Course Syllabus

1. **Course Title:** Capstone Project
2. **Course Code:** THES402117
3. **Credit Units:** 10 (0/10/20) (0 units of theory/ 10 unit of practice/ 20 units of self-study)
   Duration: 15 weeks
4. **Course Instructors**
   1/ Dr. Châu Đình Thành
   2/ Assoc. Prof. Nguyễn Trung Kiên
   3/ Dr. Phan Đức Hùng
   4/ Dr. Trần Văn Tiếng
   5/ MSc. Nguyễn Văn Khoa
   6/ MSc. Nguyễn Văn Hậu
   …
5. **Course Requirements**
   Students have accumulated at least 134 credits and finished all courses' projects
6. **Course Description**
   This course gives students an opportunity to participate in a major design experience in construction engineering. Using knowledge and skills acquired in earlier courses of the CET programme, the students are required to design a real-world construction project under the constraints and considerations of constructability, economics and sustainability. The results of analysis and design are presented in a thesis and shop-drawings.
7. **Course Goals**

Goals	Goal Description	Programme ELOs
G1	Select possible design solutions which satisfy technical and economic conditions	2.3, 2.4, 2.5
G2	Analysis and design results are well presented in the thesis report and shop-drawings, and in oral defense	3.2
G3	Judge the impact of design solutions and choose appropriate design models in the context of engineering, economy, environment, society and sustainability	4.1, 4.3
G4	Design structures of the project under considerations of processes of construction engineering practice	4.4, 4.5

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

CLOs		CLO Description	Programme ELOs
G1	**G1.1**	Select possible solutions for structural design	2.3
	G1.2	Self-study references to fulfill professional knowledge and skills which adapt with design requirements	2.4, 2.5

G2	**G2.1**	Results of analysis and design processes are well reported in the thesis and shop-drawing	3.2
	G2.2	The capstone project is successfully presented in oral under an evaluation committee	3.2
G3	**G3.1**	Judge the impact of engineering solutions and choose appropriate models for the project	4.1, 4.3
G4	**G4.1**	Analyze and design slabs, structural frame, and foundations under constrains of process of construction in practice	4.4, 4.5

9. Learning Resources

- Vietnam and foreign design codes
- Textbooks and references necessary for doing the capstone project

10. Student Assessment

- Grading scale: **10**
- The instructor assesses weekly works
- A reviewer assesses the final report and shop-drawings
- A committee (at least 3 members) assesses the oral presentation (G2.2).
- Rubrics are used for all assessments
- Score is the average of the scores given by the instructor, the reviewer, and the committee's members

11. Course Content

Week	Content	CLOs
1	***Chapter 1:*** **Architecture** *(0,10h,20h)*	
	A/ Content and pedagogical methods: *(10h)* **Content:** 1. Overview the project's architecture 2. Determine requirements and constrains of the project **Pedagogical methods**: + Give a student architectural drawings and set design requirements and constrains + Guide and discuss	G3.1
	B/ Self-study content: *(20h)* 1. Study the architecture of the projects and select an appropriate model for design 2. Revise the architecture adapting with design requirements 3. Write report about the project's architecture 4. Study outline contents of the capstone project	G2.1, G3.1
2	***Chapter 2:*** **Design a typical floor slab** *(0,30h,60h)*	
	A/ Content and pedagogical methods: *(10h)* **Content:** 1. Choose materials 2. Determine design model of the project 3. Choose design solution for the slab	G1.1, G3.1

	4. Determine computational model for the slab 5. Compute loads applied on the slab 6. Compute internal resultant forces **Pedagogical methods**: + Guide design procedures + Discuss	
	B/ Self-study content: *(20h)* 1. Study different types of materials using for structures 2. Judge the main structure of the project 3. Judge and choose appropriate design solution for the slab 4. Determine computational model for the slab 5. Compute loads applied on the slab 6. Compute internal resultant forces **Enhancement:** Compare results of internal forces given by preset tables and the finite element method (FEM).	G1.1, G1.2, G3.1, G4.1
3	***Chapter 2:*** **Design a typical floor slab (cont.)** *(0,30h,60h)*	
	A/ Content and pedagogical methods: *(10h)* **Content:** 7. Compute reinforcements for the slab 8. Check the serviceable limitations 9. Draw the slab's reinforcements in detail **Pedagogical methods**: + Guide and Discuss	G4.1, G2.1
	B/ Self-study content: *(20h)* 7. Compute and design reinforcements in the slab 8. Verify the serviceable limitations 9. Draw the slab's reinforcements in detail 10. Write report about process of analysis and design of the slab	G4.1, G2.1
4	***Chapter 2:*** **Design a typical floor slab (cont.)** *(0,30h,60h)*	
	A/ Content and pedagogical methods: *(10h)* **Content:** Check design results for the slab Study other design solutions for the slab (optional) **Pedagogical methods**: + The student presents: o Design procedure o Design theory o Solution for selection and arrangement of the slab' bars + Discuss	G1.2, G2,1, G4.1
	B/ Self-study content: *(20h)* + Complete report and shop-drawings for slab design	G1.2, G2,1, G4.1

	Enhancement (optional): Design the slab using different solutions such as flat slabs, pre-stressed slabs, or composite slabs.	
5	***Chapter 3:*** **Design a staircase** *(0,10h,20h)*	
	A/ Content and pedagogical methods: *(10h)* **Content:** 1. Choose design solution for the staircase 2. Determine computational model for the staircase 3. Compute loads applied on the staircase 4. Compute internal resultant forces 5. Compute reinforcements for the staircase 6. Check the serviceable limitations 7. Draw the staircase's reinforcements in detail **Pedagogical methods**: + Guide design procedures + Discuss	G1.1, G2.1, G4.1
	B/ Self-study content: *(20h)* 1. Judge and choose appropriate design solution for the staircase 2. Determine computational model for the staircase 3. Compute loads applied on the staircase 4. Compute internal resultant forces 5. Compute and design reinforcements in the staircase 6. Verify the serviceable limitations 7. Draw the staircase's reinforcements in detail 8. Write report about process of analysis and design of the staircase	G1.1, G2.1, G4.1
6	***Chapter 4:*** **Design a water tank** *(0,10h,20h)*	
	A/ Content and pedagogical methods: *(10h)* **Content:** 1. Choose design solution for the water tank on the roof or underground 2. Determine computational model for the water tank 3. Compute loads applied on the water tank 4. Compute internal resultant forces 5. Compute reinforcements for the water tank 6. Check the serviceable limitations 7. Draw the water tank's reinforcements in detail **Pedagogical methods**: + Guide design procedures + Discuss	G1.1, G2.1, G4.1
	B/ Self-study content: *(20h)* 1. Judge and choose appropriate design solution for the water tank 2. Determine computational model for the water tank 3. Compute loads applied on the water tank	G1.1, G2.1, G4.1

	4. Compute internal resultant forces 5. Compute and design reinforcements in the water tank 6. Verify the serviceable limitations 7. Draw the water tank's reinforcements in detail 8. Write report about process of analysis and design of the water tank	
7	**Review the design of the staircase and water tank** *(0,10,20)*	
	A/ Content and pedagogical methods: *(10)* **Content:** Evaluate whole design's contents for the staircase and water tank, including the report and drawings **Pedagogical methods**: + The student presents: o Design procedure o Design theory o Solution for selection and arrangement of reinforcements + Discuss	G1.1, G2.1, G4.1
	B/ Self-study content: *(20)* + Complete report and shop-drawings for design of the staircase and water tank **Enhancement (optional):** Use software to model, analyze, and design the water tank. Compare and comment obtained results.	G1.2, G2.1, G4.1
8	***Chapter 5:*** **Design structural frames** *(0,30h,60h)*	
	A/ Content and pedagogical methods: *(10h)* **Content:** 1. Compute dead and live loads 2. Determine preliminary dimensions of structural components 3. Model the structural frame using software 4. Compute static and dynamic wind loads 5. Compute earthquake loads 6. Compute other special loads 7. Assign load cases on the model of the structural frame 8. Combine the load cases **Pedagogical methods**: + Guide design procedures + Discuss	G1.1, G2.1, G4.1
	B/ Self-study content: *(20h)* 1. Compute dead and live loads 2. Determine preliminary dimensions of structural components 3. Model the structural frame using software 4. Compute static and dynamic wind loads 5. Compute earthquake loads using methods such as equivalent static loads, spectrum analysis or push over analysis …	G1.1, G1.2, G2.1, G4.1

	6. Compute other special loads if there are 7. Assign load cases on the model of the structural frame 8. Combine the load cases according to codes	
9	***Chapter 5:*** **Design structural frames (cont.)** *(0,30h,60h)*	
	A/ Content and pedagogical methods: *(10)* **Content:** 9. After running analysis of the model, extract internal resultant forces 10. Determine computational theory for girders, columns, and walls 11. Design reinforcements for the structural frame 12. Check the serviceable limitations 13. Draw frames' reinforcements in detail **Pedagogical methods**: + Guide design procedures + Discuss	G1.1, G2.1, G4.1
	B/ Self-study content: *(20)* 9. Obtain internal resultant forces from the result of software's analysis 10. Determine computational theory for girders, columns, and walls 11. Design reinforcements for the structural frame 12. Check the serviceable limitations 13. Draw frames' reinforcements in detail	G1.1, G1.2, G2.1, G4.1
10	***Chapter 5:*** **Design structural frames (cont.)** *(0,30h,60h)*	
	A/ Content and pedagogical methods: *(10h)* **Content:** Evaluate whole design's contents for the structural frame, including the report and drawings **Pedagogical methods**: + The student presents: o Design procedure o Design theory o Solution for selection and arrangement of reinforcements + Discuss	G1.1, G1.2, G2.1, G4.1
	B/ Self-study content: *(20h)* + Complete report and shop-drawings for design of the structural frame **Enhancement (optional):** Design the frame according to different codes and compare the obtained results	G1.1, G1.2, G2.1, G4.1
11	***Chapter 6:*** **Statistics of geotechnical data and foundation loads** *(0,10h,20h)*	
	A/ Content and pedagogical methods: *(10h)* **Content:** 1. Collect and analyze geotechnical data of the project 2. Determine the most dangerous loads transmitting from the frame structure to the foundation	G1.1

	3. Classify types of foundations 4. Select foundation solution suitable for geotechnical conditions and the project's size **Pedagogical methods**: + Guide design procedures + Discuss	
	B/ Self-study content: *(20h)* 1. Collect and analyze geotechnical data of the project 2. Determine the most dangerous loads transmitting from the frame structure to the foundation 3. Based on geotechnical conditions and the project's size, select foundation solutions such as pile, boring pile, barrette or mat foundations	G1.1, G1.2
12	***Chapter 7:*** **Design foundations – The first solution** *(0,20h,40h)*	
	A/ Content and pedagogical methods: *(10h)* **Content:** 1. Compute bearing capacity of the pile and soil 2. Compute internal forces and design reinforcements for foundation 3. Check serviceable limitations **Pedagogical methods**: + Guide design procedures + Discuss	G4.1
	B/ Self-study content: *(20h)* 1. Compute bearing capacity of the pile and soil 2. Analyze and select appropriate model for foundations 3. Compute internal forces and design reinforcements for the foundations 4. Verify serviceable limitations	G1.2, G4.1
13	***Chapter 7:*** **Design foundations – The second solution** *(0,20h,40h)*	
	A/ Content and pedagogical methods: *(10h)* **Content:** 1. Compute bearing capacity of the pile and soil 2. Compute internal forces and design reinforcements for foundation 3. Check serviceable limitations **Pedagogical methods**: + Guide design procedures + Discuss	G4.1
	B/ Self-study content: *(20h)* 1. Compute bearing capacity of the pile and soil 2. Analyze and select appropriate model for foundations 3. Compute internal forces and design reinforcements for the foundations 4. Verify serviceable limitations	G1.2, G4.1

14	**Specialized topics (optional) or Review the project** *(0,10h,20h)*	
	A/ Content and pedagogical methods: *(10h)* **Content:** 1. Students do specialized topics Or review the project **Pedagogical methods**: + Guide design procedures + Discuss	G1.2, G4.1
	B/ Self-study content: *(20)* 1. Students do specialized topics Or review the project	G1.2, G4.1
15	**Final review** *(0,10,20)*	
	A/ Content and pedagogical methods: *(10h)* **Content:** 1. Review all design, report writing and drawings of the project **Pedagogical methods**: + Discuss	G2.1, G3.1, G4.1
	B/ Self-study content: *(20)* 1. Complete the report and shop-drawings 2. Prepare procedure for oral defense	G2.1

12. Learning Ethics

Students will not submit the thesis for oral defense in the following cases

- Not completing design requirements
- Plagiarism

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

14. Approved by

Dean	Head of Department	Instructor
A/Prof. Dr. Nguyễn Trung Kiên	**MSc. Nguyễn Văn Hậu**	**Dr. Châu Đình Thành**

15. Date and Up-to-date content

1st time: <Date: > - <content>	Instructor: Head of Department: