INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE DESCRIPTOR

Course Title	**ELECTRONIC DEVICES AND CIRCIUTS LAB**			
Course Code	**AECB09**			
Programme	B.Tech			
Semester	III	ECE		
Course Type	Core			
Regulation	IARE - R18			
	Lectures	**Tutorials**	**Practical**	**Credits**
	-	-	3	1.5
Course Coordinator	Mrs. G .Mary Swarna Latha, Assistant professor			
Course Faculty	Mr. D Khalandar basha, Assistant professor Ms. M Sreevani, Assistant professor			

I. COURSE OVERVIEW:

This lab complements the electronic devices circuits course. Students will gain practical experience with designing and implementing concepts of electronic devices and circuits such as diodes, transistor configurations ,rectifiers, biasing circuits and amplifiers.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AHSB04	I	Waves and Optics	4

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Electronic devices and circuits lab	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✘	CHALK & TALK	✔	VIVA	✘	ASSIGNMENTS	✘	MOOCS
✔	LCD / PPT	✘	SEMINARS	✔	MINI PROJECT	✘	VIDEOS
✘	OPEN ENDED EXPERIMENTS						

V. EVALUATION METHODOLOGY:

Each laboratory will be evaluated for a total of 100 marks consisting of 30 marks for internal assessment and 70 marks for semester end lab examination. Out of 30 marks of internal assessment, continuous lab assessment will be done for 20 marks for the day to day performance and 10 marks for the final internal lab assessment.

Semester End Examination (SEE): The semester end lab examination for 70 marks shall be conducted by two examiners, one of them being Internal Examiner and the other being External Examiner, both nominated by the Principal from the panel of experts recommended by Chairman, BOS.

The emphasis on the experiments is broadly based on the following criteria:

20 %	To test the preparedness for the experiment.
20 %	To test the performance in the laboratory.
20 %	To test the calculations and graphs related to the concern experiment.
20 %	To test the results and the error analysis of the experiment.
20 %	To test the subject knowledge through viva – voce.

Continuous Internal Assessment (CIA):

CIA is conducted for a total of 30 marks (Table 1), with 20 marks for continuous lab assessment during day to day performance, 10 marks for final internal lab assessment.

Table 1: Assessment pattern for CIA

Component	**Laboratory**		**Total Marks**
Type of Assessment	Day to day performance	Final internal lab assessment	
CIA Marks	20	10	30

Continuous Internal Examination (CIE):

One CIE exams shall be conducted at the end of the 16th week of the semester. The CIE exam is conducted for 10 marks of 3 hours duration.

Preparation	**Performance**	**Calculations and Graph**	**Results and Error Analysis**	**Viva**	**Total**
2	2	2	2	2	10

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		**Strength**	**Proficiency assessed by**
PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Lab related Exercises
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	3	Lab related Exercises/Mini projects

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	3	Lab related Exercises
PO 11	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	2	Lab related Exercises
PO 12	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	2	Lab related Exercises

3= High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed by
PSO1	**Professional Skills:** An ability to understand the basic concepts in Electronics & Communication Engineering and to apply them to various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of complex systems.	3	Lab related exercises.
PSO2	**Problem-Solving Skills:** An ability to solve complex Electronics and communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.	1	Lab related exercises.
PSO3	**Successful career and Entrepreneurship:** An understanding of social-awareness & environmental-wisdom along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an Entrepreneur.	-	-

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VII. COURSE OBJECTIVES:

The course should enable the students to:	
I	Implement and study the characteristics of Diodes and Transistors.
II	Illustrate the concept of rectification using half wave and full wave rectifiers
III	Design and Construct different amplifier circuits.

IX. COURSE OUTCOMES (COs):

COs	Course Outcome	CLOs	Course Learning Outcome
CO 1	Identify and understand different electronic components used in the laboratory.	CLO 1	Understand identification, specifications, testing of R, L, C components (Color Codes), potentiometers, switches (SPDT, DPDT and DIP), coils, gang condensers, relays, bread boards, PCBs, identification, specifications and testing of active devices, diodes, BJTs, low power JFETs, MOSFETs, power transistors,

			LEDs, LCDs, optoelectronic devices, SCR, UJT,DIACs.
		CLO 2	Study and operation of a. Multimeters (Analog and Digital) b. Function Generator c. Regulated Power Supplies d. Study and Operation of CRO
CO 2	Verify V-I characteristics of PN and Zener diode and its use in rectifier circuits.	CLO 3	Verification of V-I characteristics of PN diode and calculate static and dynamic resistance using hardware and digital simulation.
		CLO 4	Verification of V-I characteristics of Zener diode and perform Zener diode as a Voltage regulator using hardware and digital simulation.
		CLO 5	Verification of half wave rectifier without and with filters using hardware and digital simulation.
		CLO 6	Verification of Full Wave Rectifier without and with filters using hardware and digital simulation.
CO 3	Verify input and output characteristics of CB,CE configuration and their use in amplifiers.	CLO 7	Verification of Input and Output characteristics of CB configuration using hardware and digital simulation.
		CLO 8	Verification of Input and Output Characteristics of CE configuration using hardware and digital simulation.
		CLO 9	Determine the Gain and Bandwidth of CE amplifier using hardware and digital simulation.
		CLO 10	Determine the Gain and Bandwidth of CC amplifier using hardware and digital simulation.
CO 4	Verify V-I Characteristics of UJT and SCR.	CLO 11	Verification of V-I Characteristics of UJT using hardware and digital simulation.
		CLO 12	Verification of V-I Characteristics of SCR using hardware and digital simulation.
CO 5	Verify V-I Characteristics of FET and its use in amplifiers.	CLO 13	Verification of V-I Characteristics of FET using digital simulation.
		CLO 14	Determine the Gain and Bandwidth of CS amplifier using digital simulation
		CLO 15	Determine the Gain and Bandwidth of CS amplifier using digital simulation.

X. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							
	PO1	PO2	PO5	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3		3					
CO 2	3	3	3	2	2	3	1	
CO 3	3	3	3	2	2	3	1	

Course Outcomes (COs)	Program Outcomes (POs)							
	PO1	PO2	PO5	PO11	PO12	PSO1	PSO2	PSO3
CO 4	3		3					
CO 5	3	3	3	2	2	3	1	

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XI. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AECB09.01	CLO 1	Understand identification, specifications, testing of R, L, C components (Color Codes), potentiometers, switches (SPDT, DPDT and DIP), coils, gang condensers, relays, bread boards, PCBs, identification, specifications and testing of active devices, diodes, BJTs, low power JFETs, MOSFETs, power transistors, LEDs, LCDs, optoelectronic devices, SCR, UJT,DIACs.	PO 1 PO 5	3
AECB09.02	CLO 2	Study and operation of a. Multimeters (Analog and Digital) b. Function Generator c. Regulated Power Supplies d. Study and Operation of CRO	PO 1	3
AECB09.03	CLO 3	Verification of V-I characteristics of PN diode and calculate static and dynamic resistance using hardware and digital simulation.	PO 1 PO 2	3
AECB09.04	CLO 4	Verification of V-I characteristics of Zener diode and perform Zener diode as a Voltage regulator using hardware and digital simulation.	PO 1 PO 5	3
AECB09.05	CLO 5	Verification of half wave rectifier without and with filters using hardware and digital simulation.	PO 1 PO 11	3
AECB09.06	CLO 6	Verification of Full Wave Rectifier without and with filters using hardware and digital simulation.	PO 1 PO 12	3
AECB09.07	CLO 7	Verification of Input and Output characteristics of CB configuration using hardware and digital simulation.	PO 1	3
AECB09.08	CLO 8	Verification of Input and Output Characteristics of CE configuration using hardware and digital simulation.	PO 1 PO 2	3
AECB09.09	CLO 9	Determine the Gain and Bandwidth of CE amplifier using hardware and digital simulation.	PO 1 PO 5	3
AECB09.10	CLO 10	Determine the Gain and Bandwidth of CC amplifier using hardware and digital simulation.	PO 1 PO 11	3

AECB09.11	CLO 11	Verification of V-I Characteristics of UJT using hardware and digital simulation.	PO 1 PO 5	3
AECB09.12	CLO 12	Verification of V-I Characteristics of SCR using hardware and digital simulation.	PO 1 PO 5	3
AECB09.13	CLO 13	Verification of V-I Characteristics of FET using digital simulation.	PO 1 PO 2	3
AECB09.14	CLO 14	Determine the Gain and Bandwidth of CS amplifier using digital simulation	PO 5 PO 11	3
AECB09.15	CLO 15	Determine the Gain and Bandwidth of CS amplifier using digital simulation.	PO 1 PO 12	3

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XII. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3				3										
CLO 2	3														
CLO 3	3	3											3	1	
CLO 4	3				3								3	1	
CLO 5	3										2		3	1	
CLO 6	3											2	3	1	
CLO 7	3												3	1	
CLO 8	3	3											3	1	
CLO 9	3				3								3	1	
CLO 10	3										2		3	1	
CLO 11	3				3										
CLO 12	3				3										
CLO 13	3	3											3	1	
CLO 14					3						2		3	1	
CLO 15	3											2	3	1	

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XIII. ASSESSMENT METHODOLOGIES–DIRECT

CIE Exams	PO 1, PO2,PO 5	SEE Exams	PO 1, PO 2, PO5, PSO 1	Assignments	-	Seminars	-
Laboratory Practices	PO 11,PO 12	Student Viva	PSO1,PSO2	Mini Project	-	Certification	-
Term Paper	-						

XIV. ASSESSMENT METHODOLOGIES-INDIRECT:

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XV. SYLLABUS:

WEEK-1	**ELECTRONIC WORKSHOP PRACTICE**
Identification, specifications, testing of R, L, C components (Color Codes), potentiometers, switches (SPDT, DPDT and DIP), coils, gang condensers, relays, bread boards, PCBs, identification, specifications and testing of active devices, diodes, BJTs, low power JFETs, MOSFETs, power transistors, LEDs, LCDs, optoelectronic devices, SCR, UJT,DIACs.	
WEEK-2	**ELECTRONIC WORKSHOP PRACTICE**
Study and operation of a. Multimeters (Analog and Digital) b. Function Generator c. Regulated Power Supplies d. Study and Operation of CRO.	
WEEK-3	**PN DIODE CHARACTERISTICS**
Verification of V-I characteristics of PN diode and calculate static and dynamic resistance using hardware and digital simulation.	
WEEK-4	**ZENER DIODE CHARACTERISTICS AND VOLTAGE REGULATOR**
Verification of V-I characteristics of Zener diode and perform Zener diode as a Voltage regulator using hardware and digital simulation.	
WEEK-5	**HALF WAVE RECTIFIER**
Verification of half wave rectifier without and with filters using hardware and digital simulation.	
WEEK-6	**FULL WAVE RECTIFIER**
Verification of Full Wave Rectifier without and with filters using hardware and digital simulation.	
WEEK-7	**TRANSISTOR CB CHARACTERISTICS**
Verification of Input and Output characteristics of CB configuration using hardware and digital simulation.	
WEEK-8	**TRANSISTOR CE CHARACTERISTICS**
Verification of Input and Output Characteristics of CE configuration using hardware and digital simulation.	
WEEK-9	**FREQUENCY RESPONSE OF CE AMPLIFIER**
Determine the Gain and Bandwidth of CE amplifier using hardware and digital simulation.	
WEEK-10	**FREQUENCY RESPONSE OF CC AMPLIFIER**
Determine the Gain and Bandwidth of CC amplifier using hardware and digital simulation.	

WEEK-11	**UJT CHARACTERISTICS**
Verification of V-I Characteristics of UJT using hardware and digital simulation.	
WEEK-12	**SCR CHARACTERISTICS**
Verification of V-I Characteristics of SCR using hardware and digital simulation.	
WEEK-13	**FET CHARACTERISTICS**
Verification of V-I Characteristics of FET using digital simulation	
WEEK-14	**FREQUENCY RESPONSE OF CS AMPLIFIER**
Determine the Gain and Bandwidth of CS amplifier using digital simulation.	
WEEK-15	**FREQUENCY RESPONSE OF CD AMPLIFIER**
Determine the Gain and Bandwidth of CS amplifier using digital simulation	

Reference Books:

1. J. Millman, C.C.Halkias, Millman's, "Integrated Electronics",Tata McGraw Hill, 2nd Edition, 2001.
2. J. Millman, C.C.Halkias and Satyabrata Jit, "Millman's Electronic Devices and Circuits", Tata McGraw Hill, 2nd Edition, 1998.
3. Mohammad Rashid, "Electronic Devices and Circuits", Cengage learning, 1st Edition, 2014.
4. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5 th Edition, 2009.

Web References:

1. https://archive.org/details/ElectronicDevicesCircuits
2. http://www.tedpavlic.com/teaching/osu/ece327/

XVI. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No.	CLO	Topics to be covered
1-3	Understand the electronic components and identification	Electronic Workshop Practice
4-6	Understand the pn junction diode characteristics.	PN Junction diode characteristics A. Forward bias B. Reverse bias.
7-9	Understand the zener diode characteristics.	Zener diode characteristics and voltage regulator
10-12	Analyze the half wave rectifier output waveform and parameters.	Half wave Rectifier with and without filter.
13-15	Analyze the full wave rectifier output waveform and parameters.	Full wave Rectifier with and without filter.
16-18	Design transistor under CB configuration and analyze its characteristics.	Transistor CB characteristics (Input and Output)
19-21	Design transistor under CE configuration and analyze its characteristics.	Transistor CE characteristics (Input and Output)
22-24	Analyze the amplifier gain using CE and analyze its characteristics.	Frequency response of CE Amplifier
25-27	Analyze the amplifier gain using CC and analyze its characteristics.	Frequency response of CC Amplifier
28-30	Understand UJT characteristics and analyze its characteristics.	UJT characteristics.
31-33	Understand SCR characteristics and analyze its characteristics.	SCR characteristics

34-36	Understand FET characteristics and analyze its characteristics.	FET Characteristics
37-39	Analyze the frequency response of CS amplifier.	Frequency Response Of CS Amplifier
40-42	Analyze the frequency response of CD amplifier gain	Frequency Response Of CD Amplifier

XVII. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed Actions	Relevance With POs	Relevance With PSOs
1	Design of electronic circuits on PCB boards.	Laboratory Practices	PO 1, PO 2,PO 5	PSO 1

Prepared by:
Mrs. G Mary Swarna Latha

HOD, ECE