University of Macau
Undergraduate Civil Engineering Programme

Coordinating Unit:	Department of Civil and Environmental Engineering, Faculty of Science and Technology		
Supporting Unit(s):	Nil		
Course Code:	CIVL2006	Year of Study:	2
Course Title:	Structural Analysis		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	CIVL2001 Mechanics of Materials		
Prerequisite Knowledge:	Analysis of statically determinate structures such as trusses, beams and frames. Determination of stresses, strains and deformation in structural members due to axial force, bending moment and shear force.		
Duration:	One semester	Credit Units:	3
Class/Laboratory Schedule:	Three hours of lecture and 1 hour of tutorial per week.		
Laboratory/Software Usage:	Use of structural analysis computer software.		
Course Description:	This first course in structures introduces structural design concept and process, analysis of statically determinate structures, analysis of indeterminate structures by flexibility method and stiffness method		
Course Objectives:	1. To introduce design concept and process of structures. 2. To review analysis of statically determinate structures. 3. To understand the deformations of structures under loading. 4. To introduce flexibility method for analysis of statically indeterminate structures. 5. To introduce stiffness method for analysis of statically indeterminate structures.		
Learning Outcomes (LO):	1. understand how to represent real structures by idealized structural systems [POs:a]; 2. be able to analyze various statically determinate structures including trusses, beams and frames [POs: a]; 3. understand the deformations of structures under loading and be able to apply various method to determine the deformations [POs: a]; 4. understand the concept of flexibility method and be able to apply it for analysis of statically indeterminate structures [POs: a]; 5. understand the concept of stiffness method and be able to apply stiffness methods for analysis of statically indeterminate structures [POs: a]; 6. understand how to use structural analysis computer programme to do structural analysis [POs: l];		
Texts & References: ** recommended textbook*	1. *Kenneth M. Leet, Chia-Ming Uang, Anne M. Gilbert, Fundamentals of Structural Analysis, Third Edition, McGrawHill 2. Harry H. West, Louis F. Geschwindner, Fundamentals of Structural Analysis, Second Edition, Wiley 3. R. C. Coates, M. g. Coutie, F. K. Kong, Structural Analysis, Third Edition, Chapman and Hall. 4. A. Ghali and A. M. Neville, Structural Analysis, A unified classical and matrix approach, Fourth edition, E & FN SPON 5. S. P. Timoshenko, D. H. Young, Theory of Structures, McGrawHill		

Student Assessment:	• Tests : 30%; • Assignments : 20% • Final examination: 50%
Learning Outcome Assessment:	• Tests • 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:

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)
Class Participation/ Discussion														
Assignment(s)							✓							
Test(s)												✓		
Examination												✓		
Others *(please specify)* _____														
Course Web:	Course materials are available in UMMoodle (http://webcourse.umac.mo/).													

Course Content: (topic outline)

Week no.	Topics	LO no.
1	**Introduction of Structural Design Concept and Process** Basic structural design criteria. Structural analysis as part of structural design. Design load and idealized representation of structures.Introduction	1
1,2,3	**Analysis of Statically Determinate Structures** Analysis of Trusses, Beams and Frames, Arches and Cables	2
3,4,5	**Deflections of Beams and Frames** Differential equation for elastic curve and its solution. Moment area method. Conjugate beam method.	3
6,7	**Energy Methods for Computing Deflections** Work and energy. Principle of virtual work. Unit load method. Deflections due to temperature, lack of fit and support settlement. Maxwell-Betti law of reciprocal deflections, Castigliano theorem	4
8-10	**Flexibility Method for Statically Indeterminate Structures** Redundant forces and released structures. Compatibility conditions. Flexibility coefficients and matrix. Application to trusses, beams and frames.	5
11-14	**Stiffness Method for Statically Indeterminate Structures** General stiffness method. Slope deflection method. Moment distribution method.	6

Percentage Content of:

Mathematics and Basic Sciences	Engineering Subjects	Complementary Studies	Total
0	100	0	100

Timetabled work in hours per week:

Lecture	Tutorial	Laboratory	Other	Total
3	1	---	---	4

Contribution to Programme Outcomes:	

Programme Outcomes	Contribution to POs	
	Primary	Secondary
(a) an ability to apply knowledge of mathematics, science, and engineering appropriate to the degree discipline	✓	
(b) an ability to design and conduct experiments, as well as to analyse and interpret data		
(c) an ability to design a system, component or process to meet desired needs within realistic constraints, such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability		
(d) an ability to function on multi-disciplinary teams		
(e) an ability to identify, formulate and solve engineering problems		
(f) an ability to understand professional and ethical responsibility		
(g) an ability to communicate effectively		
(h) an ability to understand the impact of engineering solutions in a global and societal context, especially the importance of health, safety and environmental considerations to both workers and the general public		
(i) an ability to stay abreast of contemporary issues		
(j) an ability to recognise the need for, and to engage in life-long learning		
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice appropriate to the degree discipline		
(l) an ability to use the computer/IT tools relevant to the discipline along with an understanding of their processes and limitations		✓

Course Instructor:	Prof Iu Vai Pan (Please refer to the following link for the consultation hours of the course instructor: http://www.fst.umac.mo/cee/contacthour.html)