

Department: ناوی به‌ش	Phyissics department به‌شی فیزییا				
College : کۆلیج	College of scince				
Student : خوێندکار	3rd degree Bochler of Science (BS.c) Academic profile بازنه‌ی یه‌کهم - به‌کالۆریۆس				
Specialty : به‌سه‌ری	زانستی فیزیایی				
Subject : بایه‌ت	Semiconductor Physics & Devices				
Language of instruction زمانی ووتنه‌وه‌ی وانه English	Language of instruction زمانی ووتنه‌وه‌ی وانه	Lecture وانه	Activity جالای	L/P تاقیگه	S سه‌مه‌نار
		8	6	8	0
Status item دۆخی وانه‌که	Semestr وه‌رز	Form of assessment شێوازی هه‌له‌سه‌نگاندن	Code ECTS کۆدی وانه	ECTS For the item ژماره‌ی ECTS بۆ وانه‌که	
Specialty subject بایه‌تی به‌سه‌ری	1st یه‌که‌م	Exam تاقیگرده‌وه	UOH102503	6	
Title Surname Name Responsible for the item: نازناوی زانستی و ناوی مامۆستاى وانه	Lecturer , Mr. Farhad Muhsin Mahmood				
<b>Course Book :SUBJECT MATTER</b>					
Objectives of the subject: ئامانجه‌کانی وانه‌که					
Objec. 1 ئامانجی 1	1. Have Brief Idea about Electricity and Electronics				
Objec. 2 ئامانجی 2	2. Understanding the meaning of electronic tools and their applications.				
Objec. 3 ئامانجی 3	3. To learn about semiconductor which is the most important sub material in the electronic.				
Objec. 4 ئامانجی 4	4. Know and try to Make a intelligent and techno-logistic day by electronic.				
Prerequisites in terms of knowledge, skills and other competencies: داواکارییه سه‌ره‌گییه‌کان له‌رووی زانین و لهنه‌تووی و ئه‌وه‌کانی دیکه					
knowl. 1 زانینی 1	Semiconductor, Electron transition , Electrical Conductivity of Semiconductors, Physical Properties of Semiconductors				
Learning outcomes (for the subject chosen in line 7) : دهرله‌نجامه‌کانی فێرکردن					
Learning Outcome دهرله‌نجامی فێرکردن	Symbol سه‌مه‌بول	Description ووردکاری ( kind of activities)	Reference to the directional effects of education ئاماره‌دان له‌سه‌ر کاربهره‌ری ئاراسته‌کردنی فێرکردن		
L01	1_L02	Having successfully completed this module, you will be able to demonstrate knowledge and understanding of: Semiconductors materials , electrical and physical properties			
L02	1_L05	Semiconductors materials Band Gap, Electrical conductivity			
L03	1_L06	P-N Junction			
L04	1_S04	Application of Diodes			
L05	1_S06	Special Diodes			
<b>Program content</b>					
Form of classes له‌ کلاسه‌وه	Topics of lectures بایه‌ته‌کانی وانه‌که			Number of Hours ژماره‌ی کاتمه‌ره‌کان	
Chapter One	Chapter One: 1.1 Atomic particle 1.2 Orbital shells 1.3 The valance shells 1.4 Energy levels 1.5 Stable and unstable atom 1.6 Energy band diagrams 1.7 Band theory of solid 1.8 Insulator energy band 1.9 Semiconductor energy band			7	
Chapter Two	Chapter Two: 2.1 Introduction 2.2 Semiconductors Definition & Atomic Structure 2.3 Semiconductor martials properties 2.4 Conduction in Semiconductors 2.5 Band Gap of Semiconductors 2.6 Intrinsic Carrier Concentration 2.7 Donor and Acceptor in Semiconductor 2.8 Doping of carrier 2.9 Carrier density 2.10 Calculation of fermi integral 2.11 Carrier density at zero kelvin 2.12 Mass action law 2.13 Intrinsic fermi energy 2.14 Doped semiconductor 2.15 Ionization energy model 2.16 Temperature dependency 2.17 Non-equilibrium carrier density			10	
Chapter Three	Chapter Three: 3.0 Introduction 3.1 The diode 3.2 Formation of depletion region 3.3 Barrier potential 3.4 Energy diagrams of PN junction and depletion region 3.5 Diffusion and drift of carrier (Einstein relation) 3.6 Biasing a diode 3.7 Forward bias 3.8 Reverse bias 3.9 Reverse breakdown 3.10 Voltage-Current characterization of a diode 3.11 W-I characterization for forward bias 3.12 W-I characterization for reverse bias 3.13 DC and AC resistance of p-n junction			8	

<b>Chapter Four</b>	Chapter Four: 4.0 Introduction 4.1 Half-Wave rectifier 4.2 Full-Wave rectifier 4.3 Power supply filter and regulator 4.4 Diode limiting and clamping circuit 4.5 Voltage multiplier 4.6 System application	8	
<b>Chapter Five</b>	Chapter Five: 5.1 Zener diode 5.2 Light Emitting Diode 5.3 Laser diode 5.4 Schottky diode 5.5 Varactor diode	6	
<b>Topics of exercises ( Activity)</b> پایه‌ها کانی هه‌سه‌نگانندن		<b>Number of Hours</b> ژماره‌ی کارمه‌کان	
Exe. 1 هه‌سه‌نگانندن 1	Chapter One	2	
Exe. 2 هه‌سه‌نگانندن 2	Chapter Two	4	
Exe. 3 هه‌سه‌نگانندن 3	Chapter Three	2	
Exe.4 هه‌سه‌نگانندن 4	Chapter Four	2	
Exe. 5 هه‌سه‌نگانندن 5	Chapter Five	2	
Exe. 6			
<b>Topics in seminars (or other classes)</b> پایه‌ها کانی سه‌مینار		<b>Number of Hours</b> ژماره‌ی کارمه‌کان	
Sem. 1	Topics will be confirmed prior to the seminar		
Sem. 2	Topics will be confirmed prior to the seminar		
<b>Subjects of laboratories</b> پایه‌ها کانی تاقیگه		<b>Number of Hours</b> ژماره‌ی کارمه‌کان	
Lab. 1 تاقیگه 1	Induction :PSIM,diode and semiconductor tools introductione	3	
Lab. 2 تاقیگه 2	Experiment 1 : diode characterization Ge	3	
Lab. 3 تاقیگه 3	Experiment 2 :diode characterization Si	3	
Lab. 4 تاقیگه 4	Experiment 3 :Visiting Outside Project	3	
Lab. 5 تاقیگه 5	Experiment 4 : diode characterization Ze	3	
Lab. 6 تاقیگه 6	Experiment 5: diode characterization LED	3	
Lab. 7 تاقیگه 7	Experiment 6 : Determining the capacitance of a plates in free space Objects of the experiments	3	
Lab. 8 تاقیگه 8	Experiment 7 : Half-Wave Rectifier Full-Wave Rectifier Objectives of the experiments	3	
<b>Didactic methods</b> ریگکانی وانه ووتنه‌وه		<b>Comments</b> کومینت	
D.M. 1 ریگکانی 1	Vedio learning method	Vedio , Powerpoint , Other	
D.M.2 ریگکانی 2	E-intro lecture, laboratory or auditorium exercises;	Google Meet , Univrsity Portal	
D.M. 3 ریگکانی 3	Usin gstudent-Centred Approch	Online meet	
D.M.4 ریگکانی 4	PBL		
<b>Student workload</b> کوششی خویندکار			
<b>Form of activity</b> له جالاکیه‌کانه‌وه		<b>Mean number of hours to complete a given activity</b> نیوه‌ندی کارمه‌کان بۆ ته‌واو کردنی جالاکیه‌کی دیاری کراو	
Contact hours with lead subjects کارمه‌کانی په‌یوه‌ندی له گه‌ل پایه‌ها سه‌ره‌کیه‌کانا		66	
Preparing for the lab or exercises ئاماده‌بوون له تاقیگه و نه‌نجامدانی جالاکی		50	
Preparing to pass ئاماده‌کاری بۆ دهرچوون		20	
Work in the library کارکردن له کتێبخانه‌ها		0	
Preparing the project کارکردن له پرۆژه		26	
Sum: کۆ		162	
ECTS sums for obligatory subjects (PO, PP and PK)		PO: 26,25, PP: 28 PK: 42 SUM: 19	
<b>Literature or Bibliography</b>			
<b>primary:</b> سه‌ره‌کی			
Semiconductor Physics and Devices			
<b>Further:</b> لاوه‌ی یاخوود زیاده			
<a href="https://www.electronicshub.org/applications-of-diodes/">https://www.electronicshub.org/applications-of-diodes/</a> <a href="https://www.digikay.com/en/maker/blogs/zener-diode-basic-operation-and-applications">https://www.digikay.com/en/maker/blogs/zener-diode-basic-operation-and-applications</a> <a href="https://electronics.howstuffworks.com/led4.htm">https://electronics.howstuffworks.com/led4.htm</a> <a href="https://www.physics-and-radio-electronics.com/electronic-devices-and-circuits/semiconductor-diodes/varactor-diode-construction-definition-working.html">https://www.physics-and-radio-electronics.com/electronic-devices-and-circuits/semiconductor-diodes/varactor-diode-construction-definition-working.html</a> <a href="https://www.electronics-tutorials.ws/transistor/tran_5.html">https://www.electronics-tutorials.ws/transistor/tran_5.html</a>			
<b>Lead person (academic title, first name, last name, email address)</b> ژانباری ستانی له‌کادیمی تایه‌ت به‌م وانه‌یه			
Lecturer , Mr Farhad Muhsin Mahmood, farhad.mahmood@uoh.edu.iq			
<b>Methods of verification of learning outcomes</b> ریگای به‌ده‌ست هه‌ینانی دهرنه‌نجامه‌کانی فێرکردن			
	<b>Passing criterion</b> په‌وه‌ره‌کانی دهرچوون	<b>Verification method</b> ریگای به‌ده‌ست هه‌ینان	<b>Comments</b> کومینت
Efekt1	Semiconductors Materials and Physical Properties of them	Activity during classes, Test, written exam	
Efekt2	Band gap of the Semiconductors	Activity during classes, Test, written exam	
Efekt3	Diodes	Activity during classes, Test, written exam	
Efekt4	Diode application	Activity during classes, Test, written exam	
Efekt5	Special Diodes	Activity during classes, Test, written exam	
Efekt6, Efekt7			
<b>Course requirements</b> داواکاری کۆرس			
mark of the course includes: 1- Pop Activity of the course (60 marks). 2- Midterm exams (15 marks). 3- The final exams (25 marks). The final mark of the course includes 25% of the final mark, 15% of the midterm and %60 of the Activity			

**Other useful information about the item**

ھەر زانبارییه کانی دیکه پتویست بۆ بابته که

1	Information on where to read the teaching materials	University website, Portal and online meet
2	Information about the place of classes	Virtual Head office, information board
3	Information on the dates of classes (course schedule)	A schedule of classes in accordance with the established schedule
4	Information on the dates and place of consultation of teachers conducting the subject	Virtual Head's office, information board