

## Course Syllabi: UEI201 Analog Electronic Devices and Circuits (L : T : P :: 3 : 1 : 2)

1. **Course number and name:** UEI201; Analog Electronic Devices and Circuits

2. **Credits and contact hours:** Credits: 4.5; Hours: 6

3. **Text book, title, author, and year**

- *Boylestad R. L., Electronic Devices and Circuit Theory, Pearson Education (2007) 9<sup>th</sup> ed.*
- *Millman, J. and Halkias, C.C., Integrated Electronics, Tata McGraw Hill (2006).*
- *Neamen, Donald A., Electronic Circuit Analysis and Design, McGraw Hill (2006) 3<sup>rd</sup> ed.*
- *Sedra A. S. and Smith K. C., Microelectronic Circuits, Oxford University Press (2006) 5<sup>th</sup> ed*

a. Other supplemental materials

- Nil

4. **Specific course information**

a. Brief description of the content of the course (catalog description)

**PN Junction:** Depletion region, Junction capacitance, Diode equation (no derivation), Effect of temperature on reverse saturation current, Construction and Working, V-I characteristics and simple applications of Junction diode, Zener diode and Tunnel diode.

**Bipolar Junction Transistor (BJT):** PNP and NPN transistors—current components in BJT: BJT static characteristics (Input and Output), Early effect, CB, CC, CE configurations (cut-off, active, and saturation regions), CE configuration as two port network: h-parameters, h-parameter equivalent circuit. Biasing and load line analysis.

**Field Effect Transistor (FET):** Structure and working of JFET and MOSFET, output and transfer characteristics, Experimental arrangement for studying the characteristics and to determine FET parameters. Application of FET as voltage variable resistor and MOSFET as a switch, Advantages of FET over transistor.

**Power Supplies:** Rectifiers: Half-wave, Full-wave and bridge rectifiers, Efficiency, Ripple factor, Regulation, Harmonic components in rectified output, Types of filters: Choke input (inductor) filter, Shunt capacitor filters; Block diagram of regulated power supply, Series and shunt regulated power supplies, Three terminal regulators (78XX and 79XX), Principle and working of switch mode power supply (SMPS).

**Amplifiers:** Analysis and frequency response of single stage RC coupled CE amplifier. Feedback Amplifiers: Positive and negative feedback, Effect of feedback on gain, band width, noise, input and output impedances.

**Oscillators:** Condition for sustained oscillation, R-C phase shift, Hartley, Colpitts, Crystal and Wien Bridge Oscillators, Negative Resistance oscillator.

**Wave shaping circuits:** Switching characteristics of diodes and transistors including square wave response, High pass and low pass filters using R-C Circuits and operational amplifiers; R-L, R-L-C circuits, Attenuators, Clipping and clamping circuits, Clamping circuit theorem, Comparators.

**Laboratory work**

Familiarity with CRO and electronic components, Diodes and BJT characteristics, FET characteristics, Zener diode as voltage regulator, Series voltage regulator, RC coupled amplifier in CE mode, I/O characteristics of Transistor in CE mode, DC load line, Testing of diode and Transistor, Rectifiers. Use of Bistable, Astable and monostable multi-vibrator, Hartley and

Colpitts Oscillator, Clipper and Clamper circuit, Computer simulation, Experiments in analysis, Design and characterization of electronic circuits.

**5. Specific goals for the course**

After the completion of the course, the students will be able to:

- Demonstrate the construction and working of different type of electronic devices such as diodes, BJT, FET.
- Analyse the characteristics of different type of electronic devices such as diodes, BJT, FET.
- Design different type of circuits such as rectifiers, clippers, clampers, filters etc.
- Design power supplies and solve problems related to amplifiers and oscillators.

**6. Brief list of topics to be covered**

- PN Junction Diode
- BJT
- FET
- Amplifiers
- Oscillators