1st Year 1st Semester

Sl. No	Course Code	Course Title	Hours/Week		Credit
			Theory	Practical/ Sessional	
1	EEE 1101	Electrical Circuit I	3		3
2	EEE 1102	Electrical Circuit I Sessional		3	1.5
3	CSE 1101	Computer Programming	3		3
4	CSE 1102	Computer Programming Sessional		3	1.5
5	CE 1102	Computer Aided Engineering Drawing		3	1.5
6	PHY 1101	Electricity and Magnetism, Modern Physics and Mechanics	3		3
7	PHY 1102	Electricity and Magnetism, Modern Physics and Mechanics Sessional		3	1.5
8	MATH 1101	Differential & Integral Calculus and Co-ordinate Geometry	3		3
9	GED 1101	English for Technical Communication	3		3
			15	**12**	**21**

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**

2nd Year 1st Semester

Sl. No	Course Code	Course Title	Hours/Week		Credit
			Theory	Practical/ Sessional	
1	EEE 2101	Electronics I	3		3
2	EEE 2102	Electronics I Sessional		3	1.5
3	EEE 2103	Energy Conversion I	3		3
4	EEE 2104	Energy Conversion I Sessional		3	1.5
5	EEE 2108	Electrical and Electronic Workshop Practice		3	1.5
6	ME 2101	Basic Mechanical Engineering	3		3
7	ME 2102	Basic Mechanical Engineering Sessional		3	1.5
8	MATH 2101	Linear Algebra and Vector Analysis	3		3
9	GED 2101	Financial Account & Economic Analysis	3		3
			15	**12**	**21**

2nd Year 2nd Semester

Sl. No	Course Code	Course Title	Hours/Week		Credit
			Theory	Practical/ Sessional	
1	EEE 2201	Electronic II	3		3
2	EEE 2202	Electronic II Sessional		3	1.5
3	EEE 4223	Energy Conversion II	3		3
4	EEE 2204	Energy Conversion II Sessional		3	1.5
5	EEE 2205	Engineering Electromagnetics	3		3
6	EEE 2208	Electrical Services Design		3	1.5
7	MATH 2201	Statistics & Probability	3		3
8	GED 2201	Professional Ethics and Moral Thoughts	3		3
			15	**9**	**19.5**

3rd Year 1st Semester

Sl. No	Course Code	Course Title	Hours/Week		Credit
			Theory	Practical/ Sessional	
1	EEE 3101	Electrical Measurement & Instrumentation	3		3
2	EEE 3102	Electrical Measurement & Instrumentation Sessional		3	1.5
3	EEE 3103	Digital Electronics	3		3
4	EEE 3104	Digital Electronics Sessional		3	1.5
5	EEE 3105	Power System I	3		3
6	EEE 3106	Power System I Sessional		3	1.5
7	EEE 3107	Power Electronics and Industrial Drives	3		3
8	EEE 3108	Power Electronics and Industrial Drives Sessional		3	1.5
9	GED 3101	Engineering Management	3		3
			15	**12**	**21.00**

3rd Year 2nd Semester

Sl. No	Course Code	Course Title	Hours/Week		Credit
			Theory	Practical/ Sessional	
1	EEE 3201	Communication Engineering Fundamentals	3		3
2	EEE 3202	Communication Engineering Fundamentals Sessional		3	1.5
3	EEE 3203	Power System II	3		3
4	EEE 3205	Signals and Systems	3		3
5	EEE 3207	Numerical Methods	3		3
6	EEE 3208	Numerical Methods Sessional		3	1.5
7	CSE 3201	Microprocessor & Microcontroller	3		3
8	CSE 3202	Microprocessor & Microcontroller Sessional		3	1.5
			15	**9**	**19.50**

4th Year 1st Semester

Sl. No	Course Code	Course Title	Hours/Week		Credit
			Theory	Practical/ Sessional	
1	EEE 4100*	Project & Thesis		3	1.5
2	EEE 4101	Digital Signal Processing	3		3
3	EEE 4102	Digital Signal Processing Sessional		3	1.5
4	EEE 4103	Control System	3		3
5	EEE 4104	Control System Sessional		3	1.5
6	EEE 4105	VLSI Circuits and Design	3		3
7	EEE 4106	VLSI Circuits and Design Sessional		3	1.5
8	EEE 4111**	Renewable Energy	3		3
9	EEE 4113**	High Voltage Engineering			
10	EEE 4115**	Optoelectronics	3		3
11	EEE 4117**	Mobile Cellular Communication	3		
12	EEE 4119**	Biomedical Engineering	3		
			15	**12**	**21.00**

*the course will be evaluated at the end of 4th year 2nd semester along with EEE 4200.

**Students can choose two courses according to their interest. If the students' choice differs, then offering of the courses will depend on number of students and availability of faculties.

4th Year 2nd Semester

Sl. No	Course Code	Course Title	Hours/Week		Credit
			Theory	Practical/ Sessional	
1	EEE 4200	Project & Thesis		3	1.5
2	EEE 4201	Power System Protection	3		3
3	EEE 4202	Power System Protection Sessional		3	1.5
4	EEE 4203	Power Plant Engineering and Economy	3		3
5	EEE 4208*	Industrial Attachment*		3	1.5
6	EEE 4211**	Smart Grid	3		3
7	EEE 4213**	Introduction to Nanotechnology and Nanoelectronics	3		3
8	EEE 4215**	Optical Fiber Communication	3		3
9	EEE 4217**	Radar and Satellite Communication	3		
10	EEE 4219**	Medical Imaging	3		
			12	**9**	**16.5**

*Industrial Attachment: Students will be attached with the industries/service agencies/ Professional training Institute for two weeks after completing their 4th year 1st semester (before starting 4th year 2nd semester/during any vacation in 4th year 2nd semester) to gain practical knowledge.

**Students can choose two courses according to their interest. If the students' choice differs, then offering of the courses will depend on number of students and availability of faculties.

Course Identification:

Every course has a unique course code. The letter prefix in any course code indicates the field or the discipline of the course, e.g., **EEE** stands for **Electrical and Electronic Engineering**, **CSE** for C**omputer Science and Engineering**, **ME** for **Mechanical Engineering**, **CE** for **Civil Engineering**, **CHEM** for **Chemistry**, **PHY** for **Physics**, **MATH** for **Mathematics** and **GED** for **General Education**.

The digits in the course code have the following meaning:

The first digit corresponds to the year in which the course is taken by the student.
The second digit represents the semester in which the course is taken by the student.
The third and fourth digits are used to specify the course.
The third digit is 1 for elective courses and for all other course is 0
The last (fourth) digit is odd for theoretical course and even for laboratory or sessional course.

Course Summary

Course Type	Semester	Theory (Credit)	Sessional (Credit)	Total (Credit)
Core Courses	1st Year 1st Semester	3.0	1.5	4.5
	1st Year 2nd Semester	6.0	1.5	7.5
	2nd Year 1st Semester	6.0	3.0	9.0
	2nd Year 2nd Semester	9.0	4.5	13.5
	3rd Year 1st Semester	12.0	6.0	18.0
	3rd Year 2nd Semester	12.0	4.5	16.5
	4th Year 1st Semester	9.0	6.0	15.0
	4th Year 2nd Semester	6.0	4.5	10.5
	Sub-Total	**63.0**	**31.5**	**94.5**
Elective Courses	4th Year 1st Semester	6.0	0.0	6.0
	4th Year 2nd Semester	6.0	0.0	6.0
	Sub-Total	**12.0**	**0.0**	**12.0**
Allied Engineering Courses	1st Year 1st Semester	3.0	3.0	6.0
	2nd Year 1st Semester	3.0	1.5	4.5
	3rd Year 2nd Semester	3.0	1.5	4.5
	Sub-Total	**9.0**	**6.0**	**15.0**
General Science Courses	1st Year 1st Semester	6.0	1.5	7.5
	1st Year 2nd Semester	9.0	3.0	12.0
	2nd Year 1st Semester	3.0	0.0	3.0
	2nd Year 2nd Semester	3.0	0.0	3.0
	Sub-Total	**21.0**	**4.5**	**25.5**
General Education Courses	1st Year 1st Semester	3.0	0.0	3.0
	1st Year 2nd Semester	3.0	0.0	3.0
	2nd Year 1st Semester	3.0	0.0	3.0
	2nd Year 2nd Semester	3.0	0.0	3.0
	3rd Year 1st Semester	3.0	0.0	3.0
	Sub-Total	**15.0**	**0.0**	**15.0**
Total		**120**	**42.0**	**162.0**

Core Courses

EEE 1101 Electrical Circuits I
Contact hours/week: 3, Credit: 3.

Circuit variables: voltage, current, power and energy, Voltage and current independent and depended sources, Circuit elements: resistance, inductance and capacitance. Modeling of practical circuits, Ohm‟s law and Kirchhoff‟s laws, Solution of simple circuits with both dependent and independent sources, Series-parallel resistance circuits and their equivalents, Voltage and current divider circuits, Delta-Wye equivalent circuits, Techniques of general DC circuit analysis (containing both independent and dependent sources): Node-voltage method, Mesh-current method, Source transformations. Thevenin and Norton equivalents, Maximum power transfer. Superposition technique. Properties of Inductances and capacitances. Series-parallel combinations of inductances and capacitances; Concepts of transient and steady state response with dc source.
Definitions of ac voltage, current, power, volt-ampere and various factors (including power, peak, form factors etc.) , Introduction to sinusoidal steady state analysis: Sinusoidal sources, phasor, impedance, admittance, reactance, susceptance; voltage, current, power of R, L, C, R-L, R-C, R-L-C circuits with sinusoidal source, Series parallel and Delta-Wye simplifications of circuits with R, L,Cs. Techniques of general ac circuit analysis (containing both independent and dependent sources): Node-voltage method, Mesh current method, Source transformations, Thevenin and Norton Equivalents, Phasor diagrams. Sinusoidal steady state power calculations, RMS values, Real and reactive power. Maximum power transfer, impedance matching. Steady state voltage, current.

EEE 1102 Electrical Circuits I 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 1101.

EEE 1201 Electrical Circuits II
Contact hours/week: 3, Credit: 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, Magneto-motive 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.

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.).

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, Mathiessen‟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; Heisenbergs‟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, Josephsontheory. Introduction to meta-materials.

EEE 2101 Electronics I
Contact hours/week: 3, Credit: 3.

Semiconductor diodes: semiconductor material and properties, pn junction, diode circuits: dc analysis and models, diode circuits: AC equivalent circuits, other diode types, single phase rectification and regulators, Zener diode circuits, clipper and clamper circuits, multiple diode circuits, photo diodes and LED circuits, DC power supply;
Bipolar Junction transistor (BJT): BJT, DC analysis of BJT circuits, basic transistor applications, biasing, multistage circuits, BJT linear amplifiers-basic configurations, CE amplifiers, AC load lines, CC and CB amplifier, multistage amplifiers, power consideration; Frequency Response: Amplifier frequency response, system transfer function, frequency response: transistor amplifiers with circuit capacitors, frequency response-BJT.

Field Effect Transistors (FET): Structure and Operation of JFET, JFET Characteristics, JFET amplifiers Structure of MOSFET, Current-Voltage Characteristics, MOS Device Models, DC circuit analysis, basic MOFET applications, Biasing, constant current biasing, multistage MOSFET circuits, Junction Field effect transistor (JFET), MOSFET amplifier: basic transistor amplifier configurations-Common-Source, Common-Gate Stage, Source Follower (common drain); single stage integrated circuit MOSFET amplifiers, multistage amplifiers, frequency response of FET
Power Amplifiers: power amplifiers, power transistors, classes of amplifiers, Class-A power amplifier, Class-AB push pull complimentary output stage.

EEE 2102 Electronics I 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 2101 and also simulated these experiments with simulation software (i.e. PSpice, Proteus, Multisim etc.).

EEE 2103 Energy Conversion I
Contact hours/week: 3, Credit: 3.

DC Generators: Types, no-load voltage characteristics, build up of a self excited shunt generator, load-voltage characteristic, effect of speed on no-load and load characteristics and voltage regulation, armature reaction.
DC Motor: Operating principle, counter emf, torque, speed, torque-speed characteristics, starting, braking, and speed control.
Transformer: principle of operation, construction, no load and excitation current, behavior during loading, effect of leakage flux, ideal transformer, leakage reactance and equivalent circuit of a transformer, equivalent impedance, voltage regulation, per unit quantities, regulation, losses and efficiency, determination of parameters by tests, polarity of transformer windings, vector group, transformer parallel operation. Harmonics in excitation current, transformer inrush current, three phase transformer connections, three phase transformers, harmonic suppression in three phase transformer connection. Auto-transformer, instrument transformers.

EEE 2104 Energy Conversion I 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 2103

EEE 2108: Electrical & Electronic Workshop practice
Contact hours/week: 3 Credits: 1.5

Verification of theories and concepts learned in electrical and electronic circuit theory courses by performing various projects to solve real life problems.

EEE 2201 Electronic II
Contact hours/week: 3, Credit: 3.

Ideal operational amplifier and op-amp circuits: Op-amp applications: inverting amplifier, non-inverting amplifier, summing amplifier, differential amplifier, logarithmic amplifier, operational trans-conductance amplifiers exponential amplifier, differentiator, integrator, voltage to current converter, voltage follower, and other applications. Non-ideality of op-amp: Non-ideal op-amp characteristics and its effects.
Integrated circuit biasing and active loads: BJT current sources, FET current sources, small signal analysis of active loads, design applications: an NMOS current source; differential and multistage amplifiers: BJT differential amplifier, FET differential amplifier, differential amplifier with active load, BiCMOS circuits, gain stage and simple output stage, BJT operational amplifier circuit, Frequency response of amplifiers: Poles, zeros and Bode plots, amplifier transfer function, techniques of determining 3 dB frequencies of amplifier circuits, frequency response of single-stage and cascade amplifiers, frequency response of differential amplifiers;
Trans-conductance (serie-series) amplifiers, trans-resistance (shunt-shunt) amplifiers, loop gain, stability of feedback circuit, frequency compensation; Applications and Design of Integrated Circuits: Active filter, Oscillators, Schmitt trigger Circuits, Non-sinusoidal oscillators and timing circuits, integrated power amplifier, voltage regulator, Design application: An active Bandpass filter. 555 Timer IC and its Applications.

EEE 2202 Electronics 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 2201

EEE 2203 Energy Conversion II
Contact hours/week: 3, Credit: 3.

Three phase induction motor: rotating magnetic field, reversal of rotating magnetic field, synchronous speed, torque in induction motor, induction motor construction: squirrel cage, wound rotor; slip and its effect on rotor frequency and voltage, equivalent circuit of an induction motor, air gap power, mechanical power and developed torque, torque speed characteristic, losses, efficiency and power factor, classification, motor performance as a function of machine parameters, shaping torque speed characteristic and classes of induction motor, per unit values of motor parameters, determination of induction motor parameters by tests, methods of braking, speed control Induction generator: operation, characteristics, voltage build up, applications in wind turbine.
Synchronous generator: construction, armature (stator) and rotating field (exciter), excitation system with brushes and brushless excitation system, cooling, generated voltage equation of distributed short pitched armature winding, armature winding connections and harmonic cancellation in distributed short pitched winding, equivalent circuit, synchronous impedance, generated voltage and terminal voltage, phasor diagram, voltage regulation with different power factor type loads, determination of synchronous impedance by tests, phasor diagram, salient pole generator d-q axes parameters, equivalent circuit, generator equations, determination of d-q axes parameters by tests, equation of developed power and torque of synchronous machines (salient and non salient pole motor and generator). Parallel operation of generators: requirement of parallel operation, conditions, synchronizing, effect of synchronizing current, hunting and
oscillation, synchronoscope, phase sequence indicator, load distribution of alternators in parallel, droop setting, frequency control, voltage control, house diagrams.
Synchronous Motors: construction, operation, starting, effect of variation of load at normal excitation, effect of variation of excitations, V curves, inverted V curves and compounding curves, power factor adjustment, synchronous capacitor and power factor correction.

EEE 2204 Energy Conversion 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 2203

EEE 2205 Engineering Electromagnetics
Contact hours/week: 3, Credit: 3.

Static electric field: Postulates of electrostatics, Coulomb's law for discrete and continuously distributed charges, Gauss's law and its application, electric potential due to charge distribution, conductors and dielectrics in static electric field, flux density- boundary conditions; capacitance- electrostatic energy and forces, energy in terms of field equations, capacitance calculation of different geometries; boundary value problems- Poisson's and Laplace's equations in different co-ordinate systems.
Steady electric current: Ohm's law, continuity equation, Joule's law, resistance calculation.
Static Magnetic field: Postulates of magnetostatics, Biot-Savart's law, Ampere's law and applications, vector magnetic potential, magnetic dipole, magnetization, magnetic field intensity and relative permeability, boundary conditions for magnetic field, magnetic energy, magnetic forces, torque and inductance of different geometries.
Time varying fields and Maxwell's equations: Faraday's law of electromagnetic induction, Maxwell's equations - differential and integral forms, boundary conditions, potential functions; time harmonic fields and Poynting theorem.
Plane electromagnetic wave: plane wave in loss less media-Doppler effect, transverse electromagnetic wave, polarization of plane wave; plane wave in lossy media- low-loss dielectrics, good conductors; group velocity, instantaneous and average power densities, normal and oblique incidence of plane waves at plane boundaries for different polarization.

EEE 2208 Electrical Services Design
Contact hours/week: 3, Credit: 1.5.

Familiarization with CAD tools for building services design. Introduction to building regulations, codes and standards: BNBC, NFPA etc. Terminology and definitions: fuses, circuit breakers, distribution boxes, cables, bus-bars and conduits. Familiarization with symbols and legends used for electrical services design. Classification of wiring. Design for illumination and lighting: lux, lumen, choice of luminaries for various applications- domestic building, office building and industry. Wattage rating of common electrical equipment. Designing electrical distribution system for low and high rise domestic, office and academic buildings, for multipurpose buildings.Size selection of conductors and breakers, bus-bar trunking (BBT) system for various applications. Single line diagram (SLD) of atypical 11kV/0.415kV, 500kVA sub-station and a 200kVA pole mounted transformer. Earthing requirements, various earthing methods. Earthing and lightning protection system design. Familiarization with indoor and underground telephone and fiber optic cables, UTP and CAT5/32 data cables. Designing routing layout and installation of intercom, PABX, telephone, public address (PA)systems, cable TV distribution, LAN and wireless data systems for a building. Safety regulations, design of security systems including CCTV, burglar alarm. Concept of fire prevention and its importance. Fire detection (smoke, heat etc.) and alarm system (with voice evacuation), firefighting system (sprinkler system, hose).Installation of air-conditioning, heating, lifts and elevators.

EEE 3101 Electrical Measurement & Instrumentation
Contact hours/week: 3, Credit: 3.

Introduction: Methods of measurement. Statistical method applied to field of measurement and error analysis and calibration. Resistance, Inductance and Capacitance measurements: Different methods of measuring high, medium and low resistances. Methods of measuring self and mutual inductance and capacitance. A.C. and DC bridge methods, Measurement of insulation and earth resistances. Localization of cable faults.
Magnetic measurement: Flux meter, Flux and Flux density measurement. Determination of iron losses and their separation.
Measuring instruments: Classification of measuring instruments. Ammeter, Voltmeter, wattmeter, AVO meter, Energy meter, Ampere-hour meter and Maximum demand meter for measuring AC and DC quantities. Speed, frequency and phase difference measurements. Illumination measurement.
Electronic measuring instruments: Digital instruments, VTVM, Q-meter and CRO.
Instrumentation: Extension of instrument range. Use of C.T. and P.T and calculation of their burden, Instrumentation of substation. Measurement of non-electrical quantities: Transducer. Measurement of temperature, pressure, displacement, velocity, acceleration. Strain gauge and their applications.

EEE 3102 Measurement & Instrumentation Sessional
Contact hours/week: 3, Credits: 1.5

In this course students will perform experiments to verify practically the theories and concepts learned in EEE 3101.

EEE 3103 Digital Electronics
Contact hours/week: 3, Credit: 3.

Analysis and Synthesis of Digital Logic Circuits: Number system, codes, and conversion. Boolean algebra, DeMorgan's law, logic gates and truth tables, combinational logic design, minimization techniques, implementation of basic static logic gates in CMOS and BiCMOS. Arithmetic and data handling logic circuits, decoders and encoders, multiplexers and combinational circuit design.
Programmable Logic Devices: Logic arrays, Field Programmable Logic Arrays and Programmable Read Only Memory.
Sequential Circuits: Different types of latches, flip-flops and their design using ASM approach, timing analysis, timing analysis and power optimization of sequential circuits. Modular sequential logic circuit design: Shift registers, counters and their applications.

EEE 3104 Digital Electronics 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 3203

EEE 3105 Power System I
Contact hours/week: 3, Credit: 3.

Power factor Improvement: Causes, Power factor improvements process.
Electric power Supply System: Electric power supply system, AC power supply, high voltage transmission, elements of power transmission, economics choice of conductor size and voltage.
Mechanical Design of overhead lines: Conductor materials, line support, insulator, string efficiency, Corona and corona power loss.
Transmission line parameters: Inductance - inductance due to internal flux, flux linkages between points external to an isolated conductor, flux linkages of one conductor in a group, single-phase two-wire line, composite-conductor lines, three-phase lines with equilateral/ unsymmetrical spacing, double circuits, bundled conductors; Capacitance - electric field of a long straight conductor, potential difference between points due to a charge, capacitance of a two-wire line, capacitance of three-phase line with equilateral/ unsymmetrical spacing, effect of Earth on transmission line capacitance, bundled conductor, parallel-circuit three-phase lines.
Performance of Transmission line: Classification, Equivalent circuit of short, medium and long lines.
Underground cables: Types and construction; oil filled, gas insulated and XLPE cables; electrical characteristics - electrical stress, capacitance, charging current, insulation resistance, dielectric power factor and dielectric loss, skin effect, proximity effect; identification of fault location.
Distribution systems: Primary and secondary distribution - radial, ring main, and interconnected system, distribution losses and feeder reconfiguration. Cable testing, DC Distribution, AC distribution.
Voltage control: Importance, Methods of voltage control, Tap changing transformer, phase shifting, booster and regulation transformer and shunt capacitor.

EEE 3106 Power System I 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 3105.

EEE 3107 Power Electronics and Industrial Drives
Contact hours/week: 3, Credit: 3.

Fundamental of power electronics, characteristics of static power semiconductor devices (BJT, MOSFET, IGBT, Thyristors).
AC/DC power converters: uncontrolled rectifiers (single phase and threephase), controlled rectifiers (single phase and three phase), dual converter.
AC/AC power converters: phase-controlled converters (single phase and three phase), AC switch, cyclo-converter.
DC/DC converters: choppers (step down and step up), switching regulators (buck, boost, buck-boost).
DC/AC converters: types, single phase and three phase inverters. Various applications of converters.
Introduction to power electronics control of motor: DC motor speed control, braking, scalar control of poly-phase induction motor.
Industrial Application: Introduction to Electric arc furnace, Dielectric heating and induction heating.

EEE 3108 Power Electronics and Industrial Drives 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 3107.

EEE 3201 Communication Engineering Fundamentals
Contact hours/week: 3 Credits: 3
Overview of communication systems: Basic Principles, fundamental elements, system limitations, message source, bandwidth requirements, transmission media types, bandwidth and transmission capacity.
Noise: Source, characteristics of various types of noise and signal to noise ratio.
Information theory: Measure of information, source encoding, error free communication over a noisy channel, channel capacity of a continuous system and channel capacity of a discrete memory less system.
Communication systems: Analog and digital.
Continuous wave modulation: Transmission types-base-band transmission.
Carrier transmission: amplitude modulation-introduction, double side band, single side band, vestigial side band, quadrate, spectral analysis of each type, envelope and synchronous detection; angle modulation-instantaneous frequency, frequency modulation (FM) and phase modulation (PM), spectral analysis, demodulation of FM and PM.
Pulse modulation: Sampling-sampling theorem, Nyquist criterion, aliasing, instantaneous and natural sampling; pulse amplitude modulation-principle, bandwidth requirements; pulse code modulation (PCM)-quantization principle quantization noise, non-uniform quantization signal to quantization error ratio, differential PCM, demodulation of PCM; delta modulation (DM)-principle adaptive DM; line coding-formats and bandwidths.
Digital modulation: Amplitude-shift Keying-principle, ON-OFF keying, bandwidth requirements, detection, noise performance; phase-shift keying (PSK)- principle, bandwidth requirements, detection, differential PSK, QPSK, noise performance; frequency-shift keying (FSK)-principle, continuous and discontinuous phase FSK, minimum shift keying, bandwidth requirements, detection of FSK. Multiplexing: Time-division multiplexing (TDM)-principle, receiver synchronization, frame synchronization, TDM of multiple bit rate systems; frequency-division multiplexing (FDM)-principle, de-multiplexing; wavelength-division multiplexing, multiple-access network-time-division multiple-access (TDMA), frequency-division multiple access (FDMA); code-division multiple-access (CDMA)-spread spectrum multiplexing, coding techniques and constraints of CDMA. Communication system design: design parameters, channel selection criteria and performance simulation.

EEE 3202 Communication Engineering Fundamentals Sessional
Contact hours/week: 3 Credits: 1.5

In this course students will perform experiments to verify practically the theories and concepts learned in EEE 3201.

EEE 3203 Power System II
Contact hours/week: 3, Credit: 3.

Fault analysis: Classification, effect of fault in power system, short circuit current and reactance of a synchronous machine.
Fault calculation methods: Symmetrical fault calculation, Symmetrical components, sequence networks and unsymmetrical fault calculation.
Load flow: Gauss- Siedel and Newton Raphson methods.
Synchronous machines: transient and subtransient reactance and short circuit currents. Symmetrical fault calculation methods. Symmetrical components: power, unsymmetrical series impedances and sequence networks. Different types of unsymmetrical faults: solid faults andfaults through impedance.
Stability: swing equation, power angle equation, equal area criterion, multi-machine system, step by step solution of swing equation. Factors affecting stability. Reactive power compensation. Flexible AC transmission system (FACTS). High voltage DC transmission system. Power quality: harmonics, sag and swell.
Sub-stations: Classification, Equipment in a substation, Arrangements in substation.

EEE 3205 Signals and Systems
Contact hours/week: 3, Credit: 3.

Classification of signals and systems: signals- classification, basic operation on signals, elementary signals, representation of signals using impulse function; systems- classification.
Linear Time Invariant (LTI) systems: Properties of LTI systems: Linearity, causality, time invariance, memory, stability, invertibility. Time domain analysis of LTI systems: Differential equations- system representation, order of the system, solution techniques, zero state and zero input response, system properties; impulse response- convolution integral, determination of system properties; state variable- basic concept, state equation and time domain solution.
Frequency domain analysis of LTI systems: Fourier series- properties, harmonic representation, system response, frequency response of LTI systems; Fourier transformation properties, system transfer function, system response and distortionless systems. Applications of time and frequency domain analyses: solution of analog electrical and mechanical systems, amplitude modulation and demodulation, time-division and frequency-division multiplexing.
Laplace transformation: properties, inverse transform, solution of system equations, system transfer function, system stability and frequency response and application.

EEE 3207 Numerical Methods
Contact hours/week: 3, Credits: 3

Computer algorithm, Mathematical modeling of physical systems. Iterative Techniques, Solution of simultaneous equations, Interpolation, Curve fitting, Solution of Differential Equations. Numerical solution of Integration. Application of the above techniques in Electrical & Electronic Engineering through computer program.

EEE 3208 Numerical Methods Sessional
Contact hours/week: 3, Credits: 1.5

In this course students will perform experiments to verify practically the theories and concepts learned in EEE 3207.

EEE 4100: Project and Thesis
Contact hours/week: 3, Credits: 1.5

EEE 4101 Digital Signal Processing
Contact hours/week: 3, Credit: 3.

Introduction to digital signal processing, sampling, quantization and signal reconstruction. Analysis of discrete-time system in the time domain: impulse response model, difference equation model. Correlation: power signal, energy signal, applications. Z-transform and analysis of LTI systems.
Frequency analysis of discrete-time signals: discrete Fourier series and discrete-time Fourier transform (DTFT).Frequency analysis of LTI systems. Discrete Fourier transform (DFT) and fast Fourier transform (FFT). Minimum phase, maximum phase and all pass systems. Calculation of spectrum of discrete-time signals. Digital filter design- linear phase filters, specifications, design using window, optimal methods; IIR filters- specifications, design using impulse invariant, bi-linear z- transformation, least-square methods.

EEE 4102 Digital Signal Processing 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 4101.

EEE 4103 Control System
Contact hours/week: 3, Credit: 3.

Review of Laplace transform, Initial and Final value theorems, Transfer Functions: Open-loop stability, Poles, Zeros, Time response, Transients, Steady-state, Block diagrams and signal flow diagram, Feedback principles: Open versus Closed-loop control, High gain control, Inversion; State variables: Signal flow diagram to state variables, transfer function to state variable and state variable to transfer function, Stability of closed-loop systems: Routh's method, Root locus, PID control: Structure, Design using root locus, Pole assignment: Sylvester's theorem, PI and PID synthesis using pole assignment, Frequency Response: Nyquist plot, Bode diagram, Nyquist stability theorem, Stability margins, Closed-loop sensitivity functions, Model errors, Robust stability, Controller design using frequency response: Proportional control, Lead-lag control, PID
control, Digital control systems: introduction, sampled data systems, stability analysis in Z-domain.

EEE 4104 Control System 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 4103.

EEE 4105 VLSI Circuits and Design
Contact hours/week: 3, Credit: 3.

IC trends, technology and design approaches. MOS device: structure, operation, threshold voltage and characteristics.
Ratioed circuits: NMOS inverter with resistive and transistor load, Pseudo NMOS inverter.
Ratioless circuits: CMOS inverters : operation, transfer characteristics, design for equal rise and fall time, propagation delay, rise time, fall time and power consumption estimation. NMOS pass transistor and CMOS pass gate circuits. Buffer chain design to drive large capacitive load. Integrated circuit fabrication technology : photolithography, CMOS process flow, design rules. Estimation of resistance and capacitance from layout. Layout matching. Stick diagram and area estimation from stick diagram. Reliability issues : Latch-up, electromigartion. Basic logic gates in CMOS.
Synthesis of arbitrary combinational logic in CMOS, pseudo-NMOS, dynamic CMOS, clocked CMOS and CMOS domino logic.
Structured design: Parity generator, bus arbitration logic, multiplexers based design, programmable logic array (PLA) design. Clocked sequential circuit design: two phase clocking, dynamic shift register. CMOS latches and flip flops.
Subsystem design : 4-bit arithmetic processor : bus architectures, shifter, design of a general purpose ALU.
Memory elements design: System timing consideration, three transistors and one transistor dynamic memory cell. Pseudo-static RAM/register cell. 4 transistors dynamic and 32 transistors static CMOS memory cell. 4x4 bit register array and 132 bit static CMOS memory array.
Finite State Machine design: Design of Moore Type and Mealy type FSM using Verilog.
Testing VLSI circuits.

EEE 4106 VLSI Circuits and Design 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 4105.

EEE 4200 Project and Thesis
Contact hours/week: 3, Credit: 1.5.

EEE 4201 Power System Protection
Contact hours/week: 3, Credit: 1.5.

Lightning arresters, CT, PT: wound type and CCVT (Capacitor Coupled Voltage Transformer), MOCT (Magneto (HRC) Fuse, Drop Out Fuse (DOF), Load Break Switches, Contactors. Bus bar layout, isolators, earthing switch; Minimum Oil Circuit Breaker (MOCB) and Sulfur Hexafluoride (SF32) circuit breaker.High Rupturing Capacity
Electric arcs, arc extinction mechanism, transient recovery voltage. Circuit Breakers: operating mechanisms, Optical Current Transducer).Breaker (ACB), Air Blast Circuit Breaker (ABCB), Vacuum Circuit Breaker (VCB), Oil Circuit Breaker (OCB),construction and operation of Miniature Circuit Breaker (MCB), Molded Case Circuit Breaker (MCCB), Air Circuit Fundamental of protective relaying. Classical relays (electromagnetic attraction type, induction type); numerical relays, distance relays, pilot relays (wire pilot, carrier).relays. Inverse Definite Minimum Time (IDMT) relays, directional relays, differential and percentage differential Protection of generators, motors, transformers, transmission lines, HVDC system and feeders.

EEE 4202 Power System Protection Sessional
Contact hours/week: 3, Credit: 1.5.

Sessional based on the theory of course EEE 4201.

EEE 4203 Power Plant Engineering and Economy
Contact hours/week: 3, Credits: 3

Introduction to thermal, hydro and nuclear power stations. Nuclear reactor, reactor construction and control. Powerreactors. Central station reactors. Nuclear hazards.Variable load problems, plotting and analysis of load curves, chronological load curves and load duration curve. load curve and its use. Load factor, capacity factor, demand factor, utilization factor, diversity factor etc. andthere impact over the cost analysis of power generation and utilization.
Load forecasting, selection of units and plant location.Load shearing: Base load and peak load plants. Use of chronological load curves to distribute load among units.Power plant Economics: Economic operation of power plants. Input output curve, heat rate curve, incremental ratecurve. Use of incremental rate curve for optimum load scheduling. Transmission line loss, determination of loss coefficient.Economic conductor selection, Kelvin's law. Graphical method for location of distribution systems. Tariffand tariff design. Bus system. Importance of power control. Current limiting reactors. Different types of bus system layout. Forces on bus section in case of short circuit.

EEE 4208 Industrial Attachment
Contact hours/week: 3, Credits: 1.5.

Students will be attached with relevant the industries for two weeks after completing their 4th year 1st semester (before starting 4th year 2nd semester/during any vacation in 4th year 2nd semester) to gain practical knowledge.

Elective Courses

EEE-4111 Renewable Energy
Contact hours/week: 3, Credit: 3.

Renewable energy sources: Solar, wind, mini-hydro, geothermal, biomass, wave and tides.
Solar Photovoltaic: Characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, sun tracking systems, Maximum Power Point Tracking (MPPT): chopper, inverter. Sizing the PV panel and battery pack in stand-alone PV applications. Modern solar energy applications (residential, electric vehicle, naval, and space). Solar power plants connected to grid.
Solar thermal: principles of concentration, solar tower, parabolic dish, receiver, storage, steam turbine and generator.
Wind turbines: Wind turbine types and their comparison, power limitation, Betz‟s law; Control mechanism: pitch, yaw, speed. Couplings between the turbine and the electric generator, Wind turbine generator - DC, synchronous, self-excited induction generator and doubly fed induction generator.
Grid interconnection: active and reactive power control. Biomass and biogas electricity generation.

EEE-4113 High Voltage Engineering
Contact hours/week: 3, Credit: 3.

Ionization and decay process: Townsend's first and second ionization coefficient. Electric breakdown in gases. Townsend's criterion for spark breakdown. Sparking potential. Penning effect. Corona discharges, power loss calculation. Breakdown of solid and liquid dielectrics.
Generation of high voltage: Alternating voltage, transformer cascade. Series resonant circuit for high voltage ac testing. Test of dc and ac cable.
Transient Voltage: Impulse wave shape. Impulse voltage generator and its mathematical analysis. Design consideration of impulse generators. Triggering of impulse generators. DC voltage doubler and cascade circuits. Electrostatic generator, voltage stabilization. Measurement of high voltage. Electrostatic voltmeter, sphere gap. Potential divider. High Voltage testing of power system equipment. Oil testing. Design consideration of transmission line based on direct stroke. High voltage transient in transmission line. High voltage lightning arrester. Insulation co-ordination.

EEE-4115 Optoelectronics
Contact hours/week: 3, Credit: 3.

Optical properties in semiconductor: Direct and indirect band-gap materials, basic transitions in semiconductors, radiative and nonradiative recombination, optical absorption, photo-generated excess carriers, minority carrier life time, luminescence and quantum efficiency in radiation.
Properties of light: Particle and wave nature of light, polarization, interference, diffraction and blackbody radiation.
Light emitting diode (LED): Principles, materials for visible and infrared LED, internal and external efficiency, loss mechanism, structure and coupling to optical fibers. Double-Hetero-structure (DH) LEDs, Characteristics, Surface and Edge emitting LEDs.
Stimulated emission and light amplification: Spontaneous and stimulated emission, Einstein relations, population inversion, absorption of radiation, optical feedback and threshold conditions. Semiconductor Lasers: Population inversion in degenerate semiconductors, laser cavity, operating wavelength, threshold current density, power output, elementary laser diode characteristics, heterojunction lasers, optical and electrical confinement. single frequency solid state lasers-distributed Bragg reflector (DBR), distributed feedback (DFB) laser. Introduction to quantum well lasers. Introduction to quantum well lasers, Vertical Cavity Surface Emitting Lasers (VCSELs), optical laser amplifiers.
Photo-detectors: Photoconductors, junction photo-detectors, PIN detectors, avalanche photodiodes, hetero-junction photodiodes, Schottky photo-diodes and phototransistors. Noise in photodetectors. PIN and APD. Photo-detector design issues.
Solar cells: Solar energy and spectrum, silicon and Schottkey solar cells.
Modulation of light: Phase and amplitude modulation, electro-optic effect, acousto-optic effect and magneto-optic devices. Introduction to integrated optics.

EEE 4117 Mobile Cellular Communication
Contact hours/week: 3, Credit: 3.

Introduction: Concept, evolution and fundamentals. Analog and digital cellular systems. **Cellular Radio System:** Frequency reuse, co-channel interference, cell splitting and components.
Mobile radio propagation: Propagation characteristics, models for radio propagation antenna at cell site and mobile antenna. Frequency Management and Channel Assignment: Fundamentals, spectrum utilization, fundamentals of channel assignment, fixed channel assignment, non-fixed channel assignment, traffic and channel assignment.
Handoffs and Dropped Calls: Reasons and types, forced handoffs, mobile assisted handoffs and dropped call rate.
Diversity Techniques: Concept of diversity branch and signal paths, carrier to noise and carrier to interference ratio performance.
Digital cellular systems: Global system for mobile, time division multiple access and code division multiple access.

EEE-4119 Biomedical Engineering
Contact hours/week: 3, Credit: 3

Origin and major types of biological signals: Human body: cells and physiological systems, bioelectric potential, bio-potential electrodes and amplifiers, blood pressure, flow, volume and sound, electrocardiogram, electromyogram, electroencephalogram, phonocardiogram, vector cardiogram. Interpretation of bio-signals. Noise in bio-signals.
Measurement of bio-signals: transducers, amplifiers and filters. Measurement and detection of blood pressure. Blood flowmeasurement: plethysmograph and electromagnetic flow meter. Measurement of respiratory volumes and flow, related devices.
Xray-Tomograph: positron emission tomography and computed tomography. Magnetic resonance imaging. Ultrasonogram. Patient monitoring system and medical telemetry. Therapeutic devices: cardiac pacemakers and defibrillators. Electrical safety in bio instrumentations and sensing.

EEE-4211 Smart Grid
Contact hours/week: 3, Credit: 3.

Smart grid: two way communication; distributed energy resources (DERs) - DG (distributed generation) and ES (energy storage); high power density batteries, EV (electric vehicles) and PHEV (plug-in hybrid electric vehicles); smart sensors, meters and appliances at demand side. Data communication channels; protocols; TCP/IP; IEEE 802 series
Wireless LANs: Bluetooth, Zigbee, WiMax; wired LANs- Ethernet, PSTN, PLC (Power Line Carrier); cyber security.
Smart meters and AMI (advanced metering infrastructure): construction; standards for information exchange- Modbus, DNP3 andIEC321850; interfacing with HAN, NAN, WAN. Power electronic interfaces between grid and DERs.
Demand side integration (DSI): DSM; real time pricing; ancillary markets; DR (demand response) for load shaping, frequency and voltage control, energy efficiency. Microgrids, self healing and restoration.

EEE 4213 Introduction to Nanotechnology and Nanoelectronics
Contact hours/week: 3, Credit: 3.

Why Nanotechnology: importance, size scales, quantum size effects,revolutionary applications, potentials. Nanotools: scanning tunnelingmicroscope, atomic forcemicroscope, electron microscope,measurement techniques based on fluorescence, other techniques.
Basics of Fabrication: fabrication and processing industry, wafermanufacturing, deposition techniques: evaporation, sputtering,chemical vapor deposition, epitaxy; Wet and dry etching techniques;photolithography, electron beam lithography, stamp technology. Bottom-up processes: chemical and organic synthesis techniques, self assembly, other techniques.
Nanoelectronics: overview ofquantum mechanics, Schrodinger equation, particle in a box. Bandtheory of solids. Importance of nanoelectronics, Moore‟s law, ITRSroadmap. Tunneling devices: quantum tunneling, resonant tunnelingdiodes. Single electron transistor: Coulomb blockade. Quantumconfinement: wires and dots, carbon nanotubes, graphenes. Briefintroductions on molecular electronics and Nanobiology.

EEE 4215 Optical Fiber Communication
Contact hours/week: 3, Credit: 3
Introduction: Historical perspective, basic system, nature of light, advantages and applications of fiber optic.
Optics review: Ray theory and applications, lenses, imaging, numerical aperture, diffraction.
Light wave fundamentals: Electromagnetic waves, Dispersion, polarization, resonant cavities, reflection at plane boundary, critical angle. Integrated optic waveguides: Slab waveguide, Modes in symmetric and asymmetric waveguide, coupling, Dispersion and distortion, integrated optic components.
Optic fiber waveguide: Step index fiber, graded index fiber, attenuation, pulse distortion and information rate, construction of optic fiber, optic fiber cables.
Light sources: LED, LD, distributed feedback LD, optical amplifiers, fiber laser, vertical cavity surface emitting laser diode.
Light detectors: Photo detection, photo multiplier, semiconductor photodiode, PIN photodiode, avalanche photodiode.
Couplers and connectors: Connector principle, end preparation, splices, connectors, source coupling.
Network distribution and fiber components: Directional couplers, star couplers, switches, isolator, wave-length division multiplexing, fiber bragg grating.
Modulation: LED modulation, LD modulation, Analogue and digital modulation, modulation formats, optic heterodyne receivers.
Noise and detection: Thermal shot and noise, SNR, error rates, receiver circuit design.
System design: Analogue and digital system design, few real life problems and examples.

EEE 4217 Radar and Satellite Communication
Contact hours/week: 3, Credits: 3

Radar: Introduction to Radar, Radar Equation CZ, Operating Principle of Radar with Block Diagram, CW and FM Radar, Tracking Radar, Antennas for Radar, Radar Receivers, Radar Transmitting System, Duplexer, Usable Frequencies for Radar, Radar Applications.

Satellite Communication: Overview of Satellite System Engineering. Spacecraft, Introduction, to Spacecraft Subsystem. (AOCS), Telemetry, Tracking and command (TT&C). Spacecraft Antennas, Basic Antenna Types and Relationships Spacecraft, Antennas in Practice, Frequency Reuse Equipment Reliability and Space Qualification,
Reliability redundancy. Multiple Access. Earth station Technology: Earth Station Design, Earth Station Design for Low System Noise Temperature, Large Earth Station Antennas. Satellite Television Broadcasting Networks, VSAT technology.

EEE-4219 Medical Imaging
Contact hours/week: 3, Credit: 3.

Introduction to imaging, medical imaging modalities, Medical imaging before x-rays, Hippocratic thermography, dissection, laparoscopy, X-radiography, Computed tomography (CT), evolution of CT scanner design, image reconstruction algorithms, filtered back projection method, iterative method, low dose computed tomography,
Ultrasound, Sonar and other early applications of acoustics, basic principles of ultrasound imaging, Evolution of ultrasound technology and clinical applications, Magnetic resonance imaging, Early use of nuclear magnetic resonance (NMR) spectroscopy, Principles of NMR and MRI, Evolution of magnetic resonance imaging (MRI) technology and clinical applications, development and applications of functional
MRI, Introduction to Nuclear imaging.

Allied Engineering Courses

CSE 1101 Computer Programming
Contact hours/week: 3, Credit: 3.

Introduction to digital computers. Programming languages, algorithms and flow charts. Structured Programming using C: Variables and constants, operators, expressions, control statements, functions, arrays, pointers, structure unions, user defined data types, input-output and files.
Object-oriented Programming using C++: introduction, classes and objects; polymorphism; function and operator overloading; inheritance.

CSE 1102 Computer Programming Sessional
Contact hours/week: 3, Credit: 1.5.

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in CSE 1101. In the second part, students will learn program design.

CE-1102 Computer Aided Engineering Drawing
Contact hours/week: 3, Credit: 1.5.

Introduction-lettering, numbering and heading; instrument and their use; sectional views and isometric views of solid geometrical figures. Plan, elevation and section of multistoried building; building services drawings; detailed drawing of lattice towers.
Introduction to CAD and usage of Auto-CAD in Drawing.

ME 2101 Basic Mechanical Engineering
Contact hours/week: 3, Credit: 3.

Introduction to sources of energy: Steam generating units with accessories and mountings; steam turbines. Introduction to internal combustion engines and their cycles, gas turbines. Refrigeration and air conditioning: applications; refrigerants, different refrigeration methods.
Fluid machinery: Study of reciprocation pumps. impulse and reaction turbines; Pelton wheel and Kalpan turbine, centrifugal pumps, fans, blowers and compressors. Basics of conduction and convection: critical thickness of insulation.

ME 2102 Basic Mechanical Engineering Sessional
Contact hours/week: 3, Credit: 1.5.

In this course students will perform experiments to verify practically the theories and concepts learned in ME 2101.

CSE 3201 Microprocessor and Microcontroller
Contact hours/week: 3, Credits: 3

Fundamental Concepts: Microprocessor: A programmable device; microcomputer components and support ICs, building blocks of MPU based systems, microprocessor buses, programming principles using MASM, microprocessor instructions.
132-bit Architecture: Pin diagram and functions, memory organization, bus activities, register layout, internal processing blocks.
Instruction Set: Classifications of instructions, addressing modes, address computing chart.
I/O Controller Programming: Port definition and read/write instructions, parallel I/O programming using 8255,serial I/O programming using 8251, display programming using 8279 and LCD, keyboard programming using 8279 and discrete components, generation of timing functions using 8254 Timer/Counter.
Interrupt Structure: Interrupt terminologies, hardware and software interrupt, multiple interrupt management, 8259 interrupt controller.
Data Conversion Algorithm: BCD2BIN conversion, BIN2BCD conversion, binary multiplication, binary division.
System Design (80832 based digital weighing machine: DWM) Top-down/Bottom-up design concept, hardware block diagram, control program flow chart, weight/rate acquisition and processing and display, cost computation and processing and display.
Microcontroller*:* Different types of microcontroller, Processor architecture, microcontroller memory types, microcontroller features, 8051 microcontroller architecture, 8051 addressing modes, 8051 hardware features, 8051 programming
PIC microcontroller: PIC microcontroller features, PIC 132F877 microcontroller, architecture, memory organization, I/O ports, Interrupts, timers, A/D I/O.
PLC: Controllers, Hardware, Internal architecture, Programming, Testing and debugging, Commercial PLC.

CSE-3202 Microprocessor and Microcontroller Sessional
Contact hours/week: 3, Credits: 1.5

In this course students will perform experiments to verify practically the theories and concepts learned in CSE 3201.

General Science Courses

PHY 1101 Electricity and Magnetism, Modern Physics and Mechanics
Contact hours/week: 3, Credit: 3

Electricity and Magnetism: Electric charge and Coulomb's law, Electric field, concept of electric flux and the Gauss's law some applications of Gauss's law, Gauss's law in vector form, Electric potential, relation between electric field and electric potential, capacitance and dielectrics, Current, Current density, ohm's law, resistivity, the magnetic field, Ampere's law, Biot Savart law and their applications, Laws of electromagnetic induction, Faraday's law, Lenz's law, self and mutual induction, Electric flux, Magnetic flux, magnetic materials, magnetization curves, Maxwell's equation.

Modern physics: Galilean relativity and Einstein's special theory of relativity, Lorentz transformation equations, Length contraction, Time dilation, relativity of mass and mass energy relation. Photoelectric effect, Compton effect, De Broglie matter waves and its success in explaining Bohr's theory, Constituent of atomic nucleus, Nuclear binding energy, different types of radioactivity, radioactive decay law, half life, mean life; Nuclear reactions, nuclear fission, nuclear fusion, nuclear chain reaction, atomic power plant.

Mechanics: Linear momentum of a particle, linear momentum of a system of particles, conservation of linear momentum of a particle, angular momentum of a system of particles, Newton's law of Gravitation, Gravitational constant, variation of acceleration of gravity, applications of law of gravitation. Kepler's law of planetary motion, the law of universal Gravitation, the motion planets and satellites, escape velocity. Introductory quantum mechanics; Wave function; Uncertainty principle, postulates, Schrodinger time independent and time dependent equation, expectation value, Probability, Particle in a zero potential, calculation of energy.

PHY 1102 Electricity and Magnetism, Modern Physics and Mechanics 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 1101.

MATH 1101 Differential & Integral Calculus and Coordinate Geometry
Contact hours/week: 3, Credit: 3

Differential Calculus: Continuity and differentiability; Leibnitz's forms; Lagrange's form of remainders; Cauchy's form of remainder; Expansion of functions; Evaluation of indeterminate forms by L 'Hospitals rule; Partial differentiation; Euler's Theorem; Tangent and Normal; Sub tangent and subnormal in Cartesian and polar coordinates; Maximum and minimum values of functions of single variable.
Integral Calculus: Definite integrals and its properties; Wally's formula; Improper integrals; Beta function and Gamma function; Area under a plane curve in Cartesian and polar coordinates; Area of the region enclosed by two curves in Cartesian and polar coordinates; Arc lengths of curves in Cartesian and polar coordinates; Volume of solids of revolution; Area of surface of revolution; Multiple integrals.
Coordinate Geometry:
Transformation of coordinates axes and its uses; General equations of second degree and their reduction to standard forms; Pair of straight lines; System of circles; Coaxial circles and limiting points; Equations of parabola, ellipse and hyperbola in Cartesian coordinates; Tangents and normal; Pair of tangents; Chord of contact; Chord in terms of its middle point.; Parametric coordinates; Conjugate diameters; Asymptotes

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, equipartation 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.

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.

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

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 cellsor Accumulators, lead accumulator and alkaline accumulator, Different types of solutions, Colligative properties of dilute solution, Thermochemistry, Chemical kinetics, Chemical equilibria.

CHEM 1202 Chemistry Sessional
Contact hours/week: 3, Credit: 1.5

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

MATH 2101 Linear Algebra and Vector Analysis
Contact hours/week: 3, Credit: 3

Linear Algebra: Introduction to systems of linear equations; Gaussian elimination; Inverse of a matrix; Eigen values and eigen vectors; Cayley Hamilton theorem; Euclidean n space; Linear transformations from IRn to IRm; Properties of linear transformations from IRn to IRm; Real vector spaces and subspaces; Basis and Dimension, Change of basis, Rank and Nullity; Inner product spaces; Diagonalization; Linear transformations: Kernel and Range.

Vector Analysis: Scalars and vectors, equality of vectors; Addition and subtraction of vectors; Multiplication of vectors by scalars; Position vector of a point; Scalar and vector product of two vectors and their geometrical interpretation; Triple products and multiple products of vectors; Linear dependence and independence of vectors; Definition of line, surface and volume integral; Gradient, divergence and curl of point functions; Gauss's theorem, Stoke's theorem, Green's theorem and their applications.

MATH 2201 Statistics and Probability
Contact hours/week: 3, Credit: 3

Introduction, Sets and Frequency distribution; Mean, Median, Mode and other measures of central tendency; Standard deviation and other measures of dispersion; Moments skewness and kurtosis; Elementary probability, Application of statistical methods to engineering problems: Random variables;

Discrete and continuous probability distributions; discontinuous probability distributions (Binomial, Poisson and negative binomial); Characteristics of Distributions functions of random variables and derived distributions; expectation and moments of random variables; point estimation of distribution parameters: methods of moments and maximum likelihood, Bayesian Analysis; confidence intervals; hypothesis tests; nonparametric statistical tests; simple and multiple linear regression and model selection; Analysis of variance, Correlation, Estimation theory.

General Education Courses

GED 1101 English for Technical Communication
Contact hours/week: 3, Credit: 3

Introduction: current approaches to learning English, communication today.
Phonetics: phonetics and correct English pronunciation.
Syntax: vocabulary, diction and English sentence; sentence variety and style; grammatical problems.
Reading skill: readability, reading strategies, generating ideas through purposive reading, reading of selected stories, comprehension.
Writing skill: principles of effective writing; generating ideas, planning, organization and development of writing; composition, précis.
Written communication: business communication, tenders and Quotations, journal articles, report.
Listening skill: listening to recorded texts; learning to take useful notes and answering questions.
Speaking skill: dialogue in peer work; participation in discussion and debate; extempore speech; narrating events; story telling; presentation.

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.

GED 2101 Financial Account & Economic Analysis
Contact hours/week: 3, Credit: 3

Accountancy: Basic accounting principles, Transaction, Journal, Ledger and Accounts. Cash book, Bank Reconciliation statement. Preparation of Financial Statement. Cost Accounts and its objects. Cost classification. Elements of costs, preparation of cost sheet. Overhead allocation. Use of Relevant costs in Decision Making, Standard costing. Material cost variance. Break even analysis.
Economics: Definition of Economics. Economics and Engineering.
Micro Economics: The theory of demand and supply and their elasticity. Price determination. Nature of an economic theory, applicability of economic theories to the problems of developing countries. Indifference curve technique. Marginal analysis. Production, production function, types of productivity. Rational region of production of an engineering firm. Concepts of market and market structure. Cost analysis and cost function. Small scale production and large scale production. Optimization. Theory of distribution.
Macro Economics: Savings, investment, employment, National income analysis. Inflation. Monetary policy, fiscal policy and trade policy with reference to Bangladesh. Economics of development and planning.

GED 2201 Professional Ethics and Moral Thoughts
Contact hours/week: 3, Credit: 3

Ethics: Meaning, Definition of ethics, need of Ethics, Ethical Dilemma, Why peopleact Unethically, Different branch of ethics, General Ethics, Framework for general ethics.
Professional Ethics: Definition of Profession and Professional Ethics. Objectives of Professional Ethics, Code of Professional Ethics. History and Development of Engineering ethics, study of ethics in Engineering, Applied ethics in Engineering. Human qualities of an engineer. Obligation of an engineer to the clients. Attitude of an engineer to other engineers. Measures to be taken in order to improve the quality of engineering profession.
Ethical Expectations: Employers and Employees, inter professional relationship. Professional organization maintaining a commitment of ethical standard. Desired characteristics of a professional code. Institutionalization of Ethical conduct.

GED 3101 Engineering Management
Contact hours/week: 3, Credit: 3

Business and industrial law: Law of contract, elements of valid contract. Consideration, Parties competent to contact. Sale of goods, hire and purchase. Negotiable instrument.
Industrial law in Bangladesh: various ordinance payments of wages, legislation relating employment in industries, factories, shops and agriculture, trade union act.
Human resources management in business: Human factors and motivation, leadership, group decision making and communication, job gradation, process of performance appraisal and reward systems, managing information for decision and management information systems.
Marketing management: Understanding marketing management, developing marketing strategies, conducting marketing research, analyzing consumer and business market, identifying market segments and targets, dealing with competition.
Safety: Evolution of modern safety concepts, industrial hazard, safety and risk management, productivity, worker health and safety, proactive management techniques for safety management, safety standards and regulations for engineering works, fire safety, hazardous materials.