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:	CIVL213	Year of Study:	2
Course Title:	Mechanics II		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	PHYS101 Physics I		
Prerequisite Knowledge:	Statics of particles, vector systems, Equivalent systems of forces, Equilibrium of rigid bodies, Distributed forces, Friction, principle of virtual work, potential energy and equilibrium.		
Duration:	One semester	Credit Units:	4
Class/Laboratory Schedule:	Three hours of lecture and two hours of tutorial per week.		
Laboratory/Software Usage:	Coding to solve dynamics problems.		
Course Description:	This course covers the following topics: kinematics of particles, kinetics of particles; Newton's second law and energy and momentum methods, systems of particles, kinematics of rigid bodies, plane motion of rigid bodies: forces and accelerations and energy and momentum methods, mechanical vibrations.		
Course Objectives:	1. To strengthen the concepts and applications of free body diagrams in engineering dynamics. 2. To understand the fundamental concepts of engineering dynamics. 3. To apply engineering mathematics on the engineering dynamics problems 4. To introduce the conservation equation to the analysis of engineering dynamics. 5. To introduce the application of computer to analysis the dynamics problem.		
Learning Outcomes (LO):	Upon completion of this course, students should be able to: 1. To define and solve problems in engineering dynamics [POs:a,e]; 2. To make appropriate assumption for the problems of engineering dynamics [POs: a,e]; 3. To carry out the mathematical formulations for the engineering dynamics [POs: a,e] 4. To reinforce the application of vector calculation in mechanics [POs: a,e]; 5. To present skillfully the solution in written form. [POs: e];		
Texts & References: *(* recommended textbook(s))*	1. Ferdinand P. Beer, e. Russell Johnston, Jr., William E. Clausen, Vector Mechanics for Engineers, Eight Edition in SI units, McGrawHill 2. J. L. Meriam, L. g. Kraige, Engineering Mechanics Volume 2, Dynamics, sixth edition, John Wiley and Sons, Inc. 3. Russell. C. Hibbeler, Engineering Mechanics, Dynamics Eight Edition, Prentice-Hall 4. Francesco Constanzo, Michael plesha, Gary Gray, Engineering Mechanics: Statics and Dynamics, 1st Edition, McGraw Hill 5. David McMahon, Statics and Dynamics Demystified, 1st edition, McGraw Hill		

Student Assessment:	• Three tests: 60%; • One final examination: 40%
Learning Outcome Assessment:	• Tests 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: programming work

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(s) (0%)														
Test(s) (60%)												✓		
Examination (40%)												✓		
Others *(please specify)* Programming work (20 %)														
Course Web: (if any)														

Course Content: (topic outline)

Week no.	Topics	Test no.	LO no.
1,2	**Kinematics of Particles** Introduction to dynamics, Rectilinear motion of particles, Curvilinear motion of particles		1-5
3,4	**Kinetics of Particles: Newton's Second Law** Newton's second law of motion, Rate of change of linear momentum and angular momentum, dynamic equilibrium, Newton's law of gravitation	1	1-5
5,6	**Kinetics of Particles: Energy and Momentum** Introduction to Principle of work and energy, conservation of energy, principle of impulse and momentum, impact		1-5
7,8	**Systems of Particles** Application of Newton's laws to the motion of a system of particles, Linear and angular momentum of system of particles, centre of mass, Conservation of energy and momentum for a system of particles.	2	1-5
9,10	**Kinematics of Rigid Bodies** Translation and Rotation of rigid bodies, general plane motions, Instantaneous center of rotation in plane motion, Rate of Change of vector with respect to a rotation frame.		1-5
11,12	**Motion of Rigid Bodies: Forces and Accelerations** Equation of motion for a rigid body, d'Alembert's principle, Angular momentum of a rigid body in plane motion, systems of rigid bodies, Constrained plane motion	3	1-5
13,14	**Mechanical Vibrations** Introduction to mechanical vibrations, Vibration without damping, simple harmonic motion, application of principle of conservation of energy, damped Vibrations, damped free vibrations, damped forced vibrations		1-5

Percentage Content of:	Math	Engineering Science	Engineering Design and Synthesis	Complementary Studies	Computer Studies	Total
	20	70	---	---	10	100

Timetabled work in hours per week:	Lecture	Tutorial	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. K. P. Kou