KINGDOOM OF SAUDI ARABIA
Ministry of Education
Al Imam Mohammad Ibn Saud Islamic University
College of Science
Department of Physics

المملكة العربية السعودية
وزارة التعلـيـم
جامعة الإمام محمد بن سعود الإسلامية
كلية العلوم
قسم الفيزياء

SYLLABUS

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Language
PHY	**324**	**Electronics**	**3**	**2**	**0**	**2**	**5**	**PHY 220**	**6**	**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 troubleshoot analog circuits using appropriate techniques and test equipment. This course covers the concepts, equations and construction of analogue and electronics circuits and it includes amplification, filtering, oscillation, voltage regulation, and other analog circuits. It deals also with semiconductor devices used in industrial applications such as the basic theory, application, and operating characteristics of semiconductor devices.

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.

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).

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

D. Topics Outline

1. *AC Fundamentals: The Sine wave –Average and RMS values–The J operator – Polar and rectangular forms of complex numbers – Phasor diagram – Complex impedance and admittance- Concept of voltage and current sources – KVL and KCL- Application to AC circuits R,C,L, RL,RC, RLC - Resonance: Series resonance and parallel resonance RLC circuits (*Contact hours*: 8).*
2. ***Introduction to Semiconductor:*** *Atomic structure, semiconductors, conductor, Insulators, conduction in semiconductor, Pure semiconductor, recombination of electrons and holes Intrinsic and extrinsic semiconductors, N and P- type semiconductors, Mobility, Drift Velocity, Energy band gap. The potential barrier, Work function, Different type of electron emission, Applications of continuity equation for the study of junction behavior – Avalanche and zener breakdown (*Contact hours*: 6).*

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3. ***PN Junction:*** *Depletion region – Junction capacitance – Diode equation (no derivation) – Effect of temperature on reverse saturation current – construction, working, V-I characteristics and simple applications of: Junction diode, Zener diode, Tunnel diode and Varactor diode. Filter considerations* (Contact hours*: 4).*

4. ***Rectifiers:*** *Half wave and full wave and bridge rectifiers - power, efficiency and ripple factor for half wave and full wave rectifiers , Regulation – Harmonic components in rectified output* (Contact hours*: 4).*

5. ***Silicon Controlled Rectifier (SCR):*** *Structure and working of SCR. Two transistor representation, Characteristics of SCR. Application of SCR for power control* (Contact hours*: 4).*

6. ***Bipolar Junction Transistor (BJT):*** *PNP and NPN transistors–current components in BJT – BJT static characteristics (Input and Output) – Early effect- CB, CC,CE configurations (cut off, active, and saturation regions) CE configuration as two port network – Alpha and Beta of a transistor ,Biasing and load line analysis – Fixed bias and self-bias arrangement. Transistor action, Transistor as an amplifier, Operating point, Load line, expressions for current gain, voltage gain, input impedance, output impedance and power gain. Power amplifier - power BJT - Thermal resistance - Maximum power- Class A, Class B, Class AB and Class C amplifiers - Basic operational amplifier- Differential amplifier* (Contact hours*: 8).*

7. ***Operational Amplifier fundamentals:*** *Characteristics - OpAmp parameters - inverting amplifier-non-inverting amplifier - unity follower - summing amplifier- difference amplifier. Differentiator, integrator, comparator using OP-Amps* (Contact hours*: 4).*

8. ***Field Effect Transistor (FET):*** *Field-Effect Transistors (FET): Construction and classification, Principle of operation, Characteristic curves, Characteristic parameters of the FET, Effect of temperature on FET, Common source amplifier, Common drain amplifier, Classification of MOSFET & UJT. Application of FET as voltage variable resistor and MOSFET as a switch – Advantages of FET over transistor* (Contact hours*: 6).*

9. ***Uni Junction Transistor (UJT):*** *Structure and working of UJT- Characteristics. Application of UJT as a relaxation oscillator* (Contact hours*: 4).*

10. ***Optoelectronic Devices :*** *Structure and operation of PN photodiode, Phototransistor, Solar cell, Photoconductive cell, Photovoltaic, Sensors, LED, LCD, Alphanumeric display* (Contact hours*: 4).*

11. ***Digital Electronics:*** *Introduction to number systems, Logic gates OR, AND, NOT, X-OR, NAND, NOR gates - Truth tables – Positive and negative logic – Logic families and their characteristics – RTL, DTL, ECL, TTL and CMOS.– Universal building blocks NAND and NOR gates* (Contact hours*: 4).*

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.

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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: 20 %	Midterm 2: 20 %	Final Exam: 40 %
Quizzes, Homework, Attendance & Participation: 20 %		

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
goo.gl/ykm7t3