

## BTech Preparatory Unit (BPU) in Electronics Engineering

### Syllabus

1. Introduction to circuits and signals
2. Introduction - SI Units, Charge and current, electrical potential and voltage, electrical power and energy, Passive sign convention, Ideal voltage and current sources, Resistance and Ohm's Law, power in resistors, Measuring devices
3. Kirchoff' Laws - Kirchoff's voltage and current laws, Resistances in Series or Parallel, Voltage divider and current divider circuit, Practical voltage and current sources
4. DC circuit Analysis using Kirchoff's Laws- Node analysis (Application of KCL), Mesh Analysis (Application of KVL), Circuits with dependent sources, Superposition Theorem
5. Equivalent Circuits - Thevenin's and Norton's equivalent circuits, Source transformation, Maximum power transfer, Nonlinear elements.
6. Energy Storage (Dynamic) Circuit elements and DC Transient Analysis- Capacitance, Inductance, Transients, First-order circuits
7. AC circuit Analysis - Alternating voltages and currents, Root-mean-square value of a sinusoid, Phasors, Impedance, Circuit analysis with phasors and impedances
8. Magnetic Circuits and Transformer - Magnetic fields, Magnetic Circuits, Right-hand rule, Forces induced in current-carrying wires in a magnetic field, Voltages induced in a field-cutting conductor, Ampere's Law, Self and Mutual Inductances, Ideal Transformer.
9. Principles of mutual inductance and transformers, diode characteristics, bridge rectifiers. Design of the DC power supply
10. Signal Representation - Continuous and discrete time signals, Periodic and non-periodic signals, Bounded and unbounded signals, Deterministic and random signals, Real and complex signals
11. Examples of all the above signals : sinusoids, signum functions, unit impulse, unit step functions, rectangular functions, triangle functions, sinc functions, Dirac delta, Dirac comb functions, complex exponential functions.
12. Spectrum of Continuous Time Signals - Fourier series of continuous periodic signals: sine-cosine forms, exponential forms, Fourier transforms of non-periodic signals, Properties of Fourier Transforms, Examples of spectra of sinusoidal functions, arbitrary periodic functions (AM & FM).