Ground Stability Analysis and Design

Course Name	Course section (credit/hours)	Elective course(3/3)		course code	E102
	course item			course component	
	Target students Division/major/grade			opening semester	2021 1ST SEMESTER
	Class time and classroom	Mon D(Pal1024)Thu D(Pal1024)		English Grade	A(100%English)
Reference to this course	Credit compositon	Theory(2) + Design(1) + Practice(0)			
	Prerequisite courses				
	Related basic courses	Material Mechanics, Soil Mechanics, Foundation Engineering			
	Recommanded concurrent courses				
	Related advanced course	Advanced Slope Stability Analysis			
Instructor	Name (title/division)	Ilhan Chang(Associate Professor, Civil System Engineering)			
	Office Room Number	509, Paldal hall	Extension Number	2503	e-mail	ilhanchang@ajou.ac.kr
	Office hour		Homepage address	http://www.ilhanchang.com	
Teaching Assistant	Name (title/division)				
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1. Course Introduction

"Ground Stability Analysis and Design" aims to implement Soil Mechanics and Geotechnical Engineering theories and knowledges to design and analyze in-situ geotechnical engineering structures including retaining walls and slopes. Ground stability is one of the most essential element for civil engineering, where ground becomes the foundation of all civil engineering structures. Thus, this course will cover detail approaches and methods how to assess ground stability, how to improve the stability within geotechnical engineering aspects, and how to enhance the economic feasibility of geotechnical engineering structures.
In addition, this course consists 1) classroom lectures for theory and background delivery and 2) design practices using various numerical simulation programs.

2. Course Objectives & course outcome

▶ Mechanical stability and seepage analyses of soil slopes and application to design with numerical tools
▶ Mechanical stability analysis of rock slopes and application to design with numerical tools
▶ Adequate braced wall and retaining wall design based on soil mechanics theories and numerical simulation assessment

3. Class types and activities

This course consists 1) main lectures and 2) numerical simulation practices.
For main lectures students will learn about the principles for slope stability analysis, lateral earth pressure phenomena, and the water flow characteristic (e.g. seepage) through porous media.
For numerical simulation practices, students will learn how to operate common numerical simulation tools which are used for geotechnical engineering structure analysis and design in real practice. Bi-weekly assignments and a session-long term-project will be assigned to enhance students understanding and availability using numerical tools.

4. Teaching Method

- [V] lecture
- [V] discussion and debate
- [V] team project(presentation and case studies)
- [ ] experiments(role-playing,etc)
- [V] designing and production
- [ ] on-site learning(on-site training)
- [ ] others

5. Support Systems in Use

- [V] AjouBb
- [ ] automatic recording system
- [ ] web-based assignment
- [ ] cyber lecture
- [ ] online content
- [ ] class behavior analyazing system
- [ ] others

6. Teaching Tools

- [V] PBL(Problem Based Learning)
- [V] CBL(Case Based Learning)
- [ ] TBL(Team Based Learning)
- [ ] UR(Undergraduate Research)
- [ ] FL(Flipped Learning)
- [ ] DSAL(Data Sciencd Active Learning)
- [ ] others

7. Evaluation method of course outcome

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance		10	
midterm exam	1	20	
final exam	1	20	
quiz			

7. Evaluation method of course outcome

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
presentation	1	26	
discussion			
homework	4	24	
etc			
study hours			

8. Textbook and Reference material

Main/Sub	Title	Writer	Publisher	Publication year
Main	Fundamentals of Geotechnical Engineering (5th Edition)	Braja M. Das, Nagaratnam Sivakugan	CENGAGE Learning	2017
Sub	토질역학 5판	이상덕	씨아이알	2017

9. Class system and Class shedule

This lecture is conducted in the following orders to learn background theories and application methods for common geotechnical engineering structures.

1. Theoretical backgrounds on the geotechnical engineering behavior of slopes and retaining walls
2. Essential design considerations for slopes and retaining walls
3. Design practice and numerical methods
4. Students own design practice and group discussions

< Schedule >

* language : K-korean, E-English

Weeks	Title of lecture	language	time distribution(minutes)			Teaching Method	evaluation method
			theory	design	experiment practice		
1	Introduction	E	3				
2	Slope stability – Factor of safety	E	3				
3	Slope stability – Mass procedure of stability analysis	E	2	1			
4	Slope stability – Method of slices	E	2	1			

< Schedule >

* language : K-korean, E-English

Weeks	Title of lecture	language	time distribution(minutes)			Teaching Method	evaluation method
			theory	design	experiment practice		
5	Slope stability – Analysis of simple slopes with steady-state seepage	E	2	1			
6	Lateral earth pressure – Earth pressure at rest	E	2	1			
7	Lateral earth pressure – Rankines theory of active and passive earth pressures	E	2	1			
8	Midterm exam	E	3				
9	Lateral earth pressure – Rankine active pressure with sloping granular backfill	E	2	1			
10	Lateral earth pressure – Coulombs earth pressure theory	E	2	1			
11	Retaining walls	E	2	1			
12	Mechanically stabilized earth retaining walls	E	2	1			
13	Braced cuts	E	2	1			
14	Sheet pile walls	E	2	1			
15	Presentation of design outcome	E	3				
16	Final exam	E	3				

10. Contribution index of the course for attaining ABEEK program outcomes

course outcome	contribution scale
No Data	

11. Analysis of improved matters for the previous semester

12.2 Training contents for design & experiment

No	1	Title	Geotechnical Engineering Structure design
content	Real design of geotechnical engineering structure (e.g. slope anchor, nails, brace cut, retaining wall) using theoretical and numerical approaches, followed by deformation and movement simulation.		
composition factor for design & experiment	분석,평가,제작,시험,		
Realistic restriction factor	보건 및 안전,경제,		
evaluation method & reference	- Program code - Model configuration - Stress-strain behavior		

13. Reference items
