(B) Course information in English

General course information:

Course title:	Structural Analysis III	**Course code:**	ΔΟ1603
Credits:	5	**Work load (hours):**	207
Course level:	Undergraduate ☒	Graduate ☐	
Course type:	Mandatory ☒	Selective ☐	
Course category:	Basic ☐	Orientation ☒	
Semester:	7th	**Hours per week:**	4

Course objectives (capabilities pursued and learning results):

The objective is the study of the Direct Stiffness Method for the analysis of frame structures. For that, the lectures concern the determination of transformation matrices, and nodal displacements and nodal forces matrices of elements. In the sequel the stiffness matrices of different types of elements are formulated in the local and global coordinate systems. The formulation of nodal loads and nodal displacements matrices of the structure together with the formulation of the total stiffness matrix of the structure follows. Finally the boundary conditions are applied and the nodal displacements of the structure are calculated. The Static Condensation Method and the Substructures Method are also included.

The result is the familiarization of the students with the Direct Stiffness Method which is used by many structural analysis programs.

Prerequisites:

- Structural Analysis I
- Structural Analysis II

Instructor's data:

Name:	O. Panagouli
Level:	Associate Professor
Office:	
Tel. - email:	24210-74146 olpanag@uth.gr
Other tutors:	-

Specific course information:

Week No.	Course contents	Hours	
		Course attendance	Preparation
1	Introduction to the Direct Stiffness Method. Transformation matrices.	4	2
2	The Direct Stiffness Method for the 2D-truss element. Formulation of stiffness matrix of the element in the local and global coordinate systems.	4	2
3	Formulation of nodal loads and nodal displacements matrices of a 2D-truss structure. Formulation of the total stiffness matrix of the structure. Calculation of nodal displacements.	4	2
4	Application of the direct stiffness method for the analysis of a plane truss with supports of arbitrary orientation.	4	2
5	The Direct Stiffness Method for the 2D-beam element. Formulation of stiffness matrix of the element in the local and global coordinate systems.	4	2
6	Formulation of nodal loads and nodal displacements matrices of a plane frame structure. Formulation of the total stiffness matrix of the structure. Calculation of nodal displacements reactions.	4	2
7	The Direct Stiffness Method for the analysis of a plane frame structure with distributed loading, including temperature effects and support displacements.	4	2
8	3D-beam element. Formulation of the stiffness and transformation matrices of the element. Formulation of the stiffness matrices for 3D-truss elements and for grillage elements.	4	2
9	Internal hinges in plane frames.	4	2
10	Modified stiffness matrices.	4	2
11	Application of modified stiffness matrices for the calculation of frame structures with internal hinges.	4	2
12	Static Condensation.	4	2

13	Elements with variable cross sections.	**4**	**2**
14	Substructuring. Application in plane frames.	**4**	**2**

Additional hours for:			
Class project	**Examinations**	**Preparation for examinations**	**Educational visit**
30(2 extended projects)	3	30	-

Suggested literature:

- M. Papadrakakis, E. Sapountzakis "Structural Analysis with Modern Methods - Direct Stiffness Method", TSIOTRA, Athens 2016.
- P. Komodromos, "Structural Analysis using Computer Software", PAPASOTIRIOU, Athens 2009.

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	☒	30%	☐	
Interim examination	☐		☐	
Final examinations	☒	70%	☐	

Other *(describe):*	☐		☐	