# BTech Bridging Unit (BBU) in Electronics Engineering
## *(Introduction to circuits and signals)*

### Objectives

- Apply various circuit theories in analysis of electrical and magnetic circuits.
- Use equipment such as DC power supply, signal generator, digital oscilloscope, multimeter for prototyping circuits in the laboratory.
- Choose appropriate values of circuit components to meet specifications and conduct experiments to demonstrate the circuit operation.
- Describe the spectrum of common signals using Fourier Series and Fourier Transforms.

### Description

- 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
- Kirchoff' Laws – Kirchhoff's voltage and current laws, Resistances in Series or Parallel, Voltage divider and current divider circuit, Practical voltage and current sources.
- DC circuit Analysis using Kirchoff's Laws- Node analysis (Application of KCL), Mesh Analysis (Application of KVL), Circuits with dependent sources, Superposition Theorem.
- Equivalent Circuits – Thevenin's and Norton's equivalent circuits, Source transformation, Maximum power transfer, Nonlinear elements.
- Energy Storage (Dynamic) Circuit elements and DC Transient Aalysis – Capacitance, Inductance, Transients, First-order circuits
- AC circuit Analysis – Alternating voltages and currents, Root-man-square value of a sinusoid, Phasors, Impedance, Circuit analysis with phasors and impedances
- Magnetic Circuits and Transformer – Magnetic fields, Magnetic Circuits, Right-hand rule, Forces induced in current-carrying wires in a magnetic field, Voltages induced in field-cutting conductor, Ampere's Law, Self and Mutual Inductances, Ideal Transformer.
- Principles of mutual inductance and transformers, diode characteristics, bridge rectifiers. Design of the DC power supply.
- Signal Representation – Continuous and discrete time signals, Periodic and non-periodic signals, Bounded and unbounded signals, Deterministic and random signals, Real and complex signals.
- 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.
- 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).

### Assessment Component

- 3 Laboratory Experiments: 15%
- 3 Assignments: 15%
- Final Examination: 70%