CIVL220 – Strength of Materials II
Syllabus
2nd Semester 2011/2012

Coordinating Unit:	Department of Civil and Environmental Engineering, Faculty of Science and Technology		
Supporting Unit(s):	Nil		
Course Code:	CIVL220	Year of Study:	2
Course Title:	Strength of Materials II		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	CIVL215 Strength of Materials I		
Prerequisite Knowledge:	Stress and strain relations; analysis of members subjected to axially-load; torsion; pure bending or transverse loading; shear force and bending moment diagram		
Duration:	One semester	Credit Units:	4
Class/Laboratory Schedule:	Three hours of lecture and two hours of tutorial per week.		
Laboratory/Software Usage:	Experiment 1: Shear centre test To illustrate the prediction of shear centre of different cross-section experimentally and compare the experimental result with theoretical result. Experiment 2: Beam deflection test To illustrate the prediction of deflection and rotation of beam subjects to different loading cases experimentally and compare the experimental results with theoretical results. Experiment 3: Column buckling test To illustrate the prediction of buckling load of compression member with different boundary conditions and compare the experimental results with theoretical results.		
Course Description:	This course covers the following topics: Composite beams, plastic bending of beams, shear center, deflection of beams, statically indeterminate beams, columns buckling behaviour, energy method		

Course Objectives:	1. To introduce to students the concept and method of stress analysis and its application to analyze composite beams and plastic bending of beams. 2. To introduce to students the method of calculation of shear stress and its application to the calculation of shear center of thin-walled open sections. 3. To introduce to students different methods of obtaining the deflection of beams and to solve for the reactions, shear force and bending moment of statically indeterminate beams. 4. To introduce to students the governing equations of compression members and the application of column buckling equations for solving the critical load of column. 5. To introduce the basic concept of energy method and its application on solving deflection of truss and beam member.
Learning Outcomes (LO):	Upon completion of this course, students should be able to: 1. apply a systematic approach to the selection of a material for the design of simple components[POs: a,e]; 2. apply different methods to solve for the deflection of statically determinate beam and the reactions, shear force and bending moment of statically indeterminate beams[POs: a,e]; 3. prediction of the equations of compression member with different boundary conditions and calculate the critical load of compression members [POs: a,e]; 4. understanding the basic concept of energy method and its application on deflection solving[POs: a,e]; 5. have basic understanding of experimental setup and procedures of structural mechanics and be capable in laboratory report writing [PO: b,g]
Texts & References: *(* recommended textbook(s))*	1. Beer F. P., Johnston, E. R. and DeWolf J. T., Mechanics of Material, 5th Edition, McGraw Hill.* 2. Gere, J. M and Timoshenko, S. P., Mechanics of Materials, 4th Edition, PWS Pub. Co. 3. Ugural, A. C., Mechanics of Materials, International Editions, Wiley.
Student Assessment:	• Laboratories: 30% • Quiz: 10% • Two tests: 30% • One final examination: 30%
Learning Outcome Assessment:	• Tests 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: Laboratories
	☑ Exercises and problems	

Major Assessment Methods:	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) Lab. Report
Class Participation/ Discussion (0%)														
Quiz(s) (10%)							✓							
Test(s) (30%)												✓		
Examination (30%)												✓		
Others *(please specify)* Laboratories (30 %)														✓
Course Web: (if any)														

Course Content:
(topic outline)

Week no.	Topics	LO no.
1	**Beam bending** Bending stress analysis of composite beam; plastic moment capacity of beam	1
2	**Shear stress analysis of cross-section** Calculation of shear stress and shear flow of cross-section; calculation of shear center of thin-walled open sections	1
3	**Quiz 1 and Experiment 1 - Shear centre test**	5
4,5	**Analysis of deflection of beams** Introducing the differential equations of the deflection curve; deflections by integration of the bending moment, shear force and load equations; moment area method, deflection of non-prismatic members, concept of superposition method	2
6,7	**Analysis of statically indeterminate beams** Calculation of reactions of statically indeterminate beams by moment area method and flexibility method; calculation of bending moments by using three moment equations	2
8	**Quiz 2 and Experiment 2 – Beam bending test**	5
9	**Test 1**	
9, 10	**Analysis of column buckling** Concept of buckling and stability; differential equations of compression member with different boundary conditions; eccentrically loaded columns; secant formula; column with initial imperfections	3
11	**Quiz 3 and Experiment 3 -** Column buckling test	5
12,13	**Energy method** Principle of virtual work; concept of strain energy; concept of unit-load method and its application for deflection solving of truss and beam members	4
14	**Test 2**	
TBA	**Final Examination**	

Percentage Content of:	

Math	Basic Science	Engineering Science	Engineering Design and Synthesis	Complementary Studies	Computer Studies	Total
5%	0%	75%	20%	0%	0%	100

Timetabled work in hours per week:	

Lecture	Tutorial (or Laboratory)	Other	Total
3	2	---	5

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) Apply 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. LAM Chi Chiu