MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**Physics and Electronic Circuits Design**	**Module Delivery**	
Module Type	B	☒Theory ☐ Lecture ☒Lab ☒Tutorial ☒Practical ☐Seminar	
Module Code	**PECD123**		
ECTS Credits	**6**		
SWL (hr/sem)	**150**		
Module Level	UG1	**Semester of Delivery**	2
Administering Department	Type Dept. Code	**College**	Type College Code
Module Leader	DR. Nihad Ibrahim Abbas	**e-mail**	Nihad ,I.abbas@uotechnology.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor	Dr. Nibras Sabih Abbas	**e-mail**	Sabeehnibras@gmail.com
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date		**Version Number**	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	

Module Objectives أهداف المادة الدراسية	1. To understand the concepts of semiconductor materials physics and the electronic components constructed using semiconductor materials such as diodes, bipolar junction transistors and unipolar field effect transistors. 2. Develop problem solving skills and understanding the electronic circuit analysis through different analysis techniques. 3. Study the characteristics and applications of semiconductor components (diodes and transistors). 4. Study the fundamentals of electronic circuit design.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Define and explain different types of semiconductor materials used in manufacturing of electronic components. 2. Study atomic structure of semiconductor's materials and comparing them with conductors and insulators materials in terms of conductivity, electric bonds, and energy levels. 3. Descried the doping effects on the semiconductor materials to construct n-type and p-type semiconductors and form p-n diode junction. 4. Study DC diode characteristics and discuss different of diode equivalent models. 5. Study and explain DC and AC diode application (clipper, clamper, rectifiers, voltage multipliers and diodes logic gate circuits. 6. Define special kinds of semiconductor diodes (Zener diodes, tunnel diodes, and varactor diodes). 7. Define bipolar junction transistors (BJTs) such as npn and pnp transistors and their inputs and outputs DC characteristics. 8. Identify different configuration connections (CB, CE, CC, ~~and~~ CE with R_E) 9. Analysis various DC biasing circuits. 10. Discuss BJT Transistor Modeling. 11. Ac small signal analysis for BJT. 12. Introduction to junction Field Effect Transistors (JFETs) and metal oxide semiconductor field effect transistors (MOSTETs) (construction and characteristics). 13. Discuss different biasing circuit configurations. 14. Explain FET ac small signal circuits.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Semiconductor materials Define: atomic structure of silicon and germanium semiconductor materials. Covalent bonds of silicon and Germanium semiconductors, Intrinsic materials, extrinsic materials conductivity and resistivity. Energy levels, temperature effects on semiconductors materials. impurity atoms and doping process. Effect of donor impurities on the energy band structure. N-type and p-type formed by doping

process. majority and minority carriers, deletion region in semiconductor diodes. [20 hrs.].

Semiconductor Diode

Semiconductor diode construction, external biasing effects on depletion region. Forward and revers bias conditions. Silicon and Germanium diode characteristics, diode chaceristics equation definition, define different parts of diode characteristics (saturation current, breakdown point, forward and reverse bias regions). Temperature effects on the characteristics of a silicon semiconductor diode, diodes resistance levels (DC or static resistance, dynamic resistance, and average ac resistance). diode equivalent circuits. [20 hrs.]

Special semiconductor diodes:

Zener Diodes, light-emitting diodes (LEDs), varactor diodes, and tunnel diodes. [10 hrs.]

Diode Applications

Diode Approximations, Series, Parallel and Series–Parallel Configurations, Full and half wave rectifiers, clipping circuits, clamping circuits, voltage multiplier circuits. [30 hrs.]

Revision problem classes [10 hrs.]

Bipolar Junction Transistors (BJTs)

Introduction, transistor construction, transistor operation, transistor configurations, input-output characteristics, DC biasing circuits, ac small signal analysis. [40 hrs.]

field-effect transistor (FET)

Introduction, construction and characteristics of JFETs, transfer characteristics, Introduction to MOSTET transistors, FET biasing circuits. [20 hrs.]

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Teaching strategies adopted in electronic circuit analysis class encourage students to stimulate their imagination in understanding electronic component operations in different circuits and electronic systems. Also, help them to improve skills in discovering electronic systems fault diagnosis. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	100	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	50	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to semiconductor materials

Week 2	Energy Levels and impurity atoms and doping process
Week 3	Extrinsic Materials—*n*- and *p*-Type and Semiconductor Diode construction
Week 4	Diode V-I characteristics and diode equivalent circuits
Week 5	Diode applications I
Week 6	Diode applications II
Week 7	Special types of diodes
Week 8	BJT construction and operations
Week 9	BJT characteristics and configurations
Week 10	DC biasing circuits
Week 11	Introduction to FET, construction and operations.
Week 12	Junction JFET characteristics and configuration
Week 13	DC biasing circuits
Week 14	BJT ac small signal analysis
Week 15	FET ac small signal analysis
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Dc diode characteristics
Week 2	Lab 2: parallel-series diode circuits
Week 3	Lab 3: AND-OR logic gates
Week 4	Lab 4: rectifier circuits(half and full wave rectifiers)
Week 5	Lab 5: capacitor smoothing filter.
Week 6	Lab 6: clipper
Week 7	Lab 7:clamper
Week	Lab 8: Zener diode as limiter
Week 9	Lab 9: BJT dc input - output characteristics
Week 10	Lab 10: DC biasing circuits
Week 11	Lab 11: introduction to FET operation
Week12	Lab12: JFET biasing circuits
Week13	Common Emitter (CE) Amplifier
Week14	Common Base (CB) Amplifier
Week15	Common collector (CC) Amplifier

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Robert Boylestad and Louis Nashelsky, "ELECTRONIC DEVICES AND CIRCUIT THEORY" 7TH Edition, PRENTICE HALL, Columbus, Ohio.	Yes
Recommended Texts	Thomas L. Floyd, "Electronic devices: electron flow version", 9th ed., 2012, Prentice Hall	yes
Websites	https://www.coursera.org/browse/physical-sience-and-engineering/electronic	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.