BSc. (H) Instrumentation
Category-I

DISCIPLINE SPECIFIC CORE COURSE -1 (DSC-1) –: Analog Electronics (INDSC1A)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (If any)
		Lecture	Tutorial	Practical/ Practice		
Analog Electronics (INDSC1A)	04	03	-	01	Course Admission Eligibility	Nil

Learning Objectives

The Learning Objectives of this course are as follows:

- To impart in-depth knowledge of semiconductor devices & circuits focusing on many aspects of design & analysis
- To design various biasing configurations for transistor circuits
- To provide knowledge of amplifiers and their design
- To introduce the concept of feedback for designing oscillators

Learning outcomes

The Learning Outcomes of this course are as follows:

- Understand the working of the diode circuits
- Analyze analog circuits and their applications using active devices
- Understand the design of feedback circuits and use them in amplifiers and Oscillators
- Explain the operation of various oscillator circuits

SYLLABUS OF DSC-1

UNIT – I **(12 Hours)**

Diode and its application: Introduction to semiconductor materials, intrinsic & extrinsic semiconductors. PN junction diode: Depletion region, Junction capacitance, Construction, and Working, Diode equation, Effect of temperature on reverse saturation current, Ideal diode. Diode applications: clipper circuits, clamping circuits, Half wave rectifier, center-tapped, and bridge full-wave rectifiers, calculation of efficiency and ripple factor. DC power supply: Block diagram of regulated power supply, Zener diode as a voltage regulator.

UNIT – II **(12 Hours)**

Bipolar Junction Transistor (BJT): NPN and PNP transistors, current components in BJT, Transistor amplifying action, Input and Output characteristics of BJT for CE, CB, CC

configurations (cut-off, active, and saturation regions), CE configuration as a two- port network: h-parameters, h- parameter equivalent circuit.

UNIT – III **(12 Hours)**

BJT Biasing: Fixed bias, collector to base bias, emitter bias, and voltage divider bias circuits.
CE amplifier and frequency response: dc and ac load line analysis, Hybrid equivalent of CE, the frequency response of CE amplifier.
Introduction to Power Amplifiers: Class A, Class B, Class AB, and Class C

UNIT – IV **(9 Hours)**

Feedback Amplifiers and Oscillators: Concept of feedback, negative and positive feedback, Negative feedback: advantages and disadvantages of negative feedback, voltage (series and shunt), current (series and shunt) feedback amplifiers, derivation of gain, input and output impedances for feedback amplifiers. Oscillators: Barkhausen criteria for sustained oscillations, Study of phase shift oscillator, Colpitt's oscillator, and Crystal oscillator.

Practical component- **(30 Hours)**

1. To study I-V characteristics of PN junction and Zener diodes in forward and reverse bias configurations.
2. To study clipping and clamping circuits.
3. To study the Half wave rectifier and full-wave rectifier.
4. To design the power supply with capacitor filter
5. To study input and output I-V characteristics of common base and common emitter transistor configurations.
6. To study Fixed Bias and Voltage divider bias configurations of BJT.
7. To design a Single Stage CE amplifier for a given gain.
8. To study the frequency response of a single stage CE Amplifier
9. To study the Colpitt's Oscillator.
10. To study the Phase Shift Oscillator.
11. To study Class A, Class B and Class AB power amplifier

Essential/recommended readings

1. R. L. Boylestad, L. Nashelsky, K. L. Kishore, Electronic Devices and Circuit Theory, Pearson Education (2006).
2. N Bhargava, D C Kulshreshtha and S C Gupta, Basic Electronics and linear circuits, Tata Mc Graw Hill (2007).
3. J. Millman and C. Halkias, Integrated Electronics, Tata McGraw Hill (2001).
4. David A. Bell, Electronic Devices & Circuits, Oxford University Press, Fifth edition.
5. Mottershed, Electronic Devices, PHI Publication, 1stEdition.
6. D. L. Schilling and C. Belove, Electronic Circuits: Discrete and Integrated, Tata McGraw Hill(2002).

Suggestive readings:

1. J. R. C. Jaegar and T. N. Blalock, Microelectronic Circuit Design, Tata McGraw Hill(2010).
2. Donald A. Neamen, Electronic Circuit Analysis and Design, Tata McGraw Hill(2002).