

**Department of Electrical and Electronic Engineering
Faculty of Engineering and Technology
Microland University of Science and Technology (MUST), Gazipur**

A Short Introduction

Degrees Offered

B.Sc. (Engg.): It is a four-year (Eight Semesters) integrated undergraduate program. Application for establishment of *Microland University of Science and Technology* was made in 2014 and received provisional permission from [Ministry of Education](#) on 16 June 2020.

Research Areas

Electrical Power Systems, Restructured Power systems, Smart Grid Systems, Electronic Materials Technology, Nanotechnology, Computer Technology and Networks, Wireless Communication, Cellular and Satellite Communication, Optical Communication, Intelligent System Engineering, Digital Signal Processing, Digital Image Processing, Renewable Energy Technology, Biomedical Engineering, Control Engineering and Robotics etc.

Higher Study Prospects

Students graduated from this department can pursue higher studies and research in any university or institute of world in the related fields. After graduation, students can apply for Commonwealth scholarship, Chinese Govt. Scholarship (CSC), Monbukagakusho scholarship, DAAD scholarship, AUSAID Scholarship, ERASMUS MUNDUS scholarship, Fulbright scholarship and many other scholarship and research grants all over the world.

Curriculum Structure:

Microland University of Science and Technology (MUST), offered 4 years EEE Course.

Program: B. Sc. (Engg.) in Electrical and Electronic Engineering

1. **Admission:** Students will be admitted to the department as per university rules.
2. **Duration of the Program:** 4 years.
3. **Total Number of Semesters:** $4 \times 2 = 8$ (2 Semesters per year)

Class: 13 weeks (3 classes per week for each course)

PL: 02 weeks

Exam: 03 weeks

Results: 03 weeks

Total: 22 weeks per semester

4. **Total Number of Credits in 8 semesters (4 years): 156.5**

1. **Grading System:** The current UGC approved grading system applies as per university rules.

Marks	Letter Grade	Grade Point
80% and Above	A+	4.00
75% to < 80%	A	3.75
70% to < 75%	A-	3.50
65% to < 70%	B+	3.25
60% to < 65%	B	3.00
55% to < 60%	B-	2.75
50% to < 55%	C+	2.50
45% to < 50%	C	2.25
40% to < 45%	D	2.00
Less Than 40%	F	0.00

2. **Marks Distribution:**

(a) For Theoretical Courses:

- i) Class attendance :10%
- ii) Quiz/presentation :05%
- iii) In-course/tutorial exam/assignment :15%
- iv) Semester end final examination :70%

(b) For Practical/Laboratory Courses:

- i) Laboratory performance during lab hours :05%
- ii) Lab attendance :10 %
- iii) Lab note book on experiment :05%
- iv) Viva-voce on experiment during practical exam :10%
- v) Semester end final exam :70%

(c) For Industrial Tour/Field work/In-plant Training Courses:

- i) Report of the Industrial Tour/Field work/In-plant Training :50%
- ii) Overall performance in the Tour/Field work/ Training :30%
- iii) Viva-voce/Quiz/Presentation :20%

(d) For Thesis/Project:

- i) Presentation and Dissertation of the Thesis/Project work :70%
- ii) Final overall defense during the work :30%

Semester wise Course Distribution

1st Year 1st Semester

Course No.	Course Title	Theory Hrs/Wk	Lab Hrs/Wk	Credit(C)
EEE-1101	Electrical Circuits-I	3	0	3.0
EEE-1102	Electrical Circuits Circuit -I Lab	0	3	1.5
EEE-1103	Physics-I	3	0	3.0
EEE-1104	Physics-I Lab	0	3	1.5
EEE-1105	Mathematics-I	3	0	3.0
EEE-1106	English	3	0	3.0
EEE-1107	Chemistry	3	0	3.0
Total		15	6	18.0

1st Year 2nd Semester

Course No.	Course Title	Theory Hrs/Wk	Lab Hrs/Wk	Credit(C)
EEE-1201	Electronics Circuit-I	3	0	3.0
EEE-1202	Electronics Circuit-I Lab	0	3	1.5
EEE-1203	Electrical Circuits-II	3	0	3.0
EEE-1204	Electrical Circuits-II Lab	0	3	1.5
EEE-1205	Programming in C	3	0	3.0
EEE-1206	Programming Lab	0	2	1.5
EEE-1207	Mathematics-II	3	0	3.0
EEE-1208	History of Bangladesh	2	0	3.0
Total		17	8	18.5

[Total Credit in First Year (1st semester+ 2nd Semester) =18+18.5=36.5]

2nd Year 1st Semester

Course No.	Course Title	Theory Hrs/Wk	Lab Hrs/Wk	Credit(C)
EEE-2101	Electronics Circuit-II	3	0	3.0
EEE-2102	Electronics Circuit-II Lab	0	3	1.5
EEE-2103	Electrical circuits Analysis- III	3	0	3.0
EEE-2104	Statistics and Probability	3	0	3.0
EEE-2105	Mathematics-III	3	0	3.0
EEE-2106	Electrical Machines-I	3	0	3.0
EEE-2107	Electrical Machines-I Lab	0	3	1.5
EEE-2108	Industrial Management & Production Engineering	3	0	3.0
Total		15	9	21.0

2nd Year 2nd Semester

Course No.	Course Title	Theory Hrs/Wk	Lab Hrs/Wk	Credit(C)
EEE-2201	Electronics Circuit-III	3	0	3.0
EEE-2202	Electronics Circuit-III Lab	0	3	1.5
EEE-2203	Digital System Design	3	0	3.0
EEE-2204	Digital System Lab	0	3	1.5
EEE-2205	Physics-II	3	0	3.0
EEE-2207	Electrical Machines-II	3	0	3.0
EEE-2208	Electrical Machines-II Lab	0	3	1.5
EEE-2209	Viva-voce	0	0	2.0
Total		12	12	18.5

[Total Credit in Second Year (1st semester+ 2nd Semester) =21.0+18.5=39.5]

3rd Year 1st Semester

Course No.	Course Title	Theory Hrs/Wk	Lab Hrs/Wk	Credit(C)
EEE-3101	Instrumentation & Measurements Technique	3	0	3.0
EEE-3102	Electromagnetic Fields & Waves	3	0	3.0
EEE-3103	Signals and Systems	3	0	3.0
EEE-3104	Electrical and Electronic Circuit Simulation	0	3	1.5
EEE-3105	Numerical Analysis	3	0	3.0
EEE-3106	Microprocessor, Microcontrollers and Peripherals	3	0	3.0
EEE-3107	Microprocessor, Microcontrollers & Peripherals Lab	0	3	1.5
EEE-3108	Engineering Economics	3	0	3.0
Total		15	12	21.0

3rd Year 2nd Semester

Course No.	Course Title	Theory Hrs/Wk	Lab Hrs/Wk	Credit(C)
EEE-3201	Power System Analysis -I	3	0	3.0
EEE-3202	Control System Engineering	3	0	3.0
EEE-3203	Control System Engineering Lab	0	3	1.5
EEE-3204	Communication Engineering-I	3	0	3.0
EEE-3205	Communication Engineering-I Lab	0	3	1.5
EEE-3206	Electrical Engineering Materials	3	0	3.0
EEE-3207	Digital Signal Processing	3	0	3.0
EEE-3208	Digital Signal Processing Lab	0	3	1.5
Total		15	12	19.5

[Total Credit in Third Year (1st semester+ 2nd Semester) =21+19.5=40.5]

4th Year 1st Semester

Course No.	Course Title	Theory Hrs/Wk	Lab Hrs/Wk	Credit(C)
EEE-4000	Thesis/ Project (started.)	0	3	2.0
EEE-4101	Industrial Attachment/ Training/Internship	0	3	1.5
EEE-4102	Power System Analysis-II	3	0	3.0
EEE-4103	Power System Analysis-II Lab	0	3	1.5
EEE-4104	Communication Engineering-II	3	0	3.0
EEE-4105	Communication Engineering-II Lab	0	3	1.5
EEE-4106	VLSI Design	3	0	3.0
EEE-4107	Power Electronics	3	0	3.0
EEE-4108	Power Electronics Lab	0	3	1.5
Total		15	12	20.5

4th Year 2nd Semester

Course No.	Course Title	Theory Hrs/Wk	Lab Hrs/Wk	Credit(C)
EEE-4000	Thesis/Project	0	6	4.0
EEE-4201	Switchgear and Protection	3	0	3.0
EEE-4202	Switchgear and Protection Lab	0	3	1.5
EEE-4203	Power Plant Engineering	3	0	3.0
EEE-4204	High Voltage Engineering	3	0	3.0
EEE-4205	High Voltage Engineering Lab	0	3	1.5
EEE-4206	Management Information Systems	3	0	3.0
Total		12	15	19.0

Total Credit in Fourth Year (1st semester+ 2nd Semester) =20.5+19.0=40.0]

Courses offered by the Department of EEE

1st Year 1st Semester

EEE-1101: Electrical Circuits-I

Electric Field and Electric Potential: Charge, Coulomb's law, electric field lines, Torque on a dipole in uniform E-field, Gauss's law and its applications, electric potential, current density, drift velocity.

Circuit Variables and Elements: Voltage, current, power, energy, independent and dependent sources, Circuit elements – resistance, inductance capacitance.

Basic Laws of Electrical Circuits: Ohm's law, Series and parallel circuits, voltage and current divider circuits, Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL).

Techniques of Circuit Analysis: Node-voltage method and Mesh-current method, super node and super mesh, Source transformation.

DC Network Theorems: Thevenin's, Norton's and superposition theorems with applications in circuits having independent and dependent sources, maximum power transfer condition and reciprocity theorem.

Energy Storage Elements: Inductors and capacitors, their characteristics, series-parallel combination of inductors and capacitors, concept of transient and response of RL and RC circuits with DC source.

Magnetic Quantities and Variables: Flux, permeability and reluctance, magnetic field strength, magnetic potential, flux density, magnetization curve, Laws in magnetic circuits: Ohm's law and Ampere's circuital law. Series and parallel magnetic circuits.

Text Books:

1. C.K. Alecgender & M.N.O. Sadiku, : Fundamental of Electric circuits
2. R.M. Kerchner & G.F Corcoren : Alternating current ciucuits

Reference Books

1. Robert P Ward, : Introduction to Electrical Engineering",
2. Kothari D.P. and Nagrath I.J., : Theory And Problems of Basic Electrical Engineering
3. Fitzgerald, Higginbotham and Gabel: Basic Electrical Engineering

EEE-1102 Electrical Ciruit I LAB

Based on the theoretical course EEE-1101.

EEE-1103: Physics-I

Wave and oscillations: Wave and composition of simple harmonic motion, simple harmonic motion, average value of kinetic and potential energies of a harmonic oscillation, superposition of simple harmonic motions, uses of Lissajous figures.

Damped and forced harmonic oscillator: Damped oscillatory system, damped harmonic oscillation, the LCR circuit, forced vibration, quality factor of forced oscillator, sharpness of resonance, phase of driven oscillator, power absorption.

Wave Motion: Types of waves, progressive and stationary wave, Energy distribution due to progressive and stationary wave, interference of sound wave, phase velocity and group velocity.

Sound Wave: Audible, ultrasonic, infrasonic and supersonic waves, Doppler's effects and its application, applications of ultrasonic sound.

Acoustics: Intensity of sound, Bel, sound pressure level, phonon, acoustic intensity, architectural acoustics, Diffraction of sound, Musical sound, and noises, Speech, Characteristics of musical Sound.

Building Acoustic: Reverberation, Sabine's reverberation formula, growth intensity, decay intensity, reverberation time and absorption co-efficient, requisites for good acoustic.

Interference: Nature of light, interference of light, coherent sources, young double slit experiment, energy distribution, condition for interference, production of interference fingers, Fresnel Bi-prism, Newton's ring.

Optical Instrument: Photographic camera, simple microscope, compound microscope, telescope astronomical telescope, spectrometer.

Text Books:

1. Resnic and Halliday : Physics, Part-II

Reference Books

1. N. Subrahmanyam and Brijlal : Atomic and Nuclear Physics
2. A. Beiser : Concept of Modern Physics
3. D.M. Rowe & C.M. Bhandari : Modern Thermoelectricity
4. Brijlal & Ghosh : A Text Book of Sound
5. Brijlal and Subramonium : A Text Book of Optics

EEE-1104 Physics I Lab

Based on the theoretical Course EEE-1103

EEE-1105 Mathematics – I

Elements of Set Theory: Introduction to sets, Set algebra, Types of sets: Finite, Infinite, Countable and Uncountable sets, Relations and Functions.

Matrices: Definition and algebra of matrices, Special types of matrices, Determinant of square matrix, Properties, Cramer's rule, Rank of a matrix, Elementary transformation and normal form, The Adjoint and Inverse of a square matrix, Matrix inversion by partitioning, Solution of system of linear equations, Gauss-Jordan method.

Complex Numbers, Complex operators and inequalities: Complex j operator, Complex numbers, Basic operations with complex numbers, Graphical representation of complex number, Polar and exponential forms of complex numbers, Properties of inequalities, Graphical solution of inequalities, Algebraic solution of inequalities, inequalities involving absolute values, Graphical solution of inequalities with two variables.

Trigonometry: Trigonometric functions, Graphs of Trigonometric functions, Complex number, De-Moivre's theorem and its applications, Functions of complex arguments, Gregory's series, Summation of trigonometric series, hyperbolic functions.

Text Books:

1. Shahidullah and Bhattacharjee : Higher Algebra and Trigonometry

Reference Books:

1. Bernnarrd and Child : Higher Algebra ⁷
2. Hall and Knight : Higher Trigonometry
3. Das and Mukherjee : Higher Trigonometry
4. Allyn J. Washington : Basic Technical Mathematics with Calculus

EEE-1106 English

The noun-phrase, the verb phrase, subject verb arrangement, pronouns, verb as complements, questions; affirmative agreement (too / so); negative agreement (either / neither); negation; commands; nouns functioning as adjective; enough with adjective, adverbs and nouns; cause connectors; causative verbs; subjunctive; problem verbs;

Similar sound words; Confusing words; Synonyms and antonyms, Scientific terminology, making questions using “Wh” and auxiliary verbs, amplifying of simple sentences, Paragraph writing, Monologue and dialogue writing, Description of graphs, pictures, Formal and informal letter writing, Official and personal E-mail writing, Commercial correspondence and tender notice, technical report writing; standard forms of term papers, thesis, etc., Developing speaking skills; listening skills.

EEE-1107: Chemistry

Atomic Properties and Binding Forces: Atoms, Molecules and forces between them, Chemical equations and stoichiometry, Atomic structure, Molecular bonding and geometry, Periodic relationships, Gases, Liquids and solids and solutions, Forces in solids and bindings, Ionic bond, Covalent bond, Metallic bond, Hydrogen bond and Vander Waal's force.

Periodic Classification of Elements: Ionization potential, Electro-negativity, Electron affinity, Atomic radius, Variation of properties along a period and down a group, Diagonal relationship, Representative elements, Transition elements, Chemical properties of s, p, d and f-block elements.

Oxidation and Reduction: Analysis of oxidation and reduction, Oxidation number, Analytic reagents.

Chemical Kinetics: Experimental techniques, The rates of reactions, Integrated rate laws of simple reactions, Half-lives and rate constants, Dependence of half-life on concentration.

Acids and Bases: Acid-base equilibrium and pH-scale in terms of activities, Acid-base titration, Acid-base indicators, Buffers, Henderson-Hasselbach approximation useful in biology applications.

Electrolysis: Electrolysis, Electrodes and electrode reactions, Standard hydrogen electrode, Reduction potential, The chemical series, Ionic equilibrium of weak electrolytes, Solubility products, Electro-chemistry, Solubility and complex formation equilibrium.

Equilibrium Electrochemistry: Electrochemical cell, Equilibrium electrochemistry, Ion activities, Standard potentials, The electrochemical series, The Nernst equation. Thermodynamic functions from cell potential measurements, Solubility constants, pH and pH measurements.

Chemical Equilibrium: Spontaneity of chemical reactions, Gibbs energy minimum, Perfect gas equilibrium, Gibbs free energy change for the reaction and chemical quotient, Expression for thermodynamic equilibrium constant, Equilibrium calculations, Response of equilibrium to pressure, volume and temperature.

Text Books:

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| 1. R.D. Madan | : Modern Inorganic Chemistry |
| 2. Bhal and Tuly | : Essentials of Physical Chemistry |

Reference Books:

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| 1. S. Z Haider | : A textbook of Modern Inorganic Chemistry |
| 2. M.M Haque and M.A. Nawab | : Principle of Physical Chemistry |

1st Year 2nd Semester

EEE-1201: Electronics Circuit-I

Overview of Semiconductor and Diode: Semiconductor, Bonds in semiconductor, commonly used semiconductors, Energy band description of semiconductors, Types of semiconductors, Junction Diode, P-N Junction, Properties of P-N junction, Applying voltage of P-N junction, P-N junction diode.

Rectifiers and Filters: Rectifiers, Half-wave rectifier, Full-wave rectifier, Bridge rectifier, Voltage regulation, Voltage multipliers, Clippers and Clampers, Zener diodes, Zener diode as voltage regulator, Filters, Shunt capacitor filter, Series inductor filter, L-C Filter, The C-L-C Filter.

The Bipolar Junction Transistor (BJT): Introduction, Transistor construction, Transistor configuration CE, CB, CC Transistor static characteristics.

Transistor Bias Stabilization: Factors contributing to thermal instability, Effect of temperature, Stability factor, Stabilization techniques, Bias compensation, Design operations, Basic design of a CE transistor amplifier; Transistor biasing, Fixed bias, Emitter stabilized bias, Voltage divider bias, DC-bias with voltage feedback, amplifying action, Cut off and Saturation points, DC load line, AC load line.

Small Signal Low-Frequency BJT Models: Transistor equivalent circuits, Hybrid parameters, Analysis of CE, CB and CC amplifiers using h-Parameters, CE amplifier with emitter resistor.

Field-Effect Transistors (FETs): FET, Junction FET, Construction of JFET, Static characteristics of FET, Parameters of FET, DC-biasing of a JFET, FET application, MOSFET, Construction and characteristics of MOSFET, Depletion-type of MOSFET, Enhancement-type MOSFET.

Text Books:

1. Boylestad and Nashelsky : Electronic Devices & circuit Theory, Prentice-Hall of India Pub. 1996
2. Millman & Tub : Principles of Electronics
3. B.L Theraza : A textbook of Electrical Technology (Vol. IV)

Reference Books:

1. Malvino : Principles of Electronics
2. J. Brophy : Basic Electronics for Scientists. McGraw-Hill Pub.1983
3. Bell : Electronic Devices Circuit
4. Millman and Halkias : Electronic Devices Circuit

EEE-1202: Electronics Circuit –I Lab

Based on the theoretical course EEE-1201

EEE-1203: Electrical Circuits-II

Magnetic Field and its Interaction: Introduction to magnetic field, lines of induction, magnetic flux, magnetism from electricity, magnetic force on a free charge, charged particle motion, magnetic force on a wire, Torque on a current loop.

Sources of Magnetic Fields: Biot-Savart Law and its applications, Magnetic force on parallel wires, Ampere's law and its applications, Magnetism in Matter.

Electromagnetic Induction: Faraday's experiment on electromagnetism, Faraday's Law, Motional EMF, Lenz's law, Eddy Currents, self and mutual inductance, energy stored in magnetic field.

Alternating Current: Equation of AC current and voltage, Reactance and Impedance, RMS value and Average value of alternating current, Form factor, Phasor diagram, use of Complex quantities in AC circuits, AC through resistance, Capacitance and inductance, Frequency response of RL, RC, RLC circuits, Power in AC Circuits, Q-factor and band width, Power factor and its improvement, AC in R-L-C circuit and Application of RLC circuit.

Thermoelectricity: Seebeck Effect, Peltier Effect and Thomson effects, Thermal EMF, Laws of addition of thermal EMF, Thermoelectric power, Thermocouples.

Text Books:

1. C.K. Alecgender & M.N.O. Sadiku, : Fundamental of Electric circuits
2. R.M. Kerchner & G.F Corcoren, : Alternating current ciucuits

Reference Books

1. Robert P Ward, : Introduction to Electrical Engineering",
2. Kothari D.P. and Nagrath I.J. : Theory And Problems of Basic Electrical Engineering
3. Fitzgerald, Higginbotham and Gabel, : Basic Electrical Engineering

EEE-1204: Electrical Circuits-II Lab

Based on the theoretical Course EEE-1203

EEE-1205: Programming in C

Data Structure and Algorithm: Data representations; data types and data structures; ways to support data structures (hardware versus software); Abstract Data Types; arrays, stacks, queues, priority queues, lists, trees, graphs and tables(Including their related algorithms); Search algorithms and structures, Sorting Techniques, Algorithm design techniques.

Programming in C: Overview of C, Constants, Variable and Data Types, Operators and Expressions, managing input and Output Operators, Decision making and branching structures; The Design Control a Case Control Structure, The Loop Control Structure, user defined functions, Recursion and Iterations Arrays 2D Array, Structures and Unions, Pointers, Searching and Sorting Techniques, Linked List using C, Playing with Bits and Bytes, File Management.

Object oriented programming using C++: Introduction, classes and objects; polymorphism; function and operator overloading; inheritance.

Reference Books:

1. Robert L. Kruse : Data Structures and Program Design.
2. Balagurushamy : Programming in ANSI C
3. Byron Gotifried : Programming With C, Schaums Outlines 2nd edition, McGraw Hill, 1996.
4. E. Balagurshami : Object Oriented Programming with C++

EEE-1206: Programming in C Lab

Based on the theoretical Course EEE-1205

EEE-1207: Mathematics-II

Differential Calculus

Function: Domain, Range, Inverse function and graphs functions, Limits, Continuity, properties of continues.

Ordinary Differtiation: Differentiability, Differentiation of real-valued functions, Successive differentiation, Leibnitz theorem.

Expansion of functions: Rolle's Theorem, Lagrange's means value theorem, Taylor's and Maclaurin's formula, Maxima and Minima functions

Partial Differtiation: Tangent and Normal, Applications of the derivatives.

Integral Calculus

Indefinite Integral: Method of substitution, Integration by parts, Integration of special trigonometric and rational functions, Fundamental theorem of calculus.

Definite Integral: General properties of definite integral, Evaluation of definite integrals and reduction formula, Applications of integration.

Multiple Integral: Determination of Length area and volume.

Mathematical Functions: Gamma function and Beta function, Relation between beta and gamma function, Bessel's differential equation, Bessel's functions, Legendre differential equations and Legendre polynomials.

Text Books:

1. Das and Mukherjee : Differential Calculus
2. Das and Mukherjee : Integral Calculus
3. S. L. Ross : Differential Equations

Reference Books:

1. Edwards : Differential Calculus
2. F. Ayres : Calculus
3. H. T. H. Piaggio : An Elementary Treatise on Differential

EEE-1208 History of Bangladesh

Pre-Colonial Bengal: Early geographical divisions (Vanga, Pundra, Gauda, Harikela), the Pala and Sena Dynasties, and the introduction of Islam.

British Colonial Era: The Battle of Plassey (1757), the Permanent Settlement (1793), and the "Divide and Rule" policy.

The 1947 Partition: The creation of Pakistan and the structural marginalization of East Bengal (East Pakistan).

Language Movement (1952): Cultural nationalism, the events of February 21, and its impact on secular identity.

Disparity & Discontent: Economic, political, and military imbalances between West and East Pakistan.

The Six-Point Movement (1966): Formulated by Bangabandhu Sheikh Mujibur Rahman as the "Charter of Freedom" for Bengalis.

Mass Upsurge (1969): Popular protests and the downfall of the Ayub Khan regime

General Elections of 1970: The landslide victory of the Awami League and the Pakistani military's refusal to transfer power.

March 1971: Non-cooperation movement.

Operation Searchlight: The military crackdown and genocide beginning March 25, 1971.

The Liberation War: Formation of the Mujibnagar Government, military sectors, the role of freedom fighters (*Mukti Bahini*), international geopolitical stances, and final victory on December 16, 1971.

2nd Year 1st Semester

EEE-2101: Electronics-II

High Frequency Response of BJT and FET: High frequency model for CE amplifier, CE short circuit current gain, High frequency current gain with resistive load, High frequency response of cascaded CE stages, Transformer coupled amplifier, Transistor noises, High frequency model for CS amplifier, High frequency model for CD amplifier, High frequency response of the FET amplifier.

Feedback Amplifiers: Basic Ideas of feedback amplifiers, voltage and current, negative feedback amplifiers, Effects of feedback on bandwidth, Noise and impedance levels, Feedback connection types, Practical feedback circuits, Feedback amplifier phase and frequency considerations, Oscillation in feedback amplifiers, The Nyquist criterion for the stability of a feedback amplifier, Basic design of feedback amplifier, Practical applications.

Oscillators: Basic oscillator operation, positive feedback in amplifier, Criterion of oscillation, RF, oscillators and Hartley oscillators, Crystal oscillators, Voltage controlled oscillator, Armstrong oscillator, Butler oscillator.

Power Amplifiers: Untuned class A, class, AB and B amplifiers, tuned Class B and C amplifiers, Neutralization, Class B and C Push-pull amplifiers, Design of push- pull amplifiers, Complementary and symmetry amplifiers.

Multistage Amplifiers: Amplifier coupling, RC coupling, Impedance coupling, Transformer coupling Two-stage amplifier, Darlington pair, emitter follower, multistage frequency effects.

Tuned Amplifiers: Single tuned, Double Tuned and stagger tuned amplifier, Application of narrow band amplifier. oscillators operation, RC phase-shift oscillators, Wien Bridge oscillator, Tuned oscillator circuits, Colpitts

Text Book:

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| 1. Boylestad and Nashelsky | : Electronic Devices and Circuit Theory |
| 2. A. Mottershead | : Electronic Devices & Circuits |

Reference Books:

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| 1. V. K. Mehtha | : Principles of Electronics |
| 2. Bagdi Singh | : Fundamentals of Electronics |
| 3. Gupta | : Electronics Device and Circuit |
| 4. Coomer | : Electronics Circuit |

EEE-2102 Electronics Circuit -II Lab

Based on the theoretical course of EEE-2101

EEE-2103: Electrical Circuits Analysis-III

Transients: Transient analysis in electrical (ac & dc) circuits.

Series and Parallel AC Circuits: Impedance and Phasor diagram, Series Configuration, Voltage divider rule, Admittance and Susceptance, Parallel ac Networks, Current Divider rule.

Methods of Analysis – AC networks: Independent versus Dependent sources, Mesh and Nodal Analysis, Wye-Delta and Delta-Wye Conversions.

Network Theorems – AC networks: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Substitution, Reciprocity and Millman's Theorems.

Power – AC networks: Average, Apparent and Reactive Power, The Power Triangle, The Total P , Q and S , Power Factor Correction

Poly phase Circuits: Analysis of balanced and unbalanced poly-phase circuits,, Phase sequence, Phase sequence at load, Numbering of phases, Interconnection of three phases, Star or Wye (Y) connection, Voltages, currents and power in Y-connections, Delta or Mesh (Δ) connection, Voltages, currents and power in Δ -connections, Balanced Y/ Δ and Δ /Y conversions, Power measurement in 3-phase circuits.

Two port networks (TPN): Two port networks (symmetrical & asymmetrical), determination of two port parameters, relationship between two port parameters, equivalent model for different parameters representation of TPNs, reciprocity and symmetry of TPNs.

Filter: Conventional filter design and operation, elementary filter sections, fundamental equations of an ideal filter, Low-pass RC filter, Low-pass RL filter, High-pass RC filter, High-pass RL filter, R-C Pass band filter, R-C Band stop filter, filter performance.

Modern Filter: Ideal transfer function, general design procedure, Butterworth and Chebyche filters, AC Bridge, Maxwell's inductance bridge, Maxwell's wien bridge, Anderson Bridge, Hay's bridge, De-Sauty Bridge.

Text Books:

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| 1. D. C. Kulshreshtha, | :Basic Electrical Engineering |
| 2. S.K. Bhattacharya , | :Basic Electrical and Electronics Engineering |

Reference Books:

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| 1. Van Valkenburg | : Network Analysis. |
| 2. Sudhakar, A.Shyammohan | : Circuits and Network. |
| 3. D. Roy Choudhury | : Networks and systems. |
| 4. Kelkar and Pandit | : Linear Network Theory. |
| 5. Mahmood Nahvi, Joseph A Edminister, | : Schaum's Outline of Electric Circuits |

EEE-2104: Statistics and Probability

Introduction: Modern Statistics, Statistics and Engineering.

Probability: Sample Spaces and events, Counting, The Axioms of Probability, Theorems of Probability, Conditional Probability, Baye's Theorem, Mathematical Expectation and Decision Making.

Probability Distributions: Random Variables, The Binomial Distribution, The Hyper geometric distribution. The Mean and Variance of a Probability Distributions, Chebyshev's theorem, the Poisson approximation to the Binomial Distribution, Poisson Processes, The Geometric Distribution, The Multinomial Distribution.

Probability Densities: Continuous Random Variables, The Normal Distribution, The Normal Approximation to the Binomial Distribution, The Uniform Distribution. The Weibull Distribution, Joint Probability Densities.

Treatment of Data: Frequency Distributions, Graphs of Frequency Distributions, Stem-and-leaf Plots, Descriptive Measures, Calculation of $\bar{x}$ and s .

Sampling Distributions: Population and Samples, The sampling distribution of the Mean (known). The Sampling Distribution of the Mean (Unknown). The sampling distribution of the Variance.

Reference Books:

1. M. Nurul Islam : An Introduction to Statistics and Probability.
2. Douglas C. Montgomery : Applied Statistics and probability for Engineers

EEE-2105: Mathematics-III

Vector Analysis: Definitions and examples of vectors, Theorems on vector and scalar product of vectors, Vector Differentiation, Differential operators: Gradient, Divergence and Curl of vector function, Vector integration: line, surface and volume integrals; Integral theorem: Gauss's divergence theorem, Stoke's theorem, Green's theorem and Related integral theorem.

Co-ordinate's geometry of two dimensions: Change of axes, system of circle, straight line and ellipse.

Co-ordinate's geometry of three dimensions: Straight line, Plane and sphere.

Differential Equations: Classification of Differential Equation, Degree and Order of Ordinary Differential Equation, Initial Value Problem, Boundary Value Problem, First-order ordinary differential equations, exact differential equations and integrating factors, Separable equations and equations reducible to this form, Linear equations and Bernolli equations.

Higher Order Differential Equations: Explicit solution of Higher-order linear differential equations, Homogeneous linear equation with constant coefficients, Method of undetermined coefficients, Variation of parameters, Cauchy-Euler equation.

Series solutions: Series solutions of linear differential equations, Power series solutions about an ordinary point, Solutions about singular points, the method of Frobenious.

Linear transformations: Eigen value and Eigen vectors, Cayley-Hamilton theorem.

Text Books:

1. S. L. Ross : Introductory to ordinary Differential Equations
2. H.T.I Piaggio : Ordinary Differential Equations.
3. B.S Rajput : Mathematical Physics.

Reference Books:

1. M.R Spiegel : Vector Analysis and Tensor Calculus
2. Rahman & Bhattacharjee : Analytical Geometry of Conic Sections

EEE-2106: Electrical Machines-I

DC Generators: Description of different parts of DC generators, emf equation, principle of DC generators, Different types of winding, Winding Table, Voltage build up, Armature reaction, losses and efficiency, Parallel operation of DC generators.

DC Motor: Principle of operation, classification, losses and efficiency, Starting, separately excited DC motor, Permanent magnet DC motor, Two and four-quadrant operation of DC motors; speed control by converter and chopper, Crane, traction and hoist application of DC motor, Choice of DC motors for different applications.

Transformer: Working principle, Construction and cooling, 'equivalent circuit, Vector diagram, voltage regulation, efficiency, Losses & efficiency, Parallel operation, Determination of transformer constants and polarity. Three phase operations of single-phase transformer; Open Delta and Scott connections, Harmonics in polyphase transformers, Induction voltage regulators; Autotransformers: three phase and single phase, Power transformers: bushing, Cooling, Tap Changing and parallel operation

Induction Motor: General principles, construction, rotating magnetic field, equivalent circuits, squirrel cage and slip ring motors, torque developed.

Text Books:

1. A. E. Fitzgerald, C. Kingsley, Jr. Stephen :Electric Machinery
2. I. J. Nagrath, D. P. Kothari, :Electric Machines

Reference Books:

1. P. S. Bhimbra, "Electrical Machinery", Seventh Edition, 1995, Khanna Publishers.
2. P. S. Bhimbra, "Generalized Theory in Electrical Machines", Khanna Publishers.
3. P. K. Mukharjee, S Chakravarti, "Electric Machines", Dhanpat Rai & Sons.

EEE-2107 Electrical Machines-I Lab

Based on the theoretical course 2106

EEE-2108 Industrial Management & Production Engineering

Introduction: Principles of management concepts of management, development of scientific management, principles of Fredric Taylor & functions such as planning organizing, staffing, leading motivating, communicating, controlling, decision making, span of control .

Personal management: Meaning, functions of personal management, manpower planning, collective bargaining, wages & salary administration, labor welfare, training, trade unions, industrial factories Act, industrial boilers Act, Trade union act.

Plant management: Plant location, plant layout, types of maintenance such as break down, predictive & preventive maintenance, stores of management, industrial safety, causes & cost of accidents, safety programs, production planning & control, job, batch & process type of production

Marketing management: Definition & selling & modern concept of marketing, market research, new product development, product life cycle product launching, sales promotion, pricing, channels of distribution, advertising, market segmentation, marketing mix.

Material management: Importance of material management, classification, codification, forecasting, necessity of inventory

Financial management: Sources of finance, financing organizations, types of capital, elements of costs & allocation of indirect expenses, cost control, break even analysis, budgets & budgetary control, equipment replacement policy, make or buy analysis, balance sheet, ratio analysis, profit & loss statement.

Text books:

1. Koontz, O Daniell, "Principles of management",
2. Kotler P., Stauton "William Principles of marketing management", Prentice Hall, 1985.

Reference Books

1. S.C. Kuchal, "Financial Management", Chaitanya Publishing House
2. T.R., Sharma S.C., "Industrial organization & engineering Economics"; Khanna Pub.

2nd Year 2nd Semester

EEE-2201: Electronics-III

Differential Amplifiers: Differential amplifier, DC analysis, AC analysis, CMRR, Constant current bias, current mirror.

Operational Amplifiers: Introduction, Block diagram, Internal circuit, Characteristics, Basic parameters of Op-amplifier, Open-loop of Op-Amp, Applications; Inverting amplifier, Non-inverting amplifier, Summing amplifier, Difference amplifier, Integrator, Differentiator, Instrumentation amplifier, Logarithmic amplifiers, Antilog amplifier, Multiplier, Divider, Voltage to current converter, Current to voltage converter.

Active Filters: Types, Advantages, Filter design, Frequency scaling, First order and second order high pass and low pass filters, Band pass filters, Notch filters, Comparators.

Pulse and Switching: Pulse characteristics, Bistables multivibrators, Monostable multivibrators, Astable multivibrators, Waveform generators, Square wave, Triangular wave, Sawtooth wave, Voltage controlled oscillator (VCO), Schmitt trigger, Blocking oscillator, UJT, Varactor diode, 555 timer circuit and applications.

Phase Locked Loops: Operating principles, Major building blocks, Application of PLL: FM demodulation, FSK demodulation, AM detector, Frequency synthesizer.

Switch Capacitor Circuits: Theory of operation, Switched capacitor interrogator, Universal filters.

Power Supplies: Voltage regulators, Fixed and variable voltage regulators, Switching regulators, Transistor voltage regulators, IC voltage regulators, Shunt and series voltage regulators, Voltage dividers, Protection of equipment from low and high voltage, stabilized power supply with ICs.

Text Books:

1. Millman & Tub : Electronic Devices and Circuits
2. Gaykwad : Operational Amplifier

Reference Books:

1. Coughlin Driscoll : Operational Amplifier
2. Mithal and Vanswasi : Pulse and Digital Electronics
3. Allen. Motorshead : Electronics Devices & Circuits
4. Millman & Halkias : Electronic Devices & Circuits
5. Gupta & Kumar : Handbook of Electronics

EEE-2202: Electronics Circuit-III Lab

Based on the theoretical course 2201

EEE-2203: Digital System Design

Fundamentals of Digital Circuits: Advantages of digital systems, Number systems and codes, Boolean algebra, Postulates and theorems of Boolean algebra, Fundamental logical operations, AND/OR/NOT/NOR/NAND/XOR/XNOR operations, switching functions by interconnection of Gates, Shanon's theorem, Minimization of switching Functions, Karnaugh Maps, Quine McClusky method.

Logic Circuit Families: Diode Logic, Diode-Transistor Logic (DTL), Resistor-Transistor Logic (RTL), Direct Coupled Transistor Logic (DCTL), Transistor-Transistor logic (TTL), Integrated-Injection Logic (IIL), Emitter-Coupled Logic (ECL), MOSL.

Combinational Circuits: Adder, Subtractor, Multipliers, Decoders, BCD to 7 segment decoders, BCD to Decimal decoder, Encoder, Switch, Encoder, Multiplexer, Demultiplexer, Applications and Comparator.

Sequential Circuits and Their Design: Practical circuit considerations, Latches, Flip-Flops, R-S, J-K, T, D Flip-Flops, Synchronizing and triggering of Flip-Flops, Master-Slave Flip-Flops, Edge triggered Flip-Flops, Analysis of synchronous and asynchronous sequential circuits, Synthesis of sequential circuits, Problem formulation to circuit implementation.

Counters: Synchronous and asynchronous counters, Ripple counter, Binary counter, Decade counter, Ring counter, N- Modulo, Up-down counter, Registers.

Semiconductor Memories: Classification and characteristics of memory, RAM, ROM, PLA, PLD, Charge Coupled Device (CCD), Programmable Logic Array (PLA), Magnetic memories, Expansion of word size and word capacity.

Converters: Digital to Analog Converter (DAC), weighted resistor DAC, R-2R ladder, Analog to Digital Converter (ADC), Ramp ADC, Successive approximation, Flash type DAC and ADC ICs.

Text Books:

1. Tocci : Digital systems
2. V. K. Jain : An Introduction to Switching Theory and Digital Electronics

Reference Books:

1. R.P. Jain : Modern Digital Electronics
2. Lutfor Rahman : Digital Electronics
3. Malvino and Leach : Digital Principles and Applications

EEE-2204: Digital System Lab

Based on the theoretical course 2203

EEE-2205: Physics-II

Atomic Physics: Thomson's plum pudding model, Rutherford's nuclear atom model, Bohr's atomic model, and its use to energy levels and spectra, Sommerfeld's relativistic model, Different quantum numbers, Vector atom model, Electron configuration, Zeeman effect, Pauli exclusion principle

Relativistic Physics: Postulates of Einstein special theory, Michelson-Morley experiment, Lorentz transformation, Length contraction and Time dilation, Twin paradox, Relativity of mass, Mass-energy equivalence, Velocity addition, General relativity.

Nuclear Reaction & Radioactivity: Properties of nucleus, nuclear shape and size, Mass defect and Binding energy, Theory of nuclear force, Meson theory, Characteristics of nuclear force. Nuclear fission and fusion, Chain reaction, nuclear reactor, Thermonuclear reaction in star, Natural and artificial radioactivity, Radioactive decay laws, Half-life and mean life, Secular and Transient equilibrium, Radioactive series, radioactive dating, Uses of radioactivity.

X-rays: X-rays and their generation, Line Spectrum and Continuous Spectrum of X-rays, Bragg's law, Laue equations, Experimental methods of X-ray diffraction.

Wave-Particle Duality: Blackbody radiation, Photoelectric effect, Quantum theory of light, The Compton effect, Pair production, Pair Annihilation, De Broglie waves, Phase and group velocities, Heisenberg's uncertainty principle and its applications.

Quantum Mechanics: Limitations of Classical mechanics, Postulates of quantum mechanics, Linear operator, Eigen values and eigen function, Time dependent and time independent Schrodinger equations, Expectation

values, Particle in a box, Finite potential well, Tunnel effect, Harmonic oscillator, Schrodinger's equation for the hydrogen atom.

Statistical distribution laws: Phase space, the probability of distribution, the most probable distribution, Maxwell-Boltzmann distribution, Evaluation of constants, Molecular energies in an ideal gas, Bose-Einstein distribution, Fermi-Dirac distribution, Transition between states, Comparison of results.

Text Book:

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| 1. A Beiser | : Concept of Modern Physics. |
| 2. Murugesan | : Modern Physics |

Reference Books:

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| 1. N. Subrahmanyam and Brijlal | : Atomic and Nuclear Physics |
| 2. B.L. Theraja | : Modern Physics |

EEE-2207: Electrical Machines-II

Single Phase Motors: Types of single-phase motor, double field revolving theory, making self-starting, Types of capacitors start motors, Repulsion motor, Universal motor, Reluctance motor, Hysteresis motor.

Alternators: Basic principle, Stationary armature, Rotor, Speed and frequency, Windings, Factors affecting size, armature on load, Voltage regulation.

Synchronous Machines: General outline of synchronous machine (SMS), Motors and generators, Salient pole and non-salient pole, Armature and field core of synchronous generator, Theory of operation, Motor terminal characteristics, Power and torque, Speed control, Application of SMS.

Electro mechanical energy conversion: Principles of electro-mechanical energy conversion, energy balanced equation, energy in single excited magnetic systems, mechanical force and energy.

Special Machines: Universal motor, reluctance motor, hysteresis motor and Pm motor.

Text Books:

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|-----------------------------------|------------------------|
| 1. P.S. Bhimbra, | : Electrical Machinery |
| 2. I.J. Nagrath, D. P. Kothari, , | : Electric Machines |

Reference Book:

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| 1. E Fitzgerald, Charles Kingsley, Jr. S.D. Umans, | : Electric Machinery. |
| 2. P. K. Mukharjee, S. Chakravarti, | : Electric Machines |
| 3. P.S. Bhimbra, | : Generalized Theory in Electrical Machines |

EEE-2208: Electrical Machines-II Lab

Based on the theoretical course 2207

EEE-2209 Viva-Voce

Based on all the theoretical courses.

3rd Year 1st Semester

EEE-3101: Measurements and Instrumentation

Measuring Instruments: Absolute and secondary instrument, Principle of operation, Essentials of indicating instruments. Classification, Indicating instruments, operation principle of ammeters, voltmeters, wattmeters and watt-hour meter.

Introduction of instrumentation error: Classification of error, normal law of error, guarantee of error.

Electrical Instruments: Classifications, Moving Iron, Attraction and repulsion type, Errors in moving iron, Moving coil meter, Permanent magnet instrument, torque equation, Error dynamic type instrument, Operating principle, Dynamometer, Voltmeter and ammeters, Errors in dynamometer instruments, Ohmmeters, series and shunt type meter, Multi-meter, Thermal instrument, Induction instruments, Rectifier instrument, Extension of range of voltmeter and ammeter, Ammeter shunt, Voltmeter multipliers, Multi-range meters, Instrument transformer, Current and voltages transformer

Electronic Instruments: Measurement fundamentals, Types of error, Voltmeter sensitivity, Loading effect, Amplified DC meter, Chopper type, AC voltmeter, RMS voltmeter, selecting factors of meter, Digital voltmeter, Component measurement, Q Meter, Frequency Meter.

Oscilloscopes: Block diagram, CRT deflections, Screens, CRT circuits, Vertical deflection system, Delay line, Multiple trace Horizontal deflection system, Probes and transducers, Storage Oscilloscopes, digital storage Oscilloscopes. Sampling Oscilloscopes.

Signal Generation and Analysis: Sine wave generators, Frequency synthesized generator, Sweep frequency generator, Wave analyzers, Harmonic distortion analyzer, Spectrum analyzer, Applications.

Transducers: Classifications, Selection of transducer, Microphones, Loudspeaker, Strain gages, Displacement transducers, LVDT, Temperature measurements, Thermometer, thermocouples, Flow meter, Liquid level detector.

Reference Books:

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| 1. A.K. Sawhney | : Electrical and Electric measurement and Instrumentation |
| 2. C.S. Rangan | : Instrumentation, Devices and Systems. |
| 3. Alan S Morris | : Measurement and instrumentation principles |
| 3. W.D. Cooper | : Electronic Instrumentation and Measurement Techniques |
| 4. Q. K. Sawhney. | : Electrical & Electronic Measurement & Measuring Instruments |
| 5. H.S. Kalsi | : Electronic Instrumentation |

EEE-3102: Electromagnetic Fields & Waves

Electromagnetics: Field equations on coulomb, Ampere, Lenz, Gauss and Faraday's law, Displacement current, Maxwell's equations, boundary conditions, Plane wave in space, Poynting's radiation vector.

Transmission Lines: Balance, unbalanced lines, Primary Line constants, Characteristics impedance, propagation coefficient, Phase and Group velocity, standing waves, standing wave ratio, losses in transmission line, Smith Chart, Transmission line components: Stub, couplers, Balun, Slotted lines. Telephone lines and Cables, RF lines, Microstrip lines and strip transmission lines.

Propagation of Waves: Electronic spectrum, propagation in free space, Tropospheric propagation, Ionospheric propagation, Ground (surface) wave propagation, space waves, LF-VLF-ELF propagations.

Waveguides: TM, TE, TEM Waves; Rectangular wave guide; modes, TEMn modes. Circular and other wave guides, Waveguide Coupling, Matching and Attenuation, Cavity resonator; Directional coupler, Isolator, Circulator, Duplexers.

Antenna: Radiation current element; Antenna equivalent circuit, Elementary Doublet, Classification of Antennas, Current-voltage distribution of antenna; Resonant antenna, Radiation pattern, Length of

antenna, non-resonant antenna, Antenna gains, Radiated Power, Antenna resistance, Beamwidth, Bandwidth, Polarization, Effects of ground; Effects of Height, Antenna Coupling; Directional HF, UHF, Microwave a Helical Antenna, Discone antenna, Loop antenna.

Text Books:

1. Hayt W.H. : Engineering Electromagnetics, 2013, Eighth Edition, Tata Mc-GrawHill.
2. Mathew, N.O. Sadiku : Elements of Electromagnetics, Fourth Edition, Oxford University Press.

Reference Books:

1. D. N. Narayan Rao, : Elements of Engineering Electromagnetics, Sixth Edition, 2006.
2. Roddy and Coolen : Electronic Communications
3. J.D. Ryder : Networks, Fields and Lines
4. Kennedy and Davis : Electronic Communication Systems.

EEE-3103: Signals and Linear Systems

Introduction: Signals, Systems and Signal Processing, Classification of Signals, Analog-to-Digital and Digital-to-Analog Conversion, Operations on signals, Properties of signals.

Random Variables and Processes: Probability, Cumulative distribution function, Probability Density Function, Tchebycheff's Inequality, The Gaussian Probability Density, The Error Function, The Rayleigh Probability Density, Correlation between random variables, the central-limit theorem, Random Processes, Autocorrelation, Power Spectral Density of a Sequence of Random Pulses, Power Spectral Density of Digital Data, Effect of rudimentary filters of digital data, the complimentary error function.

Discrete Time Signals and Systems: Discrete Time Signals, Discrete Time Systems, Analysis of Discrete Time Linear Time-Invariant Systems, Discrete Time Systems Described by Difference Equations, Correlation of Discrete-Time Signals, Time Domain Representations for Linear Time Invariant Systems, Convolution Properties of convolution Difference and differential equations - characterizing solutions.

Transformation: Fourier Representations of Signals, Discrete time periodic signals - the discrete time Fourier series Continuous time periodic signals - the Fourier series, Discrete time nonperiodic signals - the discrete time Fourier transform Continuous time nonperiodic signals - the Fourier transform Properties of Fourier representations. Applications of Fourier Representations, Frequency response from time-domain system, descriptions Fourier transform representations for periodic signals, Convolution and modulation revisited - mixing periodic and nonperiodic signals, The Fourier transform representation for discrete-time signals, Sampling, continuous-time signals, Reconstruction of continuous-time signals from samples.

The Laplace transformation: Definition Convergence Properties Inversion Solving Differential Equations Transform Analysis of Systems.

Text Books:

1. Oppenheim A.V., Willsky A.S. and Young I.T. : Signals and Systems
2. Simon Haykin and Barry Van Veen : Signals and Systems

Reference Books:

1. R.F. Ziemer, W.H. Tranter and J.D.R. Fannin, : Signals and Systems - Continuous and Discrete

EEE-3104: Electrical and Electronic Circuit Simulation

Based on all Electrical and Electronics circuit related course

EEE-3105: Numerical Methods

Computer Application to Numerical Methods: Classification of numerical methods, Errors in numerical calculations, Solution of algebraic and transcendental equations, The bisection method, The iteration method, Newton-Raphson method, The Secant method, Muller's method.

Numerical Solution of Simultaneous Equations: Elementary operations of matrices, Gauss-Jordan elimination method, Necessity of normalization, zero diagonal elements and positioning of size, Matrix inversion, Jacobi's method, Gauss-Seidel iterative method.

Polynomials: Introduction, Errors in polynomial Interpolation, Difference operators, Expressing a polynomial in factorial notation, Finite difference interpolation, The Lagrange polynomials, Lagrange's interpolation formula for unequally spaced data.

Numerical Differentiation & Integration: Numerical differentiation, Differentiation based on equal interval interpolation, Differentiation based on Lagrange's interpolation formula, Numerical integration, General quadrature formula, Trapezoidal rules, Simpson's and Romberg's formula, Legendre polynomials, Gaussian quadrature.

Numerical Solution of Ordinary Differential Equations: Introduction, Solution of Taylor's series, Euler's method, Runge-Kutta method, Predictor-Corrector method, Boundary-value problems.

Solution of Partial Differential Equations: Introduction, Examples of Partial differential equation, the approximation of derivatives of finite differences, Laplace equation, Iterative Method, Successive Over-relaxation and Alternating and Direction Methods, Parabolic differential equation, Derivation of the elliptic difference's equation.

Text Books:

1. S. S. Sastry : Introduction Methods of Numerical Analysis.
2. Gerald and Wheatley Addison : Applied Numerical Analysis", Seventh Edition, 2003, Wesley.

Reference Books:

1. Chapra and Canale : Numerical Methods and engineering.
2. M.R. Spiegel, "Theory and problems of Probability and statistics", 2nd Edition, McGraw Hill Book Company.

EEE-3107: Microprocessor, Microcontrollers and Peripherals

Introduction: Microprocessors and Microcomputer, Evolution of Microprocessor, Microprocessor instruction set and Computer language, General architecture of microprocessor and its operation, Memory, Input/Output (I/O) devices, RISC and CISC processors, Co-processors, Parallel processing.

Microprocessor Software Concept: Introduction, Instruction formats, Addressing Modes, Instruction Types, Introduction to Assembly language programming.

Intel 8085 Microprocessor: Introduction, Internal architecture, register structure, Memory addressing, Addressing modes, Instruction set, 8085 programming model, Instruction classification, How to write, Assemble and execute a simple program, Memory interfacing, Interfacing output displays, Interfacing Input Devices, Memory mapped I/O, Testing and Troubleshooting I/O interface Circuits, 8085-based System Design.

Intel 8086: Introduction, Architecture, addressing modes, Instruction set, Programming model, 8086 input/output system design using 8086.

Microcontrollers: Introduction, History, Microcontrollers versus microprocessors, Internal architecture, instruction set, Assembly language programming, Intel-8051, PIC24, AVR32.

Programmable Interface Devices: Interrupts, Basic concepts in programmable devices, The 8155/8156 and 8355/8755 etc multipurpose programmable devices, The 8279 programmable keyboard/display interface.

Peripheral Interfacing: Parallel versus serial transmission, Synchronous and asynchronous serial data Transmission, Basic concept of serial I/O, Software controlled asynchronous serial I/O, The 8085-serial I/O Lines: SID and SOD, Hardware controlled serial I/O using programmable chips, DMA controllers.

Reference Books:

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| 1. Sheat and Hebber | : Microprocessor |
| 2. Mathure | : Microprocessor |
| 4. Hall, D. V. | : Microprocessor and interfacing, Tata McGraw Hill Pub. 1986 |

EEE-3109: Microprocessor, Microcontrollers and Peripherals Lab

Based on the theoretical course EEE-3108

EEE-3109: Engineering Economics

Introduction to Engineering Economics: Types of Decisions in Engineering Economics, Limitations of Engineering Economics, Fundamental Principles of Engineering Economics, Cash Flow Diagrams, Interest Rates and Time Value of Money, Debt Management.

The Three Worths: Present Worth, Annual Equivalence, Future Worth, Evaluation of Alternatives Based on Time Value of Money, Capitalized Costs, Capitalized Recovery, Life Cycle Cost Analysis.

Rates of Return: Return on Investment (ROI), Internal Rate of Return (IRR), Incremental IRR, Mutually Exclusive Alternatives.

Benefit-Cost Analysis: Benefit-Cost Analysis (BCA) used in Public Sector Projects, Valuation of Benefits and Costs, Benefit-Cost Ratio (BCR).

Depreciation and Financial Statements: Depreciable Us. Non-Depreciable Assets, Types of Depreciation, Introduction to Income Statements, Introduction to Cash Flow Statements after Tax Analysis: Corporate Taxes, Treatment of Capital Gains and Losses, Treatment of Non-Cash Expenses, After Tax Cash Flow: Developing Cash Flow Statements, Developing Cash Flow Equations.

Inflation: Introduction to Inflation, Measuring Inflation, Equivalence Calculation under Inflation, Impact of Inflation on Capital Projects.

Retirements and Replacements: Economic Life, Replacement Analysis under Different Conditions, Replacement Analysis with after Tax Consideration.

Cost Concepts and Capital Budgeting: General Cost Concepts, Classification of Costs, Introduction to Capital Budgeting, Cost of Capital, Choice of MARR, Capital Budgeting Decisions.

Sensitivity Analysis: Break-Even Analysis, Sensitivity Analysis, Evaluating Mutually Exclusive Alternatives using Sensitivity Analysis Decision and Risk Analysis: Project Risk, Introduction to Probability Concepts for Investment Decisions, Probability Distribution for NPW Decision, Comparing Mutually Exclusive Risky Alternatives, Risk Simulation, Decision Tree Analysis in Investment Decisions.

Reference:

1. Contemporary Engineering Economics, 4 th Edition, Chan S. Park, Prentice-Hall.

3rd Year 2nd Semester

EEE-3201: Power System Analysis-I

Introduction to transmission lines: Flux linkages, inductance due to external flux, inductance of single-phase two-wire line, composite conductor lines, G.M.D, 3-phase line with equilateral and with unsymmetrical spacing, parallel circuit of 3-phase line, and use of tables.

Capacitance of Transmission lines: Electric field, capacitance of two wire line, three-phase lines with symmetrical & with equilateral spacing, effect of earth, parallel circuits lines, representation of lines: short, medium and long transmission lines, T and π representation, exact solutions, equivalent circuit of long transmission line.

Generalized line constants: General line equations in terms of ABCD constants, relations between constants, charts of line constants, constants of combined networks measurements of line constants.

Power flow solutions: Power flow problem, Gauss-Seidel method, Newton-Raphson method, Power flow studies in system design and operation, regulating transformers.

Symmetrical Faults: Transients in RL series circuits, internal voltages of loaded machines under fault conditions, Fault calculations using Zbus. Circuit breakers.

Unsymmetrical faults: Unsymmetrical faults on power system, Single line-to-ground faults, Double line-to-ground faults, Open-conductor faults.

Text Books:

1. *W.D. Stevenson Jr.* : *Elements of power system analysis, McGraw-Hill publications, 3rd Edition*
2. *V.K. Mehta & R. Mehta* : *Principle of Power Systems.*

Reference Books:

1. *John J Grainger* : *Power System Analysis, McGraw-Hill (India) Pub. , 2003*
2. *Prabha Kundur* : *Power System Analysis and Control , TMH, 2008*
3. *O. I. Elgerd,* : *Electric Energy Systems Theory, McGraw-Hill publications 1971*
4. *Hadi Saadat* : *Power System Analysis , TMH , 2002*

EEE-3202: Control System Engineering

Introduction to Control System: Conventional control system, steady state response to step, ramp, and parabolic inputs, transient response, poles and zeros, frequency response from pole-zero diagram, Routh's stability criterion; block diagrams, canonical forms, transfer functions and signal flow graph, root locus, frequency response, Nyquist's stability criterion.

Modern Control System: Introduction, state variable analysis, controllability and observability, application of Eigen value, linear control system design by state feedback, pole placement.

Introduction to Industrial Automation and Control: Definitions of Automation and Control, Relation between Automation and Information Technology, Role of Automation in Industry, Functional elements of Industrial Automation Systems that perform a variety of functions related to Instrumentation, Control, Supervision and Operations Management, Automation using PLC and SCADA.

Introduction to PLC: Definitions & History of PLC, PLC systems, I/O modules, CPU, Memory, Power supplies, Programmer, Advantages & limitations, Selection criteria for PLC.

Programming of PLC: IEC Programming Standard, Ladder Diagram, Function Block Diagram, Instruction List and Structured Text, Construction of PLC ladder diagram, Basic components & their

symbols in ladder diagram, Fundamentals of ladder diagram, Boolean logic & relay logic, Analysis of rungs, Input ON/OFF switching devices, Input analog devices, Output ON/OFF devices, Output analog devices

Text Books:

1. Benjamin C Kuo, "Automatic Control Systems", Prentice Hall of India.
2. M. Gopal, "Control Systems- Principle of Design", Fourth Edition, 2012, McGraw Hill.
3. I.J. Nagrath, "Control Systems Engineering", New Age International Ltd. , 2000

Reference Books:

1. D'Azzo Houpis, Logakusha, Huelsoman, "Linear System Analysis", McGraw Hill.
2. Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Pearson Education Inc.
3. Norman S Nise, "Control System Engineering ", John Wiley & Sons.
4. Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall of India

EEE-3204: Control System Engineering Lab

Based on the theoretical course of EEE-3203

EEE-3204: Communication Engineering-I

Introduction of communication systems: Basic principles, fundamental elements, system limitations.

Information Theory: Information and system capacity, information transmission, entropy, channel capacity, signal transmission through linear network, filter transfer function, complex frequency spectrum, distortion less transmission.

Analog communication: AM, FM, PM, DSB, SSB, VSB, ISB.

Radio Engineering: AM, FM, PM transmitter & receiver, super heterodyne receiver.

Digital communication: Introduction, Nyquist sampling theorem, quantization of analog system, quantization noise, PAM, PWM, PPM, PCM, LOGPCM, and systems, Digital modulations, ASK, FSK, PSK, DPSK, MSK, M-array digital modulation, QAM, QPSK, delta modulation, multi carrier modulation, line coding, frame construction, Error Probability.

Multiplexing: Space division multiplexing, frequency division multiplexing, time division multiplexing, and code division multiplexing.

Noise: Physical sources of noise, types of noise, calculation of noise, SNR & noise figure, and calculation of noise figure, noise temperature, equivalent noise resistance.

TV Engineering: Transmission and reception of picture information, Scanning, Synchronization, Composite video signal, Vestigial side band transmission, Line of sight transmission, TV channels, Storage type camera tubes, Image orthicon, Vidicon, CCD camera, AGC circuits Fundamentals of TV receiver, Fundamentals of Color TV receiver, Matrix circuits, color pixel composite video signal, Colour picture tube, Digital Television, TV Broadcasting system.

Text Books:

1. Martin : Modern Digital & Analog Communication systems.
2. Malvino and Leach : Digital Principles and Applications

Reference Books:

1. Roddy and Coolen : Electronic Communications.
2. Kennedy and Davis : Electronic Communication Systems.
3. G.K Mithal : Radio Engineering
4. R.R Gulati : Monochromatic Colour TV.

EEE-3205: Communication Engineering-I Lab

Based on the theoretical course 3204

EEE-3206: Electrical Engineering Materials

Elementary Materials Science Concepts: Bonding and types of solids, crystalline, crystalline defects and their significance, electrical and thermal conduction in solids, scattering, classical-Drude model, Mathiessen's rule, failure of classical theory in modern devices, introduction to quantum transport theory.

Elementary Quantum Physics: Photons, electron as wave, time-independent Schrodinger equation, Heisenberg's uncertainty principle, modern theory of solids, band theory of solids, E-K diagram & its physical meaning, density of state, electron effective mass from E-K diagram, direction dependent effective mass.

Dielectrics: Matter polarization and relative permittivity, electron polarization- covalent solids, polarization mechanisms, polar and nonpolar dielectrics, Langevin's theory of polarization, Clausius-Mossotti equation, interaction between field and matter, frequency dependent dielectric constant and dielectric loss, Gauss's Law, dielectric strength and insulation breakdown, piezo electricity.

Magnetic Properties: Magnetization, dipole and atomic moment, magnetization vector, field intensity, permeability and susceptibility, magnetic moments, diamagnetic, paramagnetic, ferrimagnetic, ferromagnetic and antiferromagnetic materials and their applications, magnetic domains polycrystalline and permanent magnetic materials, soft and hard magnetic materials magnetic recording materials.

Superconductivity: Zero resistance and Meissner effect, thermodynamic of superconductors, London equations, Penetration depth, and Coherence length, BCS theory of superconductivity, Quantum theory of superconductivity, Josephson Effect, Superconducting magnet; Type-1 and Type-2 superconductors.

Optical properties of solids: Interaction light with solids, refractive index, dispersion, Fresnel's equations light absorption and scattering, polarization, optical anisotropy, electro-optic effect

Nanotechnology: Low dimension structures, Quantum well, Quantum wires, Quantum dots, Metal, Semiconductor and organic multilayer's, Fullerenes, Nanotubes, Porous silicon and other special nanomaterials. Electronic states in 2-D, 1-D and 0-D solids. Strong and weak confinement

Text Books:

1. Dekkar, A.J., : *Electrical Engineering Materials, Reprint Edition*", 2009, Prentice Hall Publications Co.
2. Kasap S.O., : *Principle of Electronic Materials and Devices*", Second Edition, Tata McGraw-Hill.

Reference Books:

1. S.O Pillai., : *Solid State Physics*", Third Edition, New Age International Publishers.
2. R. L Sutherland : *hand Book of Non-linear Optics*
3. B.B Laud : *Laser and Non-linear Optics*.

EEE-3207: Digital Signal Processing

Introduction to Digital Signal Processing (DSP): Digital signals and systems: Operations in digital signal processing, the scope of DSP, analog to digital conversion, frequency Domain Effects of Sampling: Periodic repetitions in frequency domain due to sampling in time domain, recovery of continuous-time signal from its samples (reconstruction), role of anti- aliasing and reconstruction filters, examples of aliased signals (show how waveform is distorted), impulse response, finite impulse response (FIR) and infinite impulse response (IIR) of discrete-time systems, difference equation.

Discrete Transformations: Discrete Fourier series, the Discrete-Time Fourier Transform, discrete Fourier transform (DFT) and fast Fourier transform (FFT): Forward and inverse transforms; coefficient ordering; time and frequency resolution; periodic extension, zero padding and modulo-M reduction; properties of the DFT, circular convolution; Cooley- Tukey decomposition, recursive application, radix-2 FFTs , time and frequency decimation, computational complexity.

Z-Transformation: Basic Theory: background idea behind the z-transform (solution to LTI discrete-time diff. eq.), calculation of z-transform and its inverse (briefly), regions of convergence, Properties of z-transforms: role in solution of discrete-time LTI systems, convolution property and graphical interpretation of the convolution operation, z-transforms of cascaded systems, stability and causality, Realization and frequency Response: Frequency response (Magnitude and Phase), representation of LTI systems with rational polynomials, block-form implementations of a rational polynomial transfer function

Digital Filters: FIR filters- linear phase filters, specifications, design using window, optimal and frequency sampling methods; IIR filters- specifications, design using impulse invariant, bi-linear z-transformation, least-square methods, linear phase, Butterworth, Chebychev , Inverse Chebychev , Bessel and elliptic filters, finite precision effects in implementing digital filters.

Implementing Digital Filters: Block-diagram representations; direct forms, cascade forms, first and second-order factors, parallel forms; feedback loops transposed forms; linear-phase FIR structures.

Wavelets: Short time Fourier transform; fundamentals of wavelets, wavelet transform (continuous and discrete), time - frequency density and orthogonal bases.

Speech Processing: Speech production model, Speech analysis and Synthesis system, Vocoder.

Image Processing: Image acquisition, Storage and processing, Structure of the human eye, A simple image model, Introduction to image transforms, Restorations and compressions, Colour image processing, Morphological image processors, DSP processors.

Recommended Books:

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| 1. Proakis & Manolakis | : Digital Signal Processing. |
| 2. Alan V Oppenheim & Alan S Willsky | : Signals and Systems. |
| 3. Oppenheim & Schaffer | : Digital signal Processing |
| 4. V U Reddy and Suendra Prasad | : Signal Processing. |
| 5. R. C. Gonzalez | : Digital Image Processing |
| 6. J. C. Russ | : The Image Processing handbook |

EEE-3208: Digital Signal Processing Lab

Based on the theoretical course 3207

4th Year 1st Semester

EEE-4000: Thesis/ Project

Full Marks 100	Course works/Research works	Credit: 2.0	
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EEE-4101: Industrial Attachment/ Training/Internship

Full Marks 100	(Exam. 70, Note Book 05, Lab. Performance 05, Class Attendance 10, Viva-voce on experiment 10)	Credit: 1.5	Exam. Hours: 06
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EEE-4102: Power System Analysis-II

Insulators for overhead lines: Types of insulators, their constructions and performance, potential distribution in a string of insulators, string efficiency, methods by equalizing potential distribution, special types of insulators, testing of insulators.

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

Insulated cables: Underground cables vs. overhead lines, insulating materials, electro static stress grading, three core cable-dielectric losses and heating, modern developments oil filled and gas filled cables, measurements of capacitance, cable testing, corona & corona power loss.

Economic marginal transmission cost and tariff: energy rates and analysis, economic operation of power system.

Recent trends in transmission system: Overview of flexible ac transmission system(FACTS), high voltage dc transmission system (HVDC) and SCADA.

Power system stability: The stability problem of power system, distinction between steady state and transient stability, the swing equation, equal area criterion and its applications, solution of swing equation, factors affecting transient stability, improving stability.

Typical layout of a substation and load curves: Demand factor, diversity factor, load duration curves, energy load curve, load factor, capacity factor, plant factor and load forecasting.

Reference Books:

1. HadiSaadat : *Power system Analysis*
2. Charles A. Gross, John Wiley & Sons : *Power system Analysis by.*
3. John J. Grainger & William D. Stevenson : *Power system Analysis*
4. Abhijit Chakrabarti & Sunita Halder : *Power system Analysis Operation and control by,*
5. William D. Stevenson, Jr : *Elements of Power System Analysis*

EEE-4103: Power System Analysis-II

Based on the theoretical course of EEE-4102

EEE-4104: Communication Engineering-II

Telephony: Introduction to telephone system, principles, microphone, receiver and elements of telephone.

Ex-change: Introduction to switching systems, stronger and crossbar exchange, digital exchange, signaling & switching technique, traffic theory, PABX system, telephone/exchange tariff measurement.

Optical Communications: Optical fiber, characteristics, sources, detectors, optical transmitters, optical receivers, repeaters.

Microwave communications: Introduction, Generation of UHF by triodes and their limitation, Microwave Components, Resonator, Tees, Couplers, Circulators and isolators, Microwave transistors, Microwave tunnel diode amplifiers and oscillators, Gunn-Effect diodes, Gunn diode oscillator and amplifier, Read diode, Klystron, Reflex klystron, Magnetron, Strip lines, Microwave integrated circuits, Microwave transmitter and receiver, Microwave measurement and test equipment, Microwave link, Frequency assignment and modulation methods, Baseband repeater, Single and multi-channel RF. repeater.

Radar and Sonar: Basic principles, Radar equation, Factors influencing maximum range, Type of Radar; Pulsed Radar system, Modulator, Receiver, Duplexer, Moving target indicator, Tracking Radar, Search Radar system, Antenna system, Sonar.

Satellite Communications: Introduction, Satellite systems, Orbiting satellites, Satellite frequency bands, Satellite altitude, Transmission path, Satellite channel, Satellite transponder, Multiple-Access methods: Frequency Division Multiple Access, Time Division Multiple Access, Code Division Multiple Access.

Reference Books:

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| 1. Umesh Singh | : Telephony system. |
| 2. Bellamy | : Digital Telephony : |
| 3. Darma Prakash Agarwall | : Introduction to Wireless and Mobile System |
| 4. C. Y. Lee | : Mobile Cellular Telecommunication |
| 5. Saleh Faruque | : Cellular Mobile System |
| 6. Louis J. Ippolito, Jr. | : Satellite Communications Systems Engineering |

EEE-4105: Communication Engineering-II Lab

Based on the theoretical courses of EEE-4104

EEE-4106: VLSI Design

Basic MOS Structure: Introduction, Evolution of VLSI Device Technology, Metal Oxide Semiconductor (MOS) and VLSI Technology, Basic MOS Transistor Operation, MOS Transistor Switches, NMOS Fabrication, Basic CMOS Technology, CMOS Process Enhancements, BiCMOS Technology

MOS Device Characteristics: Introduction, Static Behaviour of the MOS Transistor, Dynamic Behaviour of MOS Transistor, The Actual MOS Transistor-Secondary Effects, NMOS Inverter, Determination of Pull-up to Pull-down Ratio, Pull-up to Pull-down Ratio for an NMOS Inverter Driven Through One or More Pass Transistor, Device Models for Simulation

MOS Circuit Design Process: Introduction, Why Design Rules, MOS Layers, Stick Diagrams, Design Rules and Layout, Elements of Physicals Design

Special Circuit Layouts: Introduction, Tally Circuits, NAND-NAND, NOR-NOR, and AOI Logic, Exclusive-OR Structures, Barrel Shifter, Transmission Gates, Latches and Flip-flops, Fan-in and Fan-out of CMOS Logic Design

Programmable Logic Devices: Introduction, NMOS PLAs, Other Programmable Logic Devices, The Finite-State Machine as a PLA Structure, Complex Programmable Gate Arrays (FPLA), Field Programmable Gate Arrays (FPGA)

CMOS Chip Design: Introduction, Design Strategies, CMOS Chip Design Options, Verilog HDL Basic Concepts, Structural Gate-Level Modeling, Switch-Level Modeling, General VLSI System Components, Combinational Logic Designs, CMOS VLSI Latch.

Text Books:

1. Principles of CMOS VLSI Design :B. T. Preas, M. Lorenzetti, The Benjamin- Cummings Publishing Co., 1988.

Reference Books:

1. Physical Design Automation of VLSI Systems :C. H. Roth, Jr. 1st ed., Thomson Engineering, 1998
2. Digital Systems Design Using VHDL :N. H. E. Weste, K. Eshraghian, 2nd ed., Addison-Wesley, 1994

Semiconductor power devices: SCRs, Thyristors, TRIACS, BJT, power MOSFET and IGBT.

AC to AC Controlled converter: On-off and phase control, single phase and three phase power controllers and cyclo-converter.

DC to DC converter: Chopper, characteristics and operation of step up and step down choppers, switching converter and power regulators.

AC to DC Controlled converter: Single phase and three phase half wave, full wave and semi-converter, phase control, characteristics, power factor control and converter triggering circuits.

Inverter: Three phase and single phase voltage source and current source inverters, voltage, frequency and harmonic control, PWM inverters, SVM inverter.

Introduction to power electronic control of motors: Scalar and vector control of poly phase induction motors, rotor power control, synchronous motor and PMSM motor control.

Industrial applications: Introduction to resistance welding, saturable reactors and magnetic amplifiers, dielectric heating, induction heating.

Text Books:

1. M. Rashid, "Power Electronics", Pearson Education India, 2004.
2. Ned Mohan, "Power Electronics", Third Edition, 2012, John Willey.

Reference Books:

1. M.D. Singh, K.B. Khanchandani, "Power Electronics", Tata McGraw Hill.
2. C.Y. Lander., "Power Electronics", Third Edition, 1993, McGraw Hill International.
3. B.K. Bose, "Modern Power electronics", 2003, Pearson Education India.
4. Joseph Vithyathil, "Principles of Power Electronics", First Edition, 2010, Tata McGraw Hill.

EEE-4108: Power Electronics Lab

Based on the theoretical course of EEE-4107

4th Year 2nd Semester

EEE-4000: Thesis/Project

Full Marks 200	Experimental/Research works	Credit: 4.0	
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EEE-4201: Switchgear and Protection

Circuit breakers: Types, ratings, constructions and selections, arc extinction, maintenance, testing and recovery voltage.

Fuse: Commercially available fuses, their constructions, characteristics and applications.

Relays: Types, construction, principle and operating characteristics of over current, IDMT, reactance, directional, power and impedance relays, balanced current relaying of parallel line, ground fault relaying, pilot relaying principles, protection relay schemes for generators, transformers, lines, feeders, buses, motor, generator and power systems, reactors, lightning arrestors, surge absorbers, ground wire, generators grounding, co-ordination of over current relay.

Digital relaying and applications: Bus bar system and reactors, Simple bus bar, double bus bar, ring bus bar, Reactors

Text Books:

1. C.R. Mason : : *Art and Science of Protective Relaying*, John Wiley & Sons, New York, 1977.
2. Y. G. Paithankar, S.R. Bhide : *Fundamentals of Power System Protection*, PHI, 2nd edition, 2010.

Reference Books:

1. S. H. Horowitz, A. G. Phadke : *Power System Relaying*, 3rd ed. John Wiley & Sons, 2008.
2. J. L. Blackburn, T. J. Domin : *Protective Relaying, principals and application*, 3rd ed. CRC press, 2007.

EEE-4202: Switchgear and Protection Lab

Based on the theoretical course of EEE-420

EEE-4203: Power Plant Engineering

Power Plants: General layout and principles, steam turbine, gas turbine, combined cycle, hydro and nuclear. Plant performance and operation characteristics,

Atomic power plant: nuclear fission and fusion; energy release; moderation, control, cooling and shielding aspects, factor, place, utility and effects on environment and human beings.

Selection of Location: Technical, economical (Efficiency, heat rate and incremental rate, load division between generating units for economy, economic conductor selection, Kelvin's law.) and environmental factors (forces on bus section in case of short circuit), load forecasting, load shearing (base load & peak load plant), Optimum load scheduling, transmission line loss, chronological load curves to distribute load among units.

Graphical method for location of distribution systems: Bus system layout, importance of current limiting reactors.

Generation Scheduling: Deterministic and probabilistic generation, load curves- demand factor, diversity factor, load duration curve, energy load curves, load factor, capacity factor, plant factor, electricity tariff formulation and type.

Reference Books:

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|-----------------------------|---|
| 1. Leonjard L. Grigs | : <i>Electric Power Generation, Transmission and Distribution</i> |
| 2. Bernhardt G.A. Skrotzki | : <i>Power Station Engineering and Economy, Tata McGraw Hill</i> |
| 3. E.I Wakil & M.M | : <i>Power Plant Technology, McGraw-Hill 1984.</i> |
| 4. S.C Arora & S.Domkundwar | : <i>A course in Power Plant Engineering</i> |
| 5. Nag P.K, Tata | : <i>Power plant Engineering, McGraw-Hill, 1998.</i> |

EEE-4204: High Voltage Engineering

High voltage Supplies: AC: Cascaded transformers, resonant circuit, DC: Rectifier circuits, cascaded generators, electrostatic generators

Impulse Generators: Impulse voltage wave shapes, mathematical analysis and design consideration of impulse generators, Multistage generators, Triggering of impulse generators.

Measurement of High Voltage: Measurement of high ac, dc, and impulse voltages and currents, sphere gap and uniform gap methods.

Corona: Power loss calculation, corona formation voltages, corona breakdown of solid, liquid and gaseous dielectrics, insulation testing, standard specifications, high voltage DC transmission merits and demerits over AC transmission, bridge arrangement, mathematical analysis of the bridge circuit, regulation reactive power, artificial commutation.

Protection against lighting and insulation co-ordination: Lighting phenomena, direct and indirect lighting, transmission line design based on direct strokes, ground wire, lighting devices, arrestors and protectors tubes, insulation co-ordination and transformer insulation protection.

Reference Books:

1. M.S. Naidu and V. Kamaraju, : *High Voltage Engineering*, Tata McGraw Hill, 3rd Edition, 2004.
2. Kuffeland, W.S. Zaengl, : *High Voltage Engineering Fundamentals*, Pergamon press, Oxford.

EEE-4205: High Voltage Engineering Lab

Based on the theoretical course of EEE-4204

EEE-4206 Management Information System

Information systems management: importance of information systems (IS) management, key trends that impacts IS Management, changes in organizational environment, changes in technology environments, IS organizational models, IS management's leadership role, New Roles of IT, Cox Model for IT management, Roger Woolfe's Federal Model for outsourcing, CIO roles in leading, governing, investing and managing, strategic uses of IT in B2E, B2C, B2B, G2P, IS planning, IS planning paradox, differences between strategic, tactical and operational planning, today's sense and response strategy, different planning techniques including stages of growth, critical success factors, competitive forces model, value chain analysis, internet value matrix, linkage analysis planning and scenario planning;

Managing essential technologies: attributes of distributed systems, different types of distributed systems including host-based hierarchy, decentralized standalone systems, peer-to-peer system, hybrid enterprise wide systems, client-server systems, internet based computing and web services, Four levels of IT infrastructure, managing telecommunications, changes of infrastructure in telecommunications, transformation of telecommunication industries, wireless technology, managing information resources, managing data, giving shape to corporate data, enterprise resource planning, managing information resources, types of information, data warehouses, document management, content management, managing operations, outsourcing IS functions, information security, business continuity planning;

Managing system development: foundation of system development, structured development, fourth generation language, software prototyping, computer-aided software engineering, object oriented development, ERP systems integration, middleware inter-organizational system development, project management, key issues of IS system management, designing motivational works, rethinking maintenance works, improving legacy systems, measuring benefits of IS system as investment;

Systems for supporting knowledge work: supporting decision-making, decision support systems, data mining, executive information systems, expert systems, real customer relationship management, real-time enterprise management, managing different types collaboration, groupware, virtual workforce, virtual.

