COURSE REQUIREMENTS FOR UNDERGRADUATE STUDENTS

Undergraduate students of the Department of Electrical and Electronic Engineering have to follow a particular course schedule which is given in the following pages according to year and semester-wise distribution of the courses.

Year/ Semester	Theory		Sessional		Total Credit
	No. of Course	Credit	No. of Course	Credit	
1st/1st*	5	16.00	4	3.00	19.00
1st/2nd	5	17.00	4	3.75	20.75
2nd/1st	5	18.00	4	3.75	21.75
2nd/2nd	5	17.00	5	4.50	21.50
3rd/1st	5	16.00	4	3.75	19.75
3rd/2nd	5	16.00	4	4.50	20.50
4th/1st	5	15.00	5	3.75	18.75
4th/2nd	5	15.00	3	7.50	22.50
Total	**40**	**130.00**	**33**	**34.50**	**164.50**
Total (Without exempted)	**35**	**114.00**	**29**	**31.50**	**145.50**

*1st year 1st semester courses are exempted because of the candidates 4-year Diploma in Engineering background after 10 years of schooling.

CATEGORY-WISE PERCENTAGE OF COURSE CREDIT

Category	Percentage of Credit (BAETE/UGC guidelines)	Percentage of Credit (EEE, DUET) Total: 164.50 With Exemption		Percentage of Credit (EEE, DUET) Total: 145.50 Without Exemption	
		Credit	Percentage	Credit	Percentage
Language & General Education	10-15	17.00	10.33	13.00	8.93
Basic Science and mathematics	20-25	33.25	20.21	30.25	20.79
Other Engineering Courses (CSE, ME, CE)	5-10	9.75	5.93	9.00	6.19
Program Core Courses	50-60	86.50	52.58	75.25	51.72
Elective Courses	10-15	18.00	10.94	18.00	12.37
Total	100	164.50	100	145.50	100

CSE: Computer Science and Engineering ME: Mechanical Engineering CE: Civil Engineering

Year and Semester-wise Distribution of the Courses

1st year 1st Semester (Exempted)

Sl. No.	Course Code	Course Title	Contact hrs/week	Credit
01.	Math 1201	Fundamentals of Mathematics	3	3.00
02.	HSS 1201	Sociology and Entrepreneurship	4	4.00
03.	EEE 1101	Electrical Circuits-I	3	3.00
04.	EEE 1102	Electrical Circuits-I Sessional	3/2	0.75
05.	EEE 1301	Electrical Machines-I	3	3.00
06.	EEE 1302	Electrical Machines-I Sessional	3/2	0.75
07.	EEE 1501	Electronics-I	3	3.00
08.	EEE 1502	Electronics-I Sessional	3/2	0.75
09.	CE 1028	Engineering Drawing	3/2	0.75
Total:			**22**	**19.00**

Contact Hours: 16T + 6S = 22 Hours / Week
Total Credit: 19.00

No. of Theory Courses: 5
No. of Lab / Sessional Courses: 4

1st Year 2nd Semester

Sl. No.	Course No.	Course Title	Contact hours/week	Credit
01.	Math 1203	Differential and Integral Calculus	4	4.00
02.	HSS 1203	Technical English	3	3.00
03.	Phy 1201	Heat, Properties of Matter, Electricity and Magnetism	4	4.00
04.	Phy 1202	Heat, Properties of Matter, Electricity and Magnetism Sessional	3/2	0.75
05.	CSE 1113	Computer Programming	3	3.00
06.	CSE 1114	Computer Programming Sessional	3/2	0.75
07.	EEE 1103	Electrical Circuits-II	3	3.00
08.	EEE 1104	Electrical Circuits-II Sessional	3/2	0.75
09.	EEE 1106	Circuit Simulation Sessional	3	1.50
Total:			**24.50**	**20.75**

Contact Hours: 17T + 7.5S = 24.50 Hours / Week
Total Credit: 20.75

No. of Theory Courses: 5
No. of Lab / Sessional Courses: 4

2nd Year 1st Semester

Sl. No.	Course No.	Course Title	Contact hours/week	Credit
01.	Math 2201	Co-ordinate Geometry, Matrices and Vector Analysis	4	4.00
02.	Phy 2201	Optics, Structure of Solid and Modern Physics	4	4.00
03.	Phy 2202	Optics, Structure of Solid and Modern Physics Sessional	3/2	0.75
04.	Ch 2201	Chemistry	4	4.00
05.	Ch 2202	Chemistry Sessional	3/2	0.75
06.	EEE 2301	Electrical Machines-II	3	3.00
07.	EEE 2302	Electrical Machines-II Sessional	3/2	0.75
08.	EEE 2901	Transmission and Distribution of Electrical Power	3	3.00
09.	HSS 2202	English Language Sessional	3	1.50
Total:			**25.50**	**21.75**

Contact Hours: 18T + 7.50S = 25.50 Hours / Week
Total Credit: 21.75

No. of Theory Courses: 5
No. of Lab / Sessional Courses: 4

2nd Year 2nd Semester

Sl. No.	Course No.	Course Title	Contact hours/week	Credit
01.	Math 2203	Differential Equations and Statistics	4	4.00
02.	ME 2101	Basic Mechanical Engineering	3	3.00
03.	ME 2102	Basic Mechanical Engineering Sessional	3/2	0.75
04.	EEE 2303	Electrical Machines-III	4	4.00
05.	EEE 2304	Electrical Machines-III Sessional	3/2	0.75
06.	EEE 2501	Electronics-II	3	3.00
07.	EEE 2502	Electronics-II Sessional	3/2	0.75
08.	EEE 2601	Digital Electronics	3	3.00
09.	EEE 2602	Digital Electronics Sessional	3/2	0.75
10.	CE 2028	Computer Aided Drawing for Engineers	3	1.50
Total:			**26**	**21.50**

Contact Hours: 17T + 9S = 26 Hours / Week
Total Credit: 21.50

No. of Theory Courses: 5
No. of Lab / Sessional Courses: 5

3rd Year 1st Semester

Sl. No.	Course No.	Course Title	Contact hours/week	Credit
01.	Math 3201	Complex Variables and Mathematical Methods	4	4.00
02.	EEE 3501	Electronics-III	3	3.00
03.	EEE 3502	Electronics-III Sessional	3/2	0.75
04.	EEE 3601	Microprocessor and Interfacing	3	3.00
05.	EEE 3602	Microprocessor and Interfacing Sessional	3/2	0.75
06.	EEE 3002	Electrical Services Design	3	1.50
07.	EEE 3701	Measurement and Instrumentation	3	3.00
08.	EEE 3702	Measurement and Instrumentation Sessional	3/2	0.75
09.	HSS 3201	Government and Bangladesh Studies	3	3.00
Total:			**23.50**	**19.75**

Contact Hours: 16T + 7.5S = 23.50 Hours / Week
Total Credit: 19.75

No. of Theory Courses: 5
No. of Lab / Sessional Courses: 4

3rd Year 2nd Semester

Sl. No.	Course No.	Course Title	Contact hours/week	Credit
01.	EEE 3901	Power System Analysis	3	3.00
02.	EEE 3902	Power System Analysis Sessional	3/2	0.75
03.	EEE 3201	Telecommunication-I	3	3.00
04.	EEE 3202	Telecommunication-I Sessional	3/2	0.75
05.	EEE 3101	Signals and Systems	3	3.00
06.	EEE 3401	Electromagnetic Fields and Waves	3	3.00
07.	EEE 3604	Numerical Analysis Sessional	3	1.50
08.	EEE 3802	Ethics in Electrical and Electronic Engineering	3	1.50
One elective course from the following:				
09.	HSS 3203	Project Management and Business Communication	4	4.00
10.	HSS 3205	Engineering Economics and Accounting	4	4.00
11.	HSS 3207	Industrial Management and Professional Practices for Engineers	4	4.00
12.	HSS 3209	Socioeconomic and Environmental Aspects of Engineering Projects	4	4.00
Total:			**25**	**20.50**

Contact Hours: 16T + 9S = 25 Hours / Week
Total Credit: 20.50

No. of Theory Courses: 5
No. of Lab / Sessional Courses: 4

4th Year 1st Semester

Sl. No.	Course Code	Course title	Contact hrs/week	Credit
01.	EEE 4000	Thesis/Capstone Design	6	3.00*
02.	EEE 4002	Industrial Attachment	3/2	0.75
03.	EEE 4501	Power Electronics	3	3.00
04.	EEE 4502	Power Electronics Sessional	3/2	0.75
05.	EEE 4701	Control System	3	3.00
06.	EEE 4702	Control System Sessional	3/2	0.75
Two elective theory courses with corresponding sessional courses from the following:				
07.	EEE 4101	Advanced Electrical Circuits	3	3.00
08.	EEE 4102	Advanced Electrical Circuits Sessional	3/2	0.75
09.	EEE 4201	Telecommunication-II	3	3.00
10.	EEE 4202	Telecommunication-II Sessional	3/2	0.75
11.	EEE 4203	Digital Signal Processing	3	3.00
12.	EEE 4204	Digital Signal Processing Sessional	3/2	0.75
13.	EEE 4703	Industrial Automation and Process Control	3	3.00
14.	EEE 4704	Industrial Automation and Process Control Sessional	3/2	0.75
One elective course from the following:				
15.	EEE 4205	Biomedical Engineering	3	3.00
16.	EEE 4207	Optical Fiber Communication	3	3.00
17.	EEE 4901	Renewable Energy	3	3.00
18.	EEE 4903	Smart Grid	3	3.00
19.	EEE 4905	Nuclear Power Engineering	3	3.00
Total:			**28.50**	**18.75***

Contact Hours: 15T + 13.5S = 28.50 Hours / Week
Total Credit: 18.75*

No. of Theory Courses: 5
No. of Lab / Sessional Courses: 5

*Thesis/Capstone Design -3.0 Credit transferred to 4th year 2nd semester

4th Year 2nd Semester

Sl. No.	Course No.	Course Title	Contact hrs/week	Credit
01.	EEE 4000	Thesis/Capstone Design	6	6.00*
02.	EEE 4401	Electrical Properties of Materials	3	3.00
03.	EEE 4503	Solid State Devices	3	3.00
04.	EEE 4907	Power Plant Engineering	3	3.00
Two elective theory courses with corresponding sessional courses from the following:				
05.	EEE 4209	Radar and Satellite Communication	3	3.00
06.	EEE 4210	Radar and Satellite Communication Sessional	3/2	0.75
07.	EEE 4403	Microwave Engineering	3	3.00
08.	EEE 4404	Microwave Engineering Sessional	3/2	0.75
09.	EEE 4601	VLSI Circuits	3	3.00
10.	EEE 4602	VLSI Circuits Sessional	3/2	0.75
11.	EEE 4909	High Voltage Engineering	3	3.00
12.	EEE 4910	High Voltage Engineering Sessional	3/2	0.75
13.	EEE 4911	Switchgear and Protection	3	3.00
14.	EEE 4912	Switchgear and Protection Sessional	3/2	0.75
Total:			**24**	**22.50***

Contact Hours: 15T + 9S = 24 Hours / Week
Total Credit: 22.50*

No. of Theory Courses: 5
No. of Lab / Sessional Courses: 3

***** Thesis/Capstone Design - 3.0 Credit transferred from 4th year 1st semester

Program Core Courses

Core & Elective Courses of the Program

Core Courses

Year/Semester	Course Code and Title	Credit
1st /1st	EEE 1101: Electrical Circuits-I	3.00
1st /1st	EEE 1102: Electrical Circuits-I Sessional	0.75
1st /1st	EEE 1301: Electrical Machines-I	3.00
1st /1st	EEE 1302: Electrical Machines-I Sessional	0.75
1st /1st	EEE 1501: Electronics-I	3.00
1st /1st	EEE 1502: Electronics-I Sessional	0.75
1st /2nd	EEE 1103: Electrical Circuits-II	3.00
1st /2nd	EEE 1104: Electrical Circuits-II Sessional	0.75
1st /2nd	EEE 1106: Circuit Simulation Sessional	1.50
2nd /1st	EEE 2301: Electrical Machines-II	3.00
2nd /1st	EEE 2302: Electrical Machines-II Sessional	0.75
2nd /1st	EEE 2901: Transmission and Distribution of Electrical Power	3.00
2nd /2nd	EEE 2303: Electrical Machines-III	4.00
2nd /2nd	EEE 2304: Electrical Machines-III Sessional	0.75
2nd /2nd	EEE 2501: Electronics-II	3.00
2nd /2nd	EEE 2502: Electronics-II Sessional	0.75
2nd /2nd	EEE 2601: Digital Electronics	3.00
2nd /2nd	EEE 2602: Digital Electronics Sessional	0.75
3rd /1st	EEE 3501: Electronics-III	3.00
3rd /1st	EEE 3502: Electronics-III Sessional	0.75
3rd /1st	EEE 3701: Measurement and Instrumentation	3.00
3rd /1st	EEE 3702: Measurement and Instrumentation Sessional	0.75
3rd /1st	EEE 3002: Electrical Services Design	1.50
3rd /1st	EEE 3601: Microprocessor and Interfacing	3.00
3rd /1st	EEE 3602: Microprocessor and Interfacing Sessional	0.75
3rd /2nd	EEE 3201: Telecommunication-I	3.00
3rd /2nd	EEE 3202: Telecommunication-I Sessional	0.75
3rd /2nd	EEE 3101: Signals and Systems	3.00
3rd /2nd	EEE 3401: Electromagnetic Fields and Waves	3.00
3rd /2nd	EEE 3604: Numerical Analysis Sessional	1.50
3rd /2nd	EEE 3901: Power System Analysis	3.00
3rd /2nd	EEE 3902: Power System Analysis Sessional	0.75
4th /1st	EEE 4002: Industrial Attachment	0.75
4th /1st	EEE 4501: Power Electronics	3.00
4th /1st	EEE 4502: Power Electronics Sessional	0.75
4th /1st	EEE 4701: Control System	3.00
4th /1st	EEE 4702: Control System Sessional	0.75
4th /2nd	EEE 4401: Electrical Properties of Materials	3.00
4th /2nd	EEE 4503: Solid State Devices	3.00
4th /2nd	EEE 4907: Power Plant Engineering	3.00
4th /2nd	EEE 4000: Thesis/Capstone Design	6.00

Elective Courses

One elective course from the following:			
HSS 3203	Project Management and Business Communication	4	4.00
HSS 3205	Engineering Economics and Accounting	4	4.00
HSS 3207	Industrial Management and Professional Practices for Engineers	4	4.00
HSS 3209	Socioeconomic and Environmental Aspects of Engineering Projects	4	4.00
Two elective theory courses with corresponding sessional courses including from the following:			
EEE 4101	Advanced Electrical Circuits	3	3.00
EEE 4102	Advanced Electrical Circuits Sessional	3/2	0.75
EEE 4201	Telecommunication-II	3	3.00
EEE 4202	Telecommunication-II Sessional	3/2	0.75
EEE 4203	Digital Signal Processing	3	3.00
EEE 4204	Digital Signal Processing Sessional	3/2	0.75
EEE 4703	Industrial Automation and Process Control	3	3.00
EEE 4704	Industrial Automation and Process Control Sessional	3/2	0.75
One elective course including from the following:			
EEE 4205	Biomedical Engineering	3	3.00
EEE 4207	Optical Fiber Communication	3	3.00
EEE 4901	Renewable Energy	3	3.00
EEE 4903	Smart Grid	3	3.00
EEE 4905	Nuclear Power Engineering	3	3.00
Two elective theory courses with corresponding sessional courses including from the following:			
EEE 4209	Radar and Satellite Communication	3	3.00
EEE 4210	Radar and Satellite Communication Sessional	3/2	0.75
EEE 4403	Microwave Engineering	3	3.00
EEE 4404	Microwave Engineering Sessional	3/2	0.75
EEE 4601	VLSI Circuits	3	3.00
EEE 4602	VLSI Circuits Sessional	3/2	0.75
EEE 4909	High Voltage Engineering	3	3.00
EEE 4910	High Voltage Engineering Sessional	3/2	0.75
EEE 4911	Switchgear and Protection	3	3.00
EEE 4912	Switchgear and Protection Sessional	3/2	0.75

Brief Outline of Syllabus

1st Year 1st Semester

Math 1201 Fundamentals of Mathematics
3 hours/week Credit: 3.00

Algebra: Polynomials & Polynomial equations, Binominal theorem for positive, negative and fractional index, exponential series & logarithmic series, Partial fractions, Solution of simultaneous equations with the help of determinant.

Set Theory: Review of sets, Operations, Venn Diagrams, Equivalence relations, and Mapping.

Differential Calculus: Function and limit, differential co-efficient from first principle, differentiation of functions, successive differentiation, Maclaurin's and Taylor's theorem, Tangent and Normal, Maxima and Minima.

Integral Calculus: Fundamental integral, Indefinite integral, Integration by substitution, Integration by parts, Integration by partial fraction, Definite integral, Application of integration for finding area, volume & work done

Vector: Addition and subtraction, dot and cross product.

HSS 1201 Sociology and Entrepreneurship
4 hours/week Credit: 4.00

Sociology: Definition, Nature and Scope of Sociology, Sociological Perspectives, Sociology for Electrical and Electronic Engineering Students, Method of Sociology, Basic Concepts: Society, Community, Association and Institution, Socialization, Nation and Nationality, Social Stratification, Group, Social Structure, Marriage and Family, Culture and Civilization, Deviance, Industrialization and Urbanization and city development; Social change and movement, Social Problems: Crime, human trafficking Unemployment, Corruption, Rights and Duties of Citizen in Society, Sustainable Development, Social Impacts of Disaster, Social control and technology, Urban Ecology and human activities.

Entrepreneurship:

Definition and historical development of Entrepreneurship, Skills, Qualities, Personality traits & characteristics of successful entrepreneurs, Entrepreneurship in Industry, business and economic theory, The rewards and challenges of entrepreneurship, Entrepreneurial practice, Type of Entrepreneurship, Entrepreneurial process, Entrepreneurial strategies, Legal Environment of Business and Entrepreneurship, Ethical and social welfare issues for new entrepreneurs and Business, Fundamentals of entrepreneurial management and development.

Form and structure of business ownership, driving forces behind creativity and innovative small and middle range business and industry, Innovation and entrepreneurship, New business planning process: conducting a feasibility analysis, developing a competitive business model, building strategic and business plan; Business process: product design and life cycle of Product Licensing, Franchising, Outsourcing, Off shoring, E-commerce, E-business.

The role of entrepreneurship in industrial development, Entrepreneurship and small business, The life cycle of business and industry, Entrepreneurial project: an entrepreneurial venture and

entrepreneurial development chain.

Technical and technological analysis of entrepreneurial projects for a "Technopreneur", The role of entrepreneurship in small business and economic development. Fostering the development of entrepreneurship, Strategic guidelines and objectives for the development of SMEs in Bangladesh.

EEE 1101 Electrical Circuits-I
3 hours/week Credit: 3.00

Electrical Engineering: Units, DC sources, Resistance and Conductance, Ohm's law, Power and energy, Series and parallel circuits, Mixed circuits, Kirchhoff's laws, Mesh and nodal analysis, Y-delta transformation, Circuit theorems, Methods of circuit analysis, Electric field, Capacitors, Magnetic circuits, Inductance, R-C and R-L circuits with DC excitation, Basic concept of dependent sources.

Alternating Current: AC quantities, Sinusoidal waveforms, Effective and average value of an alternating wave, Pharos.

AC circuit Analysis: RL, RC, RLC series and parallel circuits with sinusoidal excitation, Impedance, Admittance, Network theorems, Dependent sources.

Power and Power Factors: Real and reactive power, Power measurement, Power triangle, Power factor correction.

Balanced Polyphase Circuit: Two phase system, Three phase system, Three phase balanced generator, Star-delta connection, Delta-star connection.

EEE 1102 Electrical Circuits-I Sessional
3/2 hours/week Credit : 0.75

Sessional based on the theory of course EEE 1101

EEE 1301 Electrical Machines-I
3 hours/week Credit: 3.00

D. C. Generator: Principles, Construction, Armature windings, Voltage build up, Effect of speed on voltage buildup of a self-excited DC generator, Armature reactions and commutation, Separately excited DC generator, Series DC generator, Shunt DC generator, Performance and testing, Compounding of d.c. generator, Generator characteristics, Parallel operation, Power stage.

D. C. Motor: Construction, Operation, Back e.m.f, Torque equations, Motor characteristics, Speed-torque characteristics, Speed regulation, Separately excited DC motor, Series DC motor, Shunt DC motor, Compound DC motor, Permanent-magnet DC motor, Power stage.

Single Phase Transformer: Construction, Principles, No-load operation, Transformer on load, Types, Equivalent circuits, Performance and testing, Regulation, Losses and efficiency, Parallel operation, Instrument transformers.

EEE 1302 Electrical Machines-I Sessional
3/2 hours/week Credit: 0.75

Sessional based on the theory of course EEE 1301

EEE 1501 Electronics-I
3 hours/ week Credit: 3.00

Introduction to Semiconductors: Semiconductor materials, Properties of semiconductor materials, Atomic structure of semiconductor materials, Covalent bond, Temperature effect on semiconductor materials, Crystalline structure of semiconductors, Energy band and Fermi -level, Charge carriers in intrinsic and extrinsic semiconductors, Diffusion and drift of carriers, P-type and N-type semiconductors, P-N junction under forward and reverse bias.

Diodes & It's Applications: Graphical analysis of diode circuits, Equivalent circuits, Half-wave and full wave rectifiers, Filter circuits, Regulated power supplies.

Bipolar Junction Transistors (BJTs): Construction, Principal of operation, I-V characteristics, Transistor circuits configurations (CE, CB, CC), BJT biasing and thermal stabilization, Operating point, DC load line, Transistor switching and amplifier circuit.

Operational Amplifiers (Op-Amps): Introduction to op-amps, Inverting and non-inverting amplifier, Phase inverter, Scale changer, Integrating and differentiating circuits, Adder or summing amplifier.

EEE 1502 Electronics-I Sessional
3/2 hours/week Credit: 0.75

Sessional based on the theory of course EEE 1501

CE 1028 Engineering Drawing
3/2 hours/week Credit: 0.75

Introduction: lettering, numbering and heading; Instrument and their use; Sectional views and isometric views of solid geometrical figures; Plan, elevation and section of residential building; Building services drawings.

1st Year 2nd Semester

Math 1203 Differential and Integral Calculus
4 hours/week Credit: 4.00

Differential Calculus: Differentiability, differentiation and its geometrical representation. Successive differentiation of various types of function. Leibnitz's theorem, Role's, Mean value theorem, Taylor's and Maclaurin's theorem in finite and infinite forms. Divergency and Convergency of series. Functions of several independent variables, partial differentiation, Euler's theorem, Jacobian. Tangent, Normal and Curvature. Determination of maximum and minimum values of functions and their applications.

Integral Calculus: Definition and properties of integration. Integration by the method of substitution, Integration by parts, standard integrals, Integration by the method of successive reduction. Definite integrals, Use of definite integration 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.

HSS 1203 Technical English
3 hours/week Credit: 3.00

Grammar & Syntax: Functions of word classes, Verbal, usage of preposition, Types & functions of Clauses, Basic sentence patterns, Concord, correct usage of verbs, determiners & modifiers, misplaced and dangling modifiers, Parallelism, Fragments and run on, correction of errors

Writing Skills: Introduction to writing as a skill, Types and Mechanics of writing paragraph, Cohesion & coherence, academic essay: (Cause and Effect, Comparison-Contrast, Argumentative), Academic writing: Referencing and citation with special focus on APA and IEEE, Abstract/Executive Summary, Paraphrasing , Critical/reflective writing: response paper, book/film review; CV and Cover letter, E-mail writing; Amplification on field specific topics; Information Transfer; Technical report writing, E-tender notice; Dialogue with & without clues; Business letters: i) Placing order ii) complaint letter iii) Adjustment letter, Business/ project proposal, Press release, Memoir, Travelogue, Industrial Reports

Phonetics, Speaking & Pronunciation: International Phonetic Alphabet (IPA) symbols, vowel and Consonant phonemes, dictionary reading and pronunciation skills using RP (pronunciation), Phonemic Transcription and pronunciation drills

Reading: Effective Reading Strategies; Skimming, Scanning, Predicting, Inferring, Extensive and Intensive Reading, synthesizing reading into writing, Technical Literature, magazines and scientific journals with special focus on IEEE publications

Vocabulary: Word formation processes, Professional terminologies, British vs American English

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Phy 1201 Heat, Properties of Matter, Electricity and Magnetism
4 hours/week Credit: 4.00

Thermal Physics:

Heat: Equation of State, Kinetic Theory of Gases, Kinetic calculation of pressure, Ratio of specific heats, Mean free path; Van der Waal's equation of state, Critical constants, Van der Waals constant; Thermal Conductivity, Accretion of ice on ponds.

Thermodynamics: Thermodynamic systems and processes, Zeroth law and First law of thermodynamics and its application. Isothermal and Adiabatic gas equations and work done, Reversible and irreversible processes, Second law of thermodynamics; The Carnot cycle, Entropy of a perfect gas, Thermodynamic potentials.

Properties of Matter:

Gravitation: Kepler's Laws of motion, Newton's law of gravitation, Gravitational potential and field due to spherical shell and solid sphere, Escape velocity, Velocity of satellite.

Elasticity: Stress and Strain diagram, Elastic constants, Relation between elastic constants, Bending of beam.

Surface Tension: Molecular theory of surface tension, Surface energy, Excess pressure of curved surface, capillarity, Determination of surface tension of water by capillary rise method.

Fluid Motion and Viscosity: Equation of continuity, Bernoulli's equation, Viscosity, Poiseuille's equation, Coefficient of viscosity, Stoke's law.

Vibrations:

Oscillations: Simple harmonic motion and its energy calculation, Lissajous figures, Damped harmonic motion and its solutions for different damping, Forced oscillation and resonance.

Wave Motion: Types of wave motion, Equation and energy for plane progressive wave and stationary wave, Resonance in air column.

Acoustics: Intensity level & Interference of Sound, Beats, Doppler Effect, Reverberation, Sabine's reverberation formula and problem involving building acoustics.

Electricity and Magnetism:

Electricity: Coulomb's law, Electric field, Gauss' law, Electric potential and their applications due to continuous charge distribution and electric dipole, Capacitance and capacitor, Capacitor with a Dielectric, Gauss' Law with dielectrics, Three electric vectors and RC circuit.

Magnetism: Lorentz force, Magnetic force on a current carrying conductor, Biot-Savart law and Ampere's law and their applications, Induction and Inductance, Faraday's law, Lenz's law, self induction and mutual induction, Different types of magnetism, Three magnetic vectors, Hysteresis.

Thermal electricity: Thermocouple, Seebeck effect, Peltier and Thompson effect, Thermo-emf

Phy 1202 Heat, Properties of Matter, Electricity and Magnetism Sessional
3/2 hours/week Credit: 0.75

Sessional based on the theory of course Phy 1201

CSE 1113 Computer Programming
3 hours/week Credit: 3.00

Computer Fundamentals: Introduction to digital computers. Number system, Programming languages, algorithms and flow charts.

Structured Programming using C: Introduction, variables and constants, operators, expressions, data types, control statements, Loop, functions, recursion, arrays, pointers, structure & unions, dynamic

memory allocation, files and graphics.

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

CSE 1114 Computer Programming Sessional
3/2 hours/week Credit: 0.75

Sessional based on the theory of course CSE 1113

EEE 1103 Electrical Circuits-II
3 hours/week Credit: 3.00

Sinusoidal Single Phase Circuit Analysis: Generalized series-parallel circuits, Series and parallel resonance, Q of a circuit, Wave trap, Network theorems with dependent Sources.
Balanced Polyphase Circuits: Two and four phase system, Three-phase four-wire system, Three-phase three-wire system, N-phase star and mesh, Balanced wye and delta loads, Three origin vector diagram of a balanced three phase system, Power measurement (both active and reactive) in balanced systems, Copper required to transmit power under fixed conditions.

Unbalanced Polyphase Circuits: Unbalanced wye and delta loads, Network solutions, Phase-sequence effects, Methods of checking voltage phase sequence, Power measurements (both active and reactive) in unbalanced three phase systems.

Coupled Circuits: Conductively coupled circuits, Mutual impedance, Coefficient of coupling, Mutual inductance, Air-core transformer, Air-core autotransformer.

Transients: Transient of RL, RC and RLC circuits.

Electric Wave Filters: Basic principles, Characteristic impedances of T and π sections, Physical operation of symmetrical T and π sections, Transmission constant of a filter section, Fundamental filter equation, Constant *k*, *m*-derived half and full section, Conventional filter design and operation.

EEE 1104 Electrical Circuits-II Sessional
3/2 hours/week Credit: 0.75

Sessional based on the theory of course EEE 1103

EEE 1106 Circuit Simulation Sessional
3 hours/ week Credit: 1.50

Basics and applications of high-performance programming language (MATLAB) for technical computing and solving electrical engineering problems.

Computer aided simulation software i.e., PSpice, PSIM and Proteus for analyzing electrical circuits and systems: DC circuits, DC networks, AC circuit, Electronic Circuits, Digital Circuits.

2nd Year 1st Semester

Math 2201 Co-ordinate Geometry, Matrices and Vector Analysis
4 hours/week Credit: 4.00

Vector Analysis: Scalars and Vectors, equality of vectors, Addition and subtraction of vectors, Multiplication of vectors by scalars. Scalar and vector products of two vectors and their geometrical interpretation. Differentiation and integration of vectors, line, surface and volume integrals. Gradient of a scalar function, divergence and curl of a vector function. Physical interpretation of gradient, divergence and curl. Conservative systems. Gauss's divergence theorem, Stoke's theorem and Green's theorem and their application in solving engineering problems.

Co-ordinate Geometry: 2-Dimensional Co-ordinate Geometry, Change of axes, Transformation of co-ordinates. Pair of straight lines, Circle, System of circles. General equation of second degree. 3-Dimensional Co-ordinate Geometry, System of co-ordinates, Distance of two points. Section formula, Projection, Direction cosines. Equations of planes and lines.

Matrices: Matrix algebra, Elementary transformation, Inverse by elementary transformation, Rank, Linear dependence and independence of vectors and matrices, Solution of linear equation using matrix, Vector spaces. Linear transformation, Eigen values and Eigen vectors, Cayley-Hamilton theorem.

Phy 2201 Optics, Structure of Solid and Modern Physics
4 hours/week Credit: 4.00

Optics:

Interference: Interference due to division of wavefront and amplitude, Huygen's principle, Young's experiment, Coherent sources, Analytical treatment of Interference, Interference due to thin films, Newton's rings.

Diffraction: Fresnel and Fraunhofer diffraction, Fresnel diffraction concept of half period zone, Fraunhofer diffraction by single and double slit, Plane diffraction grating, Resolving and dispersive power of a grating.

Polarization: Polarization by reflection, refraction and double refraction, Brewster's law and Malus law, Elliptical and circular polarization of light, Nicol prism, Laser production and application of laser.

Solid State Physics:

Classification of solids: Crystalline & Amorphous, Solid Ceramics and Polymer, Defects in solids, Different types of bonds in crystal and cohesive energy.

Crystal structure: Unit cell, Crystal system and Bravais lattice, Nearest neighbor distance and Packing fraction of Simple cubic, Body centered cubic and Face centered cubic crystal structure, Miller indices and crystal plane.

Band theory of solids: Origin of allowed and forbidden bands in solid, Conductor, Semiconductor and Insulator, carrier concentration and Fermi level.

Modern Physics:

Relativity: Postulates of special theory of relativity, Galilean and Lorentz transformation equations, Length contraction, Time dilation, Twin paradox, Variation of mass with velocity, Einstein mass energy relation.

Particle properties of waves: Quantum theory of light, Photoelectric effect, Compton effect, Pair production, X-rays diffraction, Photons and gravity, Gravitational red shift.

Wave properties of particles: Concept of de-Broglie wave, Phase velocity and group velocity, Heisenberg's uncertainty principle and its application.

Quantum Mechanics: Postulates of quantum mechanics, wave function, operators, probability and expectation values, Schrodinger's equation and its applications for particle in potential well.

Atomic Structure: Atom models, Electron orbits, Energy levels and spectral series of hydrogen atom, Bohr's correspondence principle.

Nuclear structure and decay: Nuclear compositions, Mass defect, Binding energy, Radioactive decay, Laws of radioactive decay, Half life and mean life, Successive Radioactive Disintegration, Radioactive series, Nuclear fission and fusion, Q-value of nuclear reaction. Nuclear reactors.

Phy 2202 Optics, Structure of Solid and Modern Physics Sessional
3/2 hours/week Credit: 0.75

Sessional based on the theory of course Phy 2201

Ch 2201 Chemistry
4 hours/week Credit: 4.00

Inorganic Chemistry

Quantum numbers, relationship among them, different rules/principles dealing with electron distribution in atom, Redox reaction and its balancing.

Chemical bond: formation, conditions and properties of ionic, covalent, coordinate and metallic bond; Van der Waals forces, Hydrogen bond, Polar bond, Fajan's rules, Lewis structure and formal charge calculation.

Theory of covalent bonding: Valence bond theory (VBT) and Molecular orbital theory (MOT), Hybridization, Valence shell electron pair repulsion (VSEPR) model, Molecular shape and Chemistry of Transition metals.

Physical Chemistry

Thermochemistry: Enthalpy of reaction, formation and combustion, Laws of thermochemistry, Kirchhoff's equation.

Electrochemistry: Electrolytes, electrolytic solution, Nernst equation, conductance, pH and buffer solutions, Batteries and Fuel cell.

Chemical equilibrium: Law of mass action, KP and KC, Le Chatelier's principle and its applications.

Chemical Kinetics: Rate, order, Molecularity of chemical reaction, rate expression.

Colligative properties: Raoult's law, Ideal and real solution, Deviation from Raoult's law, Osmosis, reverse osmosis, Semipermeable membrane, Laws of osmotic pressure.

Ch 2202 Chemistry Sessional
3/2 hours/week Credit: 0.75

Sessional based on the theory of course Ch 2201

EEE 2301 Electrical Machines-II
3 hours/week Credit: 3.00

D. C. Generator: Voltage regulation, Losses, Efficiency, Cumulatively compounded and differentially compounded DC generator.
D. C. Motor: Equivalent circuit of a DC motor, Losses and efficiency, Methods of braking, Starters, Amplidyne, Metadyne, Magnetization Curve, Effect of magnetic saturation on DC motor performance, Methods of speed control.

Single Phase Transformer: Leakage reactance and equivalent circuit, Equivalent impedance, Regulation, Losses and efficiency, Transformer ratings, Per unit impedance and percentage impedance of windings, Auto-transformer.

Poly Phase Transformer: Polyphase transformer construction, Polyphase transformer connections, Harmonics in polyphase transformer, Transformer cooling.

Single Phase Induction Motor: Principle, Construction and types, Performance, Double revolving field theory, Cross field theory, Equivalent circuits.

Polyphase Induction Motor: Principle of operation, Constructional details, Classifications, Equivalent circuits, Circuits model parameters, Starting torque and maximum torque, Speed-torque relations, Power, Losses and efficiency, Circle diagram, Starters, Methods of speed control, Methods of braking and plugging, Induction generator.

EEE 2302 Electrical machines-II Sessional
3/2 hours/week Credit: 0.75

Sessional based on the theory of course EEE 2301

EEE 2901 Transmission and Distribution of Electrical Power
3 hours/week Credit: 3.00

Inductance of Transmission Lines: Flux linkages, Inductance due to internal flux, Inductance of single phase two-wire line, Flux linkage of one conductor in a group, Inductance of composite conductor lines, G.M.D, 3-phase line with equilateral and with unsymmetrical spacing, Parallel circuit 3-phase lines, Use of table.

Capacitance of Transmission Lines: Electric field, Potential difference between points due to a charge, Capacitance of a two-wire line, Group of charged conductors, Capacitance of 3-phase line with equilateral and with unsymmetrical spacing, Effect of earth, Parallel circuits lines.

Resistance and Skin Effects: Resistance and temperature, Skin effects influence on resistance, Use of table, Current and voltage relation on a transmission line.

Representation of Line: Short, medium and long transmission lines, T and π representation, Exact solution, Equivalent circuit of a long line, Generalized line constants, General line equation in terms

of ABCD constants, Relation between constants, Charts of line constants, Constants of combined networks, Measurements of line constants.

Circle Diagrams: Receiving and sending end power circle diagrams, Power transmitted, Maximum power, Universal power circle diagrams, Voltage and power factor control in transmission systems, Tap-changing transformers, On-load tap changing transformer, Induction regulators, Moving coil regulators, Boosting transformer, Power factor control, Static condenser in series or parallel, Synchronous condensers, Ferranti effect.

Mechanical Characteristics: Transmission line sag and stress analysis, Wind and ice loading, Supports at different elevations, Conditions at erection, Effect of temperature changes.

Insulator for Overhead Lines: Types, constructions and performance of insulators, Potential distribution in a string of insulators, String efficiency, Methods of equalizing potential distribution, Special types of insulators, Testing of insulators, Corona.

Insulated Cables: Cables versus overhead lines, Insulating materials, Electrostatic stress grading, Three-core cables, Dielectric losses and heating, Modern development on oil filled and gas filled cables, Measurement of capacitances, Cable testing.

Distribution System: Radial, Ring mains and interconnections.

HSS 2202 English Language Sessional
3 hours/week Credit: 1.50

Reading Skills:

Micro and macro skills of reading, making notes from informative texts, skimming & scanning, identifying main ideas, supporting details, outlining, identifying referential and inferential information, text mapping, interpreting tables and bar charts graphs, pie charts, flow-charting, reading critical reviews (academic & general), vocabularies activities including analogy, collocation, cloze test, signal words, synonyms and antonyms; argumentation, cause-effects, identifying similes & metaphors, Q/A, matching the best paragraph heading, matching information in a table, supplying transitional words, supplying missing word/s for summary, reading news editorials for feedback.

Writing Skills:

Important features of effective writing: prewriting, brainstorming, outlining; mechanics of writing/short composition, notice and memorandum, minutes, agenda, e-mail, paragraph & essay mapping: structure & types, using signals and transitional words for the cohesion and coherence, creating flowchart for process writing, developing rationales & justifications in argumentative texts, reasoning in cause-effect genre, comparing and contrasting between ideas, critical analysis of arts/ paintings/ sculptures/movies/books, analyzing the pros and cons of an emerging issues, press release, reporting on a temporary issues, summarizing line bar/graph and histograms, requesting reference & recommendation, CV/resume, proposal writing, describing table/ graphs/ figures, Joining/resigning/termination letters, Writing Statement of Purpose (SOP).

Listening Skills:

Listening to understand, supplying verb forms & fill-ins with worksheets, Ted-talk & inspiring speeches with worksheet, tape scripts for gist and detailed information, attending phone calls - taking notes from sample interview & meetings, natural conversation to supply the synonyms/ antonyms, filling in with missing information/ clauses/ sentences, asking & answering informative questions, conversation/role play on and about academic and non-academic affairs, short and clear dialogues including situations such as simple explanations, introductions,

messages and announcements, conversation based on compare-contrast, cause-effect, process analysis & argumentative issues; extracting & decoding information from tape scripts.

Speaking & Presentation Skills:

Social interactive English, polite and formal expression: introducing keys, suggesting, apologizing, seeking and giving instructions/ showing interest/ polite offer/refusal, talking about profession agreeing/disagreeing, asking for favor, bidding farewell, giving an extended talk on a given topic, watching video and presenting the gist, making suggestions, talking about weather/people/places, responding to news/ articles, role play, initiating public speaking-understanding the dynamics, mock interview in context, taking part in professional Group Discussion (GD) and debate on real life issues. Tidbits of presentation skills, planning, preparation, delivery, using power-point slides, designing slides, techniques of presentation, individual and collaborative presentations, poster presentation, professional presentation

2nd Year 2nd Semester

Math 2203 Differential Equations and Statistics
4 hours/ week Credit: 4.00

Ordinary Differential Equation: Definition, degree and order of differential equation. Formation of differential equations, Solution of first order differential equations by various methods, Solution of differential equation of first order and higher degrees. Solution of general linear equations of second and higher orders with constant co-efficient, Solution of Euler's homogeneous linear equations.

Series Solution: Solution of differential equations in series by the method of Frobenius, Bessel's functions, Legendre's Polynomials and their properties.

Partial Differential Equation: Elimination of arbitrary constant and arbitrary function. One dimensional wave equation, two-dimensional wave equation, steady state heat flow equation, solution of differential equation by the method based on the factorization of the operator.

Statistical Analysis: Frequency and frequency distribution and its graphical representation, Mean, Median, Mode and other measure of central tendency. Standard deviation and other measures of dispersion, Moments, Skewness and Kurtosis. Elementary probability theory and discontinuous probability distributions, e.g., binomial, Poisson and negative binomial, Continuous probability distributions, Elementary Sampling theory, Estimation, Hypothesis testing, Correlation & Regression analysis.

ME 2101 Basic Mechanical Engineering
3 hours/ week Credit: 3.00

Energy and Fuels: Introduction to sources of energy, Renewable and non-renewable energy sources and their potential, Study of fuels.

Thermodynamics: Systems and surroundings, Conversion of energy, Different thermodynamic processes, Energy transfer as heat for a control volume. Reversibility and irreversibility, Laws of Thermodynamics, Definition and corollaries of first law and second law of thermodynamics, Entropy. Analysis of different thermodynamic cycles, Representation of various cycles on PV and TS planes.

Internal combustion engines: Introduction to Internal Combustion engines and their cycles. Heat engines, diesel engines, petrol engines. Study of Gas turbines with their accessories. Study of steam generation and steam turbines. Steam generating units with accessories and mountings.

Refrigeration and air conditioning: Refrigeration and air conditioning with their accessories and applications, Refrigerants.

Turbomachineries: Pelton wheel, Francis turbine, Kaplan turbine, Centrifugal and Reciprocating pumps, Fans, blowers and compressors.

ME 2102 Basic Mechanical Engineering Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course ME 2101

EEE 2303 Electrical Machines-III
4 hours/ week Credit: 4.00

Synchronous Generators: Alternators, General outline of synchronous generators, Types of alternator, Salient pole and nonsalient pole, Armature and field cores, Winding, Insulation, Cooling, Air-gap, Flux and voltage expressions, Armature windings, Alternator regulation, Measuring model parameters, Phasor diagrams, Armature reaction, Concept of direct and quadrature axis reactances, Power and torque, Losses and efficiency, Blondel's two reaction analysis, Transient conditions in alternators, Concept of interconnected system of alternators, Conditions, Methods and problems of parallel operation and load sharing of synchronous generators.

Synchronous Motors: General constructional feature, Theory of operation and steady-state operation, Motor terminal characteristics, Mathematical analysis, Phasor diagrams, V-curves, Motor tests, Losses, Efficiency and starting.

Special Machines: Universal motor, Repulsion motor, Reluctance motor, Electrostatic motor, Permanent magnet motor, Hysteresis motor, Stepper motor and power modulators, Power rectifiers and frequency multipliers.

Generalized Energy Conversion Process: General principles of electromechanical energy conversion, Energy storage, Transformation and conversion, Methods of formulation of motion equations and co-ordinate transformation, Interpretation of generalized machines from field concepts.

EEE 2304 Electrical Machines-III Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 2303

EEE 2501 Electronics-II
3 hours/ week Credit: 3.00

Semiconductor Diodes: Characteristics and applications of different types of diodes: Zener, Tunnel, Schottky, PIN and Photo diode.

Bipolar Junction Transistors (BJTs): AC load line, BJTs at low frequencies, Hybrid model, h-parameters, Small signal analysis of BJT amplifiers, BJTs at high frequencies, Hybrid pi-model, Frequency response of BJTs.

Field Effect Transistors (FET): Principle of operation and characteristic equations of JFET, MOSFET-depletion and enhancement type, N- and P-channels, CMOS, Biasing arrangements, Low and high frequency models of FETs, Basic FET amplifiers, Use of FETs as voltage-controlled switches and resistors, Introduction to BJT and MOSFET integrated circuits.

Operational Amplifiers (Op-Amps):Astable, Monostable and Bistable multivibrators, Schmitt trigger, Ac performance of Op-amps, Bandwidth, Slew rate, Noise and frequency compensation, Operation and applications of 555 timer.

Active Filters: Different types of filters and specifications, Transfer functions, Realization of first and second order low, high and band pass filters using Op-Amps, Design aspect of filters.

Voltage and Power Amplifiers: Untuned voltage (Class-A, Class-B, Class-AB and Push-Pull circuits), Tuned voltage (RF, IF) and Power amplifiers (Class-B and Class-C), Design aspect of amplifiers.

EEE 2502 Electronics-II Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 2501

EEE 2601 Digital Electronics
3 hours/ week Credit: 3.00

Digital Circuits: Number systems, Logic Systems, Logic gates: OR, AND, NOT, INHIBIT, Exclusive OR gates, De Morgan's Laws, Boolean algebra. Simplification of Boolean functions: Karnaugh Map method, tabular method of simplification, Implementation of logic circuit using various gates, universal gates.

Digital IC Logic families: Brief description of TTL, DTL, RTL, ECL, I^2L, MOS, and CMOS logic and their characteristics, principles of operation and applications.

Combinational Digital systems: Standard gates assembly, Binary adders, Arithmetic function, Digital Comparator, Parity Checker/Generator, Decoder/Demultiplexer, Data Selector & Multiplexer, Encoder.

Sequential Digital systems: Introduction to sequential circuits, analysis and synthesis of synchronous & asynchronous sequential circuits. One-bit memory, SR, JK, Master & slave, T & D type flip- flops & their characteristic table & equations, triggering of flip-flops, flip-flop excitation table.

Modular Sequential Logic Circuit Design: Classification, operation of registers & their applications. Classifications of counters, Synchronous & asynchronous sequential counter design & analysis, ring counter, ripple counter & counter with parallel load.

Large Scale Integration Systems: MOS Integration, MOS Shift Register, Ratio Less Shift Register: MOS, Read Only Memory (ROM), Two-dimensional addressing of a ROM, ROM applications, EPROM, PLA, Random Access Memory (RAM), Read/Write, Cell-Charge Coupled Device $(CCD)_2$CCD Structure, CCD Memory organization.

D/A & A/D converters

EEE 2602 Digital Electronics Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 2601

CE 2028 Computer Aided Drawing for Engineers
3 hours/ week Credit: 1.50

Introduction to computer aided drawing, drafting and dimensioning. Isometric drawing and oblique drawing using CAD. Plan, elevation and sectional views of engineering structures. Floor layout of single and multistory residential building (minimum three rooms) with staircase (2D CAD), 3D objects and machine parts design, Tower and insulator design.

3rd Year 1st Semester

Math 3201 Complex Variables and Mathematical Methods
4 hours/week Credit: 4.00

Complex Variable: Complex number system, General functions of a complex variable, Limits and continuity of a function of complex variable and related theorem, Complex differentiation and the Cauchy-Riemann equations, Complex integration and Cauchy's theorem, Cauchy's integral formulae and related theorems, Infinite series, Taylor's and Laurent's series, Residue, The residue theorem, Contour integration.

Fourier Analysis: Fourier series, complex form of Fourier series, Parseval's theorem, Fourier integral, finite and infinite Fourier transformation. Uses of Fourier transformation in soling boundary value problems.

Laplace Transform: Laplace transformation of elementary functions, properties of Laplace transform. Inverse Laplace transform and its properties. Convolution theorem. Applications of Laplace transform to solve differential equations and partial differential equations.

Harmonics: Two-dimensional Steady Flow of Heat, Circular Harmonics, Cylindrical Harmonics and Spherical Harmonics. Two-dimensional wave equation, solutions of two and three dimensional Laplace equations.

EEE 3501 Electronics-III
3 hours/ week Credit: 3.00

Feedback Amplifiers: Classification, Feedback concept, Effect of feedback on transistor gain, Loop gain, Amplifier characteristics, Types of feedback, Negative feedback amplifiers and their applications, Stability and Nyquist criterion.
Sinusoidal Oscillators: Conditions of self-oscillation, Phase shift and resonant circuit oscillators, Colpitts and Hartley oscillators, Wien Bridge and crystal oscillators.

Radio & TV Engineering: Properties and propagation of radio wave, AM and FM radio transmitter & receiver, TV transmitter & receiver, CCTV and CATV.

Biomedical Engineering: Definition, Problems and solutions in biomedical engineering.

Biomedical Potentials: Concepts of a cell, Cell membrane, Ion channel, Resting and action potentials, Electronic conduction system of heart, Overview of electrocardiogram (ECG), EEG and EMG signals.

Medical Imaging Modalities: Introduction to X-ray, Ultra sound, Computed Tomography (CT) Scan, MRI.

Introduction and Application of Bioelectronics: Molecular components of electronics, Molecular and organic electronic devices.

EEE 3502 Electronics-III Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 3501

EEE 3601 Microprocessor and Interfacing
3 hours/ week Credit: 3.00

Microprocessor:

Basic components of a computer system, Simple-As-Possible (SAP) computer: SAP-1, SAP-2 and SAP-3, Evolution of microprocessors, Building blocks of MPU based systems, 8-bit (Intel 8085)/ (Intel 8086) 16-bit microprocessor: Their architectures, Pin diagrams and functions, Minimum mode/Maximum 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, Classifications of instructions, Different addressing modes, address computing chart. stack management and procedures, advanced arithmetic instructions for multiplication and division, instructions for BCD and double precision numbers, Advanced logical instructions.

Peripherals:

Hardware Interfacing with Intel 8086 microprocessor: programmable peripheral interface, PPI device: 8255 architecture, data transfer & parallel I/O programming, keyboard and display interface (LED, 7 segment, dot matrix and LCD), serial I/O programming using 8251, display programming using 8279 and LCD, keyboard programming using 8279 and discrete components, generation of timing functions using 8254 Timer/Counter, Interrupt terminologies, hardware and software interrupt, multiple interrupt management, 8259 interrupt controller, BCD2BIN conversion, BIN2BCD conversion, binary multiplication, binary division, Topdown/Bottomup design concept, hardware block diagram, control program flow chart, weight/rate acquisition and processing and display, cost computation and processing and display.

Advanced Microprocessors and Microcontrollers:

PVAM operation of Intel high performance architecture, overview of 80286 architecture, instruction and programming; overview of 80386 architecture, instruction and programming; CISC and RISC microcontrollers, instruction and programming..

EEE 3602 Microprocessor and Interfacing Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 3601

EEE 3002 Electrical Services Design
3 hours/ week Credit: 1.50

Electrical standards and Illumination: Introduction to building regulations, Codes and electrical standards: BNBC, IBC, BS, NFPA etc., Illumination and lighting for domestic, Industrial and academic buildings, Determination of illumination levels, Lighting calculations, Selection of appropriate luminaries.

Terminology, Definitions and Equipment: Fuses, Circuit breakers, Fittings, Smart distribution boxes, Cables, Bus-bars and conduits, Estimating the load of a building, Rating of common electrical equipment, Size of conductors and breakers, Bus-bar trunking (BBT) system for

various applications.

Wiring Design: Symbols used for electrical drawings, Conduit layout and switch board connection diagram, Design of wiring of domestic, Academic, industrial and commercial installations, Application of CAD tools for design purpose.

Substation and Protection System: Layout of HT/LT substation in a building, Parts and method of earthing system, Components of lightning protection system.

Communication and Safety Systems: Designing routing layout and installation of intercom, PABX, Telephone, Public Address (PA) systems, Cable TV distribution, LAN and wireless data systems for a building, Design CCTV system, Fire detection, Alarm and firefighting system.

EEE 3701 Measurement and Instrumentation
3 hours/ week Credit: 3.00

Introduction: Significance of measurement, Methods of measurement, Concepts of accuracy and precision, Error in measurements and their statistical analysis.

Measurements of Resistance, Inductance and Capacitance: Different methods of measuring low, Medium and high resistances, Measurement of insulation and earth resistances, Cable faults and localization of cable faults, A.C. bridge methods, Methods of measuring self and mutual inductance, Methods of measuring capacitance.

Galvanometers: D'Arsonval galvanometer, Ballistic galvanometer, Flux meter.

Magnetic Measurements: Measurement of flux density, Measurement and separation of iron losses.

High voltage measurement: Different methods for measuring high voltage AC and DC quantities.

Measuring Instruments: Classification of measuring instruments, Ammeter, Voltmeter, AVO meter, Wattmeter, Energy meter, Ampere-hour meter and Maximum demand meter for measuring AC and DC quantities, Measurement of power factor, Frequency and phase differences, Illumination measurement.

Instrumentation: Extension of instrument range, Use of C.T. and P.T and calculation of their burden, Instrumentation of substation.

Electronic Measuring Instruments: Oscilloscope, VTVM, Digital frequency meter, Digital voltmeter, Digital multimeter.

Computer Based Instrumentation: PC-based data acquisition, Filtering by moving average, Instrumentation for process control, Data conditioning.

Measurement of Non-electrical Quantities: Transducers, Measurement of pressure, Temperature, Displacement, Velocity, Acceleration, Flow, Force and torque, Level detector, Shaft encoder, Strain gauge and their applications.

EEE 3702 Measurement and Instrumentation Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 3701

HSS 3201 Government and Bangladesh Studies
3 hours/ week Credit: 3.00

Government:

Basic concepts of government and politics: form and structure of government, organs of government-legislature, executive, judiciary, Democracy; Socialism, Capitalism, State, nation and nationality etc. Political views on government structure, Form of government, Organs characteristics and functions of Government, Good governance, E-government; Local government, Public Administration in Bangladesh, Government and Politics of Bangladesh, Constitution and laws for Government, Public principal, rule, policies, and law for Administration and Government, Constitutional bodies, Central Government, Public Opinion and foreign policy of Bangladesh, Major Administrative Systems of Developed Counties.

Bangladesh Studies:

Introduction to Bangladesh, History of Ancient Bengal, Origin and development of Bengal Civilization from early and medieval periods to pre-Bangladesh period, Background of Liberation War and Independence, Post liberation Periods for Politico cultural change and development, Urbanization and Industrializations; Social welfare plan and Program, Bangladesh and its Vision, Fifth year economic plans, Progress of the Millennium Development Goals (MDGs and Sustainable Development Goals (SDGs), Bangladesh Delta Plan 2100, Development agencies and partners, challenges & prospects of Bangladesh.

3rd Year 2nd Semester

EEE 3901 Power System Analysis
3 hours/ week Credit: 3.00

Representation of power system, Symmetrical components and their applications to power system analysis, Positive, Negative and Zero sequence quantities in networks and sequence phasor diagrams, Solution of power systems networks for symmetrical and unsymmetrical faults, Sequence network of systems and their solution, Sequence impedances and constants of machines.

General network constants, Transmission line sequence impedances, Load flow studies involving simple system, Use of digital computer for simple studies.Power system stability involving two machine systems, Swing equation, Equal-area criterion of stability and its applications, Solution of swing equation, Factors affecting transient stability.

EEE 3902 Power System Analysis Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 3901

EEE 3201 Telecommunication-I
3 hours/ week Credit: 3.00

Introduction to Communication System: Basic communication system, Analog and digital message signal, Classification of signal, Signal representation by orthogonal signal set, Signal transmission through a linear system, Signal distortion over a communication channel, Signal energy and energy spectral density, Signal power and power spectral density.

Introduction to Telephony: Telephone transmitter, Receiver, Trunking diagram, Traffic engineering, Exchange, Signaling & switching techniques, Digital exchange, Traffic theory, PABX system, Telephone/exchange tariff measurement.

Noise: Source, Characteristics of various types of noise and signal to noise ratio.

Information Theory: Information and system capacity, Information transmission, Entropy, Continuous channel capacity, Transmission through electrical network.

Analog Communication: AM-SC, SSB, DSB, VSB, QAM, FM, PM.

Analog Pulse Modulation: PAM, PWM and PPM.

Analog-to-Digital Conversion: Sampling theorem, Quantization of analog signal, PCM, DPCM, DM, ADM.

EEE 3202 Telecommunication-I Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 3201

EEE 3101 Signals and Systems
3 hours/ week Credit: 3.00

Fundamentals of Signals and Systems: Classification of signals, Basic operation on signals, Elementary signals, Classification of systems, Physical and mathematical viewpoint, Linear Time Invariant (LTI) system and its properties, Impulse response, Convolution integral.

Response of Physical Systems: Solutions of differential equations, Classical methods of transient and steady-state solutions of differential, Integro-differential equations, Lumped and distributed element electrical systems, Network elements, Magnetic coupling, Dual networks, Network theorems.

Analogous Systems: Linear mechanical elements, D' Alembert's principle, Force-voltage analogy, Force-current analogy, Mechanical coupling.

Frequency Domain Analysis: Exponential form of Fourier series, System response, Application of Fourier transformation, Properties, System transfer function, System response.

Application of Laplace Transformation: The inverse Laplace transformation, Solving differential equation, Control system, Circuit analysis, Analysis of system response, Response to periodic excitations, System stability.

EEE 3401 Electromagnetic Fields and Waves
3 hours/ week Credit: 3.00

Electrostatics: Coulomb's law with applications, Force, Electric field intensity, Electrical flux density, Gauss's theorem with application, Electrostatic potential, Boundary conditions, Methods of images, Laplace's and Poisson's equations, Energy of an electrostatic system, Conductor and dielectrics.

Magnetostatics: Concept of magnetic field, Ampere's law with applications, Biot-Savart's law with applications, Helmholtz equations, Vector magnetic potential, Energy of magneto-static system, Mechanical forces and torques in electric and magnetic fields, Curvilinear coordinates, Rectangular, Cylindrical and spherical coordinates, Solution to static field problems.

Graphical field mapping with applications, Solution to Laplace's equation, Rectangular, Cylindrical and spherical harmonics with applications.

Maxwell's Equations: Derivations of Maxwell's equations, Continuity of charges, Concept of displacement current, Conduction current, Convection current, Boundary conditions for time-varying systems, Potentials used with time -varying charges and currents, Retarded potentials, Maxwell's equation in different coordinate systems.

Relation between Circuit Theory and Field Theory: Circuit concepts and the derivations from the field equations, High frequency circuit concepts, Circuits relation on resistance, Skin effect and circuit impedance, Concept of good and perfect conductors and dielectrics, Current distribution in various types of conductors, Depth of penetration, Internal impedance, Power loss, Calculation of inductance and capacitance.

Propagation and Reflection of Electromagnetic Waves in Unbounded Media: Plane wave propagation, Polarization, Power flow and Poynting's theorem, Transmission line analogy, Ideal transmission lines, Reflection from conductor and conductor-dielectric boundaries, Standing wave, Impedance transformation, Smith chart, Impedance matching and lossy transmission lines, Dispersion in dielectrics, Liquids and solids, Plane wave propagation through the ionosphere, Introduction to radiation.

EEE 3604 Numerical Analysis Sessional
3 hours/ week Credit: 1.50

Algorithm development to find roots of an equation using Bisection, Newton-Raphson, Secant, Gauss-Seidel and Jacobi methods, Finding the maximum power delivered to a load using Golden-Section Search and Newton's methods, Fitting the experimental data obtained from the response of a linear circuit to a linearly regressed equation and hence finding the circuit parameters, Finding the r. m. s and average current of a circuit using Trapezoidal rule, Finding the amount of charge stored in a device using Simpson's rules, Solving the first order equation of a simple R-L circuit to find the transient current using RK method, Approximation and error.

EEE 3802 Ethics in Electrical and Electronic Engineering
3 hours/ week Credit: 1.50

Overview of ethical concepts, methods, theories and their application, codes of ethics, concept of morality and moral frameworks, ethics and applied ethics with a special focus in electrical and electronic engineering. Professional responsibilities of engineers, disciplines, safety, risks and liabilities in relevant engineering applications. Ethical leadership, ethics in organizations and workplace.

HSS 3203 Project Management and Business Communication
4 hours/ week Credit: 4.00

Project Management

Introduction: Project Planning and management, Elements and process of project planning and management, The life cycle of Project, Types and Scope of Project and Project Management, Project Selection and portfolio management, Project strategy, structure and people, project framework.

Project evaluation and Management Tools and Techniques, Budgeting Cost/Benefit Analysis, cost behavior, cost of production, factors of production, cost of capital, capital budgeting (NPV, ARI, ARR, IRR, PI), Risk and return analysis, Depreciation and replacement studies.

Product and market analysis, Productivity; Procurement regulations and law, procurement methods, limitations of different procurement methods; Selection methods of bids, tender documents and evaluation,

Human resources Management, Motivation and leadership in Project management, Monitoring, Characteristics of development projects; Government and nongovernment project.

Project reporting, Feasibility reports based on -economic impact, Development of Social Impact Assessment (SIA) and Resettlement Action Plan (RAP) in development project; deforestation and afforestation; commerce, industries and other economic benefits; socio-economic survey; case studies.

Business Communication

Basic Principles of Communication*:* Introduction, Understanding Communication, the Communication Process, Barriers to Communication, Types of Communication, Mode and

methods of Communication Channels, Interpersonal communication, Social Penetration theory, Importance of Communication in the Workplace.

Business Communication*:* Form, Structure, Types and importance of Business Communication, responsibilities as a communication, Communication Network in Organizations

Communication Role and Feedback: principals and strategies of communication improvement, understanding different perceptions of audiences, Tools and techniques for effective communication, Barriers to Communication, Strategies for Effective Communication in Business and Industry.

Business Report Writing and presentation: Styles and principles of written communication, form and structure of different business letters and documents, Preparation of Memorandums, Notice, Minutes, letters, business proposals, report and resume; challenges to effective written communication, Qualities of business letter and reporting.

A planning Checklist for business messages, Guideline for writing Text, E-mail and Netiquette, Myths and realities of public speaking, Basic features and Principles of presentation, Framework and creating an informative presentation.

Negative News and Crisis Communication: Negative News and Crisis communication, delivering negative news message, Eliciting negative news, Crisis communication plan.

Group communication, teamwork and leadership, Business and professional meeting, Issues of international and intercultural business communication.

HSS 3205 Engineering Economics and Accounting
4 hours/ week Credit: 4.00

Engineering Economics

Introduction: Definition of Economics, Scope of Economics, Engineering Economics and its importance for engineers, Microeconomics versus Macroeconomics Principles of economics, Marginal analysis.

Market Equilibrium: Demand, demand law, determinants of demand, Supply Analysis, Market Equilibrium.

Theory of Consumer Choice: Theory of utility and preference, Indifference curve analysis, Budget line, Consumer equilibrium, Optimization.

Theory of Production: Production, factors of production, Short-run cost, long-run cost, marginal cost, average cost, total cost, variable cost, fixed cost, producer equilibrium: profit maximization and cost minimization.

Market: Markets and it types and its structure aligned with engineering perspectives

Forecasting and Casual effects: Elasticity and its calculation, elasticity calculation using regression analysis, forecasting using time series analysis.

Project Evaluation: Benefit-cost ratio, Internal rate of return, and Net Present Value

National income: National Income analysis, various concepts about GNP, NNP GDP and NDP, methods of calculation national Income, circular flow of income.

Growth, Development and Economic Policy: Growth vs. Development, Inflation, Savings, Investment, Unemployment, Fiscal policy and Monetary policy; Characteristics of five-year plans and its implication in Bangladesh Economy, Sustainable development Goals.

Environmental Engineering and Economics: Water and air pollution, Depreciation in natural

resources, extraction for current generation versus protection of natural resources for future generation. Prospects and challenges in the fourth industrial revolution.

Accounting

Accounting Theory, Principles and Practices, Journals, Ledgers, Adjusting Entries, Final Accounts and Worksheet, Basics of Cost Accounting, Cost Behavior and Cost Statements, Material, Labour, Overheads, Job order and Contract Costing, Activity based costing, Breakeven Point Analysis, Cost-volume-profit analysis, Budgets and Responsibility Accounting, Depreciation.

HSS 3207 Industrial Management and Professional Practices for Engineers
4 hours/ week Credit: 4.00

Industrial Management: Management and industrial management, Definition, Its nature and significance, Development of management, Scientific management, Process & Principles of management, Management Practices in industries in Bangladesh,

Organization Structures: Principles of organization, Form and Structure of Organization and Management, Development process for Organization and Management, Centralization and Decentralization, Specialization and Division of Labor.

Planning: Nature, features and Types of planning, Planning, Budgeting and Decision-making, Financial planning, Capital investment, production planning & control, Risk and Return analysis,

Cost of production: Elements of cost of production, Factor of production, cost behavior and analysis, Depreciation, Amortization

Human Resources Management: HR policy and significance of HRM, Recruitment and Selection, Training, Job evaluation, Appraisal, Promotion, Benefits plan and policy for employees, Leadership and motivation, Working conditions and environment, Industrial relation, Industrial welfare and compliance.

Plant Layout:Layout of physical facilities, transportation, Storage, Materials handling, Production-control in intermittent and continuous manufacturing, Maintenance and repairs plan and management, Planning-Scheduling-Dispatching Assembly line control, Cost reduction and cost control, Procurement Purchasing policy, Inventory management and control, Sales organization and promotion. Measures of performance, Measurement and analytical problems of productivity, Cost of management and industrial re-organization.

Budgetary Control: Definition and importance, Types of budget, Construction of budget.

Professional Practices

Introduction to human engineering, Morality, Ethics, Code of conduct, Code of Ethics, principles organizational practices, professional ethics in engineering, Organizational behavior, Social perspectives of technology, Ethical perspective of technology, IEEE Code of Ethics, Ethics for Business, industry, Globalization

Morality and Moral issues, Uses of Ethical Theories, Professional Ideals and Virtues, Ethics and positive roles of code of ethics, Collegiality and loyalty, Employee rights, The employee role of confidentiality, Environmental ethics through engineering ecology, Business and economics, Human-centered ethics, Engineers as Managers – Consulting Engineers– Engineers as Expert Witnesses and Advisors–Honesty–Moral Leadership–Sample Code of Conduct and human rights, Information systems technology, professional ethics in Electrical

and Electronics Engineering, BNBC, ECR, NWP;WSP; Nirman Bidhimala; Procurement regulations and law: PPA 2008, PPR 2010.

HSS 3209 Socioeconomic and Environmental Aspects of Engineering Projects
4 hours/ week Credit: 4.00

Socioeconomic Aspects of engineering projects

Society and engineering: Society and its development in engineering aspects; relationship among social, economic, scientific and technological factors of development.

Development criteria: National income measurements; unemployment and inflation; globalization, world trade organization, trade-related intellectual property rights and its impacts on development.

History of Economic Development: economic development starting around 1750; industrial revolution starts in England, great waves of technological change, diffusion of economic growth

Socioeconomic projects and optimization: profit and revenue maximization, cost and pollution minimization

Sustainable Development: sustainable development goals, engineering impacts on the natural world, social sustainability and the way forward

Environmental aspects of engineering projects

Environmental engineering: engineering and its environmental effects; environmental engineering as a profession, environmental risk analysis of an engineering projects.

Technology, its adverse effects and solutions: Technology and desert, desertification and its control, rural and urban energy needs, deforestation, modern solar appliances, challenges in solar power and wind power generation

Forecasting models in engineering: AR, MA, and ARIMA model; forecasting in temperature, weather, and other environmental indicators with the development in engineering projects, Causal analysis using regression on various environmental and engineering factors, first to Fourth Industrial Revolutions.

Technology and industries: Rural and urban industries. soil and water conservation, water harvesting, watershed planning. thermal comfort aspects of housing, transport in rural and desert areas, drought, famine and disaster management for engineering projects.

4th Year 1st Semester

EEE-4000 Thesis/Capstone Design (Thesis)
6 hours/week Credit: 3.00 (For 4th Year 1st Semester)
6 hours/week Credit: 3.00 (For 4th Year 2nd Semester)

Experimental and theoretical investigation of various topics in electrical machines, Power station, Electronic devices and circuits, Power electronics, Digital circuits, Microprocessors, Communication etc.
The students will be required to submit thesis report at the end of the work.

EEE-4000 Thesis/Capstone Design (Capstone Design)
6 hours/week Credit: 3.00 (For 4th Year 1st Semester)
6 hours/week Credit: 3.00 (For 4th Year 2nd Semester)

Concepts related to application of engineering knowledge, modern tool usage, design principles and techniques. Identifying solution for engineering problems, Feasibility analysis. Project design and Implementation. Analysis of the results and validate project outcomes. Developing report writing skill for implemented project. Final presentation for implemented project.

EEE 4002 Industrial Attachment
3/2 hours/ week Credit: 0.75

Three weeks (40 hours/week) of internship at industry or similar engineering workplace for hands-on training and/or acquiring practical engineering knowledge.

EEE 4501 Power Electronics
3 hours/ week Credit: 3.00

Power Semiconductor Switches and Triggering Devices: Characteristics of power diode, BJT, MOSFET, SCR, IGBT, GTO, TRAIC, DIAC and UJT. Types of power diode, Recovery time, Diodes with various load, Uncontrolled rectifiers: single phase and three phase, Two-transistor model of thyristor.

DC/DC Converters (chopper): Principle of step-down and step-up operation with various loads, Buck, Boost, Buck-Boost, Cuk regulators.

Power Supply Applications: Switched mode power supply (SMPS), Power conditioners and uninterruptible power supplies (UPSs),

DC/AC Converters (Inverters): Single and three phase inverters, PWM inverters, Voltage control of inverters: single phase and three phase, Series and parallel resonant inverters, ZCS resonant converters: L-type and M-type.

Controlled Rectifiers (AC/DC Converters): Single phase and three phase, Full converters, Dual converters, Power factor improvements, AC voltage controllers: single phase and three phase, Cycloconverters.

Application to Motor Drives: DC motor drives, Induction motor drives, Synchronous motor drives, Commuted inverter drives.

Industrial Applications: Magnetic amplifiers, Industrial relay circuits, Applications of photo-electric devices, Electronic control of welding machines, Induction and dielectric heating.

Introduction of Flexible AC Transmission (FACT) system.

EEE 4502 Power Electronics Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 4501

EEE 4701 Control System
3 hours/ week Credit: 3.00

Introduction to Control System: Conventional control systems, Open loop versus closed loop feedback control system, Input output relationship, Block diagrams, Transfer functions of different types of machines.

Time Domain Analysis of Control System: Unit step response of second order system, Performance criteria, Steady state response to step, ramp, and parabolic inputs.

Location of poles/roots and stability, Routh-Hurwitz stability criterion, Routh's test: difficulties and remedies, Block diagram algebra and signal flow graph.

Modern Control System: Introduction, State variable analysis, Controllability and observability, Application of Eigen value, Linear control system design by state feedback, SFG to state variable, Transfer function to state variable and state variable to transfer function.

Poles and zeros, Basic properties of root-locus, Rules to construct root-locus, Application of root-locus, Lag compensator, Lead compensator, Lag-lead compensator, PID control, Frequency response from pole-zero diagram, Bode diagram, Nyquist plot, Frequency response analysis, Nichols chart and its application.

Introduction to Programmable Logic Controllers (PLC).

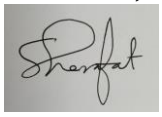
EEE 4702 Control System Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 4701

EEE 4101 Advanced Electrical Circuits
3 hours/ week Credit: 3.00

Introductory Network Concepts: Definitions and symbols, Sign convention, Terminals and ports, Network functions, Complex frequency, Driving point and transfer functions, Representation by poles and zeros, Properties of network function, Properties of immittance function, Positive real function, Hurwitz polynomials, Natural frequencies of network, Plots of network function (Magnitude and phase plots, Bode and Nyquist diagrams), Minimum phase transfer function, Calculation of a network function from prescribed real part, Imaginary part, Magnitude of phase, Syntheses of two-elements kind one port: LC, RC and RL one port networks.

Two Port Networks: Classification and characterization of two ports, Two port parameters and natural frequencies, Interconnections of two ports, Common two port configurations, Scattering parameters, One end parameter, Iterative and image parameters, Type of filters, Frequency and impedance scaling, Image parameters, Design frequency transformation, Butterworth and Chebyshev response, Insertion loss, Methods of network analysis, Block diagrams, Signals flow graphs, State variable techniques, Lattice networks, Bartlett's bisection theorem, Synthesis of



Lattice networks, Unbalancing of Lattice networks, Transmission characteristics, Signal distortions, Relationship between bandwidth and rise time, delay time and network functions.

EEE 4102 Advanced Electrical Circuits Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 4101

EEE 4201 Telecommunication-II
3 hours/ week Credit: 3.00

Line Coding: Unipolar, Polar, Bipolar, Biphase.

Digital Binary Modulation: ASK, PSK, DPSK, QPSK and M-array data communication system, QAM, Noise in digital communications.

Multiplexing & Demultiplexing: TDM, FDM, Multiple Access Techniques for wireless communication: FDMA, TDMA, CDMA.

Introduction to Wireless Communication System: Cellular mobile communication, Equalization, Diversity and channel coding.

Introduction to ISDN, B-ISDN, LAN, MAN, WAN, Data communication and Computer Networking.

Multimedia Communication: Speech coding, Huffman coding, JPGG, MPGA.

Introduction to Optical Fiber: Light propagation, Dispersion & losses, Optical source & detector.

Introduction to radar & satellite communication.

EEE 4202 Telecommunication-II Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 4201

EEE 4203 Digital Signal Processing
3 hours/ week Credit: 3.00

Introduction to Digital Signal Processing (DSP): Discrete-time signals and systems, Analog to digital conversion, Impulse response, Finite impulse response (FIR) and infinite impulse response (IIR) of discrete time systems, Difference equation, Convolution, Transient and steady state response.

Discrete Transformations: Discrete Fourier series, Discrete-time Fourier series, Discrete Fourier transform (DFT) and properties, Fast Fourier Transform (FFT), Inverse fast Fourier transform, Z-transformation: properties, transfer function, poles and zeroes and inverse Z-transform, Wavelet transform.

Correlation: Circular convolution, Auto correlation and cross correlation.

Digital Filters: FIR filters- linear phase filters, Specifications, Design using window, Optimal and frequency sampling methods, IIR filters- specifications, Design using impulse variant, Bi-linear z-transformation, Least square methods and finite precision effects.

EEE 4204 Digital Signal Processing Sessional

3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 4203

EEE 4205 Biomedical Engineering

3 hours/ week Credit: 3.00

Measurement of Bio-signals: Transducers, Amplifiers and filters, Molecular biology, DNA, RNA, Proteins, Genomics, Proteomics, Bioinformatics, Biomaterials, Bio-MEMS, Biosensors, Microfluidics, Lab on chip and point of care devices, Biomedical optics.

Therapeutic Devices: Cardiac pacemakers and defibrillators.

Introduction to Biomechanics: Forces act on the musculoskeletal system, Joint co-ordinate system, Kinematic analysis of human joint, Rehabilitation.

Tomograph: Positron emission tomography and computed tomography, Medical imaging concept with CT, MRI, Ultrasonogram devices, Medical image processing: enhancement, segmentations and detection.

EEE 4207 Optical Fiber Communication

3 hours/ week Credit: 3.00

Introduction: Historical perspective, Basic system, Nature of light, Advantages and applications of fiber optic.

Optics Review: Ray theory and applications, Lenses, Imaging, Numerical aperture, Diffraction.

Light Wave Fundamentals: Electromagnetic waves, Dispersion, Polarization, Resonant cavities, Reflection at plane boundary, Critical angle.

Integrated Optic Waveguides: Slab waveguide, Modes in symmetric and asymmetric waveguide, Coupling, Dispersion and distortion, Integrated optic components.

Optic Fiber Waveguide: Step index fiber, Graded index fiber, Attenuation, Pulse distortion and information rate, Construction of optic fiber, Optic fiber cables.

Light Sources: LED, LD, Distributed feedback LD, Optical amplifiers, Fiber laser, Vertical cavity surface emitting laser diode.

Light Detectors: Photo detection, Photo multiplier, Semiconductor photodiode, PIN photodiode, Avalanche photodiode.

Couplers and Connectors: Connector principle, End preparation, Splices, Connectors, Source coupling.

Network Distribution and Fiber Components: Directional couplers, Star couplers, Switches, Isolator, Wave-length division multiplexing, Fiber Bragg grating.

Modulation: LED modulation, LD modulation, Analogue and digital modulation, Modulation formats, Optic heterodyne receivers, CWDM, DWDM.

Noise and Detection: Thermal shot and noise, SNR, Error rates, Receiver circuit design.

System Design: Analogue and digital system design, Few real-life problems and examples.

EEE 4703 Industrial Automation and Process Control
3 hours/ week Credit: 3.00

Fundamentals of PLC: Basic functional components of PLC, Applications, Importance, Classification, Comparison of PLC with relay panel, Internal architecture of PLC, Storage capacity, Bus system, Communication between PC and PLC, PLC programming, Timer/Counter instructions, Logical instructions, Compare instructions, Move instructions, Program control instructions, Human machine interaction, Installation, Maintenance and troubleshooting of PLC Systems.

Sensors and Actuators: Characteristics and operation of main industrial sensors such as optical, inductive, capacitive, encoders, Ultrasonic and thermocouples, Pneumatic, Hydraulic and electric actuators.

Introduction to Microcontroller: Basics of microcontroller, Architecture of microcontroller, Evolution of microcontroller, Microcontroller family, Programming and applications of microcontroller.

Introduction of Robotics: Robotic systems, System interface, Engineering tools to design robots, Robot control architecture, Identify different types of robot, Distinguish uses and applications of robot, Special purpose robots and automated guided vehicles.

Process Control System: Distinguish types of process control devices, Application of process control devices to practical level, Flow and temperature control systems, Automated material handling and storage systems, Computer control of manufacturing systems, Monitoring systems and identify safety in industrial automation.

EEE 4704 Industrial Automation and Process Control Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 4703

EEE 4901 Renewable Energy
3 hours/ week Credit: 3.00

Renewable Energy Sources: Solar, Wind, Mini-hydro, Geothermal, Biomass, Wave and tides. Importance of renewable energy.

Solar Photovoltaic: Characteristics of photovoltaic (PV) systems and atmospheric factors, PV models and arrays, Equivalent circuits, Sun tracking systems, Maximum Power Point Tracking (MPPT), 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, Introduction to net-metering.

Solar Thermal: Operation of solar thermal system, 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: Basic of biomass and biogas electricity generation.

EEE 4903 Smart Grid
3 hours/ week Credit: 3.00

Smart Grid: Definition and applications of smart grid, Design, Analysis and development of smart grid, Distributed energy resources (DERs), Distributed generation (DG) and energy storage (ES), High power density batteries, Electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEV), Smart sensors, Meters and appliances at demand side, Concept of microgrids.

Smart Grid Communications: Two-way communication, Data communication channels, Protocols, TCP/IP, IEEE 802 series wireless LANs: Bluetooth, Zigbee, WiMAX, Wired LANs: Ethernet, PSTN, Power Line Carrier (PLC), Cyber security.

Smart Meters and AMI (advanced metering infrastructure): Construction, Standards for information exchange: Modbus, DNP3 and IEC61850, Interfacing with HAN, NAN, WAN.

Interfacing: Power electronic interfaces between grid and DERs.

Demand Side Integration (DSI): DSM, Real time pricing, Ancillary markets, Demand response (DR) for load shaping, Frequency and voltage control, Energy efficiency.

EEE 4905 Nuclear Power Engineering
3 hours/ week Credit: 3.00

Basic concepts of nuclear power generation, Nuclear energy, Atoms and nuclei, Atomic number and mass number, Mass-energy equivalence, Binding energy, Release of energy by nuclear reaction, Radioactivity, Types of nuclear reactions, Fission, Fusion, Fissile and fertile materials, Nuclear systems, Particle accelerator, Isotope separators, Neutron chain reaction, Production of neutron, Electric power generation process, Layout of nuclear power plant (NPP), Site selection for NPP, Comparison nuclear plants with thermal plants.

Auxiliaries, Instrumentation and control, Grid interconnection issues, Effects of frequency and voltage changes on NPP operation, Advanced and next generation nuclear plants.

Nuclear Power Plant Reactors: Introduction, General components of nuclear reactor, General problems of reactor operation, Different types of reactors, Pressurized water reactor, Boiling water reactor, CANDU reactor, Gas cooled reactor, Liquid metal cooled reactor, Breeder reactor, Very high temperature reactors.

Biological effects of radiation, Nuclear fuel transportation, Reactor safety and security, Three-mile island case, Chernobyl case, Fukushima case, Fuel cycle, Radioactive waste disposal, Gas disposal system.

4th Year 2nd Semester

EEE 4401 Electrical Properties of Materials
3 hours/ week Credit: 3.00

Introduction to Quantum Mechanics: Wave nature of electrons, Heisenberg's uncertainty principle, Schrodinger's equation, One-dimensional quantum problems: Infinite quantum well, Potential step and potential barrier, Tunneling principles, Electron in a 3D box, Hydrogen Atom.

Conductivity theory, Collision theory and conductivity of materials, Conductors, Photo cells, Solar cells, Dielectric, Polar and non-polar dielectric, Langevin function, Clausius-Mossotti equation, Ferroelectric dielectric, AC dielectric constant.

Magnetic properties of materials, Magnetic moment, Domain wall motion and coercive force in crystals, Polycrystalline and permanent magnetic materials, Magnetic resonance, Magnetic recording, Testing of magnetic materials, Super conductivity, Quantum electronics.

Biomaterials, Wearable and implantable bioelectronic materials, Advanced micro/nano materials for biomedical application.

EEE 4503 Solid State Devices
3 hours/ week Credit: 3.00

Fundamentals: Energy band in solids, Intrinsic and extrinsic semiconductors, Electron and hole, Effective mass, Density of states, Fermi energy, Fermi-Dirac statistics, Semiconductors in equilibrium, Electron and hole concentrations, Position of Fermi energy level.

Carrier Transport Processes: Drift and diffusion, Effect of scattering on mobility, Induced electric field for non-uniform doping, Einstein relation,

Excess Carriers: Generation and recombination of excess carriers, Continuity and diffusion equations for holes and electrons, Quasi-Fermi level.

PN Junction: Basic structure, Built-in potential, Space charge width and electric field for unbiased and biased condition, Minority carrier distribution, Minority and majority carrier currents, Transient and AC conditions, Reverse recovery transient.

Metal-Semiconductor Junction: Energy band diagram and current voltage characteristics of Schottky barrier diode, Non-rectifying ohmic contacts.

Bipolar Junction Transistor: Basic principle of pnp and npn transistors, Modes of operation, Minority carrier concentration in forward active mode, Mathematical expression of common base and common emitter current gain, Ebers-Moll model, Hybrid Pi model, BJT non-ideal effects, Heterojunction bipolar transistor.

MOS Structure: MOS capacitor, Energy band diagrams, Depletion layer thickness, Metal-semiconductor work function difference, Flat band voltage, Threshold voltage, Static and frequency dependent C-V characteristics, Operation of enhancement mode and depletion mode MOSFET, Current-voltage relationship of a MOSFET, Channel-length modulation, Body effect and physics of short-channel effects in MOSFETs.

Introduction to Modern MOSFET: Double gate structure, FinFET, Nanowire FET.

EEE 4907 Power Plant Engineering
3 hours/ week Credit: 3.00

Thermal, Steam, Hydroelectric barge mounted, Nuclear power plant load curves, Estimates of load, Load curves, Study and analysis of load curves, Interpretation of load curves, Determination of actual demand and capacity of various components in a system, Plotting the expected load curve of a

system, Use of the load curves, Load growth and extrapolation of load curves, Selection of plant, Effect of variable load on power plant design, Continuity of service requirements and its effect on plant design, Cost consideration, Equations of performance for plant equipment and electric service, Selection of units, Standby units, Large and small units, Number and sizes of units, Plant location, Considerations for site selection for different types of plants, General considerations for different types of power plants: large, medium and small, conventional and nuclear.

Introduction to Non-conventional Renewable Energy Conversion: Solar, Wind and wave electric energy converters.

Renewable Energy: Wind turbine generators, Construction & basic characteristics of solar cells, Photovoltaic systems, Fuel cells, Hybrid systems, Tidal energy, Biogas & biomass energy.

Economic marginal transmission cost, Graphical solution for location of different types of distribution, Rectangular distribution of loads, Economic conductor selection and general consideration, The ideal conductor, Effect of any deviation from the ideal cross-section, Limits for size of underground cables, Selection of ideal supply voltage, Plant performance and operation characteristics, Performance characteristics, Efficiency, Heat rate, Incremental rate method, Station performance characteristics, Station incremental rate, Capacity scheduling, Base load and peak load, Load division between steam and hydro stations, Bus system, Importance of power control, Current limiting reactors, Different types of bus system layouts, Forces on buses in the case of short circuits, Nuclear power stations, Comparison with conventional generation methods, Chain reactions, Moderators, Classification of reactors, Special power reactors, Shielding.

EEE 4209 Radar and Satellite Communication
3 hours/ week Credit: 3.00

Radar: Propagation of radio waves, Ionospheric, Tropospheric and ground wave propagation, Radar principles, Applications in civil, military and weather, Transmitters and radiators, Receivers and indicators, Electronic navigation system, LORAN and ILS, Sonar and other underwater sound systems.

Satellite Communication Systems: Communication satellite subsystems, Earth station, Satellite link analysis and different types of multiple access techniques: TDMA, FDMA and CDMA.

EEE 4210 Radar and Satellite Communication Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 4209

EEE 4403 Microwave Engineering
3 hours/ week Credit: 3.00

Frequency Spectrum: HF, VHF, UHF, Microwave frequency ranges, Microwave devices, Advantages and applications, The Quarter-wave transformers, Transmission lines, Generator and load mismatches, Losses, Impedance matching and tuning.

Microwave Network Analysis: Impedance, Equivalent voltages and currents, Impedance and admittance matrices, The scattering matrix, The transmission (ABCD) matrix,

Waveguides: General formulation, Structure, Characteristics, Rectangular waveguides, Circular waveguides, Microwave cavities, Directional couplers, Circulators, Isolators, Resonators, Rectangular resonant cavities, Energy storage, Losses, Strip lines: microstrip lines, parallel strip lines, coplanar strip lines, shielded strip lines.

Microwave Resonators: Series and parallel resonant circuits, Transmission line resonators, Rectangular waveguide cavity resonators, Circular waveguide cavity resonators, Dielectric resonators, Excitation of resonators, Waveguide cavity resonators, Microstrip resonators, Microwave transmitters and receivers, Microwave circuit and devices, Microwave tubes, Transmit time and velocity modulation, Klystron, Multi-cavity Klystron, Oscillator, Magnetron.

Radiation: Small current element, Radiation resistance, Radiation pattern and properties, Hertzian and half wave dipoles, Beam solid angle, Radiation intensity, Directivity, Effective aperture.

Radiation and Antennas: Types of antenna and their applications, Long antenna analysis, Radiation patterns, Rhombic and slot antenna, Infinitesimal dipole antenna, Finite length dipole antenna, Infinitesimal loop antenna, Antenna arrays, N element linear array, End fire, Broadside array: array factor and directivity.

Radiating Field Regions and Radiation Pattern: Isotropic, Directional and omni directional patterns, Radiation power density, Radiation intensity, Beam width, Directivity, Antenna efficiency and gain, Polarization, Vector effective length, Effective aperture, Equivalent circuit model and corresponding parameters, Friis transmission equation, Mathematical formalism for far field analysis,

Radar Systems: Application, Radar equation, Range, Types of radar, Polarization, Noise, Interference, Atmospheric and ground effects, Other applications of microwave, Microwave oven etc.

EEE 4404 Microwave Engineering Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 4403

EEE 4601 VLSI Circuits
3 hours/ week Credit: 3.00

VLSI Technology: Fabrication, Diffusion of impurities & characteristics of ICs, Top-down design approach, Technology trends & styles, Threshold voltage, Body effect, V-I equations characteristics, NMOS & CMOS inverters: dc & transient characteristics, Pass transistors & pass gates, CMOS layout & design rules, Complex CMOS gates, Resistance & capacitance estimation & modeling, Signal propagation delay, Noise margin & power consumption.

CMOS Building Blocks: Logic structures, Electrical & physical design of logic gates, Clocking strategies, Adders, Counters, Multipliers & barrel shifters, Data paths, Programmable Logic Arrays (PLAs) & Field Programmable Gate Arrays (FPGAs), Memories, SRAM arrays, Dynamic RAM, Logic Arrays.

VLSI Testing: Objectives, Techniques, Algorithms, Methodologies and strategies of IC testing.

VLSI Design: System specifications using (HDL/Verilog HDL), Structural gate-level modeling, Behavioral modeling, Switch-level modeling, Design hierarchies, RTL modeling.

EEE 4602 VLSI Circuits Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 4601

EEE 4909 High Voltage Engineering
3 hours/ week Credit: 3.00

High Voltage Supplies: Ranges of different voltages, Different forms of high voltages, Application of high voltages.

Generation of High AC Voltages: Cascaded transformers, Resonant transformers, Tesla coil.

Generation of High DC Voltages: Rectifier circuits, Ripple and minimization of ripple, Simple and cascaded voltage doublers, Cockcroft-Walton voltage multiplier circuit, Ripple and voltage drop in voltage multiplier circuits, Electrostatic machines, Van de Graaff generators.

Generation of Impulse Voltages: Impulse wave shapes, Codes and standards, Circuits for producing impulse waves, Mathematical analysis and design consideration, Single and multi-stage impulse generators, Tripping and control of impulse generators.

Measurements of High Voltages and Currents: Resistance and capacitance potential dividers, Capacitance voltage transformer (CVT), Generating voltmeters, Electrostatic voltmeter, Sphere gap, High voltage Schering bridge, Megaohm meter, Current transformer, Rogowski coil, Magnetic links.

High Voltage Testing: High voltage testing of electrical apparatus, IEC and IEEE standards.

Conduction and Breakdown in Gases, Liquids and Solid Dielectrics: Ionization processes, Townsend's first and second ionization coefficient, Current growth, Breakdown mechanism in gases, Streamer theory, Uniform and non-uniform field, Electronegative gases, Post breakdown phenomena, Corona, spark, Arc and glow discharge processes, Types of liquid dielectrics, Pure liquids, Commercial liquids, Breakdown in liquid dielectrics, Types of breakdown processes, Various breakdown mechanism in liquids, Purification and testing, Types of solid liquids, Properties, Breakdown mechanism in solid dielectrics, Streamer theory in solid, Composite dielectrics, Tracking and treeing, Chemical and electrochemical deterioration.

Over-voltage Phenomenon and Insulation Coordination: Charge, Cloud theory, Parameters and characteristics of the lightning strokes, Mathematical modeling, Lightning and switching surges, Design consideration of transmission line based on direct stroke, Basic insulation level (EV, EHV and UHV systems), Switching over voltages, Power frequency over voltages, Protection of transmission lines, Surge diverters and arresters.

EEE 4910 High Voltage Engineering Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 4909

EEE 4911 Switchgear and Protection
3 hours/ week Credit: 3.00

Circuit Breakers: Significance of switchgear and protection in power system, Principle of arc extinction in DC and AC circuit breakers, Re-striking voltage, Recovery voltage, Rate of rise of recovery voltage, Resistance switching, Current chopping and interruption of capacitive current, Types, construction and operating mechanisms of air circuit breaker (ACB), Oil circuit breaker (OCB), Vacuum circuit breaker (VCB) and sulfur hexafluoride (SF6) circuit breaker, Rating and

selection of power circuit breakers, Testing of high voltage circuit breakers.

Protective Relays: General requirements, Relay operation principles, Construction of relays, Relay currents and voltages, Use of instrument transformer for relays, Problem of high speed relaying transmission lines, Operating characteristics of different types of relays: DMT and IDMT relays, Overcurrent relay, Directional relay, Differential relay, Impedance relay, Reactance relay, Mho relay, Modified impedance relay, Zero sequence and negative sequence relays, Balance current relaying of parallel line, Ground fault relaying, Pilot relaying principles, Carrier pilot relay, Apparatus protection, Circuits and relay setting, Generator and motor protection, Transformer protection, Busbar protection, Line protection, HVDC system protection.

EEE 4912 Switchgear and Protection Sessional
3/2 hours/ week Credit: 0.75

Sessional based on the theory of course EEE 4911