



Ministry of Higher Education and  
Scientific Research - Iraq  
University of Diyala  
College of Engineering  
Department of Materials Engineering



### MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
<b>Module Title</b>	<b>Semiconductor materials</b>		<b>Module Delivery</b>
<b>Module Type</b>			<input type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar
<b>Module Code</b>	<b>MAE331</b>		
<b>ECTS Credits</b>	<b>2</b>		
<b>SWL (hr/sem)</b>	<b>30</b>		
<b>Module Level</b>	3	<b>Semester of Delivery</b>	
<b>Administering Department</b>	Materials Engineering	<b>College</b>	College of Engineering
<b>Module Leader</b>		<b>e-mail</b>	
<b>Module Leader's Acad. Title</b>	Assist.Professor	<b>Module Leader's Qualification</b>	
<b>Module Tutor</b>	None	<b>e-mail</b>	None
<b>Peer Reviewer Name</b>	None	<b>e-mail</b>	None
<b>Scientific Committee Approval Date</b>	19/10/2023	<b>Version Number</b>	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	None	<b>Semester</b>	None
<b>Co-requisites module</b>	None	<b>Semester</b>	None

## Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<b>Module Objectives</b> أهداف المادة الدراسية	<p>This module aims to</p> <ol style="list-style-type: none"><li>1. To develop an understanding of the fundamental laws and elements of electrical circuits.</li><li>2. To learn the energy properties of electric elements and the techniques to measure voltage and current.</li><li>3. To develop the ability to apply circuit analysis to DC and AC circuits.</li><li>4. Another objective is to prepare students to take some more advanced courses in the area of circuits and electronics.</li></ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"><li>1. Knowledge of basic terms in electrical engineering.</li><li>2. Learn about Ohm's law and the relationship of current with voltage</li><li>3. Learn about Kirchhoff's laws</li><li>4. Learn about the properties of conductors and insulators</li><li>5. Apply the knowledge of basic circuit laws and simplify the dc and ac networks using reduction techniques.</li><li>6. analyse the dc and ac circuits using mesh and nodal analysis and network simplification theorems.</li></ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>This course description provides a summary of the most important characteristics of the course and the learning outcomes that the student is expected to achieve, demonstrating whether he or she has made the most of the learning opportunities available. It must be linked to the program description</p>

## Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

<b>Strategies</b>	<p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive seminars and by considering types of simple experiments involving some sampling activities that are interesting to the students.</p>
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Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	6	5% (5)	2, 4, 6, 8, 10, 12	LO #1 to #11
	Assignments	3	5% (5)	3, 7, 13	LO #1 to #10
	Projects / Lab.	/	/	/	/
	Group Presentation	1	10% (10)	15	LO #1 - #14
Summative assessment	Midterm Exam	2hrs.	20% (20)	6 and 12	LO #1 - #14
	Final Exam	3hrs.	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction, energy band in solid, valance and conduction bands, insulators, conductors and semiconductors.
Week 2	Electric properties of materials, types of semiconductors, intrinsic of semiconductors.
Week 3	Fermi – level in intrinsic & extrinsic semiconductors.
Week 4	Majority and minority carries , mobile charge carries & immobile ions.
Week 5	Conductivity of intrinsic & extrinsic semiconductors, drift and diffusion, P – N junction.
Week 6	Formation of depletion layer junction or barrier voltage, energy band diagram of P-N junction
Week 7	Total width of the junction, Forward & reverse biased P-N junction, characteristic of P-N junction diode.
Week 8	Equation of the static characteristic diode parameters, derivation of junction resistance.
Week 9	Junction breakdown, Zener breakdown, a valanch breakdown

<b>Week 10</b>	Junction capacitance ( transition capacitance, diffusion capacitance), Equivalent circuit of P-N junction.
<b>Week 11, 12</b>	Diode fabrication, the ideal diode and the real diode, type of junction. Main application of semiconductors diodes , special diode, Zener diode.
<b>Week 13</b>	Tunneling effect and tunnel diode, tunnel diode oscillator, varactor diode, schottky diode.
<b>Week 14</b>	PIN diode , step recovery diode, Gunn diode, impatt diode.
<b>Week 15</b>	Light emitting diode, liquid crystal displays, P-N junction photodiode, Hall effect. / Final Exam

<b>Learning and Teaching Resources</b>		
مصادر التعلم والتدريس		
	<b>Text</b>	<b>Available in the Library?</b>
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>• Semiconductor radiation Detectors, Dr. Gerhard Lutz, 2nd printing of 1st ed 1999.</li> <li>• Physics of semiconductor Devices, S.M. SZE and KWOK.K.NG. third ed. 2007</li> </ul>	Yes
<b>Recommended Texts</b>		

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