University of Macau
Faculty of Science and Technology
Department of Electrical and Electronics Engineering
Part A: Course Outline

Course Title	Power Electronics Design and Implementation			
Course Code	ECEB357 (2015/2016 1st semester)		Year of Study:	3/4
Course Mode	Design			
Compulsory/Elective	Elective			
Course Prerequisites	ECEB354 Power Electronics			
Prerequisite Knowledge	Circuit Analysis, Power Electronics			
Classroom	E11-1028	Class meet up time	Tue. 4:00 ~5:45p.m. Fri, 4:30~6:15pm	
Class Schedule	2-hour lecturer, 1.5 hour project and 0.5 hour simulation per week			
Duration	One semester	Credit Units	3	
Reference Books	• "Power Electronics: Circuits, Devices, and Applications " , M.H.Rashid , Prentice-Hall International • "Power Electronics: Converters, Applications, and Design", Mohan / Undeland / Robbins , Wiley . • "Principles of Power electronics ", John G. Kassakian , Addison Wesley			
Course Description	Fundamentals of power electronics drivers, components and controller are included and reviewed. Design considerations of power electronic rectification, controlled rectification, DC chopper power modulators, and DC-to-AC inverters are discussed. Fourier series analysis of inverter waveforms, power filter design and feedback control of a power electronics system are examined. Design and implementation of a power electronics system is performed.			
Topics Covered	● Power Electronics System Specifications ● Power Electronics Drivers and Control Circuits ● Series and Parallel Operations ● Protection ● System Performance Calculations ● Case Study and Design			
Course Objectives	• To prepare students to understand the problems for the practical design of power electronics systems [a, b, e] • To design and implement a prototype of a power electronics system [a, b, c, e, k, l]			
Course Assessment:	• Laboratory/Practice/Simulation: 20% • Project : 50% • Final Exam. : 30%			
Relationship to Program Objectives and Outcomes	This course primarily contributes to ECE program outcomes that develop students abilities to: a. Ability to apply knowledge of mathematics, science and engineering. b. Ability to design and conduct experiments. e. Ability to identify, formulate and solve engineering problems.			

<table>
<tr><td></td><td>This course secondarily contributes to ECE program outcomes that develop students abilities to:
c. Ability to design a system, component or process to meet desired needs.
k. Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
l. Ability to use the computer/IT tools relevant to the discipline along with an understanding of their processes and limitations.</td></tr>
<tr><td>Course Contents and Relationship to Program Criteria:</td><td>
<table>
<tr><th>Type</th><th>Topics</th><th>Program Criteria</th></tr>
<tr><td>1</td><td>Power Electronics System Specifications</td><td>ES</td></tr>
<tr><td>2</td><td>Power Electronics Drivers and Control Circuits</td><td>ES</td></tr>
<tr><td>1</td><td>Series and Parallel Operations</td><td>ES, CS</td></tr>
<tr><td>2</td><td>Protection</td><td>ES</td></tr>
<tr><td>1</td><td>System Performance Calculations</td><td>DIC, ES, CS, CV</td></tr>
<tr><td>7</td><td>Case Study, Design and Implementation</td><td>ES, CS</td></tr>
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</td></tr>
<tr><td>Contribution of Course to meet the professional component</td><td>This course prepares students to work professionally in the area of power electronics Students should be able to apply knowledge of mathematics and engineering, and identify formulas to solve engineering design and implementation problems.</td></tr>
<tr><td>Course Instructor</td><td>Prof. Man-Chung Wong</td></tr>
<tr><td>Prepared by</td><td>Prof. Man-Chung Wong</td></tr>
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Part B: General Course Information and Policies

Instructor: Prof. Man Chung Wong Office: E11-3048

Office hours: Monday 4:00-5:00 pm, Thursday 3:00-4:00 pm or by appointment

E-mail: mcwong@umac.mo ; Office ext.: 4391

Teaching assistant: Johnny Lao Office: N11-G020

E-mail:kwlaojohnny@gmail.com Office ext.: 8025

Programme Educational Objectives

1. **Problem Solving:** Graduates have the ability to think in a critical and evaluative manner and to consider a broad perspective, in order to solve technical and nontechnical problems.
2. **Leadership and Communication:** Graduates will provide effective leadership, act in an ethical manner and skills will include the ability to communicate well and to work successfully within diverse groups.
3. **Market Acceptance:** Graduates will have successful careers in the academic environment, industrial and government organizations.
4. **Technical Competence:** Graduates will be technically competent and have a thorough grounding in the fundamentals of math and science in electrical and computer engineering and experience in engineering design. They will be able to use modern engineering techniques, skills, and tools to fulfill societal needs.

Scale: 1 (Highest) to 4 (Lowest)

	Problem Solving	**Leadership and Communication**	**Market Acceptance**	**Technical Competence**
Power Electronics Design and Implementation	1	3	2	1

Remark:

- Objective for "Problem Solving" can be achieved by assignments, quizzes, mid-term exam, final exam and projects.

- Objective for “Leadership and Communication” can be achieved by report writing and presentation. However, leadership training is not given by this course.
- Objective for “Market Acceptance” can be achieved by the course contents that are required in industries.
- Objective for “Technical Competence” can be achieved by using fundamentals of math and science in electrical and electronics engineering and experience in engineering project design and computer simulation.

Program Criteria Policy:

Course VS Program Criteria
Scale: 1 (Highest) to 4 (Lowest)

Course	PS	DIC	BS	CS	ES	DE	LA	CV	DM
Power Electronics Design and		4		4	1			4	

Terms:

Probability and Statistics (PS), Differential and Integral Calculus (DIC), Basic Science (BS), Computer Science (CS), Engineering Science (ES), Differential Equations (DE), Linear Algebra (LA), Complex Variables (CV), Discrete Mathematics (DM)

Relationship of course to Programme Outcomes:

	Program Outcomes											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
ECEB357 Power Electronics Design and Implementation	T	P	TP		P						P	P

Course VS Course Outcomes

***T – TEACH; P – PRACTICE; M – MEASURED**

The electrical and computer engineering program outcomes are:

(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

Curriculum Detail

ECEB321 ECE Seminars

Timetabled work in hours per week			No of teaching weeks	Total hours	No /Duration of exam papers	Max marks available from:	
Lecturer	Tutorial	Practice				Exams	Course
1	0.5	2.5	14	56	3 hours	30	70

Term: 5-8th

Hours			Percentage content of			
Lecturer	Tut/Lab	Other	Mathematics and Basic Sciences	Engineering Subjects	Complementary Studies	Computer Studies
24	4/8	20	20	0	20	50

Design Elements

Please use an "X" to indicate the presence of the specific elements in the course/module/subject.

Design Content in Course Work	Design Project (s)	Design Content in Laboratories
50%	X	X

Course Assessment Policy:

- No late homework and report is accepted. Zero mark will be given when homework/report is copied.

- 2 students form one group and group report should be handed up.
- 2 Case studies and 1 project design will be given.
- 1 final exam will be performed with 3 hours.
- Cheating is absolutely prohibited by the university and plagiarism on report falls in this category. Please refer to “Rules on Handling Student Academic Dishonesty” for details.

STUDENT DISABILITIES SUPPORT SERVICE

The University of Macau is committed to providing an equal opportunity in education to persons with disabilities. If you are a student with a physical, visual, hearing, speech, learning or psychological impairment(s) which substantially limit your learning and/or activities of daily living, you are encouraged to communicate with your instructors about your impairment(s) and the accommodations you need in your studies. You are also encouraged to contact the Student Disability Support Service of the Student Counselling and Development Section (SCD) in Student Affairs Office, which provides appropriate resources and accommodations to allow each student with a disability to have an equal opportunity in education, university life activities and services at the University of Macau. To learn more about the service, please contact SCD at scd.disability@umac.mo, or 8822 4901 or visit the following website: http://www.umac.mo/sao/scd/sds/aboutus/en/scd_mission.php.