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:	CIVL330	Year of Study:	3
Course Title:	Electricity & Machines		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	MATH101 Mathematical Analysis I PHYS203 Physics II		
Prerequisite Knowledge:	Basic knowledge of electricity and magnetism; concept of vector space; differential equations		
Duration:	One semester	Credit Units:	4
Class/Laboratory Schedule:	Three hours of lecture and two hours of tutorial per week.		
Laboratory/Software Usage:	None		
Course Description:	This course covers the following topics: Electrical quantities, elements, and laws. Network theorems. Phasor concept. AC circuit analysis. Power calculation and power factor correction. Resonance. Three-phase circuits. Diodes and transistors. Amplifiers. Magnetic circuits. Transformers. Electro-mechanical energy conversion. DC machines. AC Machines.		
Course Objectives:	1. To introduce to students the theory and application of the basic laws/rules in circuit analysis, the basic electronics components and the corresponding analysis methods, and the working principle of machines. 2. To develop students with an understanding of the analysis of AC networks. 3. To prepare students for the selecting suitable size of cables, meters, switches …….etc		
Learning Outcomes (LO):	Upon completion of this course, students should be able to: 1. To obtain the response of linear circuit both in time domain and frequency domain [POs: a,e]; 2. To apply reactive power compensation technique to reduce the system losses and to increase power factor [POs: a,e]; 3. To select suitable rating of power system under given load conditions. [POs: e]; 4. To apply the procedures to analyze diode, BJT and Op-Amplifier circuits [POs: a,e]; 5. To determine the max. power transfer for a given circuit [POs: a,e]. 6. To apply the procedures to start up an inductor motor[POs: a,e]		
Texts & References: *(* recommended textbook(s))*	1. Giorgio Rizzoni , Fundamentals of Electrical Engineering, McGraw-Hill, 1st Edition * 2. J. J. Cathey , Schaum's Outline of Basic Electrical Engineering, McGraw-Hill, 2nd Edition		
Student Assessment:	• Quizzes+notes: 15% • Assignments : 10% • Tests: 35% • Final examination: 40%		
Learning Outcome Assessment:	• Quizzes, Tests and final examination.		
Pedagogical Methods:	☑ Lecture ☐ Guest speakers ☐ Case study	☐ Service learning ☐ Internship ☐ Field study	

	☐ Role playing	☐ Company visits
	☐ Student presentation	☐ e-learning
	☐ Project	☑ Independent study
	☐ Simulation game	☐ Others:_ ___
	☑ Exercises and problems	

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%)														
Assignment(s) (10%)							✓							
Test(s) (35%)												✓		
Examination (40%)												✓		
Others *(please specify)* Quizzes+notes (15 %)												✓		
Course Web: (if any)														

Course Content: (topic outline)

Week no.	Topics	Assignment no.	LO no.
1	**Basic Concept** Definition of Voltage and Current; Basic Elements; Reference Direction/Polarity; Guideline for Setting Reference; Power	--	1
1,2,3, 4,5,6, 7	**DC Circuit Analysis** Introduction to three main laws, i.e. Ohm's Law, KVL and KCL; Applications of the three main laws, Components in Series and Parallel, Two Symmetrical Methods for Linear Circuit Analysis Voltage Divider; Current Divider; Thevenin Equivalents; Norton Equivalents; Superposition; Source Transformation; Maximum Power Transfer,	6	1
7	**Test 1**		
8,9	**AC Circuit Analysis** Phasor, Time Domain to Frequency Domain, Representation of Three Main Laws in Phasor Form, Phasor Diagram, Active power, Reactive Power, Complex Power, Power Factor, Power Factor Correction, Resonance	2	2
10	**Three Phase Analysis** Characteristics of Three Phase System, Y connection and Delta Connection, Delta-Y conversion /Y-Delta conversion, Line Voltage/Phase Voltage, Line Current/ Phase Current, Analysis of Symmetrical and Balance Three Phase System, and Three Phase Power	2	3~5
11	**Test 2**		3,4
11,12	**Principles and Applications of Machines** Principles and applications of DC machines, Induction Machines and Synchronous Machines	1	4,5
13,14	**Introduction to Electronics** Introduction to Diode, BJT, FET and Omp- Amplifier and their analysis and applications	1	5

Percentage Content of:

Math	Basic Science	Engineering Science	Engineering Design and Synthesis	Complementary Studies	Computer Studies	Total
20	20	60	---	---	---	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. C.K. Wong