



澳門大學
UNIVERSIDADE DE MACAU
UNIVERSITY OF MACAU

Major Programme:	Master of Science in Microelectronics & Master of Philosophy in Microelectronics															
Course Type:	<input type="checkbox"/> CM – Compulsory Major <input type="checkbox"/> L&S – Languages and Skills <input type="checkbox"/> * GE – General Education <input type="checkbox"/> MI – Minor <input checked="" type="checkbox"/> RE – Required Elective <input type="checkbox"/> CPE – Community and Peer Education <input type="checkbox"/> FE – Free Elective															
Course Title: (in Chinese and English)	Power Management Integrated Circuit Design 電源管理集成電路設計				Suggested Year of Study:		Year 1									
Duration:	<input checked="" type="checkbox"/> Semester Course <input type="checkbox"/> Yearly Course			Credit Units:		3										
Grading System:	<input checked="" type="checkbox"/> Letter Grade <input type="checkbox"/> P/NP			Pre-requisite: (if any)		None										
Medium of Instruction:	English															
Course Description:	This course starts from a single transistor, with introductions on transistor fabrication and electrical characteristics. Then, single-stage analog amplifier will be analyzed, design and analyses of two-stage amplifier will be discussed. After we know the analog integrated circuit (IC) design basics, we will learn the basic components of power management ICs: low-dropout regulators, inductor-based and switched-capacitor DC-DC converters. Last but not least, wireless power transfer circuits and systems will be briefly introduced.															
Intended Learning Outcomes (ILO):	This course enables students to have: <ul style="list-style-type: none"> • An ability to introduce the essential knowledge in power management integrated circuits design. • An ability to design and simulate power management ICs using EDA tools with CMOS process. • An ability to design a low-dropout regulator to meet full design constraints. • An ability to analyze a DC-DC converter seen for the first time. • An ability to present design project results both orally and in IEEE-style reports. 															
Major Assessment Methods:	Case Study	Role Playing	Student Presentation	Individual project / paper	Group project / paper	Group discussions	Writing Assignment	Exercises & problems	Service learning	Internship	Field study	Company visits	Reading & Writing Assessments / tests	Listening & Oral Assessments / tests	Others (please specify)	
Class Participation / Discussion								√								
Assignment(s)								√								
Test(s)			√	√												
Examination																
Others: Project			√		√											
Course Content: (topic outline)	<ul style="list-style-type: none"> - Introduction and background, review of analog basics. - Analog low-dropout regulators: feedback loops, super source follower, flipped-voltage follower, PMOS/NMOS regulator. - Digital low-dropout regulators: digital control loop design, analog-assisted digital control, and PID control analysis for regulators. - Inductor-based DC-DC converters: switching power converter topologies, converter analyses methods, loss analyses - Switched-capacitor DC-DC converters: charge redistribution loss, switched-capacitor DC-DC topologies, loss analyses - Wireless power transfer circuits and systems: wireless power transfer applications, system overview, rectifier design, output voltage/current regulation methods 															