CIVL215 – Strength of Materials I
Syllabus
1st Semester 2011/2012

Coordinating Unit:	Department of Civil and Environmental Engineering, Faculty of Science and Technology		
Supporting Unit(s):	Nil		
Course Code:	CIVL215	Year of Study:	2
Course Title:	Strength of Materials I		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	CIVL110 Mechanics I		
Prerequisite Knowledge:	Analysis of statically determined structures, e.g., beam, simple truss and frame, etc; Shear force and moment diagrams.		
Duration:	One semester	Credit Units:	4
Class/Laboratory Schedule:	Three hours of lecture and two hours of practice per week.		
Laboratory/Software Usage:	Experiment 1. Tensile coupon tests To illustrate tensile behavior of ductile and brittle specimens and to obtain the stress-strain relationship and important mechanical properties of the materials. Experiment 2. Torsion tests To obtain the shear modulus and proportional limit of the shear stress and to demonstrate the general characteristics of the "torque-angle of twist relationship". Experiment 3. Flexural bending tests To verify the "normal stress-bending moment formula" under pure bending using a steel beam.		
Course Description:	This course introduces fundamental concepts of deformable bodies. It serves as a bridge between mechanics of rigid bodies and structural analysis. It introduces the behavior of structural members, both qualitatively and quantitatively, under different types of external loadings.		
Course Objectives:	1. To introduce the basic theory of deformable bodies. 2. To introduce the behavior and quantification methods of stress and strain in structural members, such as shaft and beams, under different external loads (axial load, torsion, and bending, etc.). 3. To prepare students for other advanced courses in structural analysis and engineering.		
Learning Outcomes (LO):	Upon completion of this course, students are expected to: 1. be able to compute the stresses of members subjected to axial force and torsion [POs: a,e]; 2. be able to calculate the stresses of statically determined beams [POs: a,e]; 3. be able to analyze stress or strain state [POs: a,e]; 4. 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*	1. Ferdinand P. Beer, E. Russell Johnston, John T. DeWolf and David F. Mazurek (2009)*, Mechanics of Materials, 5th ed. in SI Units, McGraw Hill Companies 2. Gere, J. M and Timoshenko, S. P., (1997) Mechanics of Materials, 4th Edition, PWS Pub. Co. 3. Geer, J.M., and Goodno, B.J. (2008), Mechanics of Materials, 7th ed., CL-Engineering.
Student Assessment:	• Four quizzes: 20%; • Midterm examination: 30% • Final examination: 35% • Laboratory reports: 15%
Learning Outcome Assessment:	• Quizzes, midterm and final examination • Course evaluation
Pedagogical Methods:	☑ Lecture ☐ Guest speakers ☐ Case study ☐ Role playing ☐ Student presentation ☐ Project ☐ Simulation game ☑ Exercises and problems ☐ Service learning ☐ Internship ☐ Field study ☐ Company visits ☐ e-learning ☐ Independent study ☑ Others: Experiments and reports

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)
Quizzes (20%)												✓		
Midterm Exam (30%)												✓		
Final Exam (35%)												✓		
Others *(please specify)* Lab reports (15 %)				✓										
Course Web: (if any)														

Course Content: (topic outline)

Week no.	Topics	Assignment no.	LO no.
1	**Introduction: Stress, Strain and Material Behavior** Normal stress and shear stress; normal strain and shear strain; stress-strain relations for ductile and brittle materials; yield stress and ultimate stress; elasticity and plasticity; Hooke's law; Poisson's effect	--	1
2	**Axially Loaded Members** Elongation of prismatic members under axial loads; stress on inclined planes; strain energy and density	1	1,2
3	**Quiz 1** **Experiment 1**	--	1,2,4
4,5	**Torsion in Circular-Section Members** Torque and torsion; displacement and deformation of circular bars under torsion; stress and strain; polar moment of inertia; circular bars with hole; pure shear; stress on inclined planes; strain energy	2	1,2
6	**Revision of Shear Force and Bending Moment Diagrams** Reaction; relationship among bending moment, shear force and external loads; shear force and bending moment diagrams	--	--
7	**Normal Stress in Beams** Pure bending; Euler's beam assumption; relationship between curvature and bending moment; normal stress in beams; second moment of inertia **Quiz 2**	3	1,2
8	**Experiment 2** **Midterm Examination**		4
9	**Experiment 3**		4
10	**Quiz3**		1,2
11,12	**Shear Stress in Beams** Assumptions; shear stress in beams with rectangular cross sections; maximum shear stress in beams with circular or thin symmetric cross sections	4	1,2
13,14	**Stress and Strain Analysis** Plane stress; principle stress and maximum shear stress; Mohr's circle for stresses; plane strain; principle strain and maximum shear strain; Mohr's circle for strains; general 3-D stress-strain relationship in elasticity	5	3
14	**Quiz 4**		1,2
TBA	**Final Examination**		

Percentage Content of:

Math	Engineering Science	Engineering Design and Synthesis	Complementary Studies	Computer Studies	Total
5	75	20	---	---	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) 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. Chi Chiu Lam