INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE DESCRIPTOR

Course Title	**ELECTRONIC CIRCUITS AND PULSE CIRCUITS LABORATORY**				
Course Code	AEC102				
Programme	B.Tech				
Semester	IV	ECE			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	-	-	-	3	2
Chief Coordinator	Mrs. N Anusha Assistant Professor				
Course Faculty	Mr. J Sivarama Krishna, Mr. C Srihari, Mr. K Ravi, Mrs. G Swarnalatha Mrs. J Swetha, Mrs. N Anusha, Mr. S Laxmana Chary, Mr. B Naresh				

I. COURSE OVERVIEW:

This laboratory course builds on the lecture course "Electronic circuit analysis" and “pulse and digital circuits” which is mandatory for all students of electronics and communication engineering. The course aims at practical experience with the characteristics and theoretical principles of linear and non linear devices and pulse circuits.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AEC001	III	Electronic Devices and Circuits	3

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Electronic Circuits and Pulse Circuits Lab	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✘	Quiz	✘	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.	2	Lab related Exercises
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.	2	Lab related Exercises

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**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.	2	Lab related Exercises
PSO 2	**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.	-	-
PSO 3	**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.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	To understand different amplifier circuits.
II	To understand different oscillating circuits.
III	To indentify the linear and non linear wave shaping.
IV	To observe the applications of diodes like clippers and clampers.
V	To analyze the switching characteristics of transistor.
VI	To design and illustrate the characteristics of Multivibrators.

IX. 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
AEC102.01	CLO 1	Understand the response of high pass RC and low pass RC circuits to different non sinusoidal inputs with different time constants and identify RC circuit's applications.	PO 1 PO 5	3
AEC102.02	CLO 2	Understand the various clipper circuits using switching components like diodes, transistors and design various clipper circuits with and without reference voltages.	PO 1 PO 2	3
AEC102.03	CLO 3	Formulate clamping circuit theorem and design practical clamping circuits by understanding the different diode clamper circuits.	PO 1 PO 5	3
AEC102.04	CLO 4	Evaluate triggering points, hysteresis width of Schmitt trigger circuit and also design practical Schmitt trigger circuit	PO 1 PO 2	2
AEC102.05	CLO 5	Analyze the multivibrator circuits with applications and evaluate time, frequency parameters.	PO 5	2
AEC102.06	CLO 6	Analyze the unijunction transistor acts as relaxation oscillator.	PO 1 PO 2	2
AEC102.07	CLO 7	Design various amplifier circuits using Bipolar Junction Transistors in Common Emitter, Common Base and Common Collector configurations.	PO 2 PO 5	2
AEC102.08	CLO 8	Apply the usefulness of amplifiers using semiconductor devices in various real time circuit making.	PO 5	2
AEC102.09	CLO 9	Design various sinusoidal Oscillators like RC Phase shift, Hartley and Colpitts oscillator for various frequency ranges.	PO 5	2
AEC102.10	CLO 10	Analyze various types of feedback amplifiers like voltage series, current series, current shunt and voltage shunt.	PO 2	2
AEC102.11	CLO 11	Acquire experience in building and troubleshooting simple electronic analog circuits using Bipolar Junction Transistor.	PO 5	1
AEC102.012	CLO 12	Acquire the knowledge and develop capability to succeed national and international level competitive examinations	PO 1	3

3 = High; 2 = Medium; 1 = Low

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

CLOs	Program Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3				2								1		
CLO 2	2	3											1		
CLO 3	3				3								1		

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

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1, PO 2 PO 5	SEE Exams	PO 1, PO 2 PO 5	Assignments	-	Seminars	-
Laboratory Practices	PO 1, PO 2 PO 5	Student Viva	PO 1, PO 2 PO 5	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

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

XIII. SYLLABUS

LIST OF EXPERIMENTS	
Week-1	**a. Simulate frequency response of common emitter amplifier and common base amplifier.** **b. Design RC low pass and high pass circuit for different time constants.**
Calculate the frequency response of CE and CB amplifier. Calculate the different time constants of RC LPF and HPF.	
Week-2	**a. Simulate frequency response of common emitter amplifier and common base amplifier.** **b. Design RC low pass and high pass circuit for different time constants.**
Calculate the frequency response of CE and CB amplifier. Calculate the different time constants of RC LPF and HPF.	
Week-3	**a.Simulate frequency response of two stage RC coupled amplifier.** **b.Design transfer characteristics of clippers and clampers**
Calculate the frequency response of two stage RC Coupled Amplifier. Verify the transfer characteristics of Clippers and Clampers.	

LIST OF EXPERIMENTS	
Week-4	**a.Simulate frequency response of two stage RC coupled amplifier.** **b.Design transfer characteristics of clippers and clampers**
Calculate the frequency response of two stage RC Coupled Amplifier. Verify the transfer characteristics of Clippers and Clampers.	
Week-5	**a. Simulate a single tuned amplifier.** **b. Design transistor as a switch.**
Calculate the frequency of Single tuned amplifier Calculate the switching times of a transistor.	
Week-6	**a. Simulate a single tuned amplifier.** **b. Design transistor as a switch.**
Calculate the frequency of Single tuned amplifier Calculate the switching times of a transistor.	
Week-7	**a. Simulate voltage series feedback amplifier and current shunt feedback amplifier.** **b. Design different types of multivibrators and plot its waveforms.**
Calculate the frequency response of feedback amplifiers	
Week-8	**a. Simulate voltage series feedback amplifier and current shunt feedback amplifier.** **b. Design different types of multivibrators and plot its waveforms.**
Calculate the frequency response of feedback amplifiers Calculate the RC time constant and plot the waveform of a Multivibrators.	
Week-9	**a. Simulate sine wave generated for a particular frequency by an RC phase shift oscillator.** **b. Design a Schmitt trigger circuit.**
Calculate the frequency of oscillations in RC phase shift oscillator Calculate the LTP ,UTP and plot the waveform of a Multivibrators.	
Week-10	**a. Simulate sine wave generated for a particular frequency by an RC phase shift oscillator.** **b. Design a Schmitt trigger circuit.**
Calculate the frequency of oscillations in RC phase shift oscillator Calculate the LTP ,UTP and plot the waveform of a Multivibrators.	
Week-11	**a. Simulate sine wave generated for a particular frequency by Colpitts and Hartley oscillator.** **b. Design a UJT Relaxation Oscillator.**
Calculate the frequency of oscillations in Colpitts and Hartley oscillator Calculate the negative resistance path of the UJT.	
Week-12	**a. Simulate sine wave generated for a particular frequency by Colpitts and Hartley oscillator.** **b. Design a UJT Relaxation Oscillator.**
Calculate the frequency of oscillations in Colpitts and Hartley oscillator Calculate the negative resistance path of the UJT.	

Text Books:

1. Jacob Millman , Christor C Halkias,- Integrated Electronics‖, Tata McGraw Hill, 1st Edition, 2008.
2. David A.Bell," Solid State Pulse Circuits",PHI learing,4th Edition.

Reference Books:

1. David A. Bell ―Electronic Devices & Circuits‖ 5th Edition, Oxford university press, 7th Edition,
2. 2009.
3. Robert L. Boylestad, Louis Nashelsky, ―Electronic Devices and Circuits Theory, Pearson education, 9 th Edition, 2008.
4. Ronald J.Tocci,"Fundamentals of Pulse and Digital Circuits", PHI learning, 3rd Edition, 2008.

XIV. COURSE PLAN:

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

Week No.	Topics to be covered	CLOs	Reference
1	Calculate the frequency response of CE and CB amplifier. Calculate the different time constants of RC LPF and HPF.	CLO 1, CLO 7	T1-2.1 to 2.7
2	Calculate the frequency response of CE and CB amplifier. Calculate the different time constants of RC LPF and HPF.	CLO 1, CLO 7	T1-20.1 to 20.2
3	Calculate the frequency response of two stage RC Coupled Amplifier. Verify the transfer characteristics of Clippers and Clampers.	CLO 2, CLO 3, CLO 7	T1-8.1 to 8.2
4	Calculate the frequency response of two stage RC Coupled Amplifier. Verify the transfer characteristics of Clippers and Clampers.	CLO 2, CLO 3, CLO 7	T1–8.3 to 8.7
5	Calculate the frequency of Single tuned amplifier Calculate the switching times of a transistor.	CLO 2, CLO 7, CLO 8	T1-10.1 to 10.10
6	Calculate the frequency of Single tuned amplifier Calculate the switching times of a transistor.	CLO 2, CLO 7, CLO 8	T1-10.11 to10.13
7	Calculate the frequency response of feedback amplifiers Calculate the RC time constant and plot the waveform of Multivibrators.	CLO 5, CLO 10	T1-11.1 to 11.5
8	Calculate the frequency response of feedback amplifiers Calculate the RC time constant and plot the waveform of a Multivibrators.	CLO 5, CLO 10	T1 –11.12
9	Calculate the frequency of oscillations in RC phase shift oscillator Calculate the LTP , UTP and plot the waveform of a Multivibrators.	CLO 4, CLO 9	T1–17.1 to 17.6
10	Calculate the frequency of oscillations in RC phase shift oscillator. Calculate the LTP , UTP and plot the waveform of a Multivibrators.	CLO 4, CLO 9	T1–14.1 to 14.3
11	Calculate the frequency of oscillations in Colpitts and Hartley oscillator Calculate the negative resistance path of the UJT.	CLO 6, CLO 9	T1-14.9
12	Calculate the frequency of oscillations in Colpitts and Hartley oscillator Calculate the negative resistance path of the UJT.	CLO 6, CLO 9	T1-19.1 to 19.3

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

S NO	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	To improve standards and analyze the concepts.	Seminars	PO 1, PO 2	PSO 1
2	Conditional probability, Sampling distribution, correlation, regression analysis and testing of hypothesis	Seminars / NPTEL	PO 2, PO5	PSO 1
3	Encourage students to solve real time applications and prepare towards competitive examinations.	NPTEL	PO 5	PSO 1

Prepared by:
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HOD, ECE