Course Syllabus

1. **Course Title:** Foundation of Building on Weak Soils
2. **Course Code:** SOIM420818
3. **Credit Units:** 2 (2/0/4) (2 units of theory/ 0 unit of practice/ 4 units of self-study)
   Duration: 15 weeks (2 hours of theory+0 hours of practice, and 4 hours of self-study per week)
4. **Course Instructors**
   1/ Dr. Nguyễn Sỹ Hùng
   2/ Dr. Trần Văn Tiếng
   3/ Dr. Nguyễn Minh Đức
5. **Course Requirements**
   Prerequisite courses: Soil Mechanics (SOME230318)
   Previous courses: None
   Parallel courses: None
6. **Course Description**
   This course equips learners to deal with designing processes, calculation methods and testing experiments for different types of bases and foundations. The course emphasizes the method of proposing and selecting the appropriate foundation, depending on geological conditions, action loads and construction technology. The bases has particularly close links to the superstructure and underlying soil, therefore, this course has close contact with the course of Concrete Building Structures, High-rise Building Structures, Engineering Geology and Soil Mechanics. The content of the course is also closely associated with the standards on foundation design, testing experiment and foundation construction.
7. **Course Goals**

Goals	Goal Description	Programme ELOs
G1	Identify, analyse and evaluate construction quality of the ground, good soil, soft soil and the risk of incident of the construction on the soft ground.	2.1
G2	Analyze advantages and disadvantages of the soft ground reinforcement methods, select the appropriate method for weak soils improvement based on construction features and different construction conditions	2.3
G3	Team working and presentation skills, understanding basically English vocabularies of the Foundation of Building on Weak Soils	3.1, 3.2, 3.3
G4	Calculate, design, safety checks the foundation security for different methods of soft ground improvement.	4.1, 4.3, 4.4

8. **Course Learning Outcomes (CLOs)**

CLOs	CLO Description	Programme

			ELOs
G1	**G1.1**	Recognize the weak soils from the mechanical, physical properties and in-situ test results, the nature and distribution of all kinds of soft soil on the territory of Vietnam.	2.1;
	G1.2	Describe the principle of soft ground improvement methods and their scope of application.	2.1;
G2	**G2.1**	Analyze geological characteristics and work load, which recommend the possible method for ground improvement.	2.3
G3	**G3.1**	Ability to work in groups to discuss and resolve issues related to Building on Weak Soils.	3.1, 3.2
	G3.2	Understand the basic terminology and some documents on Building on Weak Soils in the English language.	3.3
G4	**G4.1**	Choose appropriate solutions for weak soils improvement from the data of geological and load, set and evaluate the safety criteria and stability of the building with the selected solution.	4.1; 4.3
	G4.2	Calculate and determine the stress state, the bearing capacity and the deformation of improved ground according to different calculation models. Check the criteria for security, stability of the building's foundation on the improved ground;	4.4

9. Learning Resources

- Textbooks:

[1] Joseph E. Bowles, **Foundation Analysis and Design**, 5th ed. Graw- Hill -1997

[2] Nguyễn Ngọc Bích**, Cải tạo đất yếu trong xây dựng**, NXBXD, Hà Nội - 2011

- References:

[3] Trần Quang Hộ**, Công trình trên nền đất yếu,** NXB ĐHQG TP.HCM - 2013

[4] Nguyễn Uyên, **Xử lý đất yếu trong xây dựng**, NXBXD, Hà Nội-2011

[5] Braja M.Das**, Principles of foundation Engineering**

10. Student Assessment:

- Grading point: **10**
- Assessment plan:

Type	Content	Timeline	Assessment methods	CLOs	Rate (%)
Exams					**40**
Exam01	Discuss the relationship between the course on Foundation of Building on weak soil and other related courses.	Week 1-2	+ Group students in teams maximum of 5 and have them work together on a project in class within which each team member is assigned a task. + Have them 35-minute duration to	G3.1;	5

			model and calculate the gable structures of single-span steel portal frame. + Have each group 3 minutes to present the project using PowerPoint. + Score by rubric + Have them comments on the project works + A feedback on the assessment will be carried out right after the project.		
Exam02	Evaluate the construction quality of soils, good soil, weak soil through mechanical, physical properties and in-situ experiments.	Week 3	+ Individual paper assessment in class + Paper document available + Duration: 20 minutes + A feedback on the assessment will be carried out right after the exam.	G1.1	5
Exam03	Understanding the distribution of soft soil in the districts of Ho Chi Minh City.	Week 4-5	+ Individual paper assessment in class + Paper document available + Duration: 20 minutes + A feedback on the assessment will be carried out right after the exam.	G1.1;	5
Exam04	Review the theory about bearing capacity, settlement calculation, the problem of one-dimensional consolidation of Terzaghi.	Week 6-9	+ Group students in teams maximum of 5 and have them work together on a project in class within which each team member is assigned a task. + Have them 35-minute duration to model and calculate the gable structures of single-span steel portal frame.	G1.2; G4.2	5

			+ Have each group 3 minutes to present the project using PowerPoint. + Score by rubric + Have them comments on the project works + A feedback on the assessment will be carried out right after the project.		
Exam05	Calculate and design embedded sand layer (compacted sand fill layer)	Week 10	+ Individual paper assessment in class + Paper document available + Duration: 20 minutes + A feedback on the assessment will be carried out right after the exam.	G4.1; G4.2;	5
Exam06	Calculate and design sand compaction piles	Week 11-12	+ Individual paper assessment in class + Paper document available + Duration: 20 minutes + A feedback on the assessment will be carried out right after the exam.	G4.1; G4.2;	5
Exam07	Calculate and design soil-cement columns	Week 13	+ Individual paper assessment in class + Paper document available + Duration: 20 minutes + A feedback on the assessment will be carried out right after the exam.	G4.1; G4.2;	5
Exam08	Calculate and design preloading	Week 14-15	+ Individual paper assessment in class + Paper document available + Duration: 20 minutes	G4.1; G4.2;	5

			+ A feedback on the assessment will be carried out right after the exam.		
Projects - Presentation					**10**
	After each lesson, students are required to read and learn about a topic, in the next lesson, group of students report their presentation to the class. List of topics are following: **1.** Method of disposition of settlement joint, the order of construction works to avoid differential settlement. **2.** Collect and present a record of soil improvement of a real construction. **3.** Learn the foundations incidents involving soft ground	Week 2-15	Projects - Presentation	G1.1; G1.2; G2.1; G3.1; G3.2	
Final exam					**50**
Final exam	The final exam covers some contents delivered in the course and CELOs.	university timeline	+ Paper assessment + Paper document available + Duration: 75 or 90 minutes	G1.1; G1.2; G2.1; G3.2; G4.1; G4.2	
Total					**100**

11. Course Content:

Week	Content	CELOs
1	***Chaper 1:*** **Introduction** *(2h/0/4h)*	
	A/ **Content and pedagogical methods in class***: (2h)* **Content:** 1.1 + Object research, purpose and requirements of course + Location of the courses in the formation program of sector 1.2 + Milestones of course 1.3 + Learning method for the course **Pedagogical methods**: + Lectures using powerpoint + Groups discussion	G3.1;
	B/ **Self-study content**: *(4h)* 1.4 + Learn documents, textbook relating the course *1.5* + Learn about the role of ground improvement in buildings	G3.2;

	construction ***Learning resourses:*** [1], [2], [3], [4], [5]	
2	***Chaper 2:*** **Weak soil and weak ground** *(6h/0/12h)*	
	A/ **Content and pedagogical methods in class***: (2h)*** **Content:** 2.1 + Definition of weak soil 2.2 + Texture, structure and mineralogy of weak soils 2.3 + Evaluate, identify weak soils through mechanical, physical properties and field experiments **Pedagogical methods**: + Lectures using powerpoint + Groups discussion	G1.1; G2.1, G3.1
	B/ Self-study content: *(4h)* 2.4 + Learn the investigation geological reports, and identify the weak soil presenting in the report. ***Learning resourses:*** [1], [2], [3], [4], [5]	G1.1;
3	***Chaper 2:*** **Weak soil and weak ground (cont.)** *(6h/0/12h*	
	A/ **Content and pedagogical methods in class***: (2h)*** **Content:** 2.5 + Capillary, shrinkage, swelling phenomenons 2.6 + Geotechnical characteristics of some kinds of soft soil 2.7 + Soft ground in the northern delta and the Mekong River **Pedagogical methods**: + Lectures using powerpoint + Groups discussion	G1.1; G2.1
	B/ Self-study content: *(4h)* 2.8 + Learn soft ground in the Mekong River and HoChiMinh city ***Learning resourses:*** [1], [2], [3], [4], [5]	G1.1;
4	***Chaper 2:*** **Weak soil and weak ground (cont.)** *(6h/0/12h*	
	A/ **Content and pedagogical methods in class***: (2h)*** **Content:** 2.9 + Overview of the soft ground improvement methods **Pedagogical methods**: + Lectures using powerpoint + Groups discussion	G1.2; G2.1
	B/ Self-study content: *(4h)* 2.10 + Collect and learn Vietnam standards relating to soft ground improvement. ***Learning resourses:*** [1], [2], [3], [4], [5]	G1.2; G2.1;
5	***Chaper 3:*** **Improve weak soils by structural measures** *(4h/0/8h)*	
	A/ **Content and pedagogical methods in class***: (2h)*** **Content:**	G2.1; G3.1;

	3.1 + Deformation of building when the ground was settled, differently settled. 3.2 + Causes of diffrential settlement. **Pedagogical methods**: + Lectures using powerpoint + Groups discussion	
	B/ Self-study content: *(4h)* 3.3 + Effect of differential settlement to buildings having different rigidity. 3.4 + Settlement and settlement limits in design standards. ***Learning resourses:*** [1], [2], [3], [4], [5]	G3.1;
6	***Chaper 3:*** **Improve weak soils by structural measures (cont.)** *(4h/0/8h)*	
	A/ **Content and pedagogical methods in class***: (2h)*** **Content:** 3.5 + Reduce settlement, differential settlement by structural measures **Pedagogical methods**: + Lectures using powerpoint + Groups discussion	G1.2; G2.1; G4.1; G4.2
	B/ Self-study content: *(4h)* 3.6 + Settlement joint and his role in reduction of differential settlement 3.7 + Settlement due to influence of adjacent building. 3.8 + Learn incidents of foundation relating to settlement and diferential settlement. ***Learning resourses:*** [1], [2], [3], [4], [5]	G2.1; G4.1; G4.2
7	***Chaper 4:*** **Weak soils improvement (cont.)** *(18h/0/36h)*	
	A/ **Content and pedagogical methods in class***: (2h)*** **Content:** 4.1 + Principe of rehabitation and improvement for weak soils. **Pedagogical methods**: + Lectures using powerpoint + Groups discussion	G1.2; G2.1; G4.1;
	B/ Self-study content: *(4h)* 4.2 + Compare the principes of rehabitation and improvement for weak soils. ***Learning resourses:*** [1], [2], [3], [4], [5]	G2.1;
8	***Chaper 4:*** **Weak soils improvement (cont.)** *(18h/0/36h)*	
	A/ **Content and pedagogical methods in class** *(2h)* **Content:** 4.3 + Geotechnical materials: geotextile and PVD **Pedagogical methods**: + Lectures using powerpoint	G1.2; G2.1; G4.1;

	+ Groups discussion	
	B/ Self-study content: *(4h)* 4.4 + Read and learn about standards of geotextile, PVD and the application of such materials in soft ground reinforcement. ***Learning resourses:*** [1], [2], [3], [4], [5]	G1.2; G2.1
9	***Chaper 4:*** **Weak soils improvement (cont.)** *(18h/0/36h)*	
	A/ **Content and pedagogical methods in class***: (2h)*** **Content:** 4.5 + Method to change the stress distribution and deformation conditions a). Method of compacted sand fill layer. b). Method of reacted pressure pad 4.6 + Excercises **Pedagogical methods**: + Lectures using powerpoint + Groups discussion	G1.2; G2.1; G3.1; G3.2
	B/ Self-study content: *(4h)* 4.7 + Design compacted sand fill layer ***Learning resourses:*** [1], [2], [3], [4], [5]	G4.1; G4.2
10	***Chaper 4:*** **Weak soils improvement (cont.)** *(18h/0/36h)*	
	A/ **Content and pedagogical methods in class***: (2h)*** **Content:** 4.8 + Method of increase soil density a). Method of sand compaction piles 4.9 + Execises **Pedagogical methods**: + Lectures using powerpoint + Groups discussion	G1.2; G2.1; G3.1; G3.2
	B/ Self-study content: *(4h)* 4.10 + Design sand compation piles ***Learning resourses:*** [1], [2], [3], [4], [5]	G4.1; G4.2
11	***Chaper 4:*** **Weak soils improvement (cont.)** *(18h/0/36h)*	
	A/ **Content and pedagogical methods in class***: (12h)*** **Content:** 4.11 + Method to increase soil density *(next)* b). Method of lime-soil and cement-soil columns 4.12 + Exercise **Pedagogical methods**: + Lectures using powerpoint + Groups discussion	G1.2; G2.1; G3.1; G3.2

	B/ Self-study content: *(4h)* 4.13 + Design cement-soil columns ***Learning resourses:*** [1], [2], [3], [4], [5]	G4.1; G4.2
12	***Chaper 4:*** **Weak soils improvement (cont.)** *(12h/0/24h)*	
	A/ **Content and pedagogical methods in class** *: (2h)* **Content:** 4.14 + Method to increase soil density *(next)* c). Method of preloading 4.15 + Exercises **Pedagogical methods**: + Lectures using powerpoint + Groups discussion	G1.2; G2.1; G3.1; G3.2
	B/ Self-study content: *(4h)* 4.16 + Design preloading ***Learning resourses:*** [1], [2], [3], [4], [5]	G4.1; G4.2
13	***Chaper 4:*** **Weak soils improvement (cont.)** *(18h/0/36h)*	
	A/ **Content and pedagogical methods in class***: (2h)* **Content:** 4.17 + Method of reinforced soil a). Soil improvement by metallic strips b). Soil improvement by geotextiles 4.18 + Exercise **Pedagogical methods**: + Lectures using powerpoint + Groups discussion	G1.2; G2.1; G3.1; G3.2
	B/ Self-study content: *(4h)* 4.19 + Learn a design document of an construction using geotextiles for soil reinforcement. ***Learning resourses:*** [1], [2], [3], [4], [5]	G2.1; G4.1; G4.2
14	***Chaper 4:*** **Weak soils improvement (cont.)** *(18h/0/36h)*	
	A/ **Content and pedagogical methods in class***: (2h)* **Content:** 4.20 + Some other methods a). Bamboo and malaleuca piles b). Top Base foundation 4.21 + Exercise **Pedagogical methods**: + Lectures using powerpoint + Groups discussion	G1.2; G3.1; G4.1; G4.2
	B/ Self-study content: *(4h)*	G2.1; G4.1; G4.2

	4.22 + Design of foundation on malaleuca piles ***Learning resourses:*** [1], [2], [3], [4], [5]	
15	***Chaper 4:*** **Weak soils improvement (cont.)** *(18h/0/36h)*	
	A/ **Content and pedagogical methods in class***: (2h)* **Content:** 4.23 + Other methods (next) b). Method of vacuum preloading 4.24 + Soil test experiments during and after the reinforcement. 4.25 + Review **Pedagogical methods**: + Lectures using powerpoint + Groups discussion	G1.2; G3.1; G4.1; G4.2
	B/ Self-study content: *(4h)* 4.1 + Review the course ***Learning resourses:*** [1], [2], [3], [4], [5]	G1; G2; G3; G4

12. Learning Ethics:

Home assignments and projects must be done by the students themselves. If plagiarism is found, students will get zero point.

13. Date of first approval: August 25th, 2015

14. Approval by:

Dean	Head of Department	Instructor
A/Prof. Dr. Nguyen Trung Kien	**Dr. Tran Van Tieng**	**Dr. Nguyen Sy Hung**

15. Date and Up-to-date content

1st time: Date:	Instructors Head of Department