



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)	High-Frequency and High-Speed Wireless/Wireline Integrated Circuit 高頻高速無線/有線集成電路					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 is an introductory course in the high-frequency and high-speed systems and circuit of both wireless and wireline tailored for ECE students. It covers topics from basic circuit techniques in the data path of both wireless and wireline, such as low-noise amplifier, mixer, linear equalizer, non-linear equalizer, automatic gain control amplifier, clock and data recovery circuit, to basic circuit techniques in the clock path, for example, PLL, VCO and divider. Also, we brief more recent techniques such as non-contact communication and RF+BB communication with special attention to hardware aspects and wireline applications. The course aims to offer students a set of modern wideband system and circuit solutions as well as the basic ideas and intuition behind, with more emphasis on hands-on experience through practical examples such as high-frequency and high-speed circuit implementation and case studies with Cadence/MATLAB.														
Intended Learning Outcomes (ILO):	This course enables students to have: <ul style="list-style-type: none"> • To introduce the essential knowledge of high-frequency and high-speed systems and circuits in both wireless and wireline designs. • To introduce the different aspects of wireless and wireline designs. • To introduce the common wireless/wireline circuit building blocks with practical considerations in the data path. • To introduce the common wireless/wireline circuit building blocks with practical considerations in the clock path. • To teach students with hands-on experience of designing and simulating high-frequency and high-speed circuits using industrial simulation tools with real-world CMOS process. 														
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) _____ 20 %								√							
Test(s) _____ 20 %								√							
Examination _____ 30 %								√							
Others (please specify) Project _____ 30 %			√	√											



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<p>Course Content: (topic outline)</p>	<ul style="list-style-type: none">- Introduction: basic concepts, future trends, examples and applications, hardware for high-frequency and high-speed systems and circuit of both wireless and wireline.- Preliminaries: CMOS analog circuit, radio-frequency system and circuit, communication principle, circuit analysis.- Circuit techniques in the data path (wireless): analog baseband, mixer, low-noise amplifier, power amplifier.- Circuit techniques in the data path (wireline): linear equalizer, non-linear equalizer, automatic gain control amplifier, clock and data recovery circuit, multiplexer and de-multiplexer.- Circuit techniques in the clock path (wireless and wireline): phase-locked loop, divider, voltage-controlled oscillator.- Practical labs: basic analysis and verification based on circuit simulation and one project involving the above circuit technique.
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