ENG 111 **BASIC ELECTRONICS**  L-T-P: 3-0-2

1. The course contains 3 lecture hours and 2 practical hours per week.
2. This course has no prerequisites.

**Unit I**

**BASIC CIRCUITS AND DIODES (9 hours)**

Ohm’s law, Kirchhoff’s current and voltage laws.

Review of semiconductor materials, doping. Forward and reverse bias characteristics of PN junction diode, barrier potential, junction capacitance, diode piecewise linear model. Design of half-wave, full-wave, bridge rectifiers with and without filters, positive and negative clipping circuits with and without bias; clamping using PN junction diode. Special diodes.

**Unit II**

**BIPOLAR JUNCTION TRANSISTORS** (**9 hours**)

Introduction to bipolar junction transistors (BJTs), NPN and PNP types. Study of common-base, common-collector and common-emitter configurations using BJTs including their input and output I-V characteristics. Current and voltage gain, transistor in active, cut-off and saturation regions. Q-point of the transistor.

**Unit III**

**FIELD EFFECT TRANSISTOR and OPERATIONAL AMPLIFIER**  (**9 hours**)

Introduction to filed effect transistor (FET), operation of junction FET and MOSFET. Characteristics of an operational amplifier, negative feedback, inverting and non-inverting op-amps, integrator and differentiator design using op-amp. Effect of positive feedback, design of oscillators using 555 timer. Differential operational amplifier and common-mode rejection ratio.

**Unit IV**

**ELECTRONIC FILTERS** (**9 hours**)

Low and high frequency noise in electronic circuits, basic low-pass, high-pass, band-pass and band-reject passive filters design using resistor, capacitor and inductor. Fourier transform, magnitude and phase response, bandwidth, bode plots. Design and analysis of higher order filters. Active filter design using operational amplifier.

**Unit V**

**DIGITAL LOGIC FUNDAMENTALS (9 hours)**

Number systems: binary, decimal, octal and hexadecimal number systems, number system conversions. Logic gates: AND, OR, NOT, NAND, NOR, X-OR, X-NOR. De Morgan’s laws, Karnaugh maps. Basic combinational logic blocks: adder, subtractor, multiplexer and demultiplexer.

**Text books:**

1. “Principles of electronics” by V K Mehta & Rohit Mehta, 2010 edition, S Chand and Co. Publisher, ISBN: 9788121924504.
2. “Electronic devices and circuits” by David A. Bell, 2008 edition, Oxford University Press, ISBN: 9780195693409.
3. “Introduction to digital logic design” by John P. Hayes, 1993 edition, Pearson Edition, ISBN: 9780201154610.

**References:**

1. “Integrated Electronics” by Millman and Halkias, 2nd edition, Tata McGraw Hill, ISBN: 9780074622452.
2. “Pulse, Digital and Switching waveforms” by Millman and Taub, 2011 edition, Tata McGraw Hill, ISBN: 9780071072724.