FR. Conceicao Rodrigues College Of Engineering

Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50

Department of Computer Engineering

S.E. (Computer) (semester III)

(2019-2020)

Course Outcomes & Assessment Plan

Subject: Electronic Circuits and Communication Fundamentals (CSC304)

Syllabus:

1. **Electronic Circuits: Bipolar junction transistor.**

   Input and Output characteristics, Types of Biasing - Fixed bias, self-bias, voltage divider bias, DC load line and significance, CE amplifier using re model, (Analysis based numericals)

2. **Power Amplifiers:**

   Introduction, Class A and Class C power amplifier. Oscillators: Introduction, Barkhausen criteria, Colpitts oscillator and Crystal oscillator

3. **Electronic Circuits** : **Operational Amplifier and its applications**

   Op-amp – block diagram, parameters and characteristics, applications- Inverting and Non inverting amplifier, Summing Amplifier(Numerical), Difference amplifier, Basic Integrator and Differentiator, Comparator, Zero Crossing Detector (only theory)

4. **Communication Fundamentals: Analog Communication**

   Block diagram and elements of analog communication systems, Theory of amplitude modulation and types of AM (Numerical) Generation of DSB SC using diode based balanced modulator, Generation of SSB using phase shift method, Introduction of FM,and its mathematical representation, Statement of Carson‟s Rule Comparison of AM, FM, Block diagram of AM transmitter (HLM and LLM) Block diagram of AM Superheterodyne receiver

5. **Pulse Modulation and Multiplexing**

   Statement of Sampling Theorem, Generation and detection of PAM, PWM, PPM, PCM, DM and ADM. Principle of TDM using PCM and FDM

6. **Communication Fundamentals**: **Information theory**

   Amount of information, average information, information rate, Statement of Shannon's theorem, channel capacity (Numericals)

Course Outcomes:

Upon completion of this course students will be able to:

CSC304.1: Analyze various analog modulation techniques
CSC304.2: Describe different pulse modulation techniques
CSC304.3: Analyze input-output Characteristics of BJT
CSC304.4: Design op-amp circuits to perform basic mathematical operations

Mapping of CO and PO/PSO

Relationship of course outcomes with program outcomes: Indicate 1 (low importance), 2 (Moderate Importance) or 3 (High Importance) in respective mapping cell.

	PO1 (Engg Know)	PO2 (Ana)	PO3 (De sign)	PO4 (inve stiga)	PO5 (tools)	PO6 (engg Soci)	PO7 (Env)	PO8 (Eth)	PO9 (ind Team)	PO10 (com.)	PO11 (PM)	PO12 (life Long)
CSC304.1	3	3										1
CSC304.2	3	1										1
CSC304.3	3	3	3		1							1
CSC304.4	3	3	3		1							1
Course To PO	3	2	3		1							1

CO	PSO1	PSO2
CSC304.1	3	
CSC304.2	3	
CSC304.3	3	
CSC304.4	3	
Course to PSO	3	

Justification

PO1: All COs are mapped to PO1 because engineering graduates will be able to apply the knowledge of **mathematics** & **electronics and Communication fundamentals** to solve complex engineering problems.

Level 3 - The course demands mathematical concept to be applied to solve given problems. Also basic knowledge of electronics fundamental is required.

PO2: CSC304.1 and CSC304.2 is mapped to PO2 because students will compare, contrast and analyze Analog and Digital Communication. CSC304.3 and CSC304.4 are mapped to PO2 because the students will analyze the operation of BJT and op-Amp.

PO3: CSC304.3 and CSC304.4 are mapped to PO3 because the students **design** the electronic circuits and implement them using hardware components.
Level 3: Because the course involves designing of various circuits, students actually design the circuit and implement it in laboratory.

PO5:
CSC304.3 and CSC304.4 are mapped to PO5 because students use advance tool such as SPICE to analyze the basic electronic circuits.
Level 1 -Since basic analysis is done using SPICE.

PO12: All Cos are mapped to PO12, as this is basic of communication and electronics which they will be learning lifelong

PSO1: All COs are mapped to PSO1 because the graduates will be able to apply knowledge of Electronics and communication to simulate the real world problem.

Course Outcomes Target:

Upon completion of this course students will be able to:

CSC304.1: Analyze various analog modulation methods (level 2.5)
CSC304.2: Describe different pulse modulation techniques (level 2.5)
CSC304.3: Analyze input-output Characteristics of BJT (level 2.5)
CSC304.4: Design op-amp circuits to perform basic mathematical operations (level 2.5)

CO Assessment Tools:

CSC304.1: Analyze various analog modulation techniques

Direct Methods(80%): Test 1 + assignment + Lab + UniExamTh + UniExam Pr

CO1dm = 0.2T1 + 0.2 A+ 0.2 lab + 0.2UTh + 0.2 UPr

InDirect Methods(20%): Course exit survey

CO1idm

CSC302.1 = 0.8*CO1dm + 0.2* CO1idm

Direct Methods	Weightage	Target	Date	Marks
Test 1	0.2	60% students will score minimum	16-Aug-2019	Q-1 (10M)

		60% marks (i.6. 6 or more out of 10)		
Assignment	0.2	70% students will score minimum 70% marks (i.e. 7 or more out of 10)	3rd week of July	10M
Lab	0.2	60% students will score minimum 60% marks (i.6. 12 or more out of 20)	3th week of July	20M
Uni Theory exam	0.2	60% students will score minimum 60% marks (i.e. 48 or more out of 80)		80M
Uni. Practical Exam	0.2	60% students will score minimum 60% marks (i.6. 15 or more out of 25)		25M

CSC304.2: Describe different pulse modulation techniques

Direct Methods(80%): Test 1 + Lab + Module Test + UniExamTh + UniExam Pr

CO1dm = 0.2T1 + 0.3 Lab + 0.1 Module Test + 0.2UTh + 0.2 UPr

InDirect Methods(20%): Course exit survey

CO1idm

CSC302.1 = 0.8*CO1dm + 0.2* CO1idm

Direct Methods	Weightage	Target	Date	Marks
Test 1	0.2	60% students will score minimum 60% marks (i.6. 6 or more out of 10)	16-Aug-2019	Q-1 (10M)
Lab	0.3	70% students will score minimum 70% marks (i.e. 7 or more out of 10)	Experiments	10M
Module Test	0.1	60% students will score minimum 60% marks (i.6. 12 or more out of 20)	4th week of July	20M
Uni Theory exam	0.2	60% students will score minimum 60% marks (i.e. 48 or more out of 80)		80M
Uni. Practical Exam	0.2	60% students will score minimum 60% marks (i.6. 15 or more out of 25)		25M

CSC304.3: Analyze input-output Characteristics of BJT

Direct Methods(80%): Test 2 + Lab + Assignment + UniExamTh + UniExam Pr

CO1dm = 0.2T1 + 0.2 Lab + 0.2 A+ 0.2UTh + 0.2 UPr

InDirect Methods(20%): Course exit survey

CO1idm

CSC302.1 = 0.8*CO1dm + 0.2* CO1idm

Direct Methods	Weightage	Target	Date	Marks

Test 1	0.2	60% students will score minimum 60% marks (i.6. 6 or more out of 10)	16-Aug-2019	Q-1 (10M)
Lab	0.2	70% students will score minimum 70% marks (i.e. 7 or more out of 10)	Experiments	10M
Assignment	0.2	70% students will score minimum 70% marks (i.6. 12 or more out of 20)	4th week of August	20M
Uni Theory exam	0.2	60% students will score minimum 60% marks (i.e. 48 or more out of 80)		80M
Uni. Practical Exam	0.2	60% students will score minimum 60% marks (i.6. 15 or more out of 25)		25M

CSC304.4: Design op-amp circuits to perform basic mathematical operations

Direct Methods(80%): Test 2 + Lab + Assignment + UniExamTh + UniExam Pr

CO1dm = 0.2T1 + 0.2 Lab + 0.2 A + 0.2UTh + 0.2 UPr

InDirect Methods(20%): Course exit survey

CO1idm

CSC302.1 = 0.8*CO1dm + 0.2* CO1idm

Direct Methods	Weightage	Target	Date	Marks
Test 1	0.2	60% students will score minimum 60% marks (i.6. 6 or more out of 10)	16-Aug-2019	Q-1 (10M)
Lab	0.2	70% students will score minimum 70% marks (i.e. 7 or more out of 10)	Experiments	10M
Assignment	0.2	60% students will score minimum 60% marks (i.6. 12 or more out of 20)	2nd week of September	20M
Uni Theory exam	0.2	60% students will score minimum 60% marks (i.e. 48 or more out of 80)		80M
Uni. Practical Exam	0.2	60% students will score minimum 60% marks (i.6. 15 or more out of 25)		25M

Curriculum Gap:

As it is a basic subject, so no prerequisite required for this.

Content Beyond Syllabus:

Fundamentals of digital communication (ASK and FSK)

In order to understand current applications, trends and new directions in Communication following topics shall be covered

Sr.No.	Curriculum gap contents	Action Plan
1	ASK and DPSK	Self Learning Resourses

List of Experiments with CO mapping

Sr. No	Title	CO	Planned Date	Actual date
1.	Study of electronic components and measuring instruments	-	3rd week of July	
2.	Modulation and Demodulation of AM.	CO1	4th week of July	
3.	Modulation and Demodulation of FM.	CO1	4th week of July	
4.	Sampling and Reconstruction	CO2	5th week of July	
5.	Time Division Multiplexing(TDM)	CO2	2nd week of August	
6.	Pulse Modulation Techniques (PAM, PWM and PPM)	CO2	2nd week of August	
7.	Implementation of inverting, non inverting amplifier using IC741.	CO3	4th week of August	
8.	Implementation of adder and subtractor using IC 741.	CO4	5th week of August	
9.	Implementation of differentiator and integrator using IC741	CO4	2nd week of September	
10.	Implementation of single stage BJTamplifier.	CO3	3rd week of September	
11.	Simulation of BJT using tool(SPICE)	CO4	4th week of September	

Rubrics for Experiments:

Indicator	Poor	Average	Good	Excellent
Timeline (2)	More than two session late (0)	Two sessions late (1)	One session late (1.5)	Early or on time (2)
Analysis of problem and Circuit optimization (2)	Failed to do proper analysis , Very complex circuit(0.5)	Analysis done. The circuit is structured but unnecessary lengthy (1.5)	N.A.	Detailed analysis done. The circuit is structured and efficient.(2)
Output (4)	Failed to implement a complete design. Partial implementation. No output (1)	Hardware implementation done but failed to show output due to some error. (2)	Hardware implementation done. Output shown but some of the test cases not working. (3)	Expected output shown. All test cases verified. (4)
PostLab Assignment (2)	Not able to solve(0)	Able to solve 25% (1)	Able to solve 50%(1.5)	Able to solve all questions(2)

Rubrics for Assignments:

Indicator	Very Poor	Poor	Average	Good	Excellent
Timeline (2)	Assignment not submitted (0)	More than one week late (0.5)	Two weeks late (1)	One week late (1.5)	Early or on time (2)
Organization (2)	N/A	Very poor readability and not structured (0.5)	Poor readability and somewhat structured (1)	Readable with one or two mistakes and structured (1.5)	Very well written and structured without any mistakes (2)
Solution (3)	N/A	All solutions incorrect (0)	More than 50% Solutions are incorrect (1)	20-30% solutions incorrect (2)	All problems solved correctly (3)
Depth and breadth discussion (3)	N/A	None in evidence; superficial at most (0.5)	Minor points/information may be missing and discussion is minimal (1)	Discussion centers on some of the points and covers them adequately (2)	Information is presented in depth and is accurate (3)

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Lesson Plan: Electronic Circuits and Communication Fundamentals

Semester III **Year: 2019-20**

Modes of Content Delivery:

I	Class Room Teaching	v	Self Learning Online Resources	Ix	Industry Visit
Ii	Tutorial	vi	Slides	X	Group Discussion
Iii	Remedial Coaching	vii	Simulations/Demonstrations	xi	Seminar
Iv	Lab Experiment	viii	Expert Lecture	xii	Case Study

Lect. No.	Portion to be covered	Planned date	Actual date	Content Delivery Method/Learning Activities
	Module1: Fundamentals of Analog Communication			
1	Block diagram and elements of analog communication systems	**2-7-2019**		Class Room Teaching
2	Theory of amplitude modulation and types of AM (Numerical)	**3-7-2019**		Class Room Teaching & Lab Experiment
3	Theory of amplitude modulation and types of AM (Numerical)	**4-7-2019**		Class Room Teaching & Lab Experiment
4	Theory of amplitude modulation and types of AM (Numerical)	**5-7-2019**		Class Room Teaching & Lab Experiment
5	Theory of amplitude modulation and types of AM (Numerical)	**9-7-2019**		Class Room Teaching & Lab Experiment
6	Generation of DSB SC using diode based balanced modulator	**10-7-2019**		Class Room Teaching & Slides
7	SSB using phase shift method	**11-7-2019**		Class Room Teaching & Slides
8	Introduction of FM,and its mathematical representation	**12-7-2019**		Class Room Teaching & Lab

				Experiment
9	Statement of Carson‟s Rule Comparison of AM, FM, Block diagram of AM transmitter (HLM and LLM) Block diagram of AM	**15-7-2019**		Class Room Teaching & Lab Experiment
10	Superheterodyne receiver	**16-7-2019**		Class Room Teaching & slides
	Module 2: Pulse Modulation and Multiplexing			
11	Statement of Sampling Theorem, of PAM, PWM, PPM, PCM, DM and ADM. Principle of TDM using PCM and FDM	**17-7-2019**		Class Room Teaching & Lab Experiment
12	Generation and detection of PAM	**18-7-2019**		Class Room Teaching & Lab Experiment
13	Generation and detection of PWM	**19-7-2019**		Class Room Teaching & slides
14	Generation and detection of PPM	**22-7-2019**		Class Room Teaching & slides
15	Generation and detection of PCM	**23-7-2019**		Class Room Teaching & slides
16	Generation and detection of DM and ADM	**24-7-2019**		Class Room Teaching & Lab Experiment
17	Principle of TDM using PCM and FDM	**26-7-2019**		Class Room Teaching & Lab Experiment
18	Module Test1	**29-7-2019**		
	Module 3: Information theory			
19	Amount of information, average information, information rate, Statement of Shannon's theorem, channel capacity (Numericals)	**30-7-2019**		Class Room Teaching & slides
20	information rate, Statement of Shannon's theorem	**31-7-2019**		Class Room Teaching
21	information rate, Statement of Shannon's theorem	**2-8-2019**		Class Room Teaching & slides
22	channel capacity (Numericals)	**5-8-2019**		Class Room Teaching & slides

23	channel capacity (Numericals)	**6-8-2019**		Class Room Teaching & slides
	Module 4: Electronic Circuits : Operational Amplifier and its applications			
24	Op-amp – block diagram, parameters and characteristics,	**7-8-2019**		Class Room Teaching & Lab Experiment
25	Inverting and Non inverting amplifier,	**9-8-2019**		Class Room Teaching, Lab Experiment
26	Summing Amplifier(Numerical),	**19-8-2019**		Class Room Teaching
27	Applications of Opamp- Difference amplifier	**20-8-2019**		Class Room Teaching & Lab Experiment
28	Basic Integrator and Differentiator	**21-8-2019**		Class Room Teaching & slides
29	Comparator, Zero Crossing Detector	**23-8-2019**		Class Room Teaching & slides
30	Comparator, Zero Crossing Detector	**26-8-2019**		Class Room Teaching & slides
31	Module Test2	**27-8-2019**		
	Module 5: Power Amplifiers			
30	Introduction, Class A and Class C power amplifier.,	**28-8-2019**		Class Room Teaching
31	Oscillators: Introduction, Barkhausen criteria	**30-8-2019**		Class Room Teaching
32	Colpitts oscillator and Crystal oscillator	**9-9-2019**		Class Room Teaching
33	Colpitts oscillator and Crystal oscillator	**11-9-2019**		Class Room Teaching
Module 6: Electronic Circuits: Bipolar junction transistor				
34	Input and Output characteristics (Analysis based numericals)	**13-9-2019**		Class Room Teaching
35	Types of Biasing - Fixed bias, self-bias	**16-9-2019**		Class Room Teaching & Lab Experiment
36	voltage divider bias, DC load line and significance	**17-9-2019**		Class Room

				Teaching & Lab Experiment
37	CE amplifier using re model	**18-9-2019**		Class Room Teaching & Lab Experiment
38	(Analysis based numericals)	**20-9-2019**		Class Room Teaching & slides
39	(Analysis based numericals)	**23-9-2019**		Class Room Teaching & slides
40	Revision	**24-9-2019**		Class Room Teaching & slides
41	Revision	**25-9-2019**		Class Room Teaching & slides
42	Question paper Solution	**27-9-2019**		Class Room Teaching & slides
43	Question paper Solution	**30-9-2019**		Class Room Teaching & slides
44	Question paper Solution	**1-10-2019**		Class Room Teaching & slides
45	Question paper Solution	**4-10-2019**		Class Room Teaching & slides

Text Books/ Reference Books:

Te x t B o o k s :

1. Robert Boylestad, „Electronic Devices and circuit Theory", Prentice Hall.

2. D Roy Choudhury, „ Linear integrated Circuits" New Age International Ltd

3. G. Kennedy, B. Davis, S R M Prasanna, „Electronic Communication Systems", McGraw Hill, 5th Edition.

4. Wayne Tomasi, „Electronic Communication Systems (fundamentals through advanced)", Pearson Education, 4th Edition.

5. K. Sam Shanmugam," Digital and analog communication systems", Wiley.

Reference Books:

1. Donald Neamen, „Electronic Circuit Analysis and Design", Tata McGraw Hill,2nd Edition.
2. K. R. Botkar, „Integrated Circuits", Khanna Publishers, 9th Edition
3. Simon Haykin, „Digital Communication systems", Wiley.
4. David Bell, „Electronic Devices and Circuits", Oxford, 5th Edition.
5. Ramakant A. Gayakwad, „Op-amp and linear integrated circuits", PHI, 3rd edition.