Hong Kong Baptist University
Faculty of Science – Department of Physics

Title (Units): **PHYS 2115 ELECTRONICS (3, 3, 1)**

Course Aims: This course provides students with basic concepts of electronic circuits. Foundation concepts in both dc and ac circuit analysis will be introduced. Next, the behaviors and applications of solid state electronic devices, including diodes and transistors will be examined. The last part is an introduction to digital electronics. This course builds a foundation upon which further work in electronics and instrumentation are based. The course includes a lab-based tutorial component which gives students hand-on experience.

Pre-requisite: PHYS 1005 Introduction to Green Energy or PHYS1006 Introduction to Physics or consent of instructor

Course Reviewed by: Prof. Shu-kong So and Dr. M.H. Chan

Course Intended Learning Outcomes (CILOs):

No.	Upon successful completion of this course, students should be able to:
1.	Apply Kirchhoff Rules, circuit theorems, and use them to analyze dc circuits.
2.	Use concepts of complex impedances to analyze ac circuits.
3.	Explain the operations of diodes and transistors and use them to construct electronic devices including rectifiers, amplifiers and, electronic switches.
4.	Describe basic digital logic gates and combine them to form higher level gates for combinational and sequential logic operations

Teaching & Learning Activities (TLAs)

CILOs	TLAs will include the following:
1-2	Students will learn how to use Kirchhoff Rules, and apply them to compute current/voltages in both dc and ac circuits; simplification of complex circuits by circuit theorems will be used as alternative tools for circuit analysis. They are required to use the concept of complex impedance to simply ac circuit analysis.
3-4	Students will use simple (linear) models to describe the behaviors of diodes and transistors, and apply these models to compute outputs of diodes/transistors circuits. Digital electronic will be examined in form of integrated circuits.
1-4	Students will carry out mini-projects that integrate key concepts 1-4.

Hong Kong Baptist University
Faculty of Science – Department of Physics

Assessment Methods (AMs):

No.	Assessment Methods	Weighting	CILOs to be addressed	Remarks
1	Continuous Assessment	50%	1-4	Assignments, mini-projects, and tests are designed to measure and gauge the learning process of students
2	Final Examination	50%	1-4	Final Examination questions are designed to give a comprehensive assessment of all the key concepts listed in CILOs 1-4.

Learning Outcomes and Weighting:

Content	LO No.	Teaching (in hours)
I. D.C. Circuit Analysis	1	6
II. A.C. Circuit Analysis	2	8
III& IV Diodes and Capacitors	2,3	6
V. Transistors	1-3	8
VI. Digital Electronics	1,3,4	8

Textbook: At the level of A.R. Hambley, Electrical Engineering: Principles and Applications, 6th Ed., Pearson Prentice Hall, 2014.

References:
1. T.L. Floyd, Electronic Devices, Prentice Hall, 2005.
2. P. Horowitz and W. Hill, The Art of Electronics, Cambridge, 2001.
3. D.R. Patrick, and S.W. Fardo, Electricity and Electronics, Prentice Hall, 2002.

Course Content in Outline:

	Topic	Hours
I.	Direct Current Circuits	6
	A. Kirchhoff Rules	
	B. Equivalent circuits.	
	C. Superposition theorem.	
	D. Maximum power transfer	

Hong Kong Baptist University
Faculty of Science – Department of Physics

II.	Alternating Current Circuits	8
	A. AC Energy Sources	
	B. Complex impedance and AC circuits analysis	
	C. AC power	
	D. Transformers (AC-AC conversion)	
	E. Generation and distribution of AC power	
III.	Capacitors and Supercapacitors	3
	A. Capacitor types	
	B. Capacitor charging and discharging	
	C. Capacitor equations	
	D. Energy storage and leakage	
IV.	Diodes	3
	A. Pn junction	
	B. Half and full-wave rectifiers	
	C. AC to DC conversion	
	D. Diode circuits and applications	
V.	Transistors	8
	A. Bipolar Junction transistors (BJTs)	
	B. Transistor switches and amplifiers	
	C. Field effect transistors	
	D. Selected transistors circuits and their applications	
VI.	Digital Electronics	8
	A. Boolean Algebra	
	B. Combinational logic	
	C. Sequential logic	
	D. Selected digital logic circuits and applications	