Section 4

CIVL454 – Design and Construction of Retaining Systems for Deep Excavation

Syllabus

1st Semester 2011/2012

Coordinating Unit:	Department of Civil and Environmental Engineering, Faculty of Science and Technology		
Supporting Unit(s):	Nil		
Course Code:	CIVL454	Year of Study:	4
Course Title:	Design and Construction of Retaining Systems for Deep Excavation		
Compulsory/Elective:	Elective		
Course Prerequisites:	None		
Prerequisite Knowledge:	Index properties, seepage, consolidation, shear strength,		
Duration:	One semester	Credit Units:	3
Class/Laboratory Schedule:	Three hours of lecture per week.		
Laboratory/Software Usage:	Software FREW for analysis of earth retaining system.		
Course Description:	Earth retaining systems form an important component of many civil engineering projects. In particular, it is a necessary element for deep excavations, which are commonly performed in modern cities to obtain underground space. This course will provide extensive discussions for the design and analysis of retaining systems including gravity walls, sheet-pile walls, and diaphragm walls. Students will learn to use computer software to analyze a retaining wall for deep excavation. The course will cover the following topics: lateral earth pressure, retaining wall types, analysis of backfilled walls and in-situ walls, stability of wall and base, settlements due to excavation, strut and anchor systems, diaphragm walls: slurry control, concrete technology, instrumentation for deep excavation.		
Course Objectives:	1. To introduce theories for lateral earth pressure. 2. To develop basic analytical skills for retaining system. 3. To analyze retaining systems for deep excavations using commercial software.		
Learning Outcomes (LO):	Upon completion of this course, students should be able to: 1. have knowledge about different types of retaining systems [POs: h,i,j]; 2. estimate lateral earth pressure for design of retaining system [POs: a,e]; 3. analyze and design simple retaining walls with basic analytical skills [POs: a,c,e]; 4. analyze and design complex retaining systems using software [POs: c,d,e,i,l];		
Texts & References: *(* recommended textbook(s))*	1. (*) Das, B.M.(2007) "Principles of Foundation Engineering,"6th edition, Thomson. 2. Clayton, C.R.I., Milititsky, J., and Woods, R.I. (1993) "Earth Pressure and Earth Retaining Structures," 2nd ed., Blackie Academic & Professional. 3. Bowles.J.E. (1997) "Foundation Analysis and Design," 5th Edition, McGraw Hill. 4. Church, H.K. (1981) "Excavation Handbook," McGraw Hill. 5. Clayton, C.R.I (1992) "Retaining Structures," Proc. of the Conference on Retaining Structures, Cam¬bridge, 20 23 July, 1992. 6. Fang, H.Y. (1991) "Foundation Engineering Handbook," 2ed., Van Nostrand Reinhold. 7. GEO (1982) "Guide to Retaining Wall Design," Geoguide1, Geotechnical Control Office Engineering Development Department, Hong Kong 8. Xanthakos, P.P. (1994) "Slurry Walls as Structural Systems," McGraw Hill.		

Student Assessment:	• Quiz and assignments: 20%; • Project: 30% • midterm: 20%; • final examination: 30%
Learning Outcome Assessment:	• Quiz, midterm and final examination. • Course evaluation

Pedagogical Methods:	☑ Lecture	☐ Service learning
	☐ Guest speakers	☐ Internship
	☐ Case study	☐ Field study
	☐ Role playing	☐ Company visits
	☐ Student presentation	☐ e-learning
	☐ Project	☑ Independent study
	☐ Simulation game	☑ Others: Computer software Lab.
	☑ Exercises and problems	

Major Assessment Methods: For each Major Assessment Method below, please indicate the specific pedagogical methods involved (by putting a ✓ in the relevant box(es) on the right-hand side).	Case Study	Role Playing	Student Presentation	Individual project/paper	Group project/paper	Simulation Game	Exercises & problems	Service learning	Internship	Field Study	Company visits	Written examination	Oral examination	Others (please specify)
Class Participation/ Discussion (0%)														
Quiz/Assignment/Report(s) (30%)			✓				✓							
Test(s) (30%)												✓		
Examination (40%)												✓		
Others *(please specify)* _____ (0 %)														
Course Web: (if any)	Course materials are available in UMMoodle (http://webcourse.umac.mo/).													

SYLLABUS

Weeks	Topics	Assignment no.	LO no.
1	Introduction Lateral earth pressure	--	2
2-3	Type of walls Selection and acquisition of soil parameters	1	1
4-6	Backfilled walls Stability check Compaction pressure Lateral pressure due to external loads Drainage	2	2,3
7-8	Sheet pile wall Free earth support method Fixed earth support method Anchor design	3	3
9	Computer Analysis of in-situ walls Program demonstration	4	4
10	Review Midterm	--	
11	Presentation of Market S. Domingos Design parameters	5	4
12-13	Presentation of the Project Stability of Wall and Base Settlements due to excavation Design of bracing system	--	2,3
14	Construction of Diaphragm Wall Concrete Technology Instrumentation	--	1

Percentage Content of:	Math	Engineering Science	Engineering Design and Synthesis	Complementary Studies	Computer Studies	Total
	20	20	40	--	20	100

Timetabled work in hours per week:	Lecture	Tutorial	Laboratory	Other		Total
	3	---	---	---		3

Contribution to Program Outcomes:	

Program Outcomes	Contribution to POs[#] 5 ----------> 1 Significant Least				
	5	4	3	2	1
(a) apply knowledge of mathematics, science, and engineering	✓				
(b) design and conduct experiments, and analyze data					
(c) design components, systems or processes in presence of constraints	✓				
(d) Function in a multi-disciplinary team		✓			
(e) Engineering problem solving		✓			
(f) Understand professional and ethical responsibility					
(g) Communicate effectively					
(h) Understand the impact of engineering solutions to the society				✓	
(i) Recognize the need and have the ability for lifelong learning				✓	
(j) Have knowledge of contemporary issues				✓	
(k) Apply the skills, techniques, modern engineering tools					
(l) Use the computer/IT tools relevant to the discipline		✓			

 # Note 5: Significant contribution; 4: Supporting contribution; 3: Moderate contribution; 2: Marginal support; 1: Least support

Course Instructor(s):	Dr. M. H. Lok