

**SRM UNIVERSITY**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**SCHOOL OF ELECTRONICS AND COMMUNICATION ENGINEERING**  
**DEPARTMENT OF ECE**  
**COURSE PLAN**

**Course Code** : EC0203  
**Course Title** : ELECTRON DEVICES  
**Semester** : III  
**Course Time** : JULY – NOVEMBER 2009  
**Location** : S.R.M.E.C

**Faculty Details**

Sec.	Name	Office	Office hour	Mail id
A	Mrs.Kayalvizhi	IT703	Tue 7 <sup>th</sup> ;wed 5 <sup>th</sup> ;thur 4 <sup>th</sup> ;fri 2 <sup>nd</sup> hours	kayalvizhi@ece.srmuniv.ac.in
B	Mrs.P. Malathi	Library staff room	Tue 5 <sup>th</sup> ;wed 4 <sup>th</sup> ;thur 2,6 <sup>th</sup> hours	mmalathi@ ece.srmuniv.ac.in
C	Mrs.J.Manjula	IT803	Tue 1,3 <sup>rd</sup> ;wed 2 <sup>nd</sup> ;thur 7 <sup>th</sup> hours	jmanjula_75@rediffmail.com
D	Mrs.B.Selvapriya	IT706	Mon 1 <sup>st</sup> ;tue 6 <sup>th</sup> ;wed 3,7 <sup>th</sup> hours	selva_abi@ ece.srmuniv.ac.in
E	Mr.A.V.M.Manikandan	MB25	Mon 4 <sup>th</sup> ;tue 2,4 <sup>th</sup> ;thur 6 <sup>th</sup> hours	avm_mani@yahoo.com
F	Mrs.J.Subhashini	IT706	Mon 4 <sup>th</sup> ;wed 1,2 <sup>nd</sup> ;thur 1 <sup>st</sup> hours	subha_j@rediffmail.com

**Required Text Books:**

1. Ben G. Streetman and Sanjay Kumar Banerjee. “*Solid State Electronic Devices*”, 6th Edition, Pearson Education
2. Robert L. Boylestad and Louis Nashelsky , “*Electronic Devices and Circuit Theory*” , 9th Edition – Pearson Education , International Edition.
3. Donald A. Neamen, “*Semiconductor Physics and Devices*, 2nd Edition, Irwin publishers.
4. S.M. Sze , “*Physics of Semiconductor Devices*”, 2nd edition, Wiley Eastern
5. Stanley G. Burns and Paul R. Bond ,“ *Principles of Electronic Circuits*”, Galgotia Publishers

**Web Resources :**

[www.wikipedia.org](http://www.wikipedia.org), [www.youtube.com](http://www.youtube.com), [www.allaboutcircuits.com](http://www.allaboutcircuits.com)

**Prerequisite** : Nil

**Objectives:**

1. To understand the operational characteristics of semiconductor devices under equilibrium and non equilibrium conditions.
2. To study the working principle of PN Junction diodes and Special purpose diodes.
3. To understand the basic construction and working principles of BJT and FET under ideal and non ideal conditions.
4. To study the working physics of High power Devices.
5. To understand the working concept of all the Blocks in Power Supplies.

## Assessment Details

Cycle Test – I	:	10 Marks
Surprise Test – I	:	7.5 Marks
Cycle Test – II	:	10 Marks
Surprise Test – II	:	7.5 Marks
Model Exam	:	15 Marks

## Test Schedule

S.No.	DATE	TEST	TOPICS	DURATION
1	10/08/09	Cycle Test – I	Unit – I, II	2 Periods
2	14/09/09	Cycle Test – II	Unit – II & III	2 Periods
3	21/10/09	Model Exam	Full Portion	3 Hr

## Outcomes

Students who have successfully completed this course

Course outcome	Program outcome
1. To understand the operational characteristics of a Semiconductor in Equilibrium and Non-Equilibrium conditions. 2. To understand the working of PN junction diodes and special purpose diodes. 3. To understand the basic working physics of BJT and FET both in ideal and non-ideal conditions.	a) Graduates will demonstrate knowledge of mathematics, science and engineering. b) Graduates will demonstrate the ability to identify, formulate and solve engineering problems c) Graduates will demonstrate the ability to design and conduct experiments, analyze and interpret data. d) Graduates will demonstrate the ability to design a system, component or process as per needs and specifications k) Graduates will show the ability to participate and try to succeed in competitive examinations.

## Detailed Session Plan

<b>ENERGY BANDS AND EXCESS CARRIERS IN SEMICONDUCTORS</b>					
<b>Energy bands and excess carriers in semiconductors:</b> Bonding forces and Energy Bands in Solids – Charge Carriers in Semiconductors – Carrier concentrations – Drift of Carriers in Electric and Magnetic Fields – Invariance of the Fermi level at Equilibrium. <b>Excess carriers in semiconductors:</b> Optical Absorption – Luminescence – Carrier Lifetime and Photoconductivity – Diffusion of Carriers.					
Session No.	Topics to be covered	Time	Ref	Teaching Method	Testing Method
1	Bonding forces and Energy Bands in Solids	50	1,2	BB	Group discussion Self -test questions
2	Charge Carriers in Semiconductors	50	1,2	BB	Self -test questions
3	Carrier concentrations	50	1,2	BB	Self -test questions
4	Drift of Carriers in Electric and Magnetic Fields	50	1,2	BB	Self -test questions
5	Invariance of the Fermi level at Equilibrium	50	1	BB	Self -test questions
6	Optical Absorption and Luminescence	50	1	BB	Self -test questions
7	Carrier Lifetime and Photoconductivity	50	1,2	BB	Self –test questions

8.	Diffusion of Carriers	50	1,2	BB	Self -test questions
<b>SEMICONDUCTOR JUNCTIONS</b> <b>Junctions : Equilibrium Conditions – Forward and Reverse Biased Junctions – Reverse Bias Breakdown – Transient and AC Conditions – Deviations from the Simple Theory – Metal-Semiconductor Junctions.</b> <b>Field Effect transistors: Transistor Operation – The junction FET – The Metal-Semiconductor FET – The Metal-Insulator-Semiconductor FET – The MOS FET</b>					
9	Equilibrium Conditions	50	1	BB	Self -test questions
10	Forward and Reverse Biased Junctions – Reverse Bias Breakdown.	50	1,2	BB	Self -test questions
12	Transient and AC Conditions	50	1	BB	Self -test questions
13	Deviations from the Simple Theory	50	1	BB	Self -test questions
14	Metal-Semiconductor Junctions	50	1,2	BB	Self -test questions
15	Transistor Operation – The junction FET	50	1,2	BB	Self -test questions
16	The Metal-Semiconductor FET	50	1,2	BB	Self -test questions
17	The Metal-Insulator-Semiconductor FET – The MOS FET	50	1,2	BB	Self -test questions
<b>SOLID STATE DEVICES - I</b> <b>Bipolar Junction Transistors: Fundamentals of BJT Operation – Amplification with BJT's – Minority Carrier Distributions and Terminal Currents – Generalized Biasing – Switching – Other Important Effects – Frequency Limitations of Transistors – Hetero junction Bipolar Transistors</b> <b>Opto-electronic devices:</b> <b>Photodiodes – Light Emitting Diodes – Lasers and Semiconductor Lasers</b>					
18	Fundamentals of BJT Operation	50	1,3	BB	Group discussion Self test questions
19	Amplification with BJT's	50	1,3	BB	Self test questions
20	Minority Carrier Distributions and Terminal Currents	50	1,3	BB	Self test questions
21	Generalized Biasing and Switching	50	1,3	BB	Self test questions
22	Frequency Limitations of Transistors	50	1,3	BB	Self test questions
23	Hetero junction Bipolar Transistors	50	1,3	BB	Self test questions
24	Photodiodes and Light Emitting Diodes	50	1	BB	Self test questions
25	Lasers and Semiconductor Lasers	50	1	BB	Self test questions
<b>SOLID STATE DEVICES - II</b> <b>Charge transfer devices: Dynamic Effects in MOS Capacitors – The basic CCD – Improvements on the Basic Structure – Applications of CCD's.</b> <b>High-frequency and high-power devices: Tunnel Diodes – IMPATT Diode – Gunn Diode – PNP Diode – SCR – IGBT – DIAC – TRIAC - UJT.</b>					
31	Dynamic Effects in MOS Capacitors and basic CCD	50	1	BB	Group discussion Self -test questions
32	Improvements on the Basic Structure and applications of CCD's.	50	1	BB	Self -test questions
33	Tunnel Diodes and IMPATT Diode	50	1	BB	Self -test questions
34	Gunn Diode	50	1	BB	Self -test questions

35	PNPN Diode	50	1	BB	Self -test questions
36	SCR and IGBT	50	1,3	BB	Self -test questions
37	DIAC and TRIAC	50	1,3	BB	Group discussion Self -test questions
38	UJT	50	1,3	BB	Self -test questions
<b>POWER SUPPLIES</b>					
<b>Half wave Rectification – Full wave Rectification – General filter consideration – Capacitor Filter – RC Filter – Discrete Transistor Voltage Regulation – IC Voltage Regulators – Practical Applications – SMPS.</b>					
41	Half wave Rectification and Full wave Rectification	50	2	BB	Group discussion Self test questions
42	General filter consideration	50	2	BB	Self -test questions
43	Capacitor Filter and RC Filter	50	2	BB	Self -test questions
44	Discrete Transistor Voltage Regulation	50	2	BB	Self -test questions
45	IC Voltage Regulators	50	2	BB	Self -test questions
46	SMPS	50	2	BB	Self -test questions
47	Practical Applications	50	2	BB	Self -test questions