| Course Type | Course Code | Name of Course | L | T | P | Credit |
|---|---|---|---|---|---|---|
| DC | EEC 202 | Analog and Digital Electronics | 3 | 0 | 0 | 9 |

**Course Objective**

The course will give a brief overview about various aspects of Analog and Digital Electronics and will help the students in understanding application of different electronic components. The course will also give an insight into the design concepts of different electronic circuits, their thermal properties and frequency response which are important from design point of view.

**Learning Outcomes**

Upon successful completion of this course, students will:

- understand the fundamentals as well as to have an insight of different aspects of Analog and Digital Electronics.
- understand the operation of well-known ICs, Transistors, FETs and their application in electronics.
- Gain knowledge about latest developments in the field of sequential circuit design and application of CMOS in IC technology.

| Unit No. | Topics to be Covered | Lecture Hours | Learning Outcome |
|---|---|---|---|
| 1 | Biasing of Discrete Devices & Integrated Circuits. Thermal Stability, Transistor heat dissipation, Significance of Q-point in thermal runaway, Junction to case thermal resistance, Conditions for thermal Stability, Selection of heat sink size. | 7 | Knowledge about operation and fundamental concepts of Bipolar Junction Transistors |
| 2 | Field Effect Transistor – Basic construction, properties; MOSFET – as an amplifier and as a switch, CMOS; DG-MOSFET, Relaxation oscillator using UJT; Power Transistors – construction; characteristics; | 6 | Knowledge about operation and fundamental concepts of Field Effect Transistors, Uni-junction Transistor and their applications |
| 3 | Power amplifiers –Class, A, B, C, AB; frequency response | 4 | In depth knowledge about operation of power amplifiers and its frequency response |
| 4 | Operational amplifiers, Ideal and practical Op-amp, Op-amp based circuits: Inverting amplifier, Non-inverting amplifier, Voltage follower, Summing amplifier, Differential amplifier, Controlled voltage and current sources, level shifter, Comparator, Hysteresis and Schmitt Trigger. Instrumentation amplifier, Log & Anti-log amplifiers, Precision rectifier; Active filters; Oscillators; Timer: Monostable and astable operation using 555 timers; Voltage regulators. | 7 | Understanding the basics of operational amplifier and 555 timer IC; applications of these well-known ICs in electronic circuits |
| 5 | Boolean algebra, logic gates and circuits, Minimization of logic expressions. Karnugh Map; Quine–McCluskey algorithm; Different Logic families RTL, DTL, TTL, ECL, nMOS and CMOS. Waveform generation using gates | 4 | Knowledge about basics and fundamental concepts of digital electronics, minimization of Boolean expressions. The students will also gain knowledge about different logic families. |
| 6 | MOS devices and its characteristics; pseudo nMOS- DC operation, transient analysis; Capacitances in MOS devices; Static and Dynamic CMOS Circuits- energy dissipation and circuit response speed; Pass Transistor; Domino Logic; Interfacing logic families. Memory Systems: RAM, ROM; | 7 | In depth knowledge about MOS devices, working, implementation of logic gates using CMOS, static and dynamic logic gates and their application. |
| 7 | Design of combinational circuits-programming logic devices and gate arrays. Design of Sequential Circuits – Flip/Flops, various types of registers and counters, sequential circuits. State machines – Moore and Mealy Machine; | 7 | The students will gain knowledge about basic Flip-Flops, Design of combinational and sequential circuit. Special sequential circuits-Moore and Mealy machine |

**Text Books**

1. Integrated Electronics by J. Millman, C. Halkias C.D. Parikh
2. Digital Logic And Computer Design by M. Morris Mano

**Reference Books**

1. Electronic Devices and Circuit Theory, R.L. Bollestad, 11th edn., Pearson publication.