Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tut.	Theory	TW/Pract.	Tut.	Total
EXC302	Electronic Devices	04	--	-	04	--	-	04

Sub. Cod	Subject Name	Examination Scheme							
		Theory Marks				TW	Pract and Oral.	Oral	Total
		Internal Assessment			End Semester Exam				
EXC302	Electronic Devices	Test 1	Test 2	Average of Test1 & Test2					
		20	20	20	80	--	--	--	100

Prerequisite: FEC105 Basic Electrical & Electronics Engineering

Course Objectives:

1. To deliver the knowledge about physics of basic semiconductor devices
2. To enhance comprehension capabilities of students through understanding of electronic devices
3. To introduce and motivate students to the use of advanced microelectronic devices
4. To create foundation for forthcoming circuit design courses

Course Outcome:

1. Ability to understand semiconductor devices through energy band diagrams
2. Ability to analyze characteristics of semiconductor junctions
3. Ability to differentiate between bipolar and unipolar conduction
4. Ability to understand physics of optical devices
5. Ability to understand working principle of power devices
6. Knowledge about advanced semiconductor devices used in research
7. Ability to appreciate the role of semiconductor devices in various applications

Module No.	Topics	Hrs.
1.0	**Junction Analysis**	**14**
1.1	**PN junction Diode:** Basic Structure, Energy Band Diagrams, Zero Applied Bias, Forward Applied Bias, Reverse Applied Bias, PN Junction current, Small signal model of PN junction, Generation and recombination of currents, junction breakdown. **Zener Diode:** Breakdown mechanisms, Characteristics, Effect of Temperature, Application as voltage regulator and backward diode **Varactor diode:** Working and characteristics **Tunnel diode:** V-I Characteristics and working **TED (Transferred Electron Device):** Basic concept, Negative differential resistance, V-I Characteristics and working of **Gunn Diode** **IMPATT:** Static and Dynamic Characteristics	
1.2	**Metal semiconductor and semiconductor Heterojunctions:** **Schottkey barrier diode:** Qualitative characteristics, Ideal junction properties, Nonideal effects on barrier height and V-I characteristics **Metal-semiconductor ohmic contacts:** Ideal Non rectifying barriers, Tunneling Barrier, Specific contact resistance **Heterojunctions:** Heterojunction materials, Energy Band Diagrams, Two dimensional electron gas.	
2	**Bipolar Devices**	**08**
2.1	BJT: The bipolar transistor action, minority carrier distribution, low-frequency common-base current gain, non-ideal effects, Ebers-Moll Model, Gummel-Poon Model, Hybrid-Pi Model, Frequency Limitations	
2.2	HBT (Heterojunction bipolar transistor): Current gain in HBT, Basic n-p-n HBT structure with band diagram	
3.0	**Field Effect Devices**	**16**
3.1	**JFET:** Construction, operation and device characteristics. V-I relationship and transconductance. Small signal equivalent model, frequency limitation factors and cutoff frequency	
3.2	**MOSFET:**Two terminal MOS structure, MOSFET construction, Band diagrams under equilibrium and external bias, Threshold Voltage, V-I and CV characteristics, Channel length modulation, Short Channel effects, MOSFET Model	
3.3	**MESFET:** Device structure, principle of operation, V-I characteristics, High frequency performance	
	MODFET (i.e HEMT) : Fundamentals, V-I Characteristics, Cutoff Frequency	
4.0	**Optical Devices**	**06**
4.1	**Optical absorption:** Photon absorption coefficient, EHP generation rate **Solar Cells:** The pn junction, heterojunction and amorphous silicon solar cells	
4.2	**Photodetectors:** Photoconductor, photodiode, PIN photodiode, APD (avalanche photodiode), phototransistor **Optocouplers:** Operation, construction, specifications and applications	
5.0	**Power Devices**	**08**
5.1	**PNPN Diode:** Basic structure and characteristics **SCR:** Basic structure, characteristics, Two transistor analogy. **DIAC and TRIAC:** Basic Structure and characteristics	

5.2	**GTO:** Basic structure and characteristics **PUT:** Operation and characteristics **UJT:** Operation, characteristics, parameters and UJT as a relaxation oscillator **IGBT:** Device structure, equivalent circuit and characteristics	
	Total	**52**

Recommended Books:

1. Donald A. Neamen, "*Semiconductor Physics and Devices*" Tata MCGraw Hill, Third Edition
2. S. M. Sze, "*Semiconductor Devices: Physics and Technology*", Wiley, Second Edition
3. Sung-Mo Kang,Yusuf Leblebici, "*CMOS Digital Integrated Circuits*", Tata McGraw Hill, Third Edition
4. David Bell, "Electronic Devices and Circuits", Oxford, Fifth Edition.
5. S Slivahanan and N. Suresh Kumar, "*Electronic Devices and Circuits*", McGraw Hill, Third Edition
6. Gordon W. Roberts and Adel S. Sedra, "*Spice*", Oxford, Second Edition

Internal Assessment (IA):
Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the test will be considered as final IA marks

End Semester Examination:
1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. The students need to solve total 4 questions.
3: Question No.1 will be compulsory and based on entire syllabus. 4:
Remaining question (Q.2 to Q.6) will be set from all the modules. 5:
Weightage of marks will be as per Blueprint.