

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:	CIVL2000	Year of Study:	2
Course Title:	Kinematics and Dynamics		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	ECEN1008 Physics I and CIVL1003 Statics		
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:	3
Class/Laboratory Schedule:	Three hours of lecture and one hour of tutorial per week.		
Laboratory/Software Usage:	Nil		
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, kinetics of rigid bodies in three dimensions, mechanical vibrations.		
Course Objectives:	<ol style="list-style-type: none"> 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):	<p>Upon completion of this course, students should be able to:</p> <ol style="list-style-type: none"> 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: <i>(* recommended textbook(s))</i>	<ol style="list-style-type: none"> 1. Ferdinand P. Beer, e. Russell Johnston, Jr., William E. Clausen, Vector Mechanics for Engineers*, 11th edition in SI units, McGrawHill 2. J. L. Meriam, L. G. Kraige, J. N. Bolton, Engineering Mechanics: Dynamics, 8th edition, John Wiley and Sons, Inc. 		

	<ol style="list-style-type: none"> 3. Russell. C. Hibbeler, Engineering Mechanics, Dynamics, 14th edition, Prentice-Hall 4. Michael Plesha, Gary Gray, Engineering Mechanics: Statics and Dynamics, 2nd edition, McGraw Hill 5. David McMahon, Statics and Dynamics Demystified, 1st edition, McGraw Hill 																
Student Assessment:	<ul style="list-style-type: none"> • Three tests: 60%; • One final examination: 40% 																
Learning Outcome Assessment:	<ul style="list-style-type: none"> • Tests and final examination. • Course evaluation 																
Pedagogical Methods:	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"><input checked="" type="checkbox"/> Lecture</td> <td style="width: 50%; border: none;"><input type="checkbox"/> Service learning</td> </tr> <tr> <td style="border: none;"><input type="checkbox"/> Guest speakers</td> <td style="border: none;"><input type="checkbox"/> Internship</td> </tr> <tr> <td style="border: none;"><input type="checkbox"/> Case study</td> <td style="border: none;"><input type="checkbox"/> Field study</td> </tr> <tr> <td style="border: none;"><input type="checkbox"/> Role playing</td> <td style="border: none;"><input type="checkbox"/> Company visits</td> </tr> <tr> <td style="border: none;"><input type="checkbox"/> Student presentation</td> <td style="border: none;"><input type="checkbox"/> e-learning</td> </tr> <tr> <td style="border: none;"><input type="checkbox"/> Project</td> <td style="border: none;"><input checked="" type="checkbox"/> Independent study</td> </tr> <tr> <td style="border: none;"><input type="checkbox"/> Simulation game</td> <td style="border: none;"><input type="checkbox"/> Others</td> </tr> <tr> <td style="border: none;"><input checked="" type="checkbox"/> Exercises and problems</td> <td></td> </tr> </table>	<input checked="" type="checkbox"/> Lecture	<input type="checkbox"/> Service learning	<input type="checkbox"/> Guest speakers	<input type="checkbox"/> Internship	<input type="checkbox"/> Case study	<input type="checkbox"/> Field study	<input type="checkbox"/> Role playing	<input type="checkbox"/> Company visits	<input type="checkbox"/> Student presentation	<input type="checkbox"/> e-learning	<input type="checkbox"/> Project	<input checked="" type="checkbox"/> Independent study	<input type="checkbox"/> Simulation game	<input type="checkbox"/> Others	<input checked="" type="checkbox"/> Exercises and problems	
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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														
Assignment(s)														
Test(s)												✓		
Examination												✓		
Others														
Course Web : (if any)	Course materials are available in UMMoodle (http://webcourse .umac.mo/).													

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:				
	Mathematics and Basic Sciences	Engineering Subjects	Complementary Studies	Total
	20	80	---	100
Timetabled work in hours per week:				
	Lecture	Tutorial	Practice	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(s):	Dr. Sin Chi KUOK (Please refer to the following link for the consultation hours of the course instructor: http://www.fst.umac.mo/cee/contacthour.html)			