

Chapter 3

Syllabus for Undergraduate Program

Semester Credit Distribution

S.N.	Year/ Semester	Theory		Sessional		Total Credits
		No of Course	Credits	No of Course	Credits	
1	1st/Odd	5	15	4	4.50	19.50
2	1st/Even	5	15	4	4.50	19.50
3	2nd/Odd	5	15	4	5.25	20.25
4	2nd /Even	5	15	4	5.25	20.25
5	3rd/Odd	5	15	4	4.50	19.50
6	3rd/Even	5	15	5	6.00	21.00
7	4th/Odd	5	14	6	5.50	19.50
8	4th/Even	5	15	4	5.50	20.50
Total		40	119	33	41.00	160.00

Summary of Undergraduate Course Plan

S.N.	Course Type		Credit	%	
1	Departmental Courses				
	Core Courses	Theory	69		
		Lab	32.75		
	Elective Courses	Theory	15		
		Lab	2.25		
Sub-Total			119.0	74.38	
2	Related Courses				
	Humanities	Theory	11		
		Lab	0.75		
	Sub-Total			11.75	7.34
	Basic Sciences	Theory	18		
		Lab	1.5		
	Sub-Total			19.50	12.19
	Related Engg.	Theory	6		
Lab		3.75			
Sub-Total			9.75	6.09	
Total			160	100.00	

List of Undergraduate Courses

Core Courses (EEE)

S.N.	Course Number	Course Title	Contact Hrs/week	Credit
1	EEE 1101	Electrical Circuits I	3	3.0
2	EEE 1102	Electrical Circuits I Sessional	3	1.5
3	EEE 1201	Electrical Circuits II	3	3.0
4	EEE 1202	Electrical Circuits II Sessional	3/2	0.75
5	EEE 1203	Electronics I	3	3.0
6	EEE 1204	Electronics I Sessional	3	1.5
7	EEE 2100	Electrical Shop Practice	3	1.5
8	EEE 2103	Electronics II	3	3.0
9	EEE 2104	Electronics II Sessional	3	1.5
10	EEE 2203	Electronics III	3	3.0
11	EEE 2204	Electronics III Sessional	3	1.5
12	EEE 2105	Electrical Machine I	3	3.0
13	EEE 2106	Electrical Machine I Sessional	3	1.5
14	EEE 2205	Electrical Machine II	3	3.0
15	EEE 2206	Electrical Machine II Sessional	3	1.5
16	EEE 2211	Measurement and Instrumentation	3	3.0
17	EEE 2212	Measurement and Instrumentation Sessional	3	1.5
18	EEE 2213	Digital Electronics I	3	3.0
19	EEE 2214	Digital Electronics I Sessional	3/2	0.75
20	EEE 3100	Electronic Shop Practice	3	1.5
21	EEE 3101	Signals and Linear Systems	3	3.0
22	EEE 3105	Control Systems	3	3.0
23	EEE 3106	Control Systems Sessional	3/2	0.75
24	EEE 3107	Electromagnetic Fields & Waves	3	3.0
25	EEE 3109	Computational Methods in Electrical Engineering	3	3.0
26	EEE 3110	Computational Methods in Electrical Engineering Sessional	3	1.5
27	EEE 3117	Communication Engineering I	3	3.0
28	EEE 3118	Communication Engineering I Sessional	3/2	0.75
29	EEE 3200	Electrical and Electronic Circuit Simulation Sessional	3	1.5
30	EEE 3203	Power Electronics	3	3.0
31	EEE 3204	Power Electronics Sessional	3/2	0.75
32	EEE 3205	Power Plant Engineering and Economy	3	3.0
33	EEE 3209	Microprocessor, Interfacing and System Design	3	3.0
34	EEE 3210	Microprocessor, Interfacing and System Design Sessional	3	1.5
35	EEE 3211	Power System I	3	3.0
36	EEE 3212	Power System I Sessional	3	1.5
37	EEE 3217	Communication Engineering II	3	3.0
38	EEE 3218	Communication Engineering II Sessional	3/2	0.75

S.N.	Course Number	Course Title	Contact Hrs/week	Credit
39	EEE 4000	Project and Thesis	3	4.5
40	EEE 4100	Industrial Training	3	1.0
41	EEE 4107	Digital Signal Processing	3	3.0
42	EEE 4108	Digital Signal Processing Sessional	3/2	0.75
43	EEE 4117	Radio and TV Engineering	3	3.0
44	EEE 4118	Radio and TV Engineering Sessional	3/2	0.75
45	EEE 4200	Seminar	3	1.0
46	EEE 4209	Embedded System Design	3	3.0
47	EEE 4210	Embedded System Design Sessional	3/2	0.75
48	EEE 4217	Mobile Cellular Communication	3	3.0
		Total		101.75

Core Courses (Humanities)

S.N.	Course Number	Course Title	Contact Hrs/week	Credits
1	Hum 1111	Technical English	3	3.0
2	Hum 1112	Technical English Sessional	3/2	0.75
3	Hum 1211	Financial Account and Economic Analysis	3	3.0
		Total	7.5	6.75

Core Courses (Mathematics)

S.N.	Course Number	Course Title	Contact Hrs/week	Credits
1	Math 1101	Engg. Mathematics I	3	3.0
2	Math 1201	Engg. Mathematics II	3	3.0
3	Math 2101	Engg. Mathematics III	3	3.0
4	Math 2201	Engg. Mathematics IV	3	3.0
		Total	12	12.0

Core Courses (Physics)

S.N.	Course Number	Course Title	Contact Hrs/week	Credits
1	Phy 1111	Physics	3	3.0
2	Phy 1112	Physics Sessional	3/2	0.75
		Total	4.5	3.75

Core Courses (Chemistry)

S.N.	Course Number	Course Title	Contact Hrs/week	Credits
1	Chem 1211	Chemistry	3	3.0
2	Chem 1212	Chemistry Sessional	3/2	0.75
		Total	4.5	3.75

Core Courses (ME)

S.N.	Course Number	Course Title	Contact Hrs/week	Credits
1	ME 1200	Engineering Drawing	3	1.50
2	ME 2101	Basic Mechanical Engineering	3	3.0
3	ME 2102	Basic Mechanical Engineering Sessional	3/2	0.75

		Total	7.5	5.25
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Core Courses (CSE)

S.N.	Course Number	Course Title	Contact Hrs/week	Credits
1	CSE 1111	Computer Programming	3	3.0
2	CSE 1112	Computer Programming Sessional	3	1.5
		Total	6	4.5

Core Courses (IPE)

S.N.	Course Number	Course Title	Contact Hrs/week	Credits
1	IPE 2111	Legal Issues and Management for Engineers	3	3.0
2	IPE 4111	Project and Operations Management	2	2.0
		Total	5	5.0

Elective Courses

From 4th year Odd semester, the department starts offering elective courses under three (3) major tracks viz. Power-, Electronics-, and Communication-Engineering.

Track selection:

1. Students will be divided into the three major tracks on the basis of options given by the students and their CGPA at the end of 3rd year odd semester. For regular students, this will be done in 3rd year even semester.
2. Maximum number of students in any major group will be $N/3$, where N is the total number of students in a class.
3. A student will have to take five (5) elective courses along with the corresponding sessional courses from the respective track.
4. Students will be assigned their projects/ theses in 4th year odd semester. The theme of project/thesis shall reflect the respective track.
5. Maximum class size of an elective course for regular students will be $N/3$. However, a student who has previously failed in an elective course will be allowed to re-register the course regardless of the class size.
6. In case of any unforeseen situation or ambiguity, the UGAC will take an appropriate decision.

Power Group

Sl. No.	Course Number	Course Title	Contact Hrs/week	Credits
1	EEE 4141	Power System II	3	3.0
2	EEE 4142	Power System II Sessional	3/2	0.75
3	EEE 4143	High Voltage Engineering	3	3.0
4	EEE 4144	High Voltage Engineering Sessional	3/2	0.75
5	EEE 4241	Power System Protection	3	3.0
6	EEE 4242	Power System Protection Sessional	3/2	0.75
7	EEE 4243	Power System Operation and Control	3	3.0
8	EEE 4245	Electrical Machine III	3	3.0
9	EEE 4247	Renewable Energy	3	3.0

Electronics Group

Sl. No.	Course Number	Course Title	Contact Hrs/week	Credits
1	EEE 4161	Digital Electronics II	3	3.0
2	EEE 4162	Digital Electronics II Sessional	3/2	0.75
3	EEE 4163	VLSI	3	3.0
4	EEE 4164	VLSI Sessional.	3/2	0.75
5	EEE 4261	Biomedical Engineering	3	3.0
6	EEE 4262	Biomedical Engineering Sessional	3/2	0.75
7	EEE 4263	Optoelectronics	3	3.0
8	EEE 4265	Processing & Fabrication Technology	3	3.0
9	EEE 4267	Transducers and Instrumentation	3	3.0
10	EEE 4268	Transducers and Instrumentation Sessional	3/2	0.75

Communication Group

Sl. No.	Course Number	Course Title	Contact Hrs/week	Credits
1	EEE 4181	Microwave Engineering	3	3.0
2	EEE 4182	Microwave Engineering Sessional	3/2	0.75
3	EEE 4183	Digital Communication	3	3.0
4	EEE 4184	Digital Communication Sessional	3/2	0.75
5	EEE 4281	Antennas and Propagation	3	3.0
6	EEE 4282	Antennas and Propagation Sessional	3/2	0.75
7	EEE 4283	Radar and Satellite Communication	3	3.0
8	EEE 4285	Optical Fiber Communication	3	3.0

4. Prerequisite Courses

S. N.	Course	Prerequisite Course
1	EEE 1201	EEE 1101
2	EEE 1203	EEE 1101
3	EEE 2103	EEE 1203
4	EEE 2105	EEE 1101
5	EEE 2203	EEE 2103
6	EEE 2205	EEE 2105
7	EEE 2213	EEE 1203
8	EEE 3105	EEE 1201
9	EEE 3107	Math 2101
10	EEE 3109	CSE 1112
11	EEE 3203	EEE 2213
12	EEE 3209	EEE 2213
13	EEE 4209	EEE 3209

Semester Course Plan

Department will offer the courses to its students, in general, as per the following arrangement.

1st Year Odd semester

Sl. No	Course No.	Course Title	Theory		Sessional		Total Credits
			Contact Hrs/week	Credits	Contact Hrs/week	Credits	
1	EEE 1101	Electrical Circuit I	3	3			3.00
2	EEE 1102	Electrical Circuit I Sessional			3	1.5	1.50
3	CSE 1111	Computer Programming	3	3			3.00
4	CSE 1112	Computer Programming Sessional			3	1.5	1.50
5	Math 1101	Engg. Mathematics I	3	3			3.00
6	Phy 1111	Physics	3	3			3.00
7	Phy 1112	Physics Sessional			3/2	0.75	0.75
8	Hum 1111	Technical English	3	3			3.00
9	Hum 1112	Technical English Sessional			3/2	0.75	0.75
Total			15	15	9	4.5	19.50

1st Year Even semester

Sl. No	Course No.	Course Title	Theory		Sessional		Total Credits
			Contact Hrs/week	Credits	Contact Hrs/week	Credits	
1	EEE 1201	Electrical Circuit II	3	3			3.00
2	EEE 1202	Electrical Circuit II Sessional			3/2	0.75	0.75
3	EEE 1203	Electronics I	3	3			3.00
4	EEE 1204	Electronics I Sessional			3	1.5	1.50
5	Chem 1111	Chemistry	3	3			3.00
6	Chem 1112	Chemistry Sessional			3/2	0.75	0.75
7	Hum 1211	Financial Account & Economic Analysis	3	3			3.00
8	Math 1201	Engg. Mathematics II	3	3			3.00
9	ME 1200	Engineering Drawing			3	1.5	1.50
Total			15	15	9	4.5	19.50

2nd Year Odd semester

Sl. No	Course No.	Course Title	Theory		Sessional		Total Credits
			Contact Hrs/week	Credits	Contact Hrs/week	Credits	
1	EEE 2100	Electrical Shop Practice			3	1.5	1.50
2	EEE 2103	Electronics II	3	3			3.00
3	EEE 2104	Electronics II Sessional			3	1.5	1.50
4	EEE 2105	Electrical Machine I	3	3			3.00
5	EEE 2106	Electrical Machine I Sessional			3	1.5	1.50
6	Math 2101	Engg. Mathematics III	3	3			3.00
7	ME 2101	Basic Mechanical Engineering	3	3			3.00
8	ME 2102	Basic Mechanical Engineering Sessional			3/2	0.75	0.75
9	IPE 2111	Legal Issues and Management for Engineers	3	3			3.00
Total			15	15	10.5	5.25	20.50

2nd Year Even semester

Sl. No	Course No.	Course Title	Theory		Sessional		Total Credits
			Contact Hrs/week	Credits	Contact Hrs/week	Credits	
1	Math 2201	Engg. Mathematics IV	3	3			3.00
2	EEE2203	Electronics III	3	3			3.00
3	EEE2204	Electronics III Sessional			3	1.5	1.50
4	EEE2205	Electrical Machine II	3	3			3.00
5	EEE2206	Electrical Machine II Sessional			3	1.5	1.50
6	EEE2211	Measurement & Instrumentation	3	3			3.00
7	EEE2212	Measurement & Instrumentation Sessional			3	1.5	1.50
8	EEE2213	Digital Electronics I	3	3			3.00
9	EEE 2214	Digital Electronics I Sessional			3/2	0.75	0.75
Total			15	15	10.5	5.25	20.25

3rd Year odd semester

Sl. No	Course No.	Course Title	Theory		Sessional		Total Credits
			Contact Hrs/week	Credits	Contact Hrs/week	Credits	
1	EEE 3100	Electronic Shop Practice			3	1.5	1.50
2	EEE 3101	Signals and Linear Systems	3	3			3.00
3	EEE 3105	Control Systems	3	3			3.00
4	EEE 3106	Control Systems Sessional			3/2	0.75	0.75
5	EEE 3107	Electromagnetic Fields & Waves	3	3			3.00
6	EEE 3109	Computational Methods in Electrical Engineering	3	3			3.00
7	EEE 3110	Computational Methods in Electrical Engineering Sessional			3	1.5	1.50
8	EEE 3117	Communication Engineering I	3	3			3.00
9	EEE 3118	Communication Engineering I Sessional			3/2	0.75	0.75
Total			15	15	9	4.5	19.50

3rd Year even semester

Sl. No	Course No.	Course Title	Theory		Sessional		Total Credits
			Contact Hrs/week	Credits	Contact Hrs/week	Credits	
1	EEE 3200	Electrical and Electronic Circuit Simulation Lab			3	1.5	1.50
2	EEE 3203	Power Electronics	3	3			3.00
3	EEE 3204	Power Electronics Sessional			3/2	0.75	0.75
4	EEE 3205	Power Plant Engineering and Economy	3	3			3.00
5	EEE 3209	Microprocessor, Interfacing and System design	3	3			3.00
6	EEE 3210	Microprocessor, Interfacing and System design Sessional			3	1.5	1.50
7	EEE 3211	Power System I	3	3			3.00
8	EEE 3212	Power System I Sessional			3	1.5	1.50
9	EEE 3217	Communication Engineering II	3	3			3.00
10	EEE 3218	Communication Engineering II Sessional			3/2	0.75	0.75
Total			15	15	12	6.00	21.00

4th Year odd semester

Sl. No	Course No.	Course Title	Theory		Sessional		Total Credits
			Contact Hrs/week	Credits	Contact Hrs/week	Credits	
1	EEE 4000	Project & Thesis			3	1.5	1.50
2	EEE 4100	Industrial Training*				1	1.00
3	EEE 4107	Digital Signal Processing	3	3			3.00
4	EEE 4108	Digital Signal Processing Sessional			3/2	0.75	0.75
5	EEE 4117	Radio and TV Engineering	3	3			3.00
6	EEE 4118	Radio and TV Engineering Sessional			3/2	0.75	0.75
7	IPE 4111	Project and Operations Management	2	2			2.00
8	EEE ****	Elective I	3	3			3.00
9	EEE ****	Elective I Sessional			3/2	0.75	0.75
10	EEE ****	Elective II	3	3			3.00
11	EEE ****	Elective II Sessional			3/2	0.75	0.75
Total			14	14	9	5.5	19.50

**Industrial Training: Students will be attached with the industries/service agencies for two weeks after completion of their third year odd semester or during any vacation in Third year even semester) to gain practical knowledge.*

4th Year even semester

Sl. No	Course No.	Course Title	Theory		Sessional		Total Credits
			Contact Hrs/week	Credits	Contact Hrs/week	Credits	
1	EEE 4000	Project & Thesis			6	3	3.00
2	EEE 4200	Seminar			2	1	1.00
3	EEE 4209	Embedded System Design	3	3			3.00
4	EEE 4210	Embedded System design Sessional			3/2	0.75	0.75
5	EEE 4217	Mobile Cellular Communication	3	3			3.00
6	EEE ****	Elective III	3	3			3.00
7	EEE ****	Elective III Sessional			3/2	0.75	0.75
8	EEE ****	Elective IV	3	3			3.00
9	EEE ****	Elective V	3	3			3.00
Total			15	15	11	5.5	20.50

2. Elective Course divisions

Elective I

Group	Course No.	Course Title	Credit
Power	EEE 4141	Power System II	3.00
	EEE 4142	Power System II Sessional	0.75
Electronics	EEE 4161	Digital Electronics II	3.00
	EEE 4162	Digital Electronics II Sessional	0.75
	EEE 4165	Processing & Fabrication Technology	3.00
	EEE 4166	Processing & Fabrication Technology	0.75
Communication	EEE 4181	Microwave Engineering	3.00
	EEE 4182	Microwave Engineering Sessional	0.75

Elective II

Group	Course No.	Course Title	Credit
Power	EEE 4143	High Voltage Engineering	3.00
	EEE 4144	High Voltage Engineering Sessional	0.75
Electronics	EEE 4163	VLSI	3.00
	EEE 4164	VLSI Sessional	0.75
Communication	EEE 4183	Digital Communication	3.00
	EEE 4184	Digital Communication Sessional	0.75

Elective III

Group	Course No.	Course Title	Credit
Power	EEE 4241	Power System Protection	3.00
	EEE 4242	Power System Protection Sessional	0.75
Electronics	EEE 4261	Biomedical Engineering	3.00
	EEE 4262	Biomedical Engineering Sessional	0.75

	EEE 4267	Transducers and Instrumentation	3.00
	EEE 4268	Transducers and Instrumentation Sessional	0.75
Communication	EEE 4281	Antennas and Propagation	3.00
	EEE 4282	Antennas and Propagation Sessional	0.75

Elective IV

Group	Course No.	Course Title	Credit
Power	EEE 4243	Power System Operation and Control	3.00
Electronics	EEE 4263	Optoelectronics	3.00
Communication	EEE 4283	Radar and Satellite Communication	3.00

Elective V

Group	Course No.	Course Title	Credit
Power	EEE 4245/ EEE 4247	Electrical Machine III / Renewable Energy	3.00
Electronics	EEE 4269	Photovoltaic System	3.00
Communication	EEE 4285	Optical Fiber Communication	3.00

EEE 2204 Electronics III Sessional

Contact hours/week: 3

Credits:1.5

Sessional based on the theory of course of **EEE 2203**

EEE 2105 Electrical Machine I

Contact hours/week: 3

Credits: 3

Transformer: Ideal transformer- transformation ratio, no-load and load vector diagrams; actual transformer- equivalent circuit, regulation, short circuit and open circuit tests. Three phase transformer and its connections; Vector group of three phase transformers; Phase conversion.

Three Phase Induction Motor: Rotating magnetic field, equivalent circuit, vector diagram, torque-speed characteristics, effect of changing rotor resistance and reactance on torque-speed curves, motor torque and developed rotor power, no-load test, blocked rotor test, starting and braking and speed control; Induction generator.

Single Phase Induction Motor: Theory of operation, equivalent circuit and starting.

EEE 2106 Electrical Machine I Sessional

Contact hours/week: 3

Credits: 1.5

Sessional based on the theory of course **EEE 2105**.

EEE 2205 Electrical Machine II

Contact hours/week: 3

Credits:3

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

DC Motor: Operating principle, counter emf, torque, speed, torque-speed characteristics, starting, braking, and speed control.

Synchronous Generator: Windings, excitation systems, equivalent circuit, vector diagrams at different loads, factors affecting voltage regulation, synchronous impedance, synchronous impedance methods of predicting voltage regulation and its limitations. Parallel operation: necessary conditions, synchronizing, circulating current and vector diagram.

Synchronous Motor: Operation, loading effect, effect of changing excitation, V-curves, and starting methods.

EEE 2206 Electrical Machine II Sessional

Contact hours/week: 3

Credits:1.5

Sessional based on the theory of course **EEE 2205**.

EEE 2211**Measurement & Instrumentation**

Contact hours/week: 3

Credits:3

Introduction : Methods of measurement. Statistical method applied to field of measurement and error analysis and calibration.

Resistance, Inductance and Capacitance measurements: Different methods of measuring high, medium and low resistances. Methods of measuring self and mutual inductance and capacitance measurement. A.C. and DC bridge methods, Measurement of insulation and earth resistances. Localization of cable fault.

Magnetic measurement: Flux meter, Flux and Flux density measurement. Determination of iron losses and their separation.

Measuring instruments : Classification of measuring instruments. Ammeter, Voltmeter, wattmeter, AVO meter, Energy meter, Ampere-hour meter and Maximum demand meter for measuring AC and DC quantities. Speed, frequency and phase difference measurements. Illumination measurement.

Electronic measuring instruments: Digital instruments, VTVM, Q-meter and CRO.

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

Measurement of non-electrical quantities: Transducer. Measurement of temperature, pressure, displacement, velocity, acceleration. Strain gauge and their applications.

EEE 2212**Measurement & Instrumentation Sessional**

Contact hours/week: 3

Credits:1.5

Sessional based on the theory of course **EEE 2211**.

EEE 2213 Digital Electronics I

Contact hours/week: 3

Credits:3

Analysis and Synthesis of Digital Logic Circuits: Number system, codes, and conversion. Boolean algebra, De Morgan's law, logic gates and truth tables, combinational logic design, minimization techniques, implementation of basic static logic gates in CMOS and BiCMOS. Arithmetic and data handling logic circuits, decoders and encoders, multiplexers and combinational circuit design.

Programmable Logic Devices: Logic arrays, Field Programmable Logic Arrays and Programmable Read Only Memory.

Sequential Circuits: Different types of latches, flip-flops and their design using ASM approach, timing analysis, timing analysis and power optimization of sequential circuits. Modular sequential logic circuit design: Shift registers, counters and their applications.

EEE 2214**Digital Electronics I Sessional**

Contact hours/week: 3/2

Credits:0.75

Sessional based on the theory of course EEE 2213.

EEE 3100**Electronic Shop Practice**

Contact hours/week: 3

Credits: 1.5

Introduction to formal procedures of preventive maintenance. Circuit tracing, trouble shooting, fault repairing, soldering and de-soldering of electronic circuits. Design of PCB layout, etching.

Radio receivers: Principles of operations, circuit tracing, fault finding by signal injection alignment. TV camera, B/W TV, color TV. CD and VCD player.

EEE 3101**Signals and Linear Systems**

Contact hours/week: 3

Credits:3

Analogous system, Response to non-sinusoidal voltage, L-system. Transform methods, Purpose and nature of transform, Fourier and Laplace transforms. Impulse function. Convolution integral and their application to network and system analysis. Filter equations, modern filters.

EEE 3105**Control Systems**

Contact hours/week: 3

Credits: 3

Introductory Concepts: Open loop versus closed loop feedback system. Input output relationship. Transfer function. DC machine dynamics, performance criteria, sensitivity and accuracy. Analysis of control systems time and frequency domain error constants.

Stability of control system : Routh-Hurwitz criterion, bode plot, polar plot. Nyquist method. Root locus techniques. Frequency response analysis. Nicholes chart, compensation. Introduction to non-linear control system. State variable characterization of systems, transition matrix, canonical forms. Controllability and observability.

EEE 3106**Control Systems Sessional**

Contact hours/week: 3/2

Credits: 0.75

Sessional based on the theory of course EEE 3105.

EEE 3107**Electromagnetic Fields & Waves**

Contact hours/week: 3

Credits:3

Electrostatics and Magnetostatics using vector methods. Fields in dielectrics and conductors. Boundary conditions of Electric and Magnetic fields. Time

EEE 3203**Power Electronics**

Contact hours/week: 3

Credits:3

Power semiconductor switches and triggering devices: BJT, MOSFET, SCR, IGBT, GTO, TRIAC, UJT and DIAC. Rectifiers: Uncontrolled and controlled single phase and three phase. Regulated power supplies: Linear-series and shunt, switching buck, buckboost, boost and cuk regulators. AC voltage controllers, single and three phase. Choppers. DC motor control. Single phase cycloconverter. Inverters: single phase and three phase current and voltage source. AC motor control. Stepper motor control. Resonance inverters. Pulse width modulation control of static converters.

EEE 3204 Power Electronics Sessional

Contact hours/week: 3/2

Credits:0.75

Sessional based on the theory of course EEE 3203.

EEE 3205**Power Plant Engineering and Economy**

Contact hours/week: 3

Credits: 3

Introduction to thermal, hydro and nuclear power stations. Nuclear reactor, reactor construction and control. Power reactors. Central station reactors. Nuclear hazards.

Variable load problems, plotting and analysis of load curves, chronological load curves and load duration curve. Energy load curve and its use. Load factor, capacity factor, demand factor, utilization factor, diversity factor etc. and there impact over the cost analysis of power generation and utilization. Load forecasting, selection of units and plant location.

Load shearing: Base load and peak load plants. Use of chronological load curves to distribute load among units.

Power plant Economics: Economic operation of power plants. Input output curve, heat rate curve, incremental rate curve. Use of incremental rate curve for optimum load scheduling. Transmission line loss, determination of loss co-efficient. Economic conductor selection, Kelvin's law. Graphical method for location of distribution systems. Tariff and tariff design. Bus system. Importance of power control. Current limiting reactors. Different types of bus system layout. Forces on bus section in case of short circuit.

EEE 3209**Microprocessor, Interfacing and System design**

Contact hours/week: 3

Credits:3

Fundamental Concepts: Microprocessor: A programmable device; microcomputer components and support ICs, building blocks of MPU based systems, microprocessor buses, programming principles using MASM, microprocessor instructions.

16-bit Architecture: Pin diagram and functions, memory organization, bus activities, register layout, internal processing blocks.

Instruction Set: Classifications of instructions, addressing modes, address computing chart.

I/O Controller Programming: Port definition and read/write instructions, parallel I/O programming using 8255, serial I/O programming using 8251, display programming using 8279 and LCD, keyboard programming using 8279 and discrete components, generation of timing functions using 8254 Timer/Counter.

Interrupt Structure: Interrupt terminologies, hardware and software interrupt, multiple interrupt management, 8259 interrupt controller.

Data Conversion Algorithm: BCD2BIN conversion, BIN2BCD conversion, binary multiplication, binary division.

System Design (8086 based digital weighing machine: DWM)
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: History of the evolution of MPU/MCU, multitasking systems, 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 3210 Microprocessor, Interfacing and System design Sessional

Contact hours/week: 3

Credits:1.5

Sessional based on the theory of course **EEE 3209**.

EEE 3211 Power System I

Contact hours/week: 3

Credits:3

Inductance and Capacitance of overhead power line. Line representation : equivalent circuit of short, medium and long line. Network representation: single line and reactance diagram of power system and per unit representation. Load flow studies : Gauss – seidel and Newton-Raphson method. Control of voltage, real power and reactive power. Reactive power compensation. Fault analysis: Symmetrical fault calculation, symmetrical components, sequence impedance and sequence networks, different unsymmetrical fault calculation. Introduction to different kinds of relays and circuit breakers. Typical layout of substation equipment.

Students will be attached with the industries/service agencies for two weeks after completing their Third year first semester (before starting Third year second semester/during any vacation in Third year second semester) to gain practical knowledge. It is a 1-credit course and without completion of this course the student will not fulfill the requirements of B. Sc. Engineering Degree.

EEE 4107

Digital Signal Processing

Contact hours/week: 3

Credits: 3

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.

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 4108

Digital Signal Processing Sessional

Contact hours/week: 3/2

Credits:0.75

Sessional based on the theory of course EEE 4107.

EEE 4117

Radio and TV Engineering

Contact hours/week: 3

Credits: 3

Introduction to radio communication, History, Frequency management. Design of radio transmitter and receiver circuits using scattering-parameter methods. Circuits include oscillators, radio frequency amplifiers and matching networks, mixers and detectors. Design of amplitude, frequency, and pulse-modulated communication systems, including modulators, detectors, and the effects of noise.

Television: Introduction, principle of operation, transmitter and receiver, Receiving and transmitting antenna. Camera tube, Picture tube, Electron beam scanning, T-lines, balun, duplexer, Vestigial side-band filters. Introduction to color TV, VCR, CCTV, CATV, MATV, TV Booster.

EEE 4118

Radio and TV Engineering Sessional

Contact hours/week: 3/2

Credits:0.75

Sessional based on the theory of course EEE 4117.

EEE 4200 Seminar

Contact hours/week: 2

Credits: 1

Students will work in groups or individually to prepare review articles on the corresponding topic of their thesis/project and will present before audience.

EEE 4209 Embedded System Design

Contact hours/week: 3

Credits: 3

Embedded Processing – Evolution, Issues and Challenges; System and Processor Architecture: von Neumann, Harvard and their variants; Memory Architecture and Devices; Input-Output Devices and Mechanisms; Instruction Set and Addressing Modes; Interfacing of Memory and Peripheral Devices – Functional and Timing Issues; Application Specific Logic Design using Field Programmable Devices and ASICs; Analog to Digital and Digital to Analog Converters; Bus I/O and Networking Considerations; Bus and Wireless Protocols; Embedded Systems Software: Constraints and Performance Targets; Real-time Operating Systems: Introduction, Scheduling in Real-time Operating Systems; Memory and I/O Management: Device Drivers; Embedded Software Development: Flow, Environments and Tools, System Specification and Modelling, Programming Paradigms, System Verification; Performance Analysis and Optimisation: Speed, Power and Area Optimisation; Testing of Embedded Systems System Design Examples using Microcontrollers, PLC, and FPGA.

EEE 4210 Embedded System Design Sessional

Contact hours/week: 3/2

Credits:0.75

Sessional based on the theory of course **EEE 4209**.

EEE 4217 Mobile Cellular Communication

Contact hours/week: 3

Credits: 3

Introduction: Concept, evolution and fundamentals, analog and digital cellular systems.

Cellular Radio System: Frequency reuse, co-channel interference, cell splitting and components

Mobile Radio Propagation: Propagation characteristics, models for radio propagation, antenna at cell site and mobile antenna.

Frequency Management and Channel Assignment: Fundamentals, spectrum utilization, fundamentals of channel assignment, traffic and channel assignment.

Handoffs and Dropped Calls: Reasons and types, forced handoffs, mobile assisted handoffs and dropped call rate.

Diversity Techniques: Concept of diversity branch and signal paths, diversity types, Alamouti space-time block coding; carrier to noise and carrier to interference ratio performance.

Digital Cellular Systems: Global system for mobile, OFDM. GSM, AMPS, GPRS, EDGE, W-CDMA, generations of mobile communication, Packet switching and data communication

2. Elective Courses offered by the Department of EEE

2.1 Power Group

EEE 4141

Power System II

Contact hours/week: 3

Credits: 3

Design and constructional features of overhead power transmission lines and underground cables. DC and AC power distribution. Stability: Swing equation, power angle equation, equal area criterion, multi-machine system, step-by-step solution of swing equation, factors affecting transient stability. Flexible AC transmission system. High voltage DC transmission system. Power system harmonics.

EEE 4142

Power System II Sessional

Contact hours/week: 3/2

Credits:0.75

Sessional based on the theory of course **EEE 4142**.

EEE 4143

High Voltage Engineering

Contact hours/week: 3

Credits: 3

Ionization and decay process: Townsend's first and second ionization coefficient. Electric breakdown in gases. Townsend's criterion for spark breakdown. Sparking potential. Penning effect. Corona discharges, power loss calculation. Breakdown of solid and liquid dielectrics.

Generation of high voltage: Alternating voltage, transformer cascade. Series resonant circuit for high voltage ac testing. Test of dc and ac cable.

Transient Voltage: Impulse wave shape. Impulse voltage generator and its mathematical analysis. Design consideration of impulse generators. Triggering of impulse generators.

DC voltage doubler and cascade circuits. Electrostatic generator, voltage stabilization. Measurement of high voltage. Electrostatic voltmeter, sphere gap. Potential divider. High Voltage testing of power system equipment. Oil testing. Design consideration of transmission line based on direct stroke. High voltage transient in transmission line. High voltage lightning arrester. Insulation co-ordination.

EEE 4144**High Voltage Engineering Sessional**

Contact hours/week: 3/2

Credits:0.75

Sessional based on the theory of course **EEE 4143**.**EEE 4243****Power system Operation and Control**

Contact hours/week: 3

Credits: 3

Principles of power system operation : SCADA, convention and competitive environment. Unit commitment, static security analysis, state estimation, optimal power flow, automatic generation control and dynamic security analysis.

EEE 4241**Power system protection**

Contact hours/week: 3

Credits: 3

Philosophy of switchgear and protection. Circuit breakers, principle of arc extinction in DC and AC circuit breakers. Recovery voltage, rate of rise of recovery voltage and other transient phenomena. Switching surges. Disconnection of unloaded transformer and transmission line. Speed of circuit breaker. Construction, operation, rating and testing of bulk oil and minimum oil breaker, SF₆ circuit breaker, ABCB, ACB, and VCB. Selection of circuit breaker. Travelling wave in transmission line. Surge absorber, lightning arrester, horn gap, its rating and testing.

Protective relaying: Relay voltage rating, high, medium and low. Basic protective zone. Relaying Scheme.

Electromechanical Relays: Principal, general equation. overcurrent, balanced current, overvoltage, distance, directional, positive sequence, negative sequence and differential relays and their applications.

Static relays: Introduction to solid state device in the construction of static relays. Different type of static relays.

Generator protection. Transformer protection, Buchholz's relay. Protection of bus bar, transmission line, feeder etc. Relay testing.

EEE 4242**Power system protection Sessional**

Contact hours/week: 3/2

Credits: 0.75

Sessional based on the theory of course **EEE 4241**.**EEE 4245****Electrical Machine III**

Contact hours/week: 3

Credits:3

Special Machines: Series universal motor, permanent magnet DC motor, unipolars and bipolar brush less DC motors, stepper motor and control circuits. Reluctance and hysteresis motors with drives circuits, switched

reluctance motor, electro static motor, repulsion motor, synchros and control transformers. Permanent magnet synchronous motors.

Acyclic Machines: Generators, conduction pump and induction pump.

Magneto Hydrodynamic Generators: Fuel cells, thermoelectric generators, flywheels, vector control, linear motors and traction.

EEE 4247

Renewable Energy

Contact hours/week: 3

Credits: 3

Importance of renewable energy, sources. Statistics regarding solar radiation and wind speed. Insulation: geographical distribution, atmospheric factors, measurements. Solar cell: principle of operation, spectral response, factors affecting conversion efficiency, I-V characteristics, maximum power output. PV modules and arrays: stationary and tracking. PV systems: stand alone, battery storage, inverter interfaces with grid. Wind turbine generators: types, operational characteristics, cut-in and cut-out speed, control, grid interfacing, AC-DC-AC link. Wind and Tidal energy conversion.

2.2 Electronics Group

EEE 4161

Digital Electronics II

Contact hours/week: 3

Credits: 3

TTL: TTL NAND gate operation, current-sourcing and current-sinking action, totem pole output circuit, TTL NOR gate, standard TTL characteristics, supply voltage and temperature range, voltage levels, power dissipation, propagation delay, fan out, introduction to improved TTL series, TTL loading and fan out, other TTL characteristics, connecting TTL outputs together, open collector output, Tri-state, TTL driving CMOS, problem with TTL.

ECL: Basic ECL circuit, CL OR/NOR gate, ECL characteristics, fan out, speed of operation.

CMOS Logic Families: Introduction to the working principle of enhancement type NMOS, PMOS and depletion MOS. Comparison of NMOS and PMOS with respect to speed. Design of NOMS inverter with resistive load, with NMOS enhancement load and with NMOS depletion load. Egde time and speed calculation for NMOS inverter with depletion load. CMOS inverter: Circuit diagram, operation, transfer characteristic and noise margin. Design of basic CMOS gates (NAND gate and NOR gate) with specified parameters (rise time and fall time). Circuit implementation from logic equations. NMOS pass transistors and CMPS pass gate. Implementation of multiplexer by NMOS and CMOS pass gate. Buffer circuit. CMOS gates driving TTL gates and comparison of CMOS logics with TTL logics. Design of basic logic gates using CMOS and BiCMOS.

Interfacing Data Converters: Digital to Analog Converters (D/A):

The binary weighted resistor D/A converter. The R/2R ladder D/A converter. The inverted ladder D/A converter. Specification for D/A converters (resolution, linearity, settling time and accuracy).

Analog to Digital Converters (A/D): Flash converters, Successive approximation converter and Dual slope converter. A/D converter specifications (analog input voltage, input impedance, accuracy, conversion time etc.). A comparison of converter types. Sample and hold circuit (S/H), interconnecting the S/H circuit and the A/D converter.

EEE 4162 Digital Electronics II Sessional

Contact hours/week: 3/2

Credits: 0.75

Sessional based on the theory of course **EEE 4161**.

EEE 4263 Optoelectronics

Contact hours/week: 3

Credits: 3

Light : Nature of light, Polarization, superposition, interference, diffraction, sources, blackbody radiation.

Modulation of light : Elliptical polarization, Birefringence, quarter wave plate, optical activity, electro-optic effect, Kerr modulators, scanning and switching, magneto –optic devices, acousto-optic effect, nonlinear optics.

Display devices: Luminescence, photoluminescence, cathodoluminescent, LED materials, LED construction, response time, plasma displays, LCD, numerical display.

Lasers : Emission and absorbs ion, Einstein relation, optical feedback, laser losses, line shape function, modes, classes of laser, laser applications, distance measurements, holography.

Photo detectors : Thermal detectors, photon devices, vacuum photodiodes, Noise, Image intensifier, junction detectors, detector arrays.

Optical communication system: Fiber optic communication, integrated optics.

Noncommunication applications: Optical fiber sensors, Light guiding fiber.

EEE 4163 VLSI

Contact hours/week: 3

Credits: 3

Introduction to Microelectronics and MOS Technology, Basic Electrical Properties and Circuit Design Processes of MOS and Bi CMOS Circuits, Inverter Circuits, Sub-System Design Processes and Layout, Scaling of MOS Circuits: Scaling Models and Scaling Factors, Limitation of Scaling.

Computational Elements: Design of an ALU Sub-System, Adder, Multipliers, Memory Registers, Dynamic & Static Flip-Flops, Bus Arbitration and Aspects of System Timing. CMOS Fabrication, Practical Aspects of Design Tools and Test-Ability CMOS Design, Behavioral

Description, Structural Description, Physical Description and Design Verification. Introduction to Ga-As Technology: Ultra-Fast Circuits and Systems.

VHDL background and basic concepts, structural specifications of hardware design organization and parameterisation.

EEE 4164

VLSI Sessional

Contact hours/week: 3/2

Credits: 0.75

Sessional based on the theory of course **EEE 4163**.

EEE 4165

Processing and Fabrication Technology

Contact hours/week: 3

Credits: 3

Monolithic Fabrication Processes and Structures: Substrate materials: Crystal growth and wafer preparation. Basic MOS process, Basic Bipolar process, Photolithographic process, pattern generation, pattern transfer, mask alignment, soft and hard baking, Photomask fabrication. Thermal oxidation, oxide quality, oxide thickness characterization.

Cleaning: Surface cleaning, organic cleaning and RCA cleaning.

Diffusion: Mathematical model, constant source diffusion, limited source diffusion, two-step diffusion, sheet resistance. Diffusion systems: Boron, Phosphorous, Ion implementation.

Etching: Wet chemical etching, silicon and GaAs etching, anisotropic etching, selective etching, dry physical etching, ion beam etching, sputtering etching and reactive ion etching.

Film Deposition: Evaporation, sputtering, CVD, Epitaxy.

Isolation: p-n junction isolation, mesa isolation and oxide isolation, BJT based microcircuits, p-channel and n-channel MOSFETs, complimentary MOSFETs and silicon on insulator devices. Testing, bonding and packaging.

Interconnection, contacts, packaging and testing.

EEE 4166

Processing and Fabrication Technology Sessional

Contact hours/week: 3/2

Credits: 0.75

Sessional: Sessional based on theory of course **EEE 4165**

EEE 4261**Biomedical Engineering**

Contact hours/week: 3

Credits: 3

Medical terminology, cell physiology, membrane potential, action potential, Rhythmic excitation of heart. Transducers used in medical diagnostics.

Biomedical Instrumentation: Normal Electrocardiograph, ECG simulator, Watch filter, ECG amplifier, pulse beat monitor, pace maker, galvanic skin resistance detector, respiratory and suction apparatus. Electronic stethoscope. Electronic clinical thermometer, blood flow and pressure monitoring recorders, metabolic rate measurement.

Special topics: Bio-telemetry, application of ultrasonic and laser in biology and medicine. Clinical X- ray equipment. Fluoroscopy. Infrared heating.

EEE 4262**Biomedical Engineering Sessional**

Contact hours/week: 3/2

Credits: 0.75

Sessional based on the theory of course **EEE 4261**.

EEE 4267**Transducers and Instrumentation**

Contact hours/week: 3

Credits: 3

Introduction : Functional elements of Instrumentation system, classification, standards and calibration of different instruments, use of personal computer in instrumentation.

Static performance of Instruments : Errors and uncertainties, propagation of uncertainties, Accuracy, Precision, Resulation, Linearity etc., Impedance loading and matching, selection of instruments.

Transducer elements : Analog and digital transducer, Active and passive transducer. Construction, operating principle and characteristics of Resistive, Inductive and capacitive transducer, Strain Gauge, Light dependent transducer, LVDT, Piezoelectric, Hall effect transducer, Thermistor, Thermocouple, RTD, Proximity transducer.

Data Acquisition and display : Amplifiers, Compensators, Filters, A-D and D-A converter, Data transmission elements, Display and recording elements.

Motion measurement : Relative and absolute motion, Linear and rotational motion measurement.

Force measurement : Pneumatic and elastic force, measurement of time varying force.

Pressure measurement : High, moderate and low (Vacuum) pressure measurement.

Torque and power measurement : transmission dynamometers, non-contact dynamometers.

Temperature measurement : Measurement of ambient temperature, temperature monitoring and control, measurement of high temperature, use of RTD, Pyrometers.

Flow measurement : Linear resistance element flow meter, Ultrasonic flow meter, electromagnetic flow meter. Hot wire anemometer, Laser Doppler anemometer.

Acoustic measurement : Sound pressure and power level, Loudness, sound level meter. Microphones, Piezoelectric crystal type microphone, Electrodynamics type microphone, Carbon microphone.

Computer aided instrumentation : Example of a few open loop and closed loop control system using different transducers and personal computer.

EEE 4268 Transducers and Instrumentation Sessional

Contact hours/week: 3/2

Credits: 0.75

Sessional: Sessional based on theory of course EEE 4267

EEE 4269 Photovoltaic System

Contact hours/week: 3

Credits: 3

Introduction to Photovoltaic Systems; Solar Radiation; the PN-junction and Solar cell physics; function and performance of the components in the PV-system; batteries, power point tracker, DC-AC inverter, charge regulator; system design of stand-alone and grid connected systems; building integration of PV-systems.

Fundamentals of photo-electrochemistry, Fundamentals and applications in electron-transfer reactions, Experimental techniques in photo-electrochemistry.

Cells, Modules, and Arrays, Batteries, Charge Controllers, Inverters, System Sizing, Mechanical Integration, Electrical Integration, Design the domestic solar cell, Net metering of PV systems; Commissioning, Maintenance, and Troubleshooting;

Si-based Solar cells, extremely thin absorber (ETA) cells, Organic donor-acceptor heterojunction solar cells, Dye-sensitized mesoscopic solar cells, semiconductor/ liquid junction solar cells, Photo-electrochemical storage cells.

2.3 Communication Group

EEE 4181 Microwave Engineering

Contact hours/week: 3

Credits: 3

UHF Transmission Lines: Voltage and current in ideal transmission lines, reflection, transmission, standing wave, impedance transformation, smith

chart, impedance matching and lossy transmission lines. Microwave Components: Cavities, Slow wave structures, Waveguide Tees, Directional Couplers, Circulators and Isolators, S-parameter. Microwave tubes: Klystron amplifier, multicavity klystron amplifier, Reflex Klystron oscillator, magnetron, TWT amplifier, BWO. Semiconductor microwave devices: Tunnel diodes, Gunn-Effect diodes, IMPATT diodes. Microwave measurements.

EEE 4182 **Microwave Engineering Sessional**
Contact hours/week: 3/2 Credits: 0.75
Sessional based on the theory of course **EEE 4181**.

EEE 4183 **Digital Communication**
Contact hours/week: 3 Credits: 3

Introduction : Communication channels, mathematical model and characteristics. Probability and stochastic process. Source coding: Mathematical models of information, entropy, Huffman code and linear predictive coding. Digital transmission system: Base band digital transmission, inter-symbol interference, bandwidth, power efficiency, modulation and coding trade-off. Receiver for AWGN channels: Correlation demodulator and maximum likelihood receiver. Channel capacity and coding: Channel models and capacities and random selection of codes. Block codes and conventional codes: Linear block codes, convolution codes and coded modulation. Spread spectrum signals and system.

EEE 4184 **Digital Communication Sessional**
Contact hours/week: 3/2 Credits: 0.75
Sessional based on the theory of course **EEE 4183**.

EEE 4281 **Antennas and Propagation**
Contact hours/week: 3 Credits : 3

Fundamental of Antennas: Vector Potential Functions, Electric and Magnetic Fields for Electric and Magnetic Current Sources, Solution of Vector Potential Wave Equation.

Antenna Arrays: Two-Element Array, N-element Linear Arrays: Broad-side, End-fire, Phased, Binomial, Dolph- Tchebyschef and Super-directive Arrays, Determination of Array Factor and Patterns, Planar and Circular Arrays.

Travelling-Wave and Broad-band Antennas: Long wire, V, Rhombic and Helical Antennas, Yagi, Uda array, Frequency Independent and Log-periodic Antennas.

Optic fiber waveguide : Step index fiber, graded index fiber, attenuation, pulse distortion and information rate, construction of optic fiber, optic fiber cables.

Light sources : LED, LD, distributed feedback LD, optical amplifiers, fiber laser, vertical cavity surface emitting laser diode.

Light detectors : Photo detection, photo multiplier, semiconductor photodiode, PIN photodiode, avalanche photodiode.

Couplers and connectors : Connector principle, end preparation, splices, connectors, source coupling.

Network distribution and fiber components: Directional couplers, star couplers, switches, isolator, wave-length division multiplexing, fiber bragg grating.

Modulation: LED modulation, LD modulation, Analogue and digital modulation, modulation formats, optic heterodyne receivers.

Noise and detection : Thermal shot and noise, SNR, error rates, receiver circuit design.

System design: Analogue and digital system design, few real life problems and examples.

3. Courses from other departments

3.1 Department of Computer Science and Engineering

CSE 1111 Computer Programming

Contact hours/week: 3

Credits: 3

Introduction to digital computers. Programming languages, algorithms and flow charts. Structured programming using C: Variables and constants, operators, expressions, control statements, functions, array, pointer, structure union, user defined data types, input-output files.

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

CSE 1112 Computer Programming Sessional

Contact hours/week: 3

Credits: 1.5

Sessional based on the theory of course CSE 1111

3.2 Department of Mechanical Engineering

ME 1200 Engineering Drawing

Contact hour/week: 3

Credit : 1.5

Introduction. Orthographic projections. Pictorial views. Drawing standards and practices. Interpenetrating of surfaces. Development of surfaces.

Ordinary differential equations: Degree and order of ODE, Formation of differential equations, Solution of first order Differential equations by various methods, Solution of first order but higher degree ODE, Solution of general linear equations of second and higher order with constant coefficients, Solution of homogeneous linear equations and its applications, Solutions of Differential equations of higher order when dependent and independent variable are absent, Solution of differential equation by the method based on factorization of operators.

Partial differential equations: Lagrange's method of solving PDE of order one, Integral surfaces passing through a given curve, Non linear PDE of order one (Complete, Particular, Singular and general integrals) ; Standard forms $f(p,q)=0$, $z=px+qy+f(p,q)$, $f(p,q,z) = 0$, $f_1(x,p) = f_2(y,q)$, Charpit's method, Second order PDE; Its nomenclature and classifications to canonical (Standard) parabolic, elliptic, hyperbolic, Solution by separations of variables, Linear PDE with constants coefficients.

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

Math 2101 Engg. Mathematics III

Contact hours/week: 3

Credits: 3

Matrix: Definition of matrix, Different types of matrix, Algebra of matrix, Adjoin and inverse of a matrix, Elementary transformations of matrix, Matrix polynomials, Calay-Hamilton theory with uses of rank and nullity, Normal and canonical forms, Solution of linear equations, Eigenvalues and eigenvectors.

Vector Analysis: Review of vector algebra: Addition and subtraction of vectors, Scalar and vector product of two vectors and their geometrical interpretation, Triple products and multiple products, Linear dependents and independents of vectors. Vector Calculus: Differentiation and Integration of Vectors together with elementary applications, Definition of line, Surface and volume Integrals, Gradient, Divergence and curl of point functions, various formulae, Gauss's theorem, Stoke's theorem, Green's theorem.

Fourier Analysis: Real and complex form of Fourier series, Finite transform, Fourier Integral, Fourier transforms and their uses in solving boundary value problems of wave equations.

Laplace Transforms: Definition Laplace transforms of some elementary functions, Sufficient conditions for existence of Laplace Transforms, Inverse Laplace Transforms, Laplace Transforms of derivatives. The unit step function, Periodic function, Some special theorems on Laplace Transforms, Partial fractions, Solutions of differential equations by Laplace Transforms, Evaluation of improper integrals.

Math 2201 Engg. Mathematics IV

Contact hours/week: 3

Credits: 3

Complex variable: Complex number system, General functions of a complex variable, Limits and continuity of a function of complex variable and related theorems; Complex differentiation and the Cauchy-Riemann equations, Mapping by elementary functions, Line Integral of a complex function, Cauchy's Integral theorem, Cauchy's Integral formula, Liouville's theorem, Taylor's theorem and Laurent's theorem. Singular points, Residue, Cauchy's Residue theorem. Evaluation of residues, Contour integration, Conformal mapping.

Statistical Analysis: Frequency distribution; Mean, Median, Mode and other measures of central tendency; Standard deviation and other measures of dispersion; Moments skewness and kurtosis; Elementary probability theory and discontinuous probability distributions (Binomial, Poisson and negative binomial); Characteristics of distributions; Elementary sampling theory; Estimation; Hypothesis testing and regression analysis.

3.4 Department of Physics

Phy 1111

Physics

Contact hours/week: 3

Credits: 3

Atomic Structure: Thompsons, Rutherford and Bhor's atomic model. Atomic arrangement in solid. Different types of bonds in solid-metallic, Vander Walls and ionic bond.

Electronic structure of materials: Free electron theory, Metallic conduction. Energy bands, Brillouin zones, Temperature dependence of metallic conductivity. Semiconductors: Band theory, intrinsic and extrinsic semiconductors, Fermi levels, mobility and electrical conductivity, carrier diffusion and life time. Magnetic materials: Properties, Dia-, Para- and Ferro-magnetism. Hysteresis loop, B-H curve, Energy losses in magnetic materials and their measurements. Soft and hard magnetic materials, ferrites.

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

Photoelectricity: Laws of photoemission and Einstein's equation. Photoelectric cell and its use.

Sound: Simple harmonic motion, wave equation, Principle of superposition. Beats, Dispersion, Phase and group velocities, Doppler's effect, Free and force vibrations.

Physical Optics: Theories of light; Hyugen's principle and construction. Interference of light: Young's double slit experiment, Fresnel bi-prism, Newton's ring, interferometers. Diffraction of light: Fresnel and Fraunhofer diffraction, diffraction by single and double slit diffraction gratings.

Business and industrial law: Law of contract, elements of valid contract. Consideration, Parties competent to contract. Sale of goods, hire and purchase. Negotiable instrument.

Industrial law in Bangladesh: various ordinance payments of wages, legislation relating employment in industries, factories, shops and agriculture, trade union act.

Human resources management in business: Human factors and motivation, leadership, group decision making and communication, job gradation, process of performance appraisal and reward systems, managing information for decision and management information systems.

Marketing management: Understanding marketing management, developing marketing strategies, conducting marketing research, analyzing consumer and business market, identifying market segments and targets, dealing with competition.

Safety: Evolution of modern safety concepts, industrial hazard, safety and risk management, productivity, worker health and safety, proactive management techniques for safety management, safety standards and regulations for engineering works, fire safety, hazardous materials.

IPE 4111

Project and Operations Management

Contact hours/week: 2

Credits: 2

Project identification and selection, planning, appraisal, project implementation, project organization, budgeting, scheduling using bar diagram, CPM, PERT, resource allocation, information system and project control, project termination, matrix organization, project manager, contract negotiation and conflict resolution, evaluation of an investment project, project failure and risk control.

Production systems, product/service life cycle, forecasting models, bill of materials, material and inventory management: Inventory models, ABC analysis, coding and standardization. Aggregate planning, MPS, MRP, capacity planning, operating scheduling, facility location algorithm, facility layout techniques, work study.