INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF ELECTRICAL AND ELECRONICS ENGINEERING

COURSE PLAN PART I					
Name of the programme and specialization	**B.Tech. – Electrical and Electronics Engineering**				
Course Title	**ANALOG ELECTRONIC CIRCUITS**				
Course Code	**EEPC14**		**No. of Credits**	**03**	
Course Code of Pre-requisite subject(s)	**EEPC10**				
Session	**January 2019**		**Section**	**A**	
Name of Faculty	**Dr. N. Ammasai Gounden**		**Department**	**EEE**	
Official Email	**ammas@nitt.edu**		**Telephone No.**	**0431-2503253**	
Name of Course Coordinator(s) (if, applicable)	**-NA-**				
Official E-mail	**-NA-**		**Telephone No.**	**-NA-**	
Course Type	✓	**Core course**		**Elective course**	

Syllabus (approved in BoS)

- Small signal amplifiers - biasing circuits of BJT and FET transistors, analysis and design of BJT and FET amplifiers, chopper stabilized amplifiers
- Large signal amplifiers – analysis and design of class A and class B power amplifiers, class C and class D amplifiers, thermal considerations, tuned amplifiers
- Feedback amplifiers – gain with feedback - effect of feedback on gain stability, distortion, bandwidth, input and output impedances; topologies of feedback amplifiers
- Oscillators – Barkhausen criterion for oscillation - Hartley & Colpitts oscillators - phase shift, Wien bridge and crystal oscillators - 1lap oscillator – oscillator amplitude stabilization
- Pulse circuits – attenuators – RC integrator and differentiator circuits – diode clampers and clippers – multi-vibrators - Schmitt Trigger- UJT Oscillator

COURSE OBJECTIVES

To give a comprehensive exposure to all types of amplifiers, oscillators and multivibrators constructed with discrete components such as BJTs and FETs. This helps to develop a strong basis for building linear and digital integrated circuits.

MAPPING OF COs with POs	
Course Outcomes	**Programme Outcomes (PO)**
Upon completion of the course, the students will be able to	
1. Understand the working of different types of amplifier, oscillator and multivibrator circuits.	**2,3,8,9**
2. Design BJT and FET amplifier and oscillator circuits.	**1,2,8,9**
3. Analyze transistorized amplifier and oscillator circuits.	**1,2,8,9**
4. Understand the applications of different types of amplifier, oscillator, attenuators and multivibrator circuits.	**1,2,3,8,9**

COURSE PLAN – PART II

COURSE OVERVIEW

The foundation of electronic circuits is establised by the study of the two transistor types namely BJT and FET. The various types of amplifiers and oscillators in which the transistors are operated in linear mode and the multi-vibrator circuits in which the transistors are operated in switching mode will be discussed in depth. This course is a classical course which will present discrete version of transistor amplifiers and oscillators. Much reading, thinking, problems solving and laboratory experience are required to have a comprehensive understanding of this course.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1.	2nd week of January '20 (8 to 10) **(3 Contact Hours)**	) Introduction to the course; Difference between amplifiers, Oscillators and Multi-vibrators;) Linear and switching mode; Biasing, Q point selection, DC and AC load lines,) Instability factors, Expression for stability factor; Analysis of fixed bias and collector to base bias circuits	Lecture / Tutorial C & T / PPT or any suitable mode
2.	3rd week of January '20 (16 to 17) **(2 Contact Hours)**	) Analysis of potential divider bias circuit; Fundamentals of amplifiers;) Common Emitter amplifier (RC coupled): Role of biasing circuit and coupling and emitter bypass capacitors; Mid frequency analysis;	

3.	4th week of January '20 (22 to 24) **(3 Contact Hours)**	) Effect of cascading on the I -stage; Analysis of common emitter amplifier with R_E un-bypassed; Analysis of LFR using HPF) Analysis of LFR using actual equivalent circuit; Analysis of HFR using LPF;) Analysis of HFR using actual equivalent circuit; concept of Miller's Theorem;	Lecture / Tutorial C & T / PPT or any suitable mode
4.	5th week of January '20 (29 to 31) **(3 Contact Hours)**	) Design of common emitter amplifier – Selection of C_c and C_E; Analysis of common collector amplifier; Expressions for A_V, R_i & R_o.) Applications of common collector amplifier as a buffer in cascading of common emitter amplifier stages;) Darlington amplifier – advantages; biasing problem; Boot strapping amplifier;	
5.	1st week of February '20 (5 to 7) **(3 Contact Hours)**	) Introduction to FET biasing; Self bias and potential divider bias circuits with graphical analysis;) AC equivalent circuit of JFET; Analysis of common source amplifier; Design aspects of FET amplifier;) Solving Tutorial problems	
6.	2nd week of February '20 (12 to 14) **(3 Contact Hours)**	) **(Case study 1:** Application of Darlington Emitter Follower in SCR circuits.)) Direct coupled amplifier – Introduction, advantages and drawback;) Differential amplifier: construction, modes of operation and analysis with constant current source.	
7.	3rd week of February '20 (19 to 21) **(3 Contact Hours)**	) **(Assessment-3(1) : Solving numerical examples – 10 marks**)) Introduction to feedback amplifiers; advantages of negative feedback; history of negative feedback; Effect of negative feedback on gain stability,) N/L distortion and bandwidth, input and output impedances.	

8.	4th week of February '20 (26 to 28) **(3 Contact Hours)** **26.02.2020: 50 minutes**	) Topologies of feedback amplifier; sampling and mixing circuits; Details of voltage series, voltage shunt, current series and current shunt amplifiers;) Rules for Identification of topology; to obtain amplifier without feedback; Analysis of voltage series and voltage shunt feedback amplifiers;) **(Assessment - 1) Written test**	
9.	1st week of March '20 (4 to 6) **(3 Contact Hours)**	) Analysis of current series and current shunt amplifiers.) Analysis of two stage voltage series feedback amplifiers;) Tutorial problems on feedback amplifiers and solutions.	Lecture / Tutorial C & T / PPT or any suitable mode
10.	2nd week of March '20 (11 and 12) **(2 Contact Hours)**	) **Case Study 2** : Application of negative feedback in DC – DC converters.) Power amplifiers – introduction, classification of power amplifiers	
11.	3rd week of March '20 (18 and 20) **(3 Contact Hours)**	) why VA can't be used as a power amplifier; Construction and analysis of class A power amplifier) How $V_{CE} = 2V_{CC}$ in class - A power amplifier.) **(Assessment-3 (2) : Solving numerical examples – 10 marks**)	
12.	4th week of March '20 (25 to 27) **(3 Contact Hours)**	) Working and analysis of class B power amplifier (basic circuit) – Class B push pull power amplifier without transformer and with a single power supply;) Thermal runaway; $P_{D(max)} = 0.4\ P_{o(max)}$;) Oscillators: Principle of working; RC and LC oscillator; FET phase shift oscillator – construction and working.	
13.	1st week of April '20 (1 to 3) **(3 Contact Hours)**	) Wein bridge oscillators; LC oscillators: introduction and classification - Colpitts and Hartley;) UJT oscillator working, analysis and application in SCR circuits. **Case study 3:** Application of UJT oscillator in firing SCRs in a 1- phase bridge; variation of α with R; ZCD implementation.	

14.	2nd and 3rd week of April '20 (8 and 9,15 and 16) **(4 Contact Hours)** **08.04.2020: 50 minutes**	) Astable and Monostable Multi-vibrator: working and analysis; Expression for pulse-on time, T in Astable Multi-vibrator;) Bistable Multi-vibrator – working and design problems; RC attenuators, response of compensated attenuator;) Tutorial problems.	
15.	4th week of July'20 Between 20.07.2020 and 31.07.2020	**Assessment 4 – Written Test**	

COURSE ASSESSMENT METHODS (shall range from 4 to 6**)**

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment-1 **(Written test)**	completed	50 minutes	30
2	Assessment-2 **(Written test)**	2nd week of July '20	50 minutes	10
3	Assessment-3 Assignment / Open book test (2 Nos. each for 15 marks)	completed		30
4	Compensation Assessment **(Written test)**	2nd week of July '20	50 minutes	30
5	Assessment-4 End Semester **(Written test)**	4th week of July '20 Between 20.07.2020 and 31.07.2020	90 minutes	30

***mandatory; refer to guidelines on page 7**

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

- Feedback from the students during class committee meetings
- Anonymous feedback through questionnaire

COURSE POLICY (including compensation assessment to be specified**)**

1. The above course has 4 assessments in total (A1, A2, A3 (1), A3 (2) and A4) of which A2,A3(1) and A3(2) and A4 are open book tests.
2. The compensation assessment will be held in the 2nd week of July(on-line) which will include the portions of A1 and A2.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

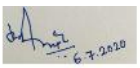
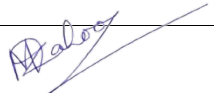
ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programme.

ADDITIONAL INFORMATION, IF ANY

- The faculty is available for consultation at times as per the intimation given by the faculty.
- Queries may also be emailed to the faculty directly to **ammas@nitt.edu**

FOR APPROVAL

Course Faculty  **CC- Chairperson**  **HOD** _____

Guidelines

a) The number of assessments for any theory course shall range from 4 to 6.

b) Every theory course shall have a final assessment on the entire syllabus with at least 30% weightage.

c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.

d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	**2017**	**2016**	**2015**	
35% or (Class average/2) whichever is greater.		(Peak/3) or (Class Average/2) whichever is lower		40%

e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.

f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.

g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.