Hajee Mohammad Danesh Science and Technology University (HSTU)
Dinajpur-5200
Faculty of Computer Science and Engineering
Layout of Syllabus for 4 years B. Sc. (Engineering) in Electrical and Electronic Engineering
(B.Sc. (Engineering) in EEE)
(Effective from the semester Jan-Jun, 2017)

Summary of Credits per Semester

Level	Semester	Theory		Sessional		Total Credits
		No. of Courses	Credits	No. of Courses	Credits	
1	I	5	15.00	4	4.50	19.50
	II	5	14.00	4	4.50	18.50
2	I	6	16.00	3	3.75	19.75
	II	6	17.00	3	3.75	20.75
3	I	6	17.00	3	3.75	20.75
	II	5	14.00	4	5.25	19.25
4	I	4	12.00	3	6.00	18.00
	II	4	12.00	4	7.00	19.00
Total		**41**	**117.00**	**28**	**38.50**	**155.50**

SUMMARY OF COURSES

Level 1 Semester I

S/N	Course Code	Course Title	Credit	Contact Hours/Week
1	EEE 101	Electrical Circuits-I	3.00	3.00
2	EEE 102	Electrical Circuits- I Sessional	1.50	3.00
3	CHE 117	General Chemistry	3.00	3.00
4	CHE 118	General Chemistry Sessional	0.75	1.50
5	PHY 115	Mechanics, Waves and Oscillations, Optics and Thermal Physics	3.00	3.00
6	PHY 116	Mechanics ,Waves and Oscillations, Optics and Thermal Physics Sessional	0.75	1.50
7	MAT 129	Calculus- I	3.00	3.00
8	MAT 131	Calculus- II	3.00	3.00
9	AIE 124	Engineering Drawing	1.50	3.00
	Total		**19.50**	**24.00**

No. of theory Courses	5
No. of Sessional Courses	4
Total Contact Hours (15+9)	24
Total Credit	19.50

Level 1 Semester II

S/N	Course Code	Course Title	Credit	Contact Hours/Week
1	EEE 151	Electrical Circuits- II	3.00	3.00
2	EEE 152	Electrical Circuits- II Sessional	1.50	3.00
3	EEE 154	Electrical Circuit Simulation Laboratory	1.50	3.00
4	PHY 133	Modern Physics ,Electricity and Magnetism	3.00	3.00
5	PHY 134	Modern Physics ,Electricity and Magnetism Sessional	0.75	1.50
6	CSE 163	Computer Programming	3.00	3.00
7	CSE 164	Computer Programming Sessional	0.75	1.50
8	MAT 135	Ordinary and Partial Differential Equations	3.00	3.00
9	SOC 121	Sociology	2.00	2.00
	Total		**18.50**	**23.00**

No. of theory Courses	5
No. of Sessional Courses	4
Total Contact Hours (14+9)	23
Total Credit	18.50

Level 2 Semester I

S/N	Course Code	Course Title	Credit	Contact Hours/Week
1	EEE 201	Electronics- I	3.00	3.00
2	EEE 202	Electronics- I Sessional	1.50	3.00
3	EEE 204	Electronics Circuit Simulation Laboratory	0.75	1.50
4	EEE 205	Electrical Machine-I	3.00	3.00
5	EEE 206	Electrical Machine-I Sessional	1.50	3.00
6	EEE 207	Electromagnetic Fields and Waves	3.00	3.00
7	ECE 207	Signals and Systems	3.00	3.00
8	MAT 213	Linear Algebra	2.00	2.00
9	SSL 223	English	2.00	2.00
	Total		**19.75**	**23.50**

No. of theory Courses	6
No. of Sessional Courses	3
Total Contact Hours (16+7.5)	23.50
Total Credit	19.75

Level 2 Semester II

S/N	Course Code	Course Title	Credit	Contact Hours/Week
1	EEE 251	Electrical Machine-II	3.00	3.00
2	EEE 252	Electrical Machine-II Sessional	1.50	3.00
3	EEE 253	Electronics -II	3.00	3.00
4	EEE 254	Electronics- II Sessional	1.50	3.00
5	EEE 255	Numerical Methods in Engineering	3.00	3.00
6	AIE 227	Mechanical Engineering Fundamentals	3.00	3.00
7	AIE 228	Mechanical Engineering Fundamentals Sessional	0.75	1.50
8	STT 223	Basic statistics and probability	3.00	3.00
9	ECN 277	Fundamentals of Economics	2.00	2.00
	Total		**20.75**	**24.50**

No. of theory Courses	6
No. of Sessional Courses	3
Total Contact Hours (17+7.5)	24.50
Total Credit	20.75

Level 3 Semester I

S/N	Course Code	Course Title	Credit	Contact Hours/Week
1	EEE 301	Optoelectronics	3.00	3.00
2	EEE 303	Digital Electronics	3.00	3.00
3	EEE 304	Digital Electronics Sessional	1.50	3.00
4	EEE 305	Transmission & Distribution of Electrical Power	3.00	3.00
5	EEE 307	Electrical Properties of Material	3.00	3.00
6	EEE 310	Electrical Services Design	1.50	3.00
7	ECE 313	Communication Theory	3.00	3.00
8	ECE 314	Communication Theory Sessional	0.75	1.50
9	ACT 305	Financial and Managerial Accounting	2.00	2.00
	Total		**20.75**	**24.50**

No. of theory Courses	6
No. of Sessional Courses	3
Total Contact Hours (17+7.5)	24.50
Total Credit	20.75

Level 3 Semester II

S/N	Course Code	Course Title	Credit	Contact Hours/Week
1	EEE 351	Industrial and Power Electronics	3.00	3.00
2	EEE 352	Industrial and Power Electronics Sessional	1.50	3.00
3	EEE 353	Digital Signal Processing	3.00	3.00
4	EEE 354	Digital Signal Processing Sessional	1.50	3.00
5	EEE 355	Power System-I	3.00	3.00
6	EEE 356	Power System-I Sessional	1.50	3.00
7	CSE 365	Microprocessor and Interfacing	3.00	3.00
8	CSE 366	Microprocessor and Interfacing Sessional	0.75	1.50
9	MGT 309	Industrial Management	2.00	2.00
	Total		**19.25**	**24.50**

No. of theory Courses	5
No. of Sessional Courses	4
Total Contact Hours (14+10.5)	24.50
Total Credit	19.25

Level 4 Semester I

S/N	Course Code	Course Title	Credit	Contact Hours/Week
1	EEE 444	Project/Thesis	3.00	3.00
2	EEE 401	Solid State Devices & VLSI	3.00	3.00
3	EEE 403	Control System	3.00	3.00
4	EEE 404	Control System Sessional	1.50	3.00
5	Elective I	One course from Elective I	3.00	3.00
6	Elective II	One course from Elective II (Theory + Sessional)	3.00	3.00
			1.50	3.00
	Total		**18.00**	**21.00**

No. of theory Courses	4
No. of Sessional Courses	3
Total Contact Hours (12+9)	21
Total Credit	18.00

Level 4 Semester II

S/N	Course Code	Course Title	Credit	Contact Hours/Week
1	EEE 488	Project/Thesis	3.00	3.00
2	EEE 451	Microcontroller Based System Design	3.00	3.00
3	EEE 452	Microcontroller Based System Design Sessional	1.50	3.00
4	Elective III	One course from Elective III (Theory + Sessional)	3.00	3.00
5			1.50	3.00
6	Elective IV	One course from Elective IV	3.00	3.00
7	Elective V	One course from Elective V	3.00	3.00
8	EEE 480	Industrial Training	1.00	
	Total		**19.00**	**21.00**

No. of theory Courses	4
No. of Sessional Courses	4
Total Contact Hours (12+9)	21
Total Credit	19.00

Elective Course divisions:

Five elective courses (Elective I – Elective V) are offered to the students according to the following lists.

Elective I (One Theory Course will be selected):

S/N	Course Code	Course Title	Credit	Contact Hours/Week
1	EEE 409	Optical Fiber Communication	3.0	3.0
2	EEE 411	Electrical Machine III	3.0	3.0
3	EEE 413	Analog Integrated circuit	3.0	3.0

Elective II(One Theory course with Sessional will be selected):

S/N	Course Code	Course Title	Credit	Contact Hours/Week
1	EEE 415	Power System protection	3.0	3.0
2	EEE 416	Power System protection Sessional	1.5	3.0
3	EEE 417	Telecommunication Engineering	3.0	3.0
4	EEE 418	Telecommunication Engineering Sessional	1.5	3.0
5	EEE 419	Biomedical Instrumentation	3.0	3.0
6	EEE 420	Biomedical Instrumentation Sessional	1.5	3.0

Elective III (One Theory course with Sessional will be selected):

S/N	Course Code	Course Title	Credit	Contact Hours/Week
1	EEE 453	Renewable Energy	3.0	3.0
2	EEE 454	Renewable Energy Sessional	1.5	3.0
3	EEE 455	Digital Image Processing	3.0	3.0
4	EEE 456	Digital Image Processing Sessional.	1.5	3.0
5	EEE 457	High Voltage Engineering	3.0	3.0

6	EEE 458	High Voltage Engineering Sessional	1.5	3.0

Elective IV (One Theory Course will be selected):

S/N	Course Code	Course Title	Credit	Contact Hours/Week
1	EEE 459	Power Plant Engineering and Economy	3.0	3.0
2	EEE 461	Nano Technology	3.0	3.0
3	EEE 463	Computer Networks	3.0	3.0

Elective V (One Theory Course will be selected):

S/N	Course Code	Course Title	Credit	Contact Hours/Week
1	EEE 465	Mobile Cellular Communication	3.0	3.0
2	EEE 467	Measurement and Instrumentation	3.0	3.0
3	EEE 469	Microwave Engineering	3.0	3.0

Detailed Syllabus

B.Sc. (Engineering) in Electrical and Electronic Engineering (EEE)

Hajee Mohammad Danesh Science and Technology University, Dinajpur Bangladesh

(Effective from Jan-Jun 2017)

Level 1 Semester I

EEE 101 Electrical Circuits- I 3.0 Credits

Circuit variables: voltage, current, power and energy, Voltage andcurrent independent and depended sources, Circuit elementsresistance, inductance and capacitance. Modeling of practical circuits,Ohm‟s law and Kirchhoff‟s laws, Solution of simple circuits with bothdependent and independent sources, Series-parallel resistance circuitsand their equivalents, Voltage and current divider circuits, Delta-Wyeequivalent circuits,

Techniques of general DC circuit analysis (containing both independent and dependent sources): Node-voltagemethod, Mesh-current method, Source transformations. Thevenin andNorton equivalents, Maximum power transfer. Superpositiontechnique. Properties of Inductances and capacitances. Series-parallelcombinations of inductances and capacitances;Concepts of transientand steady state response with dc source.

Definitions of acvoltage, current, power, volt-ampere and variousfactors (including power, peak, form factors etc.)

Introduction tosinusoidal 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 bothindependent and dependent sources): Node-voltage method, Mesh current method, Source transformations, Thevenin and NortonEquivalents, Phasor diagrams. Sinusoidal steady state powercalculations, RMS values, Real and reactive power. Maximum powertransfer, impedance matching. Steady state voltage, current.

EEE 102 Electrical Circuits-I Sessional
1.5 Credits

In this course students will perform experiments to verify practically the theories and concepts learned in EEE 101.

CHE 117 General Chemistry
3.0 Credits

Atomic Structure, quantum numbers, electronic configuration, periodic table. Properties and uses of noble gases. Different types of chemical bonds and their properties. Molecular structures of compounds. Selective organic reactions.

Different types of solutions and their compositions. Phase rule, phase diagram of monocomponent system. Properties of dilute solutions. Thermochemistry, chemical kinetics, chemical equilibria. Ionization of water and pH concept. Electrical properties of solution.

CHE 118 General Chemistry Sessional
0.75 Credit

Laboratory experiments based on CHE 117.

PHY 115 Mechanics, Waves and Oscillations, Optics and Thermal Physics
3.0 Credits

Mechanics: Linear momentum of a particle, linear momentum of a system of particles, conservation of linear momentum, some applications of the momentum principle; Angular momentum of a particle, angular momentum of a system of particles, Kepler's law of planetary motion, the law of universal Gravitation, the motion of planets and satellites, introductory quantum mechanics; Wave function; Uncertainty principle, postulates, Schrodinger time independent equation, expectation value, Probability, Particle in a zero potential, calculation of energy.

Waves and oscillations: Differential equation of simple harmonic oscillator, total energy and average energy, combination of simple harmonic oscillations, spring mass system, torsional pendulum; two body oscillation, reduced mass, damped oscillation, forced oscillation, resonance, progressive wave, power and intensity of wave, stationary wave, group and phase velocities.

Optics: Defects of images: spherical aberration, astigmatism, coma, distortion, curvature, chromatic aberration. 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, diffraction from a circular aperture, 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, Polarimeters.

Thermal Physics: Heat and work- the first law of thermodynamics and its applications; Kinetic Theory of gases- Kinetic interpretation of temperature, specific heats of ideal gases, equipartition of energy, mean free path, Maxwell's distribution of molecular speeds, reversible and irreversible processes, Carnot's cycle, second law thermodynamics, Carnot's theorem, entropy, Thermodynamic functions, Maxwell relations, Clausius and Clapeyron equation.

PHY 116 Mechanics, Waves and Oscillations, Optics and Thermal Physics Sessional
0.75 Credit

Laboratory experiments based on PHY 115.

MAT 129 Calculus- I
3.0 Credits

Differential Calculus: Limits, continuity and differentiability. Successive differentiation of various types of functions. Leibnitz's theorem. Rolle's theorem, Mean value theorem, Taylor's and Maclaurin's theorems in finite and infinite forms. Lagrange's form of remainders. Cauchy?s form of remainders. Expansion of functions, evaluation of indeterminate forms of L? Hospital's rule. Partial differentiation. Euler's theorem. Tangent and normal. Subtangent and subnormal in cartesian and polar co-ordinates. Determination of maximum and minimum values of functions. Curvature. Asymptotes. Curve tracing.

Integral Calculus: Integration by the method of substitution. Standard integrals. Integration by successive reduction. Definite integrals, its properties and use in summing series. Walli's formulae. Improper integrals. Beta function and Gamma function. Area under a plane curve and area of a region enclosed by two curves in cartesian and polar co-ordinates. Volumes and surface areas of solids of revolution.

MAT 131 Calculus- II
3.0 Credits

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-Riemann 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.

Vector Analysis: Multiple product of vectors. Linear dependence and independence of vectors. Differentiation and integration of vectors together with elementary applications. Line, surface, and volume integrals. Gradient of a scalar function, divergence and curl of a vector function, various formulae. Integral forms of gradient, divergence and curl. Divergence theorem. Stoke's theorem, Green's theorem and Gausse's theorem.

AIE 124 Engineering Drawing
1.5 Credits

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.

Level 1 Semester II

EEE 151 Electrical Circuits- II
3.0 Credits

Circuits with non-sinusoidal excitations, power and power factor of accircuits with multiple sources of different frequencies; Transients inAC circuits,

Passive Filter Networks: basic types. Characteristicimpedance and attenuation, ladder network, low pass, high pass filters,propagation coefficient and time delay in filter sections, practicalcomposite filters.

Resonance in AC circuits: Series and parallelresonance and Q factors. Magnetically coupled circuits.

Analysis ofthree phase circuits: Three phase supply, balanced and unbalanced circuits, power calculation and measurements, Power factorimprovement.

Basic 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, Analysis of magnetic circuits.

EEE 152 Electrical Circuits-II Sessional
1.5 Credits

In this course students will perform experiments to verify practically the theories and concepts learned in EEE 151.

EEE 154 Electrical Circuit Simulation Laboratory
1.5 Credits

Simulation laboratory based on EEE 101 and EEE 151 theory courses. Students will verify the theories and concepts learned in EEE 101 and EEE 151 using simulation software like PSpice and Matlab. Students will also perform specific design of DC and AC circuits theoretically and by simulation.

PHY 133 Modern Physics, Electricity and Magnetism
3.0 Credits

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

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.

PHY 134 Modern Physics, Electricity and Magnetism Sessional
0.75 Credits

Laboratory experiments based on PHY 133.

CSE 163 Computer Programming
3.0 Credits

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; polyorphism; function and operator overloading; inheritance.

CSE 164 Computer Programming Sessional
0.75 Credits

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in CSE 163. In the second part, students will learn program design.

MAT 135 Ordinary and Partial Differential Equations
3.0 Credits

Ordinary Differential Equations: Degree and order of ordinary differential equations, formation of differential equations. Solution of first order differential equations by various methods. Solution of general linear equations of second and higher orders with constant coefficients. Solution of homogeneous linear equations. Solution of differential equations of the higher order when the dependent or independent variables are absent. Solution of differential equation by the method based on the factorization of the operators. Frobenius method.

Partial Differential Equations: Introduction. Linear and non-linear first order equations. Standard forms. Linear equations of higher order. Equations of the second order with variable coefficients. Wave equations. Particular solution with boundary and initial conditions.

SOC 121 Sociology
2.0 Credits

Introduction: Society, Science and Technology- an overview; Scientific Study of Society; Social Elements, Society, Community, Association and Institution; Mode of Production and Society Industrial Revolution, Development of Capitalism.

Culture and Socialization: Culture; Elements of Culture; Technology and Culture; Cultural Lag; Socialization and Personality; Family; Crime and Deviance; Social Control. Technology, Society and Development; Industrialization and Development; Development and Dependency Theory; Sustainable Development; Development and Foreign Borrowing; Technology Transfer and Globalization, Modernity and Environment; Problem and Prospects.

Pre-industrial, Industrial and Post-industrial Society: Common Features of Industrial Society; Development and Types of Social Inequality in Industrial Society; Poverty, Technology and Society; Social Stratification and Social Mobility; Rural and Urban Life, and their Evaluation.

Population and Society: Society and Population; Fertility. Mortality and Migration; Science, Technology and Human Migration; Theories of Population Growth-Demographic Transition Theory, Malthusian Population Theory; Optimum Population Theory; Population Policy.

Level 2 Semester I

EEE 201 Electronics-I
3.0 Credits

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, multiplediode 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, ACload lines, CC and CB amplifier, multistage amplifiers, power consideration.

MOS Transistors: 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, basic JFET amplifiers. .

Frequency Response: frequency response of BJT and FET circuits.

EEE 202 Electronics- I Sessional
1.5 Credits

In this course students will perform experiments to verify practically the theories and concepts learned in EEE 201.

EEE 204 Electronics Circuit Simulation Laboratory

0.75 Credits

Simulation laboratory based on EEE 201 theory courses. Students will verify the theories and concepts learned in EEE 201 using simulation software like PSpice and Matlab. Students will also perform specific design of Electronic circuits theoretically and by simulation

EEE 205 Electrical Machine- I
3.0 Credits

DC generator: Types, no-load voltage characteristics, build-up of a self-excited shunt generator, critical field resistance, load-voltage characteristic, effect of speed on no-load and load characteristics and voltage regulation.

DC motors: principle of operation, constructional features, back emfand torque equations, armature reaction and its effect on motorperformance, compensating winding, problems of commutation andtheir mitigations, types of dc motors and their torque speedcharacteristics, starting and speed control of dc motors, applications ofdifferent types of dc motor.

Transformer: principle of operation, construction, no load andexcitation current, behavior during loading, effect of leakage flux,ideal transformer, leakage reactance and equivalent circuit of atransformer, equivalent impedance, voltage regulation, per unitquantities, regulation, losses and efficiency, determination ofparameters by tests, polarity of transformer windings, vector group,transformer parallel operation. Harmonics in excitation current,transformer inrush current, three phase transformer connections, threephase transformers, harmonic suppression in three phase transformerconnection. Autotransformer,Instrument transformer.

EEE 206 Electrical Machine-I
1.5 Credits

In this course students will perform experiments to verify practically the theories and concepts learned in EEE 205.

EEE 207 Electromagnetic Fields and Waves
3.0 Credits

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.

Waveguides: General Formulation, Modes of Propagation and Losses in Parallel Plate, Rectangular and Circular Waveguides. Microstrip Lines: Structures and Characteristics. Microwave Resonators: Waveguide Cavity Resonators, Microstrip Resonators. Microwave Network Analysis: Scattering Matrices and Multiport Analysis Techniques. Introduction to Radiation and Antennas: Types of Antenna and Their Applications, Radiating Field Regions, Radiation Pattern- Isotropic, Directional and Omni Directional Patterns, Radiation Power Density, Radiation Intensity, Beamwidth, Directivity, Antenna Efficiency and Gain, Polarization.

ECE 207 Signals and Systems
3.0 Credits

Classification of signals and systems: signals- classification, basic operation on signals, elementary signals, representation of signals using impulse function; systems- classification.

Properties of Linear Time Invariant (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 distortion-less 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.

MAT 213 Linear Algebra
2.0 Credits

Introduction to systems of linear equations. Gaussian elimination. Definition of matrices. Algebra of matrices. Transpose of a matrix and inverse of matrix. Factorization. Determinants. Quadratic forms. Matrix polynomials. Euclidean n-space. Linear transformation from IRn to IRm. Properties of linear transformation from IRn to IRm . Real vector spaces and subspaces. Basis and dimension. Rank and nullity. Inner product spaces. Gram-Schmidt process and QR-decomposition. Eigenvalues and eigenvectors. Diagonalization. Linear transformations. Kernel and Range. Application of linear algebra to electric networks.

ENG223 English
2.0 Credits

General discussion: Introduction, various approaches to learning English.

Grammatical Problems: Construction of sentences, grammatical errors, sentence variety and style, conditionals, vocabulary and diction.

Reading Skill: Discussion readability, scan and skin reading, generating ideas through purposive reading, reading of selected stories.

Writing Skill: Principles of effective writing; Organization, planning and development of writing; Composition,pretiswriting, amplification.General strategies for the writing process: Generating ideas, identifying audiences and purposes, construction arguments, stating problems, drafting and finalizing.

Approaches to Communication: Communication today, business communication, different types of business communication.

Listening Skill: The phonemic systems and correct English pronunciation.

Speaking Skill: Practicing dialogue; Story telling; Effective oral presentation.

Report Writing: Defining a report, classification of reports, structure of a report, and writing of reports.

Level 2 Semester II

EEE 251 Electrical Machine- II
3.0 Credits

Synchronous Generator: excitation systems, equivalent circuit, vector diagrams at different loads, factors affecting voltage regulation, synchronous impedance, synchronous impedance method of predicting voltage regulation and its limitations. Parallel operation: Necessary conditions, synchronizing, circulating current and vector diagram. Synchronous motor: Operation, effect of loading under different excitation condition, effect of changing excitation, V-curves and starting.

Synchronous Motors: construction, operation, starting, effect ofvariation of load at normal excitation, effect of variation ofexcitations, V curves, inverted V curves and compounding curves,power factor adjustment, synchronous capacitor and power factorcorrection.

Three phase induction motor: rotating magnetic field, reversal ofrotating magnetic field, synchronous speed, torque in induction motor,induction motor construction: squirrel cage, wound rotor; slip and itseffect on rotor frequency and voltage, equivalent circuit of aninduction motor, air gap power, mechanical power and developedtorque, torque speed characteristic, losses, efficiency and powerfactor, classification, motor performance as a function of machineparameters, shaping torque speed characteristic and classes ofinduction motor, per unit values of motor parameters, determinationof induction motor parameters by tests, methods of braking, speedcontrol.

Single Phase Induction Motor: operation, quadrature field theory,double revolving field theory, split phasing, starting methods,equivalent circuit, torque-speed characteristic and performancecalculation.

EEE 252 Electrical Machine- II Sessional
1.5 Credits

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 251. In the second part, students will design simple systems using the principles learned in EEE 251.

EEE 253 Electronics- II
3.0 Credits

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.

Operational amplifiers (Op-Amp): Properties of ideal Op-Amps, non-inverting and inverting amplifiers, inverting integrators, differentiator, weighted summer and other applications of Op-Amp circuits, effects of finite open loop gain and bandwidth on circuit performance, logic signal operation of Op-Amp, DC imperfections. General purpose Op-Amp: DC analysis, small-signal analysis of different stages, gain and frequency response of 741 Op-Amp.

Negative feedback: properties, basic topologies, feedback amplifiers with different topologies, stability, frequency compensation.

Active filters: Different types of filters and specifications, transfer functions, realization of first and second order low, high and bandpass filters using Op-Amps.

Signal generators: Basic principle of sinusoidal oscillation, Op-Amp RC oscillators, LC and crystal oscillators.

Power Amplifiers:Classification of output stages, class A, B and AB output stages.

EEE 254 Electronics-II Sessional
1.5 Credits

In this course students will perform experiments to verify practically the theories and concepts learned in EEE 253.

EEE 255 Numerical Methods in Engineering

3.0 Credits

Introduction to MATLAB programing.

Introduction to numerical techniques. Solution of systems of linear equations. Gaussian elimination, matrix decomposition, ill-conditioned systems. Systems of non-linear equations. Interpolation and curve fitting. Least-Squares Regression o Interpolation by polynomials and splines. Numerical differentiation. Numerical integration (Quadrature) methods, associated errors. Solution of ordinary differential equations: initial value problems. First-order ODE's Euler, Heun's Runge-Kutta methods. Solution of systems of ODE's and higher-order ODE's. Introduction of partial differential equation solution and boundary value problems. Optimization.

AIE 227 Mechanical Engineering Fundamentals
3.0 Credits

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: impulse and reaction turbines; centrifugal pumps, fans, blowers and compressors.

Basics of conduction and convection: critical thickness of insulation.

AIE 228 Mechanical Engineering Fundamentals Sessional
0.75 Credits

In this course students will perform experiments to verify practically the theories and concepts sal based on AIE 227.

STT 223 Basic Statistics and Probability
3.0 Credits

Introduction. Sets and probability. Random variable and its probability distributions. Treatment of grouped sampled data. Some discrete probability distributions. Normal distribution. Sampling theory. Estimation theory. Tests of hypotheses. Regression and correlation. Analysis of variance.

ECN 277 Fundamentals of Economics
2.0 Credits

Introduction to economics. Economics and engineering. Different economic systems. Fundamental economic problems. Basic elements of demand, supply and product market. Theory of utility and preferences, consumer's surplus. Theory of production and cost. Theory of the firm and market structure. Optimization.

Introducing macroeconomics. National income accounting, the simple Keynesian analysis of national income, employment and inflation. Savings, investment and decision making. Fiscal policy and monetary policy- money and interest rate, income and spending.

Economics of development and planning.

Level 3 Semester I

EEE 301 Optoelectronics

3.00 Credits

Optical properties in semiconductor: Direct and indirect band-gap materials, basic transitions in semiconductors, radiative and non-radiative 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, hetero-junction 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, Schottkey photo-diodes and phototransistors. Noise in photo-detectors. 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 303 Digital Electronics

3.00 Credits

Introduction to number systems and codes.

Analysis and synthesis of digital logic circuits: Basic logic functions, Boolean algebra, combinational logic design, minimization of combinational logic.

MOSFET Digital circuits: NMOS inverter, CMOS inverter, CMOS logic circuits, Clocked CMOS logic circuits, transmission gates, sequential logic circuits.

Memories: classification and architecture, RAM memory cells, Read only memory, data converters, BJT digital circuits: ECL, TTL, STTL, BiCMOS.

Modular combinational circuit design: pass transistor, pass gates, multiplexer, demultiplexer and their implementation in CMOS, decoder, encoder, comparators, binary arithmetic elements and ALU design.

Sequential circuits: different types of latches, flip-flops and their design using ASM approach, timing analysis and power optimization of sequential circuits.

Modular sequential logic circuit design: shift registers, counters and their applications. State Machine Design. Asynchronous and synchronous sequential circuits.

Multivibrator, 555 Timer circuits.

EEE 304 Digital Electronics Sessional

1.50 Credits

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 303. In the second part, students will design simple systems using the principles learned in EEE 303.

EEE 305 Transmission & Distribution of Electrical Power

3.00 Credits

Transmission systems: Types of conductors, resistance, definition of inductance, inductance of conductor due to internal flux, flux linkages between two points external to an isolated conductor, inductance of a single phase two wire line.

Capacitance of transmission lines: Capacitance of a three-phase with equilateral spacing and unsymmetrical spacing, effect of earth on the capacitance of three-phase transmission lines, bundled conductors, parallel-circuit three-phase lines.

Current and voltage relations on a transmission line: Representation of lines, the short transmission line, the medium transmission line the long transmission line, solution of differential equation, interpretation of the equations, hyperbolic form of the equations, the equivalent circuit of a long line, direct current transmission.

General line equation in terms of ABCD constants, relations between constants, charts of line constants, constants of combined networks, measurement and advantages of generalized line constants.

Power circle diagram: Receiving and sending end power circle diagrams, transmitted maximum power, universal power circle diagrams, use of circle diagrams.

Voltage and power factor control in transmission systems: Tap changing transformer, induction regulators, moving coil regulators, booster transformer, power factor control, static condensers in series or parallel, synchronous condensers, Ferranti effect.

Insulated cables: Cables versus overhead lines, insulating materials, electrostatic stress grading, three core cables, dielectric losses and heating, modern developments, oil-filled and gas-filled cables, measurement of capacitance, cable testing.

Insulator of overhead lines: Types of insulators, their constructions and performances, potential distribution, special types of insulators, testing of insulators.

Distribution: Distributor calculation, copper efficiencies, radial ring mains and inter connections.

Mechanical characteristics of transmission lines: Sag and stress analysis, ice and wind loading, supports at different elevations, conditions of erection, effect of temperature changes.

EEE 307 Electrical Properties of Material

3.00 Credits

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, ferroelectricity, pyroelectricity.

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.

EEE 310 Electrical Services Design

1.50 Credits

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 a typical 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 CAT5/6 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.

ECE 313 Communication Theory

3.00 Credits

Overview of communication systems: Basic principles, fundamental elements, system limitations, message source, bandwidth requirements, transmission media types, bandwidth and transmission capacity.

Noise: Sources of noise, characteristics of various types of noise and signal to noise ratio.

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, quadrature; 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. Sampling- sampling theorem, Nyquist criterion, aliasing, instantaneous and natural sampling, flat-topped 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 and demodulation: Amplitude-shift keying- principle, ON-OFF keying, bandwidth requirements, detection, noise performance; phase-shift keying (PSK)- principle, bandwidth requirements, detection, differential PSK, quadrature PSK, noise performance; frequency-shift keying (FSK)- principle, continuous and discontinuous phase FSK, minimum-shift keying, bandwidth requirements, detection of FSK, Multilevel signalling.

Multiplexing: Time-division multiplexing (TDM) - principle, receiver synchronization, frame synchronization, TDM of multiple bit rate systems; frequency-division multiplexing (FDM) - principle, de-multiplexing. PDH, SONET/SDH.

Multiple-access techniques: Time-division multiple-access (TDMA), frequency-division multiple access (FDMA); code-division multiple-access (CDMA) - spread spectrum multiplexing, coding techniques and constraints of CDMA.

ECE 314 Communication Theory Sessional

0.75 Credits

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in ECE 313. In the second part, students will design simple systems using the principles learned in ECE 313.

ACT 305 Financial and Managerial Accounting

2.00 Credits

Financial Accounting: Objectives and importance of accounting, branches of accounting, accounting as an information system, computerized system and applications in accounting. Recording System: Double entry mechanism, accounts and their classification, accounting equation, accounting cycle journal, ledger, trial balance. Preparation of financial statements considering adjusting and closing entries. Accounting concepts and conventions. Financial statements analysis and interpretation: ration analysis- tests for profitability, liquidity, solvency and overall measure.

Costs and Management Accounting: Cost concept and classification. Segregation and mixed cost. Overhead cost: meaning and classification, allocation of overhead cost, overhead recovery method. Job order costing: preparation of job cost sheet and quotation price. Inventory valuation: absorption costing and variable costing technique. Cost volume profit analysis: meaning, breakeven analysis, contribution margin approach, sensitivity analysis. Short-term

investment decisions: Relevant and differential cost analysis; Linear programming. Long-term investment decisions: Capital budgeting, various techniques of evaluation of capital investment, investment appraisal under uncertainty, risk management, capital rationing. Concept of working capital, need for working capital, management of cash, stock debtors.

Level 3 Semester II

EEE 351 Industrial and Power Electronics

3.00 Credits

Fundamental of power electronics, characteristics of static power semiconductor devices (BJT, MOSFET, IGBT, Thyristors). AC/DC power converters: uncontrolled rectifiers (single phase and three phase), controlled rectifiers (single phase and three phase), dual converter. AC/AC power converters: phase controlled converters (single phase and three phase), AC switch, cycloconverter. 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.

Industrial Heating: Different types of heating and their application. PLC: Controllers, Hardware, Internal Architecture, Programming, Testing and Debugging, Commercial PLC.

EEE 352 Industrial and Power Electronics Sessional

1.50 Credits

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 351. In the second part, students will design simple systems using the principles learned in EEE 351.

EEE 353 Digital Signal Processing

3.00 Credits

Introduction to digital signal processing. Sampling and signal reconstruction. Analysis of discrete-time system in the time domain: impulse response model, difference equation model. Correlation of signals with biomedical 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). Calculation of spectrum of biomedical 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 method.

Wavelet Signal Processing: Wavelet, Continuous and Discrete Wavelet Transform, Fast Wavelet Transform, Orthogonal basis, Wavelet multi-resolution analysis, Applications of Wavelet, Short time Fourier Transform.

EEE 354 Digital Signal Processing Sessional

1.50 Credits

Experiments Based on EEE 353.

EEE 355 Power System-I

3.00 Credits

Network representation: Single line and reactance diagram of power system and per unit system. Line representation: equivalent circuit of short, medium and long lines, reactive compensation of lines, introduction to DC transmission.

Load flow: Gauss- Siedel and Newton Raphson methods. Power flow control.

Synchronous machines: transient and sub transient 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 and faults through impedance.

Protection: fault level calculation, selection of circuit breakers, introduction to relays and circuit breakers. Typical layout of a substation.

Power plants: types, general layout of a thermal power plant and major components of gas turbine, steam turbine and combined cycle power plants.

EEE 356 Power System-I Sessional

1.50 Credits

This course consists of two parts. In the first part, students will perform experiments and do simulations to verify practically the theories and concepts learned in EEE 355. In the second part, students will design simple systems using the principles learned in EEE 355.

CSE 365 Microprocessor and Interfacing

3.00 Credits

Introduction to Intel 8086 microprocessor: features, architecture, minimum mode operation of 8086 microprocessor: system timing diagrams of read and write cycles, memory banks, design of decoders for RAM, ROM and PORT.

Introduction to Intel 8086 Assembly Language Programming: basic instructions, logic, shift and rotate instructions, addressing modes, stack management and procedures, advanced arithmetic instructions for multiplication and division, instructions for BCD and double precision numbers, introduction to 8086 programming with C language. Hardware Interfacing with Intel 8086 microprocessor: programmable peripheral interface, programmable interrupt controller, programmable timer, serial communication interface, keyboard and display interface (LED, 7 segment, dot matrix and LCD).

CSE 366 Microprocessor and Interfacing Sessional
0.75 Credits
Experiments Based on CSE 365.
MGT 309 Industrial Management
2.00 Credits

Management Functions and Organization: Evolution, management function: organization, theory and structure, span of control, authority delegation, manpower planning.

Personal Management: Importance, need hierarchy, motivation, leadership, wage incentives, performance appraisal and participative management.

Operation Management: Production planning and control (PPC) functions, quantitative methods applied in production, quality management, location and layout planning safety and loss management.

Cost and Financial Management: Elements of cost products, cost analysis, investment analysis, benefit cost analysis, risk analysis.

Management Accounting: Cost planning and control, budget and budgetary control.

Marketing Management: Concepts, strategy, sales promotion, patent laws.

Technology Management: Management of innovation and changes, technology life cycle.

Case studies.

Level 4 Semester I

EEE 444 Project/Thesis
3.00 Credits

The students are required to undertake a project/Thesis in the field of Electrical and Electronic Engineering. The objective is to provide an opportunity to the students to develop initiative, creative ability, confidence and engineering judgment. The results of the work should be submitted in the form of a dissertation, which should include appropriate drawings, charts, tables, references etc.

EEE 401 Solid State Devices & VLSI
3.00 Credits

Semiconductors in equilibrium: Energy bands, intrinsic and extrinsic semiconductors, Fermi levels, electron and hole concentrations, temperature dependence of carrier concentrations and invariance of Fermi level.

Carrier transport processes and excess carriers: Drift and diffusion, generation and recombination of excess carriers, built-in-field, recombination-generation SRH formula, surface recombination, Einstein relations, continuity and diffusion equations for holes and electrons and quasi-Fermi level.

PN junction: Basic structure, equilibrium conditions, contact potential, equilibrium Fermi level, space charge, non-equilibrium condition, forward and reverse bias, carrier injection, minority and majority carrier currents, transient and AC conditions, time variation of stored charge, reverse recovery transient and capacitance.

Bipolar Junction Transistor: Basic principle of pnp and npn transistors, emitter efficiency, base transport factor and current gain, diffusion equation in the base, terminal currents, coupled-diode model and charge control analysis, Ebers-Moll model and circuit synthesis. BJT non-ideal effects; Hetero-junction transistors.

MOS structure: MOS capacitor, energy band diagrams and flat band voltage, threshold voltage and control of threshold voltage, static C-V characteristics, qualitative theory of MOSFET operation, body effect and current-voltage relationship of a MOSFET. Non-ideal characteristics of MOSFET: channel-length modulation and short-channel effects in MOSFETs. MOS scaling.

VLSI technology: Top down design approach, technology trends and design styles. Review of MOS transistor theory: Threshold voltage, body effect, I-V equations and characteristics, latch-up problems, NMOS inverter, CMOS inverter, pass-transistor and transmission gates. CMOS circuit characteristics and performance estimation: Resistance, capacitance, rise and fall times, delay, gate transistor sizing and power consumption. CMOS circuit and logic design: Layout design rules and physical design of simple logic gates. CMOS subsystem design: Adders, multiplier and memory system, arithmetic logic unit. Programmable logic arrays. I/O systems. VLSI testing.

EEE 403 Control Systems
3.00 Credits

Introduction to control systems. Linear system models: transfer function, block diagram and signal flow graph (SFG). State variables: SFG to state variables, transfer function to state variable and state variable to

transfer function. Feedback control system: Closed loop systems, parameter sensitivity, transient characteristics of control systems, effect of additional pole and zero on the system response and system types and steady state error. Routh stability criterion. Analysis of feedback control system: Root locus method and frequency response method. Design of feedback control system: Controllability and observability, root locus, frequency response and state variable methods. Digital control systems: introduction, sampled data systems, stability analysis in Z-domain.

EEE 404 Control System Sessional
1.50 Credits

Experiments Based on EEE 403.

Elective I (One course from three courses shown below)

EEE 409 Optical Fiber Communication

3.00 Credits

Introduction to optical communication. Guided and unguided optical communication system, Light propagation through guided medium, Optical Fibers: SMF and MMF, SI fibers and GI fibers. Fiber modes, mode theory for light propagation through fibers, single mode condition and multimode condition. Transmission impairments: fiber loss, chromatic dispersion in a fiber, polarization mode dispersion (PMD). Different types of fibers: DSF, DCF, Dispersion compensation schemes. Fiber cabling process, Fiber joints/connectors and couplers, Optical transmitter: LED and laser, Operating principles, Characteristics and driver circuits. Optical receivers: PN, PIN and APD detectors, Noise at the receiver, SNR and BER calculation, Receiver sensitivity calculation. IM/DD and Coherent communication systems. Nonlinear effects in optical fibers. Optical amplifiers, Optical modulators, Multichannel optical

systems: Optical FDM, OTDM and WDM. Optical Access Network, Optical link design and Free space optical communication.

EEE 411 Electrical Machine III

3.00 Credits

Special Machines: Series universal motor, permanent magnet DC motor, unipolars and bipolar brush less DC motors, stepper motor and control circuits. Reluctance and hysteresis motors with drives circuits, switched reluctance motor, electro static motor, repulsion motor, synchros and control transformers. Permanent magnet synchronous motors.

Acyclic Machines:

Generators, conduction pump and induction pump.

Magneto Hydrodynamic Generators:

Fuel cells, thermoelectric generators, flywheels, vector control, linear motors and traction.

Photovoltaic Systems:

Stand alone and grid interfaced.

Wind Turbine Generators:

Induction generator, AC-DC-AC conversion.

EEE 413 Analog Integrated Circuit

3.00 Credits

Analog IC Design: Bipolar, MOS and BiCMOS IC technology and its impact, eggshell analogy, application areas and the future of analog IC design.

Review of transistors: Large and small signal models, compact models for Bipolar, FET, and BiCMOS. Amplifiers with passive and active loads, cascode stages. Multiple current sources/sinks using Bipolar and FET technologies.

Current mirrors: Basic, cascode and active current mirrors; influence of channel modulation, mismatched transistors and error in aspect ratios. Wilson current mirror.

Constant current or voltage references: Supply voltage and temperature independent biasing, band-gap references; constant-Gm biasing. Widlar band-gap voltage reference.

Differential pairs: Differential vs. Single-ended operations of simple amplifiers, differential and common mode voltages, common mode rejection ratio (CMRR), input common mode range (ICMR), transfer characteristics, small signal analysis, and frequency response of differential pairs.

High-gain amplifiers: Design and analysis of operational amplifiers (Op Amps) using BJTs and FETs, hierarchy in analog integrated circuits for an Op-Amps, internal structure of IC Op-Amps, high-performance Op-Amps. Switch capacitor circuits: Equivalent resistance of a switched capacitor, unity gain buffers, charge amplifiers and integrators.

Sampling switches: Charge injection, clock feed-through, charge feed-through; quantized model and remedy of charge injection. Switched capacitor filters.

Elective II (One course including sessional from three courses shown below)

EEE 415 Power System Protection

3.00 Credits

Purpose of power system protection. Criteria for detecting faults: over current, differential current, difference of phase angles, over and under voltages, power direction, symmetrical components of current and voltages, impedance, frequency and temperature. Electromechanical, electronic and digital relays: basic modules, over current, differential, distance and directional. Trip circuits. Different protection schemes for generator, transformer, motor, bus bar, transmission lines. Protection of ring mains and radial feeders. Miniature circuit breakers and fuses. Circuit breakers: principle of arc extinction, selection criteria and ratings of circuit breakers, types-air, oil, SF6 and vacuum.

EEE 416 Power System Protection Sessional

1.50 Credits

Experiments Based on EEE 415.

EEE 417 Telecommunication Engineering

3.00 Credits

Introduction: Principle, evolution and telecommunication networks. National and International regulatory bodies, Telephone apparatus, telephone Exchanges, subscriber loop, supervisory tones, PSTN. Switching systems: Introduction to analog system: Strowger and Crossbar switching systems, Stored program control (SPC) systems, Digital switching systems: space division switching, time division switching, blocking probability and multistage switching, and digital memory switch. Traffic analysis: Traffic characterization, grades of service, network blocking probabilities, delay system and queuing. Integrated services digital network (ISDN): N-ISDN and B-ISDN, architecture of ISDN, B-ISDN implementation. Digital subscriber loop (DSL), Wireless local loop (WLL), FTTx, SONET/SDH, WDM Network, IP telephony and VoIP, ATM network and Next Generation Network (NGN).

EEE 418 Telecommunication Engineering Sessional

1.50 Credits

Experiments Based on EEE 417.

EEE 419 Biomedical Instrumentation

3.00 Credits

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 flow measurement: plethysmograph and electromagnetic flow meter. Measurement of respiratory volumes and flow, related devices. X-ray.

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 420 Biomedical Instrumentation Sessional

1.50 Credits

Experiments Based on EEE 419.

Level 4 Semester II

EEE 488 Project/Thesis

3.00 Credits

The students are required to undertake a project/Thesis in the field of Electrical and Electronic Engineering. The objective is to provide an opportunity to the students to develop initiative, creative ability, confidence and engineering judgment. The results of the work should be submitted in the form of a dissertation, which should include appropriate drawings, charts, tables, references etc.

EEE 451 Microcontroller Based System Design

3.00 Credits

Review of 8 bit/ 16 bit CISC/RISC microcontrollers: Hardwire architecture, First access register file, instruction pipelining.

System design: Digital taximeter, prepaid energy meter, VVVF driven and the like, advances in system design.

EEE 452 Microcontroller Based System Design Sessional

1.50 Credits

Experiments Based on EEE 451.

Elective III (One course including sessional from three courses shown below):

EEE 453 Renewable Energy

3.00 Credits

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 454 Renewable Energy Sessional

1.50 Credits

Experiments Based on EEE 453.

EEE 455 Digital Image Processing

3.00 Credits

Basic Image Processing Systems: Image Sources, Characteristics, Image Representation, Hardware and Software Requirements

Two-Dimensional Systems: Properties of Two-Dimensional Sequences and Systems, 2D Fourier Transform, 2D Z-Transform, 2D Sampling Theory.

Image Quantization, Image Perception, Quality Measures.

Image Transforms: 2D DFT, 2D DCT, Sine Transform, Hadamard, Slant and KL Transform

Image Compression Algorithms: Pixel Coding-PCM, Run Length Coding, Predictive Technique DPCM, Transform Coding-DCT, Vector Quantization, VQ in Image Coding, Wavelet Based Compression, Inter-frame Coding, Standards for Image Compression-JPEG, MPEG.

Image Segmentation: Feature Extraction, Edge Detection, Boundary Extraction, Region Representation, Moment Representation, Shape Features, Scene Matching Image Segmentation, Classification Techniques of Supervised and Non-supervised Learning.

EEE 456 Digital Image Processing Sessional

1.50 Credits

Experiments Based on EEE 455.

EEE 457 High Voltage Engineering

3.00 Credits

High voltage DC generation: rectifier circuits, ripple minimization, voltage multipliers, Van-de-Graaf and electrostatic generators; applications.

High voltage AC generation: Tesla coils, cascaded transformers and resonance transformers.

Impulse voltage generation: Shapes, mathematical analysis, codes and standards, single and multi-stage impulse generators, tripping and control of impulse generators.

Breakdown in gas, liquid and solid dielectric materials, applications of gas and solid dielectrics in transformer. Corona.

High voltage measurements and testing: IEC and IEEE standards, sphere gap, electrostatic voltmeter, potential divider, Schering bridge, Megaohm meter, HV current and voltage transducers: contact and noncontact.

Over-voltage phenomenon and insulation coordination. Lightning and switching surges, basic insulation level (EV, EHV and UHV systems), surge diverters and arresters.

EEE 458 High Voltage Engineering Sessional

3.00 Credits

Experiments Based on EEE 457.

Elective IV (One course from three courses shown below)

EEE 459 Power Plant Engineering and Economy

3.00 Credits

Load forecasting. Load curve: demand factor, diversity factor, load duration curve, energy load curve, load factor, capacity factor, utilization factor. Thermal power station: heat rate, incremental heat rate, efficiency, capacity scheduling, load division. Principles of power plants: steam, gas, diesel, combined cycle, hydro and nuclear.

Captive power plant and cogeneration. Power plant auxiliaries and instrumentation. Power evacuation and switchyard. Selection of location: technical, economical and environmental factors. Generation scheduling.

EEE 461 Nano Technology

3.00 Credits

Why Nanotechnology: importance, size scales, quantum size effects, revolutionary applications, potentials. Nanotools: scanning tunneling microscope, atomic force microscope, electron microscope, measurement techniques based on fluorescence, other techniques.

Basics of Fabrication: fabrication and processing industry, wafer manufacturing, 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 of quantum mechanics, Schrodinger equation, particle in a box. Band theory of solids. Importance of nanoelectronics, Moore's law, ITRS roadmap. Tunneling devices: quantum tunneling, resonant tunneling diodes. Single electron transistor: Coulomb blockade. Quantum confinement: wires and dots, carbon nanotubes, graphene's. Brief introductions on Molecular electronics and nanobiology.

EEE 463 Computer Network

3.00 Credits

Protocol Hierarchies, Data link Control; HLDC, DLL in Internet; DLL of ATM; LAN Protocols; Standards IEEE 802, Switches and Hubs, Bridges, FDDI, Fast Ethernet; Routing algorithm; Congestion Control, Internetworking, WAN, Fragmentation, Firewalls, IPV4, IPV6, ARP, RARP, Mobile IP, Network layer of ATM, Transport Protocols, Transmission Control Protocol, Connection Management, Transmission policy,

Congestion Control, Timer Management, UDP, AAL of ATM, Network Security; Cryptography, DES, IDEA, Public Key Algorithm, Authentication; Digital Signatures, Gigabit Ethernet, Domain Name system, Name Servers; Email and its privacy; SNMP, HTTP, World Wide Web, DSK and Radio link.

Elective V (One course from three courses shown below):

EEE 465 Mobile Cellular Communication

3.00 Credits

History and Evolution of Mobile Radio Communications: 1G, 2G, 3G & Forthcoming 4G Cellular Mobile Systems, Limitations of Conventional Mobile Radio Systems, Overview of WiMAX,WiFi,

Radio Paging: Introduction, Paging Receiver Types, On Site Paging, Transmitter Specifications, Wide Area Paging, Transmission Specifications, Paging Receivers Architecture.

The Cellular Concept: Frequency Reuse, System Capacity, Co channel Interference, Adjacent Channel Interference, Cell Splitting, Sectoring, and Microcell Zone Concept.

Mobile Radio Propagation: Free Space Propagation Model, Propagation Mechanisms, Ground Reflection Model, Knife- edge Diffraction Model, Outdoor & Indoor Propagation Models.

Fading and Multipath: Factors Influencing Fading, Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread, Coherence Time, Flat Fading, Frequency Selective Fading, Slow Fading, Fast Fading, Rayleigh Fading Distribution, Ricean Fading Distribution.

Equalization, Diversity, and Channel Coding: Fundamentals of Equalization, Linear Equalizers, Nonlinear Equalizers, Decision Feedback Equalizers, Maximum Likelihood Sequence Estimation (MLSE) Equalizers, Diversity Techniques, Space Diversity, Frequency Diversity, Time Diversity, Rake Receiver, Fundamentals of Channel Coding, Block Codes, Reed-Solomon Coding, Convolution Codes.

Cellular Radio Systems: Basic Elements of Cellular Radio Systems/Network, GSM Transmission Process (Segmentation, Speech Coding, Channel Coding, Interleaving, Burst Formatting), Cell Selections, Physical & Logical Channels, Principles of CDMA Transmitter & Receiver.

Handoff and Dropped Calls: Initiation of a Handoff, Two Handoff Level Algorithm, Hard Handoff (Network Controlled Handoff, Mobile Controlled Handoff, Mobile Assisted Handoff), Soft Handoff, Calculation of Dropped Call Rate.

EEE 467 Measurement and Instrumentation

3.00 Credits

Introduction: Applications, functional elements of a measurement system and classification of instruments. Measurement of electrical quantities: Current and voltage, power and energy measurement.

Current and potential transformer. Transducers: mechanical, electrical and optical. Measurement of non-electrical quantities: Temperature, pressure, flow, level, strain, force and torque. Basic elements of DC and AC signal conditioning: Instrumentation amplifier, noise and source of noise, noise elimination compensation, function generation and linearization, A/D and D/A converters, sample and hold circuits.

Data Transmission and Telemetry: Methods of data transmission, DC/AC telemetry system and digital data transmission. Recording and display devices. Data acquisition system and microprocessor applications in instrumentation.

EEE 469 Microwave Engineering

3.00 Credits

Transmission Lines: The Lumped-Element Circuit Model for a Transmission Line, Field Analysis of Transmission Lines, The Terminated Lossless Transmission Lines, The Smith Chart, The Quarter-Wave Transformers, Generator and Load Mismatches, Impedance Matching and Tuning, Lossy Transmission Lines.

Introduction to Microwave devices: Klystrons, Magnetrons, Travelling wave tubes (TWT), Microwave Strip lines.

EEE 480 Industrial Training

1.00 Credits

02 (Two) weeks industrial Training