	**2**
9	Improvement of real collapse mechanisms in frames with distributed loads.	**4**	**2**
10	The geometric method of plastic design with min weight.	**4**	**2**
11	Modern methods of plastic analysis with linear programming.	**4**	**2**
12	The matrix formulation of plastic analysis and plastic design problems**.**	**4**	**2**
13	The matrix formulation of the "step by step" method.	**4**	**2**
14	Examples of elastoplastic analysis with the use of "step by step" method in the context of	**4**	**2**

	structural analysis software.		

Additional hours for:			
Class project	**Examinations**	**Preparation for examinations**	**Educational visit**
20	3	35	-

Suggested literature:
• K. Barkarakis, Analysis and Design of Frame Structures with the Theory of Plasticity, N.T.U.A., Athens 1985. • M. Papadrakakis, Plastic Analysis of Frame Structures - Modern Methods, N.T.U.A., Athens 1996. • B. Neal, The plastic Methods of Structural Analysis, Chapman and Hall ltd., 1977.

Teaching method *(select and describe if necessary -* **weight***):*		
Teaching	☒	50%
Seminars	☐	
Demonstrations	☐	
Laboratory	☐	
Exercises	☒	50%
Visits at facilities	☐	
Other *(describe):* …….	☐	
Total		100%

Evaluation method *(select)*- **weight:**				
	written	*%*	*Oral*	*%*
Homework	☐		☐	
Class project	☒	25%	☐	
Interim examination	☐		☐	

Final examinations	☒	75%	☐	
Other *(describe):* ……	☐		☐	