



SYLLABUS

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Language
PHY	104	Applied Physics	3	2	2	0	6	PHY 103	2	English

A. Course Description

This course introduces the characteristics and applications of semiconductor devices and circuits. Emphasis is placed on analysis, selection, biasing, and applications. Upon completion, students should be able to construct, analyze, verify, and trouble shoot analog and logic circuits using appropriate techniques. This course covers the concepts, equations and construction of analogue and digital electronics circuits. The laboratory part is designed to provide students with fundamental concepts of Electronic Circuits for lab experience. Emphasis is placed on analysis, selection, biasing, and applications. Upon completion, students should be able to construct, analyze, verify, and troubleshoot analog circuits using appropriate techniques and test equipment. Every class will have a short lecture introducing the procedures, concepts, formulas and instructions relevant to the experiment. The lecture will also cover what is expected in the lab-report; don't be late. Attendance and participation is mandatory. Experiments will usually be performed in groups, but each student will turn in an individual lab report.

B. Course Outcomes

At the end of this course the student will be able to:

1. Understand the basic principles of the circuit theorems.
2. Develop and enhance the students' knowledge and understanding of the concepts of electronics.
3. Appreciate the semiconductor technologies and their use in basic circuits.
4. Get a lot of practical experience in building all kinds of electronic circuits.
5. Provide a background in analogue and digital electronics.
6. Give an understanding of the fundamental electronic components of computer hardware.
7. Observe and analyze physical data relevant to some of the experiments in electronics circuits.
8. Use of the laboratory equipment to collect and record data, apply relevant mathematical models and perform required computations, and present the derived results as an application of a measured observation of the electronic physics.
9. Understand the basic concepts of physics and the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of mathematical analysis.

C. References

Required Textbook

Floyd T. L., *Electronic Devices, Prentice Hall*, 9th Edition (2011).

Other references

- Horowitz P. and Hill W., *The Art of Electronics, Cambridge University Press*, 2nd Edition (1989).
- Boylestad R.L. and Nashelsky L., *Electronic Devices and Circuit Theory*, Pearson Education (2005).



- Laboratory Manual supplied by the Department of Physics.

Course Website: <http://www.imamm.org/>

D. Topics Outline

1. **An introduction to electric circuits:** *Electrical power and energy – summary of terms, units and their symbols, Electric current and quantity of electricity, Potential difference and resistance, Linear and non-linear devices, Ohm's law, conductors and insulators, main effects of electric current – resistance, and resistivity, solution of series and parallel combination of resistances in brief, KCL and KVL2, Introduction to capacitors, capacitance, capacitors, capacitors connected in parallel and series, energy stored in capacitors, energy stored, inductance of a coil (Contact hours: 7).*
2. **A.C. Fundamentals and Single phase A.C. circuits:** *Generation of voltage and current and their equations, definitions, RMS value, average value, complex algebra, vector representation of alternating quantities, AC series and parallel circuit, resonance in series and parallel circuits (Contact hours: 5).*
3. **Physics of Semiconductors:** *Introduction to band theory, metals semiconductors and insulators, charge carriers in semiconductors, conductivity and mobility of charge carriers, concepts of Fermi level, Fermi level in intrinsic and extrinsic semiconductors, semiconductor junction diodes (Contact hours: 4).*
4. **PN-Junction Diode and its Applications:** *PN junction, forward & reverse Bias PN junction, V-I Charac. Of PN junction, junction Break down, Zener and avalanche break down, diode resistance, PN junction diode, V-I characteristic and diode parameters, diode ratings or specification, photo Diode, Zener diode, full wave and half wave rectifiers, bridges rectifiers (Contact hours: 5).*
5. **Transistor and its Characteristics:** *Introduction of BJT, transistor's components – emitter, base and collector, transistor construction and biasing, transistor circuit configuration: common base, common emitter, common collector configuration, DC-operating point, Bias stabilization, stabilization techniques, Bias compensation (Contact hours: 5).*
6. **Logic Circuits: Introduction, Gates:** *AND, OR, NAND, NOR, NOT, Gate applications (diodes, transistors) (Contact hours: 4).*

Topics to be covered in the Laboratory

1. **Experiment 1:** *Alternating current with coil and Ohmic resistors.*
2. **Experiment 2:** *Determining the capacitive reactance of a capacitor in an AC circuit.*
3. **Experiment 3:** *Recording the current – voltage characteristics of a diode.*
4. **Experiment 4:** *Half-wave rectifier circuit.*
5. **Experiment 5:** *Full-wave rectifier circuit.*
6. **Experiment 6:** *Capacitor filter circuit.*
7. **Experiment 7:** *Zener-diode characteristics.*
8. **Experiment 8:** *Voltage stabilization with Zener diode.*
9. **Experiment 9:** *Bipolar transistor characteristics.*
10. **Experiment 10:** *Field effect transistor (FET).*



E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm 1:** 6th or 7th week.
- **Midterm 2:** 11th or 12th week.
- **Quizzes & Homeworks:** During the semester.
- **Final Exam:** 16th week.

Your course grade will be based on your semester work as follows:

Midterm 1: 10 %	Midterm 2: 10 %	Final Exam: 40 %
Quizzes, Homework, Attendance & Participation: 20 %		
Laboratory: 30 %		

The grading distribution:

A⁺	A	B⁺	B	C⁺	C	D⁺	D	F
[95, 100]	[90, 95]	[85, 90]	[80, 85]	[75, 80]	[70, 75]	[65, 70]	[60, 65]	[0, 60]

G. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. (“Immediate family” is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

[Executive Rules for Study Regulations and Exams](http://goo.gl/ykm7t3)

goo.gl/ykm7t3

