

# ANALOG ELECTRONICS

(Core Subject)

<b>Course Code:</b>	10B11EC312	<b>Semester:</b>	3rd Semester, B. Tech (ECE)
<b>Credits:</b>	4	<b>Contact Hours:</b>	L-3, T-1, P-0

## Course Objectives

The objectives are to study

1. To give the idea about fundamental properties of semiconductors.
2. To prepare students to perform the analysis of any Analog electronics circuit.
3. To empower students to understand the design and working of BJT / FET amplifiers, oscillators and Operational Amplifier.
4. To prepare the students for advanced courses in Communication system Circuit Design.

## Course Outcomes

1. Acquire basic knowledge of physical and electrical conducting properties of semiconductors.
2. Develop the Ability to understand the design and working of BJT / FET amplifiers.
3. Able to design amplifier circuits using BJT s And FET's. and observe the amplitude and frequency responses of common amplifier circuits
4. Observe the effect of negative feedback on different parameters of an Amplifier and different types of negative feedback topologies.
5. Observe the effect of positive feedback and able to design and working of different Oscillators using BJTS.
6. Develop the skill to build, and troubleshoot Analog circuits.

## Course Content

Unit	Topics	References (chapter number, page no. etc)	Lectures
<b>1</b>	<b>Review of Semiconductors</b> Intrinsic and extrinsic semiconductors, Effect of temperature and doping on carrier mobility, PN junction under thermal equilibrium, Contact potential and Formation of depletion layer, Effect of bias on PN junction, Calculation of electric field and potential distribution, Diode resistances, Junction capacitance, Diffusion equations and Einstein relation, Carrier injection and diffusion process, Low and high level injection, Electron and hole diffusion coefficient and diffusion current, Diffusion length	<b>Chap- 1,3,4,5</b> <b>B.G.</b> <b>Streetman</b>	<b>10</b>

<b>2</b>	<b>AC Analysis of BJT Amplifiers</b> BJT small signal model, Transistor $r_e$ model, Fixed bias, Self bias, Collector feedback, voltage divider bias, common base, Emitter follower, Effect of $R_L$ and $R_s$ , Cascade, Cascode, Darlington pair, Feedback pair, Hybrid equivalent model, relationship between h-parameter and $r_e$ model of CE, CB and CC configuration Low frequency response of BJT amplifier Multistage frequency response.	<b>Chap-7,8,9,11,12</b>  <b>R L Boylestad</b>	<b>10</b>
<b>3</b>	<b>AC Analysis of FET Amplifiers</b> JFET small signal model, Fixed bias, Self bias, voltage divider bias, common gate, source follower, MOSFETs, effect of $R_L$ and $R_{sig}$ , Cascade configuration	<b>Chap-10</b>  <b>R L Boylestad</b>	<b>6</b>
<b>4</b>	<b>Feedback Amplifier</b> Feedback concept, negative & positive feedback, voltage/ current, series/shunt feedback, Practical feedback circuits, Design Procedure for the feedback amplifiers.	<b>Chap-17</b>  <b>R L Boylestad</b>	<b>5</b>
<b>5</b>	<b>Oscillators</b> Berkhausen criterion, Colpitts, Hartley's, Phase shift, Wein bridge and crystal oscillators.	<b>Chap-17</b>  <b>R L Boylestad</b>	<b>5</b>
<b>6</b>	<b>Power Amplifiers</b> Class A, B, AB, C and D amplifiers, Conversion efficiency, and Design of Tuned amplifier using BJT.	<b>Chap-15</b>  <b>R L Boylestad</b>	<b>5</b>

## Evaluation Scheme

1. Test 1 :15 marks
2. Test 2 : 25 marks
3. Test 3 : 35 marks
4. **Internal Assessment** : 25 marks
  - 10 Marks : Class performance, Tutorials & Assignments
  - 10 Marks : Quizzes
  - 5 marks : Attendance

## Text Books

1. B.G. Streetman: Solid State Electronic Devices, 5<sup>th</sup> Ed., Prentice Hall, 2000
2. R L Boylestad and Nachelsky: Electronic Devices & circuit Theory, 10<sup>th</sup> Ed.Pearson.

## Reference Books

1. S.M.Sze: Semiconductor Devices: Physics & Technology, John Wiley, 2002.
2. Adel S. Sedra, Kenneth C. Smith : Microelectronics Circuits, 5th Ed., Oxford University Press, 2004