Course Syllabus

1. **Course Title:** Foundation Engineering
2. **Course Code:** FOEN330518
3. **Credit Units:** 3 (3/0/6) (3 units of theory/ 0 unit of practice/ 6 units of self-study)
   Duration: 15 weeks (3 hours of theory+0 hours of practice, and 6 hours of self-study per week)
4. **Course Instructors**
   1/ Dr. Nguyễn Minh Đức
   2/ Dr. Nguyễn Sỹ Hùng
   3/ Dr. Trần Văn Tiếng
5. **Course Requirements**
   Prerequisite courses: None
   Previous courses: Soil Mechanics (SOME240318)
   Parallel courses: None
6. **Course Description**
   Although the practice of foundation engineering requires significant knowledge in the areas of structural analysis, concrete and steel design, as well as construction means and methods, this course will focus on the geotechnical aspects of foundation engineering.
   This course is designed to provide graduate students in civil engineering with methods of analysis and design for various geotechnical systems. Topics to be covered include: subsurface investigations; shallow foundation, pile foundation, retaining wall and soil improvement.
   In this course, you will learn and be familiar with various design standards for foundation designs. We will discuss actual field problems during the semester and show you how the concepts that are taught in class can be applied to understand and solve real engineering problems.

7. **Course Goals**

Goals	Goal Description	Programme ELOs
G1	Are proficient in the general knowledge of engineering science, the fundamental and specialized knowledge of foundation engineering	1.3
G2	Grow professional knowledge by analyzing and solving problems of soil mechanics	2.3
G3	Adapt effectively in the professional environment, leadership and teamwork in the context of foundation engineering	3.1, 3.3
G4	Apply knowledge and skills to design, develop and select reasonable solutions to foundation engineering projects	4.3; 4.4

8. Course Learning Outcomes (CLOs)

CLOs		CLO Description	Programme ELOs
	G1.1	Analyze advanced fundamental knowledge of foundation engineering necessary for foundation engineering practice	1.3
G2	**G2.1**	Select possible solutions of foundation engineering within the context of society, enterprise and technique	2.3
G3	**G3.1**	Develop experience of collaborative group-working	3.1
	G3.2	Engage in reading foundation engineering materials in English	3.3
G4	**G4.1**	Select appropriate models of foundation engineering performance to meet desired needs within realistic constraints such as economy, environment, society, and sustainability	4.3
	G4.2	Design a part or complete foundation construction project by means of design experiences integrated throughout the professional component of the curriculum	4.4

9. Learning Resources

- Textbooks:

[1] Châu Ngọc Ẩn, **Nền Móng**, Nhà xuất bản Đại học Quốc gia TP.HCM

[2] Phan Hồng Quân, **Nền Móng**, Nhà xuất bản Giáo dục Việt Nam

[3] Tomlinson, **Foundation design and Construction**

- References:

[4] Nguyễn Uyên, **Thiết kế móng nông,** Nhà xuất bản xây dựng

[5] Võ Phán, **Phân tích và tính toán móng cọc,** Nhà xuất bản Đại học Quốc gia TP.HCM

[6] Nguyễn Ngọc Bích, **Các phương pháp cải tạo đất yếu trong xây dựng,** Nhà xuất bản Xây dựng

[7] Bowles, **Foundation analysis and design**

[8] Tomlinson, **Pile design and Construction practice**

10. Student Assessment

- Grading scale: **10**
- Assessment plan:

Type	Content	Timeline	Assessment method	CLOs	Rate (%)
Progress assessment					**30**
Problem#1	Review on soil mechanics	1	Assignment	G1.1; G2.1;	3
Problem #2	Analyze geological condition and loading from superstructure for foundation solution	3&4	Work in group	G1.1; G2.1; G3.1;	3
Problem #3	Pad footing design	5&6	Assignment	G2.1; G3.2; G4.1;	3

				G4.2	
Problem #4	Spread footing design	7&8	Assignment	G2.1; G3.2; G4.1; G4.2	3
Problem #5	Shaft footing design	9	Assignment	G2.1; G3.2; G4.1; G4.2	3
Problem #6	Driving pile foundation design	8	Assignment	G2.1; G3.2; G4.1; G4.2	3
Problem #7	Bore pile foundation design	9	Assignment	G2.1; G3.2; G4.1; G4.2	3
Problem #8	Pile cap design	10-11	Assignment	G2.1; G3.2; G4.1; G4.2	3
Problem #9	Pile foundation against horizontal forces	12-13	Assignment	G2.1; G3.2; G4.1; G4.2	3
Problem#10	Soil Improvement design	14-15	Assignment	G2.1; G3.2; G4.1; G4.2	3
Report on Foundation Engineering					**20**
	Report and present a foundation engineering problem related to the content given in class	2-15	Group report & presentation	G1.1; G2.1; G3.1; G3.2; G4.1, G4.2	
Final examination					**50**
	Content coverage: Chapter 1-7 - Duration: 90 mins		Writing exam	G1.1; G2.1; G3.2; G4.1, G4.2	

11. Course Content:

Week	Content	CLOs
1	***Chapter 1:*** **Introduction to foundations** *(3h,0,6h)*	
	A/ Content and pedagogical methods in class*: (3h)* **Content:** Introduce the course's goals, CLOs, content, pedagogical and assessment methods 1.1 Introduction to geotechnical engineering 1.2 Review on Soil Mechanics 1.3 Course introduction, syllabus 1.3.1 Expected learning outcomes (ELOs) 1.3.2 Programme specification 1.3.3 Programme structure and content **Pedagogical methods**: + Presentation of lecture + Group discussion	G1.1; G2.1;
	B/ Self-study content: *(6h)* + Analyze the roles of soil mechanics in civil engineering, + Review on soil mechanics, + **Problem#1** ***Studying materials*** [1], [2], [3], [4], [5], [6], [7], [8], [7], [8]	G1.1; G2.1;
2	***Chapter 2:*** **Foundation Design - General Introduction** *(3h,0,6h)*	
	A/ Content and pedagogical methods in class*: (3h)* **Content:** 2.1 Types of foundation 2.2 Geological condition for foundation design 2.3 Failure and critical condition for foundation design **Pedagogical methods**: + Presentation of lecture + Group discussion	G2.1; G3.1;
	B/ Self-study content: *(6h)* + Geological analysis ***Studying materials:*** + [1], [2], [3], [4], [5], [6], [7], [8]	G1.1; G3.2;
3	***Chapter 2:*** **Foundation Design - General Introduction (cont.)** *(3h,0,6h)*	
	A/ Content and pedagogical methods in class*: (3h)* **Content:** 2.4 Geological survey 2.5 Soil Classification Schemes **Pedagogical methods**: + Presentation of lecture	G1.1; G2.1 G3.1; G3.2

	+ Group discussion	
	B/ Self-study content: *(6h)* + Analyze geological condition and loading from superstructure for foundation solution, + **Problem#2** ***Studying materials:*** + [1], [2], [3], [4], [5], [6], [7], [8]	G1.1; G2.1; G3.1; G3.2;
4	***Chapter 2:*** **Foundation Design - General Introduction (cont.)** *(3h,0,6h)*	
	A/ Content and pedagogical methods in class: (3h) **Content:** 1. + Loads for foundation design 2. + Generals about design procedure for foundation 3. + Introduction about foundation software, Plaxis, SAFE **Pedagogical methods:** + Presentation of lecture + Group discussion	G1.1; G2.1; G3.1; G3.2
	B/ Self-study content: *(6h)* ***4.*** Investigate the relationship among structure loadings, geological condition and types of foundation	G1.1; G2.1; G3.1; G3.2;
5	***Chapter 3:*** **Shallow Foundation design** (3/0/6*)*	
	A/ Content and pedagogical methods in class: (3h) **Pedagogical methods:** 3.1 + General introduction of Shallow foundation 3.2 + Types of shallow foundation **Pedagogical methods:** + Presentation of lecture	G1.1; G2.1; G4.1; G4.2
	B/ Self-study content: *(6h)* 3.3 Investigate the desgn of shallow foundation in reliaty **3.4 Problem 3** ***Studying materials:*** + [1], [2], [3], [4], [5], [6], [7], [8]	G2.1; G3.2; G4.1; G4.2
6	***Chapter 3:*** **Shallow Foundation design** (3/0/6*) (cont.)*	
	A/ Content and pedagogical methods in class: (3h) **Pedagogical methods:** 3.5 + Desgn requirement of shallow foundation **Pedagogical methods:** + Presentation of lecture	G2.1; G4.1; G4.2
	B/ Self-study content: (6h) 3.6 Study the depth of shallow foundation depending on geological structure loading condition.	G2.1; G3.2; G4.1;

	3.7 Investigate the role of foundation beam on design shallow foundation **3.8 Problem # 3** ***Studying materials:*** + [1], [2], [3], [4], [5], [6], [7], [8]	G4.2
7	***Chapter 3:*** **Shallow Foundation design** (3/0/6*) (cont.)*	
	A/ Content and pedagogical methods in class: (3h) **Pedagogical methods:** 3.9 + Design of strip foundation on wall **Pedagogical methods:** + Presentation of lecture	G1.1; G2.1; G4.1; G4.2
	B/ Self-study content: (6h) 3.10 Study the design method of foundation types for different geological and loading condition **3.11 Problem 4** ***Studying materials:*** + [1], [2], [3], [4], [5], [6], [7], [8]	G2.1; G3.2; G4.1; G4.2
8	***Chapter 3:*** **Shallow Foundation design** (3/0/6*) (cont.)*	
	A/ Content and pedagogical methods in class: (3h) **Pedagogical methods:** 3.12 + Design of strip foundation on row of columns 3.13 + **Problem 4** **Pedagogical methods:** + Presentation of lecture	G1.1; G2.1; G4.1; G4.2
	B/ Self-study content: (6h) 3.14 + Beam on elastic foundation - Winkler model 3.15 Comparisions amongs different methods for evaluating load of strip foundation **3.16 Problem 4 (cont.)** ***Studying materials:*** + [1], [2], [3], [4], [5], [6], [7], [8]	G2.1; G3.2; G4.1; G4.2
9	***Chapter 3:*** **Shallow Foundation design** (3/0/6*) (cont.)*	
	A/ Content and pedagogical methods in class: (3h) **Pedagogical methods:** 3.17 + Mat (raft) foundation **Pedagogical methods:** + Presentation of lecture	G1.1; G2.1; G4.1; G4.2
	B/ Self-study content: (6h) 3.18 Evaluate beam on elastic foundation using SAP **3.19 Problem 5**	G2.1; G3.2; G4.1; G4.2

	Studying materials: + [1], [2], [3], [4], [5], [6], [7], [8]	
10	***Chapter 4:*** **Pile foundation** *(3/0/06)*	
	A/ Content and pedagogical methods in class: (3h) **Pedagogical methods:** 4.1 + General on pile foundation 4.2 + Pile specification *4.3* +**Pedagogical methods:** + Presentation of lecture ***Studying materials:*** + [1], [2], [3], [4], [5], [6], [7], [8]	G1.1; G2.1; G4.1; G4.2
	B/ Self-study content: (6h) 4.4 Study the construction methods for different types of pile (bored pile and driven pile) **4.5 Problem 6**	G2.1; G3.2; G4.1; G4.2
11	***Chapter 4:*** **Pile foundation** *(3/0/06) (cont.)*	
	A/ Content and pedagogical methods in class: (3h) **Pedagogical methods:** 4.6 + Capacity of pile **Pedagogical methods:** + Presentation of lecture ***Studying materials:*** + [1], [2], [3], [4], [5], [6], [7], [8]	G1.1; G2.1; G4.1; G4.2
	B/ Self-study content: (6h) 4.7 Study different analytical methods to predict capacity of pile 4.8 Investigate design of pile in reality **4.9 Problem 7**	G2.1; G3.2; G4.1; G4.2
12	***Chapter 4:*** **Pile foundation** *(3/0/06) (cont.)*	
	A/ Content and pedagogical methods in class: (3h) **Pedagogical methods:** 4.10 + Pile cap specification 4.11 + Evaluate and design pile cap **Pedagogical methods:** + Presentation of lecture ***Studying materials:*** + [1], [2], [3], [4], [5], [6], [7], [8]	G2.1; G4.1; G4.2
	B/ Self-study content: (6h) 4.12 Design depth of pile	G2.1; G3.2; G4.1;

	4.13 Study the experimental method to test pile capacity in site **4.14 Problem 8**	G4.2
13	***Chapter 4:*** **Pile foundation** *(3/0/06) (cont.)*	
	A/ Content and pedagogical methods in class: (3h) **Pedagogical methods:** 4.15 + Negative skin friction 4.16 + Lateral pile capacity **Pedagogical methods:** + Presentation of lecture ***Studying materials:*** + [1], [2], [3], [4], [5], [6], [7], [8]	G2.1; G4.1; G4.2
	B/ Self-study content: (6h) 4.17 Comparision between driven pile and bored pile 4.18 Study on evaluate and minimize negative skin friction for pile design **4.19 Problem 9**	G2.1; G3.2; G4.1; G4.2
14	***Chapter 5:*** **Soil improvement** (3/0/6*)*	
	A/ Content and pedagogical methods in class: (3h) **Pedagogical methods:** 5.1 General on soft soil and soil improvement 5.2 + Sand cushion design 5.3 + Sand compaction pile design **Pedagogical methods:** + Presentation of lecture	G2.1; G4.1; G4.2
	B/ Self-study content: (6h) 5.4 Study the distribution of soft soil in Vietnam 5.5 Evaluate different soil improvement methods for different soil condition 5.6 Investigate several soil improvement design in reality **5.7 Problem 10** ***Studying materials:*** [1], [2], [3], [4], [5], [6], [7], [8]	G2.1; G3.2; G4.1; G4.2
15	***Chapter 5:*** **Soil improvement** (3/0/6)*(cont.)*	
	A/ Content and pedagogical methods in class: (3h) **Pedagogical methods:** 5.8 + Prefabricated Vertical Drains 5.9 + Deep mixing 5.10 + Other soil improvement methods	G2.1; G4.1; G4.2

	Pedagogical methods: + Thuyết giảng + Trình chiếu + Thảo luận nhóm	
	B/ Self-study content: (6h) 5.11 Vacuum method, Top base, bamboo piles 5.12 + Design soil improvement 5.13 + Soil improvement experiment 5.14 **Problem 10** ***Studying materials:*** [1], [2], [3], [4], [5], [6], [7], [8]	G2.1; G3.2; G4.1; G4.2

12. Learning Ethics:

Students must do homework by themselves. If plagiarism is found, students will get zero point.

13. Date of first approval: August 1st, 2012

14. Approved by:

Dean	Head of Department	Instructor
A/Prof. Dr. Nguyễn Trung Kiên	**Dr. Trần Văn Tiếng**	**Dr. Nguyễn Minh Đức**

15. Date and Up-to-date content

1st time: Date: August 25th, 2015 - Revise to consistent with curriculum mapping	Instructor: Head of Department: