Subject Code	Subject Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW	Tutorial	Total
ETC 302	Analog Electronics I	4	--	--	4	--	--	04

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical and Oral	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. Of Test 1 and Test 2					
ETC 302	Analog Electronics I	20	20	20	80	--	--	--	100

Course pre-requisite:

- FEC102: Applied Physics I
- FEC105: Basic Electrical and Electronics Engineering

Course objectives:

- To understand physical operation of semiconductor devices
- To understand DC and AC models of semiconductor devices
- To apply concepts of DC and AC modeling of semiconductor devices for the design and analysis
- To verify the theoretical concepts through laboratory and simulation experiments.

Course outcomes:

After completion of this course students will be:

- Able to understand the current voltage characteristics of semiconductor devices.
- Able to understand and relate dc and ac models of semiconductor devices with their physical Operation.
- Able to perform design and analysis of electronic circuits
- Able to design analog system and components

Module No.	Unit No.	Topics	Hrs.
1.0		**Diodes and their Applications**	**08**
	1.1	**PN Junction Diode:** Diode current equation, effect of temperature on diode characteristics, breakdown mechanism, diode as a switch, small signal model	
	1.2	**Clippers and Clampers**: Voltage transfer characteristics, series and shunt clippers, single diode series and shunt clamper circuits	
	1.3	**Other PN junction devices:** Construction and operation of Varactor diode, photodiode, Schottkey diode	
2.0		**Field Effect Transistors**	**08**
	2.1	**Junction Field Effect Transistor (JFET):** Construction, working, regions of operation, transfer (V_{GS}, Vs, I_D) and output (V_{DS}, Vs, I_D) characteristics, Schockely equation	
	2.2	**Metal-Oxide Semiconductor Field Effect Transistor (MOSFET):** **E-MOSFET:** MOS capacitor, energy band diagram of MOS capacitor in accumulation, depletion and inversion region, concept of threshold voltage, operation of MOSFET, derivation of threshold voltage and drain current, body effect, channel length modulation **D-MOSFET**: Construction and working	
3.0		**DC Analysis of Transistor Circuits**	**10**
	3.1	**Bipolar Junction Transistor:** Review of BJT characteristics, DC load line and regions of operation, transistor as a switch, DC analysis of common BJT circuits, analysis and design of fixed bias, collector to base bias and voltage divider bias, stability factor analysis	
	3.2	**Junction Field Effect Transistor:** Analysis and design of self bias and voltage divider bias	
	3.3	**MOSFET:** DC load line and region of operation, common MOSFETs configurations, analysis and design of biasing circuits	
4.0		**Small Signal Analysis of BJT Amplifiers**	**10**
	4.1	**BJT CE Amplifier:** Understanding of amplification concept with reference to input/output characteristics, AC load line analysis, definition of amplifier parameters Z_i, Z_0, A_v and A_i, graphical analysis to evaluate parameters	
	4.2	**Small Signal mid Frequency Models:** Hybrid-pi model, early effect, h-parameter model	
	4.3	**Small Signal Analysis:** Small signal analysis (mid-frequency) (Z_i, Z_0, A_v and A_i) of CE, CB, and CC configurations using hybrid-pi model, comparison between CE, CB, and CC configurations with reference to parameters	
5.0		**Small Signal Analysis of FET Amplifiers**	**08**
	5.1	**JFET CS Amplifier:** Small signal equivalent circuit and analysis (mid-frequency) (Z_i, Z_0 and A_v)	
	5.2	**E-MOSFET Amplifier:** Graphical analysis to evaluate parameters, AC load line, small signal model, small signal (mid-frequency) analysis of CS, CD and CG amplifiers	
6.0		**Oscillators (no numericals)**	**08**
	6.1	**Concepts of Oscillator:** Concept of negative and positive feedback and conditions for oscillation	
	6.2	**RC oscillators**: Phase shift and Wein bridge	
	6.3	**LC Oscillators**: Hartley, Colpitts and Clapps	
	6.4	**Tuned Oscillator**: Twin-T oscillator and crystal oscillator	
		Total	**52**

Text Books:

1. Donald A. Neamen, *"Electronic Circuit Analysis and Design",* Tata McGraw Hill, 2nd Edition
2. Adel S. Sedra, Kenneth C. Smith, and Arun N Chandorkar, *"Microelectronic Circuits Theory and Applications",* International Version, OXFORD International Students, Sixth Edition

Recommended Books:

1. Sung-Mo Steve Kang, and Yusuf Leblebici*, "CMOS Digital Integrated Circuits Analysis and Design",* TATA McGraw Hill,
2. S. Salivahanan*,* N. Suresh Kumar, *"Electronic Devices and Circuits",* Tata Mc-Graw Hill, 3rd Edition
3. Jacob Millman*,* Christos C Halkias and Satyabrata G., *"Millman's Electronic Devices and Circuits",* Mc-Graw Hill, 3rd Edition
4. Muhammad H. Rashid, *"Microelectronics Circuits Analysis and Design",* Cengage Learning, 2nd Edition
5. Anil K. Maini and Varsha Agrawal*, "Electronic Devices and Circuits",* Wiley Publications

Internal Assessment (IA):
Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the tests will be considered for final Internal Assessment.

End Semester Examination:
1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. The students need to solve total 4 questions.
3. Question No.1 will be compulsory and based on entire syllabus.
4. Remaining question (Q.2 to Q.6) will be selected from all the modules.