Syllabus

COURSE CODE: **EE1007**
COURSE TITLE: **ELECTRON DEVICES AND CIRCUITS**

SYLLABUS:

PURPOSE

To enable the students to have a fair knowledge about semiconductor devices like diodes, transistors, thyristors and their applications like amplifiers, basic concepts of feedback, oscillators, power supply.

INSTRUCTIONAL OBJECTIVES

At the end of the course the students will be able to:

1. Understand the theory of semiconductor diodes and their application.
2. Know the basics of BJT and FET operation, configuration and their application.
3. Gain a thorough understanding of operation and characteristics of TRIAC & DIAC, GTO, and HEMT.
4. Understand the concept of frequency response of amplifiers and different types of feedback.
5. Gain knowledge about the operation of oscillators and power supplies.

UNIT I - APPLICATIONS OF SEMICONDUCTOR DEVICES **(12 hours)**

Introduction to diode and its characteristics, Characteristics of DIAC, TRIAC, GTO, HEMT-MOS as a charge transferring Device – CCD, VVR operation of a FET. LED, LCD characteristics, Photo diode, Tunnel diode, Schotkky diode, - Photo voltaic cell - Rectifiers: HWR, FWR, DBR, filters, Regulators (series and shunt), SMPS.

UNIT II - SMALL SIGNAL ANALYSIS **(12 hours)**

Introduction to transistor and its characteristics- Transistor as a switch -Operating point of a BJT - Bias stability - Thermal runaway - Use of a heat sink-Biasing circuits for transistors - Hybrid model – Evaluation of H- parameters —- Cascade – Darlington connection - JFET – Biasing a JFET and MOSFET-small signal model – CS and CD amplifiers.

UNIT III - LARGE SIGNAL AMPLIFIERS **(12 hours)**

Classification of amplifiers, Distortion in amplifiers - Determining efficiency of Class A amplifiers, Class B amplifier, push-pull amplifier - Class C-Single, double-stagger tuned amplifiers, Class D amplifier – Class S amplifier - MOSFET power amplifier Differential amplifiers: DC and AC analysis-CMRR.

UNIT IV - FEED BACK AMPLIFIERS **(12 hours)**

Feedback amplifiers – Barkhausen criterion- Stability –Distortion - Voltage / current, series / shunt feedback amplifiers - Operation and analysis of RC phase shift, Wienbridge, Hartely, colpitts and crystal oscillators.

UNIT V - PULSE CIRCUITS **(12 hours)**

RC wave shaping circuits- Clampers and Clippers-Differentiator-Integrator-Voltage Multiplier - Multivibrators – Astable, Monostable, Bistable - Analysis of performance parameters of multivibrators - Schmitt trigger , UJT relaxation oscillators.

TEXT BOOKS

1. Jacob. Millman, Christos C.Halkias, "*Electronic Devices and Circuits"*, Tata McGraw Hill Publishing Limited, New Delhi, 2007.
2. Sedha.R.S, "*A Text Book of Applied Electronics"*, Sultan Chand Publishers, 2008.

REFERENCES

1. David A.Bell, "*Electronic Devices and Circuits"*, Prentice Hall of India Private Limited, New Delhi, 2007.
2. Gupta.J.B, "*Electron Devices and Circuits"*- S.K.Kataria & Sons, 2012.
3. Mathur.S.P, Kulshreshtha.D.C and Chanda.P.R, "*Electronic Devices –Applications and Integrated circuits"* – Umesh Publications, 2005.
4. Malvino, "*Electronic Principles"*, Tata McGraw Hill, 6th edition,2000.
5. Boylestad & Nashelsky, "*Electronic Devices & Circuit Theory"*, Eighth edition, Prentice Hall Of India (P) Ltd., 2003.
6. www.circuitstoday.com
7. www.electronic_circuits.com

<table>
<tr><th colspan="13">EE 1007 - ELECTRON DEVICES AND CIRCUITS</th></tr>
<tr><td colspan="2">Course designed by</td><td colspan="11">Department of Electrical and Electronics Engineering</td></tr>
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<tr><td rowspan="2">3</td><td rowspan="2">Category</td><td colspan="2">General (G)</td><td colspan="2">Basic Sciences (B)</td><td colspan="2">Engineering Sciences and Technical Arts(E)</td><td colspan="5">Professional Subjects(P)</td></tr>
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<tr><td rowspan="2">4</td><td rowspan="2">Broad area</td><td colspan="2">Electrical Machines</td><td colspan="2">Circuits and Systems</td><td colspan="2">Electronics</td><td colspan="2">Power System</td><td colspan="3">Intelligent Systems</td></tr>
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<tr><td>5</td><td>Course Coordinator</td><td colspan="11">Mrs. T.M.Thamizh Thentral</td></tr>
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Course Plan mapped with Student Outcomes

SRM UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
SCHOOL OF ELECTRONICS AND ELECTRICAL ENGINEERING
DEPARTMENT OF EEE

Course Code: EE1007
Course Title: **ELECTRON DEVICES AND CIRCUITS**
Semester: III
Course Time: JULY-NOVEMBAR 2014
Location: ESB BLOCK

Course timings:

	A		B		C		D	
	HR	**TIMING**	**HR**	**TIMING**	**HR**	**TIMING**	**HR**	**TIMING**
D1	5	1:30-2:20 pm					4	**11:25 am -12:15 pm**
D2			6	2:20-3:10 pm	6	2:20-3:10 pm	7	3:10-4 pm
D3			1	8:45 – 9:35 am				
D4	5	1:30-2:20 pm			1	8:45 – 9:35 am	5	1:30-2:20 pm
D5	3	10:35-11:25 am	3	10:35-11:25 am	2	**9:35-10:25 am**		

	E		F		G		H	
	HR	**TIMING**	**HR**	**TIMING**	**HR**	**TIMING**	**HR**	**TIMING**
D1	**6**	**2:20-3:10 pm**			**2 & 4**	**9:35-10:25 am 11:25am-12:15pm**	**3 & 6**	10:35-11:25 am 2:20-3:10 pm
D2	**1 & 5**	8:45 – 9:35 am 1:30-2:20 pm	**4**	**11:25 am -12:15 pm**				
D3			**2**	**9:35-10:25 am**				
D4			**4**	**11:25 am -12:15 pm**	**1**	8:45 – 9:35 am	**4**	**11:25 am -12:15 pm**
D5								

Faculty Details

Sec.	Name of the Staff	Office	Office hour	Mail id
A	T.M.Thamizh Thentral	ESB402	12:15 – 1:30 pm	thamizhthentral.t@ktr.srmuniv.ac.in
B	S.Alamelumangai	ESB403	12:15 – 1:30 pm	alamelumangai.s@ktr.srmuniv.ac.in
C	P.Sivasankari	ESB	12:15 – 1:30 pm	sivasankari.p@ktr.srmuniv.ac.in
D	D.Karthikeyan	ESB403	12:15 – 1:30 pm	karthikeyan.d@ktr.srmuniv.ac.in
E	K.Mohan Raj	ESB221	12:15 – 1:30 pm	mohanraj.k@ktr.srmuniv.ac.in
F	C.Sujitha	ESB403	12:15 – 1:30 pm	sujitha.c@ktr.srmuniv.ac.in
G	R.Palani Samy	ESB403	12:15 – 1:30 pm	palanisamy.r@ktr.srmuniv.ac.in
H	M.Santha Priya	ESB219	12:15 – 1:30 pm	

Required Text Books:

1. Jacob. Millman, Christos C.Halkias, "*Electronic Devices and Circuits"*, Tata McGraw Hill Publishing Limited, New Delhi, 2007.
2. Sedha.R.S, "*A Text Book of Applied Electronics"*, Sultan Chand Publishers, 2008.

3. David A.Bell, "*Electronic Devices and Circuits"*, Prentice Hall of India Private Limited, New Delhi, 2007.
4. Gupta.J.B, "*Electron Devices and Circuits"*- S.K.Kataria & Sons, 2012.
5. Mathur.S.P, Kulshreshtha.D.C and Chanda.P.R, "*Electronic Devices –Applications and Integrated circuits"* – Umesh Publications, 2005.
6. Malvino, "*Electronic Principles"*, Tata McGraw Hill, 6th edition,2000.
7. Boylestad & Nashelsky, "*Electronic Devices & Circuit Theory"*, Eighth edition, Prentice Hall Of India (P) Ltd., 2003.

Web Resources:
www.circuitstoday.com
www.electronic_circuits.com

Prerequisite :

- EC1001-Basic Electronics Engineering

INSTRUCTIONAL OBJECTIVES:

After the completion of this course successfully the students will be able to:

- Understand the theory of semiconductor diodes and their application.
- Know the basics of BJT and FET operation, configuration and their application.
- Gain a thorough understanding of operation and characteristics of TRIAC & DIAC, GTO, HEMT.
- Understand the concept of frequency response of amplifiers and different types of feedback.
- Gain knowledge about the operation of oscillators and power supplies.

Assessment Details

Cycle Test – I	:	10 Marks
Surprise Test	:	05 Marks
Cycle Test – II	:	10 Marks
Model Exam	:	20 Marks
Attendance	:	05 Marks
Total	:	50 Marks

Test Schedule

S. No	DATE	TEST	TOPICS	DURATION
1	18.08.14	CYCLE TEST-I	UNIT-I & II	1 hr 30 minutes
2	24.07.14	SURPRISE TEST	H-Parameters	50 min
3	19.09.14	CYCLE TEST-II	UNIT- III & IV	1 hr 30 minutes
4	05.11.14	MODEL EXAM	ALL 5 UNITS	3 hrs

Outcomes

Student who have successfully completed this course,

Instructional Objectives	Student Outcomes
➢ Understand the theory of semiconductor diodes and their application. ➢ Know the basics of BJT and FET operation, configuration and their application. ➢ Gain a thorough understanding of operation and characteristics of TRIAC & DIAC, GTO, HEMT. ➢ Understand the concept of frequency response of amplifiers and different types of feedback. ➢ Gain knowledge about the operation of oscillators and power supplies.	➢ a) An ability to apply knowledge of mathematics, science, and engineering. ➢ b) An ability to design and conduct experiments, as well as to analyze and interpret results. ➢ c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. ➢ e) An ability to identify, formulate and solve engineering problems. ➢ k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Detailed Session Plan

UNIT I - APPLICATIONS OF SEMICONDUCTOR DEVICES (12 hours)

Introduction to diode and its characteristics, Characteristics of DIAC, TRIAC, GTO, HEMT-MOS as a charge transferring Device – CCD, VVR operation of a FET. LED, LCD characteristics, Photo diode, Tunnel diode, Schotkky diode, - Photo voltaic cell - Rectifiers: HWR, FWR, DBR, filters, Regulators (series and shunt), SMPS.

Session No.	Topics to be covered	Text book	Chap.no &Page No.	Testing Methods	Instructional Objective	Student Outcomes
1	Introduction to diode and its characteristics	1.S.Salivahanan& N.Sureshkumar Electronic devices &circuits Tata McGraw Hill 2.R.S.SEDHA Applied Electronics S.Chand& company Ltd. 3.David A.Bell, "*Electronic Devices and Circuits*", Prentice Hall of India Private Limited, New Delhi, 2007.	B1 90-92	1) CycleTest-1 2) Model Exam	1.Understand the theory of semiconductor diodes and their application. 2.Gain a thorough understanding of operation and characteristics of TRIAC & DIAC, GTO, HEMT.	a) An ability to apply knowledge of mathematics, science, and engineering.
2	**Characteristics of**					
	DIAC		B1 211-212 B2 287-288			
	TRIAC		B1 209-211 B2 379-282			
	GTO		B3 925-926			
	HEMT-MOS					
3	CCD, VVR operation of a FET		B1 193-196			
4	**Characteristics of**					
	LED		B1 557-559 B2 267-271			
	LCD		B1 559-561 B2 276-277			
5	Photo diode		B2 277-280			
6	Tunnel diode		B1 28-131 B2 255-257			
7	Schotkky diode		B1 127 B2 263-264			
8	**Rectifiers**					
	HWR		B1 470-472			
	FWR		B1 474-476			
	DBR		B1 477-478			
9	**filters**					
	C- filters		B1 482-483			
	L- filters		B1 480-482			
	LC- filters		B1 484-485			
	π- filters		B1 486			
10	**Regulators**					
	series		B1 489-492 B2 467-485			
	shunt					

11	SMPS		**B1 499-505**			

UNIT II - SMALL SIGNAL ANALYSIS (12 hours)

Introduction to transistor and its characteristics- Transistor as a switch - Operating point of a BJT - Bias stability - Thermal runaway - Use of a heat sink- Biasing circuits for transistors - Hybrid model – Evaluation of H- parameters - Cascade – Darlington connection - JFET – Biasing a JFET and MOSFET-small signal model – CS and CD amplifiers.

Session No.	**Topics to be covered**	**Text book**	**Chap. no & Page No.**	**Testing Methods**	**Instructional Objective**	**Student Outcomes**
12	Introduction to transistor and its characteristics	1.R.S.SEDHA **Applied Electronics S.Chand & company Ltd** **2.** S.Salivahanan& N.Sureshkumar Electronic devices &circuits Tata McGraw Hill publications Ltd	**B1 524-552**	**1) Cycle Test-1** **2) Model Exam**	1. Know the basics of BJT and FET operation, configuration and their application.	a) An ability to apply knowledge of mathematics, science, and engineering. c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. e) An ability to identify, formulate and solve engineering problems.
13	Transistor as a switch					
14	Operating point of a BJT					
15	Bias stability		**B2 156**			
16	Thermal runaway		**B2 160**			
17	Use of a heat sink		**B2 160**			
18	Biasing circuits for transistors		**B1 524-552**			
19	Hybrid model		**B1 625-649**			
20	Evaluation of H- parameters		**B1 577-581**			
21	Cascade – Darlington connection		**B1 748-760**			
22	Biasing a JFET and MOSFET		**B1 762-771**			
23	small signal model – CS and CD amplifiers					

UNIT III - LARGE SIGNAL AMPLIFIERS (12 hours)

Classification of amplifiers, Distortion in amplifiers - Determining efficiency of Class A amplifiers, Class B amplifier, push-pull amplifier - Class C-Single, double-stagger tuned amplifiers, Class D amplifier – Class S amplifier – MOSFET power amplifier Differential amplifiers: DC and AC analysis-CMRR.

Session No.	Topics to be covered	Text book	Chap.no & Page No.	Testing Methods	Instructional Objective	Student Outcomes
24	Classification of amplifiers	1.R.S.SEDHA **Applied Electronics S.Chand& company Ltd**	**B1 657-669**	**Cycle test II Model Exam**	1.Get an exposure to various transistor configurations and analyse FET amplifiers.	a) An ability to apply knowledge of mathematics, science, and engineering.
25	Distortion in amplifiers					
26	Determining efficiency of Class A amplifiers	**2.**S.Salivahanan& N.Sureshkumar Electronic devices &circuits Tata McGraw Hill publications Ltd	**B1 684-706**			
27	Class B amplifier, push-pull amplifier		**B1 707-712**			
28	Class C-Single, double-stagger tuned amplifiers		**B1 717-725**			
29	Class D amplifier	3.Malvino Electronic principles Tata McGraw Hill publications Ltd	**B2 308**			
30	Class S amplifier		**B2 309**			
31	MOSFET power amplifier		**B4 846-848**			
32	Differential amplifiers: DC and AC analysis-CMRR	4. David A.Bell, "*Electronic Devices and Circuits"*, Prentice Hall of India Private Limited, New Delhi, 2007.	**B3 572-576**			

UNIT IV - FEED BACK AMPLIFIERS (12 hours)

Feedback amplifiers – Barkhausen criterion- Stability –Distortion - Voltage / current, series / shunt feedback amplifiers - Operation and analysis of RC phase shift, Wienbridge, Hartely, colpitts and crystal oscillators.

Session No.	Topics to be covered	Text book	Chap.no & Page No.	Testing Methods	Instructional Objective	Student Outcomes
33	Feedback amplifiers	B1.S.Salivahanan& N.Sureshkumar Electronic devices &circuits Tata McGraw Hill B2. R.S.SEDHA Applied Electronics S.Chand& company Ltd	B1 404-406	Cycle test II Model Exam	Understand the concept of frequency response of amplifiers and different types of feedback.	a).An ability to apply knowledge of mathematics, science, and engineering. c).An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic ,environmental, social, political, ethical, health and safety, manufacturability, and sustainability e). An ability to identify, formulate and solve engineering problems.
34	Barkhausen criterion		B2 780-785 B1 424			
35	Stability –Distortion		B1 406-409			
36	Voltage series feedback amplifiers		B1 409-412			
37	Voltage shunt feedback amplifiers		B1 412-414			
38	Current series feedback amplifiers		B1 414-417			
39	Current shunt feedback amplifiers		B1 417-419			
40	Operation and analysis of					
	RC phase shift oscillators		B1 433-435 B2 801-805			
	Wienbridge oscillators		B1 436 B2 808-809			
	Hartely oscillators		B1 427-429			
	Colpitts oscillators		B1 429-431			
	crystal oscillators		B1 437-438			

UNIT V - PULSE CIRCUITS (12 hours)

RC wave shaping circuits- Clampers and Clippers-Differentiator-Integrator-Voltage Multiplier - Multivibrators – Astable, Monostable, Bistable - Analysis of performance parameters of multivibrators - Schmitt trigger , UJT relaxation oscillators

Session No.	Topics to be covered	Text book	Chap.no & Page No.	Testing Methods	Instructional Objective	Student Outcomes
41	RC wave shaping circuits	B1. **R.S.SEDHA** Applied Electronics S.Chand& company Ltd **B2. S.SALIVAHANAN& .SURESHKUMAR** Electronic devices &circuits Tata McGraw Hill **3. P.Mathur & C.Kulshreshtra** Electronic devices& integrated circuits Umesh publications		**Model Exam**	Gain knowledge about the operation of oscillators and power supplies.	a).An ability to apply knowledge of mathematics, science, and engineering. c).An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic ,environmental, social, political, ethical, health and safety, manufacturability, and sustainability e). An ability to identify, formulate and solve engineering problems.
42	Clampers		**B3 691-695**			
43	Clippers					
44	Differentiator		**B1 543-545**			
45	Integrator					
46	Voltage Multiplier		**B2 487**			
48	Multivibrators					
	Analysis of performance parameters of Astable		**B1 819-829 B2 446-448**			
	Analysis of performance parameters of Monostable		**B1 824-826 B2 449-451**			
	Analysis of performance parameters of Bistable		**B1 827-828 B2 452-454**			
49	Schmitt trigger		**B1 829-831 B2 454-457**			
50	UJT relaxation oscillators		**B2 214-215**			