

Course Code	PHYS8751 (RPG)		
Title	Device Physics		
Offering Department	Physics		
Course Co-ordinator	Prof M H Xie Physics		
Course Co-ordinator Email	mhxie@hku.hk		
Teachers Involved	Name	Department	Percentage
	Prof M H Xie	Physics	100
Course Objectives	<p>The growth in the past 70 years of modern electronics industry has had great impact on society and everyday life, the foundation of which rests upon the semiconductor physics and devices. This course aims at presenting a comprehensive introductory account of the physics and operational principles of some selected and yet classic semiconductor devices, microelectronic and optoelectronic. A brief introduction on the processing technology of the devices will also be given. The text is primarily designed for postgraduates but can be of interest to senior undergraduates in physics, electrical and electronic engineering and materials science. Students are assumed to have acquired some basic knowledge of quantum mechanics, statistical mechanics, and solid state physics, though a review of the physics of semiconductors will be given in the beginning of the course.</p>		
Course Contents & Topics	<p>This course begins by giving a review of solid state physics, particularly of the physics of semiconductors. It is then followed by discussions of the fundamentals and practical aspects of PN-junctions and rectifying diodes, amplifying and switching devices like bipolar and field-effect transistors (e.g., MOSFET), light-emitting and detection devices such as LEDs, laser diodes, and photodetectors. It will end by a brief discussion of special devices, e.g. charge-couple device (CCD), negative conductance microwave device (e.g., Tunnel and Gunn diodes) and also integrated circuits.</p>		
Course Learning Outcomes (CLO)	<p>On successful completion of this course, students should be able to:</p> <p>CLO 1 understand basic working principles of selected devices</p> <p>CLO 2 understand the device performance merits and their characterization methods</p> <p>CLO 3 be acquainted with the processing technology and steps of device fabrications</p>		
Pre-requisites (and Co-requisites and Impermissible combinations)	Nil		
Offer in 2022 - 2023	Y 2nd sem	Examination	May
Course Grade	Pass or Fail		
Grade Descriptors	<p>Pass: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</p> <p>Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</p>		
Course Type	Lecture-based elective course		

Course Teaching & Learning Activities	Activities	Details	No. of Hours
	Lectures		36
	Tutorials		12
	Reading/Self study		80
Assessment Methods and Weighting	Methods	Details	Weighting in final course grade (%)
	Assignments		20
	Examination	2-hour written exam	50
	Test		30
Quota	9999 (9999 if no quota)		
Required/recommended reading and online materials	<ol style="list-style-type: none"> 1. Solid State Electronic Devices (5th ed.), by B.G. Streetman and S. Benerjee 2. Semiconductor Physics and Devices, Basic Principles (3rd ed.), by D.A. Neamen 3. Physics of Semiconductor Devices (2nd ed.), by S.M. Sze 4. Introduction to Semiconductor Materials and Devices, by M.S. Tyagi 		