Course Code	PHYS8750 (RPG)		
Title	Nanophysics		
Offering Department	Physics		
Course Co-ordinator	Dr D K Ki Physics		
Course Co-ordinator Email	dkki@hku.hk		
Teachers Involved	Name	Department	Percentage
	Dr D K Ki	Physics	100
Course Objectives	This course is designed to deliver fundamental concepts and principles of nano physics to fresh postgraduate students, mostly focusing on the transport properties of the low-dimensional electronic systems under external electric and/or magnetic fields.		
Course Contents & Topics	The course will cover various topics in nano physics, such as zero-, one-, and two-dimensional electronic gas systems, quantum dots, graphene and 2D materials, semiconductor heterostructures, quantum Hall effects, Coulomb blockade effects, single electron effects, field effect transistors, phase-coherent interference effects, and more. While most discussions will be made based on experimental findings, the basics of the relevant theories will also be covered using the tight-binding model, basic quantum mechanics, and Landauer-Büttiker formula. The principles and applications of nano fabrication and low-temperature measurement techniques will also be discussed.		
Course Learning Outcomes (CLO)	On successful completion of this course, students should be able to: CLO 1 recall basic concepts and knowledge of dimensionality, density of states, and quantum size effect CLO 2 identify and compare various transport phenomena occurring at low energy and low dimensions, such as quantum Hall effects, single electron tunneling, and Aharonov-Bohm effects CLO 3 understand the physics and applications of low-dimensional electron systems and can explain them effectively to colleagues		
Pre-requisites (and Co-requisites and Impermissible combinations)	Nil		
Offer in 2022 - 2023	Y 1st sem	Examination	Dec
Course Grade	Pass or Fail		
Grade Descriptors	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. 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.		
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		40
	Examination	2-hour written exam	40
	Test	mid-term test	20
Quota	9999 (9999 if no quota)		
Required/recommended reading and online materials	Lecture notes provided by Course Coordinator Y. Imry, *Introduction to mesoscopic physics*, Oxford, 1997 T. Heinzel, *Mesoscopic Electronics in Solid State Nanostructures*, Wiley-VCH, 2003 J.J. Sakurai, *Modern Quantum Mechanics*, Addison-Wesley, 1994 M. Tinkham, *Introduction to Superconductivity*, 2nd Edition, Dover, 1996 N. Ashcroft and N. Mermin, *Solid State Physics*, Holt, Rinehart and Winston, 1976 J.K. Jain, *Composite Fermions*, Cambridge, 2007		