



Course Specification

(Bachelor)

Course Title: **Physics of Electronics 1**

Course Code: **PHYS 0325**

Program: **PHYSICS**

Department: **PHYSICS**

College: **Science**

Institution: **Majmaah University**

Version: **1**

Last Revision Date: **29/12/2024**



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A. General information about the course:

1. Course Identification

1. Credit hours: 4 (3+2+0)

4

2. Course type

- A. University College Department Track Others
- B. Required Elective

3. Level/year at which this course is offered: (6)

4. Course General Description:

This course covers the operating principles, analysis and applications of semiconductor devices underpinning electronic systems. It builds on the foundational electrical concepts developed at Level I and provides an in-depth exploration of important non-linear devices: diodes, bipolar junction transistors. Equivalent circuit models for these devices are developed and applied to the analysis and design of practical systems, such as voltage rectifiers and amplifiers. Important system concepts are introduced along the way, including amplifier types and gains. Examine the characteristics and applications of operational amplifiers (op-amps). Develop skills in the design and analysis of op-amp amplifiers, comparators, voltage and current regulators, adders, subtractor, integrators, and differentiators.

5. Pre-requirements for this course (if any):

PHYS 0223

6. Co-requisites for this course (if any):

Nil

7. Course Main Objective(s):

1. Understand the basic principles and abstractions that are used to analyses and design analog electronic circuits and systems.
2. Understand the language of analog electrical and electronic and how to formulate and solve basic analog electrical and electronic problems.
3. Understand how analog electronic circuits and systems fit into the larger context of science careers, ethics, societal needs, and environmental concerns.





2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	75	100
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	30
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		75

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Gain a basic understanding of semiconductor material and p-n junction properties and ideal current-voltage characteristics	K1	Direct teaching: Lectures Presentations discussions Indirect teaching: Peer Learning	Quiz Assignment Mid term exams Final exams
1.2	Learn DC and small-signal AC analysis techniques for diode circuits with one or more diodes using	K1 , K2	Direct teaching: Lectures Presentations discussions	Quiz Assignment Mid term exams



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	linear and nonlinear equivalent circuit models		Indirect teaching: Peer Learning	Final exams
1.3	Learn about diode applications in rectifier circuits, voltage regulators	K2	Direct teaching: Lectures Presentations discussions Indirect teaching: Peer Learning	Quiz Assignment Mid term exams Final exams
2.0	Skills			
2.1	Apply the physical principles, construction, characteristics, modelling and limitations of bipolar junction transistors	S2 & S4	Direct teaching: Lectures Presentations discussions Indirect teaching: Peer Learning	Quiz Assignment Mid term exams Final exams
2.2	Apply op-amps fundamentals in design and analysis of op-amps applications.	S2 & S4	Direct teaching: Lectures Presentations discussions Indirect teaching: Peer Learning	Quiz Assignment Mid term exams Final exams
2.3	Apply op-amps fundamentals and computer tools in project design, evaluation, and analysis.	S2	Direct teaching: Lectures Presentations discussions Indirect teaching: Peer Learning	Quiz Assignment Mid term exams Final exams
3.0	Values, autonomy, and responsibility			
3.1	Work collaboratively and constructively and lead diverse teams to perform a wide range of tasks with responsibility and play a major role in joint work planning and evaluation.	V2	Direct teaching: Lectures Presentations discussions Indirect teaching: Peer Learning	Quiz Assignment Mid term exams Final exams
3.2	Manage tasks and activities related to the	V2	Direct teaching:	Quiz



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	discipline and work in a professional manner and with autonomy.		Lectures Presentations discussions Indirect teaching: Peer Learning	Assignment Mid term exams Final exams
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Semiconductor Materials and Diodes:	6
2.	Semiconductor materials and properties, the p-n junction, DC analysis and models of diodes circuits, AC equivalent circuit model of diodes, and other types of diodes.	9
3.	Diodes Circuits:	6
4.	Rectifier circuits, Zener diode circuits, clipper circuits, multiple diodes circuits.	9
5.	Bipolar Junction Transistors (BJTs):	9
6.	Basic BJT, DC analysis of BJT circuits, basic BJT applications, biasing circuits, multistage circuits.	6
7.	LAB1: P-N junction forward and reverse bias and I-V characteristics	2
8.	LAB2: P-N junction application- Half wave rectifier	2
9.	LAB3: P-N junction application- Full wave rectifier	2
10	LAB4: P-N junction application- Full wave rectifier with filters	2
11	LAB5: P-N junction application- clipper and clamper	2
12	LAB6: Zener regulation of power supplies	2
13	LAB7: Basic BJT characteristics	2
14	LAB8: BETA effects of BJT	2
15	LAB9: Emitter bias of BJT	2
16	LAB10: Common emitter amplifier	2
17	LAB11: Common base amplifier	2
18	LAB12: Common collector amplifier	2
19	LAB13: Ideal operational amplifier, inverting and non-inverting amplifier	2
20	LAB14: operational amplifier, voltage summation, subtraction	2
21	LAB15: operational amplifier integration, and differentiation.	2
Total		75



D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	First exam	6th	15%
2.	Second exam	12th	15%
3.	Lab. Exam	12th	20%
4.	Homework	Every week	5%
5	Quiz	8th	5%
6	Final exam	End of the semester	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Electronic Devices by Thomas L. Floyd, PEARSON Prentice Hall 9 th edition.
Supportive References	N. R. Malik, <i>Electronic Circuit Analysis, Simulation and Design</i> , Prentice-Hall, 1995
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms, data show, Smart Board, software
Technology equipment (projector, smart board, software)	Computer Lab. and Internet Lab.
Other equipment (depending on the nature of the specialty)	Library, Wi-Fi internet connections

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students (Indirect)	Course Evaluation Survey
Effectiveness of Students assessment	Faculty (Direct)	Learning Source



Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students/ internal committee	Direct (Student evaluation electronically organized by Deanship of registration and admission)/ Verification of students' papers
Effectiveness of students' assessment	Staff members (Peer Reviewer)	Indirect (Frequent meetings and consultation among the teaching staff)
Quality of learning resources	Staff members (Peer Reviewer)	Indirect (Frequent meetings and consultation among the teaching staff)
The extent to which CLOs have been achieved	Staff members (Peer Reviewer)	Direct (Meeting between course coordinators and the tutors)

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	1
DATE	29/12/2024

