THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Department of physics

PHY315 – Introductory Solid States Electronics

COURSE PARTICULARS

Course Code: PHY 315
Course Title: Introductory Solid States Electronics
No. of Units: 3
Course Duration: Two hour of theory and one hour of tutorial per week for 15 weeks.
Status: Compulsory
Course Email Address: phy315@gmail.com
Course Webpage: http://www.phy.futa.edu.ng/courseschedule.php?coursecode=PHY%20204
Prerequisite: PHY210

COURSE INSTRUCTORS

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COURSE DESCRIPTION

Electronics is essentially the science and technology of controlling the flow of electrons under the influence of applied electric or magnetic fields to produce useful results. Sold state electronics deals with means of generating electric current in semiconductor devices. Since semiconductor devices are finding their ways in today's electronics, it is pertinent to understand the basic principles involved in fabrication and mode operation of these devices. In the course of the lecture, some natural phenomena such as secondary electronic emissions, Hall effects, thermoelectric and photoelectric effects will be explained before moving to the fabrication of simple devices such as bipolar and field effect transistors which seem to be the fundamental interest to many intellectuals.

COURSE OBJECTIVES

It is expected that at the end the course students will,

- Become familiar with many important concepts of in solid state electronics such as energy barriers, biasing a transistor, doping of semiconductors, fabrication of PN junction diodes, fabrication of NPN and PNP transistor etc.
- Be able to appreciate the basic applications of these devices and how they work.

COURSE LEARNING OUTCOMES / COMPETENCIES

Students in this course will:

(Knowledge based)

- Gain an understanding of movement of current in metals and semiconductors.
- Be able to describe and explain some of the basic concepts in solid state electronics.

(Skills)

- Know that much of the modern technology depends on electronics,
- Learn simple techniques involved in semiconductor and be able to apply in fabricating devices

This course will be graded as follows:

[1]Class Attendance/Quizzes	10%
Assignments	10%
Test(s)	20%
Final Examination	60%
TOTAL	**100%**

[1] Quizzes on current topic will be randomly given during the lectures (No makeup or extension). This will be strictly enforced.

GENERAL INSTRUCTIONS

Attendance: It is expected that every student come to class ON time. No or limit all discussions to the physics topic under discussion. Attendance records will be kept and used to determine each person's qualification to sit for the final examination. The university recognises that a student may miss a class for legitimate reasons. In such cases, the absences are excusable; however, student must communicate as soon as possible with the course lecturer, indicating the reason(s) for the absence.

Academic Integrity: Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances are prohibited. No student is allowed to make copies of another person's work and submit it as his/her own; that is plagiarism. All cases of academic dishonesty will be reported to the University Management for appropriate sanctions in accordance with the guidelines for handling students' misconduct as spelt out in the Students' Handbook.

Assignments and Group Work: Students are expected to submit assignments by 1200hrs. on the due date. Failure to submit an assignment, as at when due, will earn such student zero for that assignment. All assignment should be done on A4, plain or rule papers of the same size. Be sure that the assignments by individual student. If any student should need help with the assignment, he/she can visit me with proof that the problems have been attempted severally. Only under extenuating circumstances, for which a student has notified the lecturer-in-charge in advance, will late submission of assignments be accepted. **THERE ARE NO MAKEUPS FOR ANYTHING!** No exams, no quizzes, no assignments.

Code of Conduct in Lecture Rooms and Laboratories: All electronic devices are banned during lectures. This includes all cell phones, pagers, radios and other disruptive devices. Students are prohibited from engaging in other activities (such as texting, watching videos, *etc*.) during lectures. Food and drinks are not permitted in class.

READING LIST

Text: [1,2,4,5] Basic Electronics Solid state by B.L. Theraja

References: [2,4]Basic Electronics (ninth edition) by Bernard Grob and Mitchel E. Schultz:

[2,4]Art of Electronics (second edition) by Paul Horowitz, Winfield Hill and C. Thomas Wu:

[2,4]Physics of Semiconductor by B. Saporal and C. Hermann

Legend

1- Available in the University Library

2- Available in Departmental/School Libraries
3- Available on the Internet.
4- Available as Personal Collection
5- Available in local bookshops.

COURSE OUTLINE

Week	Topic	Remarks
1	Introduction and Course Overview Basic concepts and atomic structure	During this first class, the expectation of the students from the course will also be documented.
2 & 3	• Electrical conduction in metals and semiconductors • Energy barriers • Motion of electrons in electric and magnetic fields •	• Be able to differentiate between electrical conduction in metals and semiconductors • Be able to explain energy barriers, its implication and condition necessary to overcome it. • Be able to describe the motion of electrons in electric and magnetic fields.
4 & 5	• Hall effects • Thermoelectric and Photoelectric effects • Secondary electronic emissions phenomenon	• Be able to explain hall, Thermoelectric and Photoelectric effects • Understand the principle of secondary electronics emissions **Mid Semester Test #1**
6 & 7	• Photoconduction • Devices based on photoelectric effects • Photoconductive and secondary emission effects	• Be able to explain the concept of photoconduction • Be able to give examples devices that use photoelectric effects • Be able to explain Photoconductive and secondary emission effects •
9 & 10	• Photomultipliers and photodiodes • Intrinsic and Extrinsic semiconductors	• Be able to differentiate between intrinsic and extrinsic semiconductors • Be able to state the applications of photoconductive and photodiodes
11	• Fabrication of simple devices • Pn junction	• Ability to explain the fabrication simple devices • Be able to form a pn junction of a diode
12	• Bipolar and field effect transistor	• Be able to explain the basic working principle of bipolar and field effect transistor
13	• Solar cell	• Be able to explain working principles of solar cell
14	Revision	**Mid Semester Test #2**