BỘ GIÁO DỤC VÀ ĐÀO TẠO
TRƯỜNG ĐẠI HỌC MỞ TP. HCM

COURSE SPECIFICATION

1. COURSE IDENTIFICATION

1.1 Course tiltle: **STRUCTURAL MECHANICS** Code: **CENG2404**
1.2 Faculty: **Faculty of Civil Engineering and Management**
1.3 Credits: **04 (**Theory)
1.4 Pre-requisites: **MECHANICS OF MATERIALS 1**
1.5 Self-study**:** **16 hours/week**

2. COURSE DESCRIPTION

The subject provides the fundamental concepts in structural analysis as structural modelisation, classification of structures and causes applied on structures... The knowlegde of geometric stability enables to analyse and propose structural models. The subject presents analysis methods for statically determinate planar structures under the action of static loads. Furthermore, the subject provides the knowlegde: the method of virtual work for determination of structural displacements, the force method for analysis of statically indeterminate structures, the displacement method for analysis of kinematically indeterminate structures.

3. LEARNING OUTCOMES

3.1 General objectives:

Understanding of the fundamental concepts of mechanics of structures.

Understanding the basic theory of the structural mechanics and the method for analysing of internal forces and displacements of structures under loadings

3.2 Specific objectives:

At the end of this course, the student should be able to:

3.2.1 Knowledge:

- Understand and obtain knowledge of internal and external forces, distinguish actual and calculated model, classify loads and involved factors, and understand fundamental assumptions.
- Understand and be able to analyze geometric stability of planar structures
- Understand and be able to analyze the internal forces and to calculate the displacements of statically determinate structures subjected to static loads
- Understand and be able to calculate internal forces of statically indeterminate structures using the force method and be able to calculate internal forces of kinematically indeterminate structures using the displacement method

3.2.2 Cognitive Skill:

- Model from the real structures to analytical models
- Teamwork skills and communication

3.2.3 Interpersonal Skills and Responsibility:

- Extend in the professional courses.
- Laying the basis for FEM and other engineering subjects in civil engineering.

4. COURSE OUTLINE AND CONTENT

The subject of this course is organized in 6 chapters. Chapter 1 aims to equip the students with fundamental concepts as structural modelisation, classification of structures, causes applied on structures, basic assumptions and the principle of superposition. Before starting the force analysis of a structures, it is necessary to establish the properties of the structure. The concepts of degree of freedom of structures, and geometric stability included stable or unstable are given in chapter 2. Chapter 3 presents analysis methods for various types of statically determinate planar structures such as beams, frames, trusses, three-hinged structrures and complex structures under the action of static loads. Chapter 4 provides the concepts of external work, strain energy and the principle of work and energy and the principle of virtual work for determination of structural displacements of statically determinate and indeterminate structures due to load, temperature change and support subsidence. The force method for analysis of statically indeterminate structures due to load, temperature change and support subsidence is presented in chapter 5. Finally, Chapter 6 covers the analysis of kinematically indeterminate structures using the displacement method.

No	Topic	Content	Class Hours				Reference Books
			Total	Theory	assign ment	Experiment	
1	***Introduction***	***Introduction*** - Lecturer informations -Related issues -Course outline -References -Learning and assessment methods ***Chapter 1: Introduction*** - General concepts - Fundamental assumptions, external forces, restraints, support reactions	**4.5**				[1], [2]
1	***Chapter 2. Geometric Stability of Planar Structures***	***Chapter 2. Geometric Stability of Planar Structures*** - General concepts - Types of restrains - Reaction forces - Necessary condition - Sufficient condition - Examples - Problems of chapter 2	**9**				[1], [2]

No	Topic	Content	Class Hours				Reference Books
			Total	Theory	assignment	Experiment	
2	***Chapter 3. Statically Determinate Structures Subjected To Static Loads***	***Chapter 3. Statically Determinate Structures Subjected To Static Loads*** - General concepts - Beam: Internal forces, Examples - Frame: Example - Three-hinged frame: General concepts, analysis methods, examples - Truss: General concepts, geometric stability, loads, restrains, internal forces, analysis methods, example - The combined structures: General concepts, internal forces, analysis methods, example	**13.5**				[1], [2]
4	***Chapter 4. Displacement of Statically Determinate Structures***	***Chapter 4. Displacement of Statically Determinate Structures*** - General concepts - The principle of virtual work - Reciprocity theorems Mohr formula - State of "K" when calculating displacements - Calculate displacements using the Veresaghin Method - Examples Structure subjected to load, temperature… - Examples - Problems of Chapter 4	**9**	9	0		[1], [2]
5	***Chapter 5. The Force Method***	- General concepts - The statically indeterminate structures: the degree of freedom, canonical equations, the flexibility matrix, analysis	**13.5**	13.5	13.5		[1], [2]

No	Topic	Content	Class Hours				Reference Books
			Total	Theory	assign ment	Experiment	
		method, internal forces. - Examples - The statically indeterminate structures subjected to temperature: Analysis method, examples. - The statically indeterminate structures subjected to displacements: Analysis method, examples. - Simplify calculations based on symmetry - Problems of chapter 5					
6	***Chapter 6. The Displacement Method***	***Chapter 6. The Displacement Method*** - General concepts - The kinematically indeterminate structures: the degree of freedom, canonical equations, the stiffness matrix, analysis method, internal forces. - Examples - The statically indeterminate structures subjected to displacements: Analysis method, examples.	**10.5**	10.5			[1], [2]

5. ESSENTIAL REFERENCES

- **Textbook:**

[1] Lều Thọ Trình, *Cơ học kết cấu tập 1& 2*, NXB Khoa học và kỹ thuật, 2014.
[2] Lều Thọ Trình, *Bài tập Cơ học kết cấu tập 1& 2*, NXB Khoa học và kỹ thuật, 2011.

- **Recommended Books:**

[3] **Hibbeler R.C.**, *Structual Analysis*, 9th edition, Pearson Education, 2015

6. ASSESSMENT

No	Assessment task	Proportion	Remarks
01	Midterm Exam	50%	

02	Final Exam	50%	

7. SCHEDULE: 4.5 hours/session

No	Session	Content	Remarks
1	Session 1	*Chapter 1: Introduction*	
2	Session 2	*Chapter 2. Geometric Stability of Planar Structures*	
3	Session 3	*Chapter 2. Geometric Stability of Planar Structures*	
4	Session 4	*Chapter 3. Statically Determinate Structures Subjected To Static Loads*	
5	Session 5	*Chapter 3. Statically Determinate Structures Subjected To Static Loads*	
6	Session 6	*Chapter 3. Statically Determinate Structures Subjected To Static Loads*	
7	Session 7	*Chapter 4. Displacement of Statically Determinate Structures*	
8	Session 8	*Chapter 4. Displacement of Statically Determinate Structures*	
9	Session 9	*Chapter 5. The Force Method*	
10	Session 10	*Chapter 5. The Force Method*	
11	Session 11	*Chapter 5. The Force Method*	
12	Session 12	*Chapter 6. The Displacement Method*	
13	Session 13	*Chapter 6. The Displacement Method*	
14	Session 14	*Chapter 6. The Displacement Method*	

1. LECTURER RESPONSIBLE FOR THE COURSE

Name of lecturers:

A/Prof. Nguyễn Trọng Phước, M.S. Lê Thanh Cường, M.S. Lê Văn Bình

DEAN

Trần Tuấn Anh