1st Year 2nd Semester

Sl. No	Course Code	Course Title	Hours/Week		Credit
			Theory	Practical/ Sessional	
1	EEE 1201	Electrical Circuits II	3		3
2	EEE 1202	Electrical Circuits II Sessional		3	1.5
3	EEE 1203	Electrical Properties of Materials	3		3
4	PHY 1201	Waves and Oscillations, Optics and Thermal Physics	3		3
5	PHY 1202	Waves and Oscillations, Optics and Thermal Physics Sessional		3	1.5
6	MATH 1201	Differential Equations and Complex Variables	3		3
7	CHEM 1201	Chemistry	3		3
8	CHEM 1202	Chemistry Sessional		3	1.5
9	GED 1201	Bangladesh Studies	3		3
			18	09	22.5

Core Courses

1. EEE 1201 Electrical Circuits II
Contact hours/week: 3, Credits: 3

Circuits with non-sinusoidal excitations, power and power factor of ac circuits with multiple sources of different frequencies; Transients in AC circuits, Resonance in AC circuits: Series and parallel resonance and Q factors.
Passive Filter Networks: basic types. Characteristic impedance and attenuation, ladder network, low pass, high pass filters, propagation coefficient and time delay in filter sections, practical composite filters. Magnetically coupled circuits.
Analysis of three phase circuits: Three phase supply, balanced and unbalanced circuits, power calculation and measurements, Power factor improvement.
Magnetic Circuits: Magnetic quantities and variables: Field, Flux, Flux Density, Magnetomotive Force, Magnetic Field Strength, permeability and B-H Curve, reluctance, magnetic field strength. Laws in magnetic circuits: Ohm's law and Ampere's circuital law.
Magnetic circuits: Composite series magnetic circuit, parallel and series-parallel circuits. Comparison between electrical and magnetic quantities, Hysteresis and hysteresis loss. Magnetic materials.

2. EEE 1202 Electrical Circuits II Sessional
Contact hours/week: 3, Credit: 1.5

In this course students will perform experiments to verify practically the theories and concepts learned in EEE 1201 and also simulated these experiments with simulation software (i.e. PSpice, Proteus, Multisim etc.).

3. EEE 1203 Electrical Properties of Materials

Contact hours/week: 3, Credit: 3

Crystal structures: Types of crystals, lattice and basis, Bravais lattice and Miller indices. Classical theory of electrical and thermal conduction: Scattering, mobility and resistivity, temperature dependence of metal resistivity, Matthiessen's rule, Hall effect and thermal conductivity. Introduction to quantum mechanics: Wave nature of electrons, Schrodinger's equation, one-dimensional quantum problems- infinite quantum well, potential step and potential barrier; Heisenberg's uncertainty principle and quantum box, Electron in a 3D box. Hydrogen Atom.

Band theory of solids: Band theory from molecular orbital, Bloch theorem, Kronig-Penny model, Brillouin zone, effective mass, density-of-states. Carrier statistics: Maxwell Boltzmann and Fermi-Dirac distributions, Fermi energy. Modern theory of metals: Determination of Fermi energy and average energy of electrons, classical and quantum mechanical calculation of specific heat.

Dielectric properties of materials: Dielectric constant, polarization-electronic, ionic, orientational and interfacial; internal field, Clausius-Mosotti equation, spontaneous polarization, frequency dependence of dielectric constant, dielectric loss, piezoelectricity, ferro-electricity, pyro-electricity.

Magnetic properties of materials: Magnetic moment, magnetization and relative permittivity, different types of magnetic materials, origin of ferromagnetism and magnetic domains.

Introduction to superconductivity: Zero resistance and Meissner effect, Type I and Type II superconductors and critical current density. BCS theory. Magnetic recording materials, Josephson theory. Introduction to meta-materials.

General Science Courses

4. PHY 1201 Waves and Oscillations, Optics and Thermal Physics

Contact hours/week: 3, Credit: 3

Waves and oscillations: Differential equation of simple harmonic oscillator, total energy and average energy, combination of simple harmonic oscillations, Lissajous' figures, spring mass system, torsional pendulum; two body oscillation, reduced mass, damped oscillation, forced oscillation, resonance, progressive wave, power and intensity of wave, types of wave, transverse and longitudinal nature of waves, stationary and standing wave, group and phase velocities, velocity of wave in different medium.

Optics: Theories of light; Interference of light, Young's double slit experiment, displacement of fringes and its uses, Fresnel bi prism, interference in thin films, Newton's rings, interferometers; Diffraction: Diffraction by single slit, resolving power of optical instruments, diffraction at double slit and N slits, diffraction grating, polarization: Production and analysis of polarized light, Brewster's law, Malus law, polarization by double refraction, Nicol prism, optical activity, optics of crystals, Polarimeters.

Thermal Physics: Heat and work; the first law of thermodynamics and its applications; molar specific heats of gases, isothermal and adiabatic process, work done by gas, Kinetic theory of gases; Kinetic interpretation of temperature, specific heats of ideal gases, calculation of specific heat, equipartition of energy, mean free path, Maxwell's distribution of molecular speeds, reversible and irreversible processes, Carnot's cycle, efficiency of Carnot engine, second law thermodynamics, Carnot's theorem, entropy, Thermodynamic functions, Maxwell relations, Clausius and Clapeyron equation.

5. PHY 1202 Waves and Oscillations, Optics and Thermal Physics Sessional
Contact hours/week: 3, Credit: 1.5

In this course students will perform experiments to verify practically the theories and concepts learned in PHY 1201.

6. MATH 1201 Differential Equations and Complex Variables
Contact hours/week: 3, Credit: 3

Ordinary Differential Equation: Formation of differential equations; Solution of first order differential equations by various methods; Solution of differential equation of first order but higher degrees; Solution of general linear equations of second and higher orders with constant co efficient; Solution of Euler's homogeneous linear differential equations.
Partial Differential Equation: Introduction, Linear and nonlinear first order differential equations; Standard forms; Linear equations of higher order; Equations of the second order with variable coefficients.
Complex Variable: Complex number system. General functions of a complex variable. Limits and continuity of a function of complex variable and related theorems. Complex differentiation and the Cauchy Reimann equations. Infinite series. Convergence and uniform convergence. Line integral of a complex function. Cauchy's integral formula. Liouville's theorem. Taylor's and Laurent's theorem. Singular points. Residue. Cauchy's residue theorem

7. CHEM 1201 Chemistry
Contact hours/week: 3, Credit: 3

Atomic structure, quantum numbers, electronic configuration, periodic table, Properties and uses of noble gases, Different types of chemical bonds and their properties, Modern concept of acid and bases, problems involving acid base titration, Ionization of water and concept of Ph Electrochemistry, Mechanism of electrolytic conduction, Transport number, Kohl Rausch's law. Different types of cells, Cell emf, Single electrode potentials, their determination and application. Secondary cells or Accumulators, lead accumulator and alkaline accumulator, Different types of solutions, Colligative properties of dilute solution, Thermochemistry, Chemical kinetics, Chemical equilibria.

8. CHEM 1201 Chemistry Sessional
Contact hours/week: 3, Credit: 1.5

Volumetric analysis: acid base titration, oxidation reduction titrations, determination of Fe, Cu and Ca volumetrically.

General Education Courses

9. GED 1201 Bangladesh Studies
Contact hours/week: 3, Credit: 3

Introduction to the course and its objectives.

History and Society of Bengal under the British rule and Pakistan rule: The impact of British and Pakistan rules on the economy and education of the people. Language Movement of 1952, Events Leading to the Mass Upsurge of 1969, War of Independence and the Emergence of Bangladesh in 1971.

Study of Geography and Resources of Bangladesh: Location, Area, Boundary, Ecological Settings, River System, Climate, People and Resources of Bangladesh.

Social Structure of Bangladesh.

Culture of Bangladesh: Language, Literature, Art and Culture of Bangladesh.

Politics, Formation and role of major political parties in Bangladesh and Constitutional development of Bangladesh.

Economy of Bangladesh.

Achievements in different sectors (economy, culture, sports etc.) of Bangladesh.

Socio-cultural problems and prospects of Bangladesh.