SUBJECT- ANALOG ELECTRONICS AND OP-AMP **SUBJECT CODE- TH2**

SEM-4TH **BRANCH-EE**

Module No.	Topic to be covered	No. of periods required	Tentative date for completion
1	**P-N JUNCTION DIODE:**		
1.1	P-N Junction Diode	1	
1.2	Working of Diode		
1.3	V-I characteristic of PN junction Diode.	1	
1.4	DC load line		
1.5	Important terms such as Ideal Diode, Knee voltage	1	
1.6	Junctions break down. 1.6.1 Zener breakdown 1.6.2 Avalanche breakdown	1	
1.7	P-N Diode clipping Circuit	1	
1.8	P-N Diode clamping Circuit	1	
2	**SPECIAL SEMICONDUCTOR DEVICES:**		
2.1	Thermistors, Sensors & barretters	2	
2.2	Zener Diode	1	
2.3	Tunnel Diode	1	
2.4	PIN Diode	1	
3	**RECTIFIER CIRCUITS & FILTERS**		
3.1	Classification of rectifiers	2	
3.2	Analysis of half wave, full wave centre tapped and Bridge rectifiers and calculate: 3.2.1 DC output current and voltage 3.2.2 RMS output current and voltage 3.2.3 Rectifier efficiency 3.2.4 Ripple factor 3.2.5 Regulation 3.2.6 Transformer utilization factor 3.2.7 Peak inverse voltage	3	
3.3	Filters: 3.3.1 Shunt capacitor filter 3.3.2 Choke input filter 3.3.3 π filter	2	
4	**TRANSISTORS:**		
4.1	Principle of Bipolar junction transistor	1	
4.2	Different modes of operation of transistor	1	
4.3	Current components in a transistor	1	
4.4	Transistor as an amplifier	1	
4.5	Transistor circuit configuration & its characteristics 4.5.1 CB Configuration 4.5.2 CE Configuration 4.5.3 CC Configuration	3	

5	**TRANSISTOR CIRCUITS:**		
5.1	Transistor biasing	2	
5.2	Stabilization	1	
5.3	Stability factor	1	
5.4	Different method of Transistors Biasing 5.4.1 Base resistor method 5.4.2 Collector to base bias 5.4.3 Self bias or voltage divider method	3	
6	**TRANSISTOR AMPLIFIERS & OSCILLATORS:**		
6.1	Practical circuit of transistor amplifier		
6.2	DC load line and DC equivalent circuit		
6.3	AC load line and AC equivalent circuit	1	
6.4	Calculation of gain		
6.5	Phase reversa		
6.6	H-parameters of transistors	1	
6.7	Simplified H-parameters of transistors		
6.8	Generalised approximate model	1	
6.9	Analysis of CB, CE, CC amplifier using generalised approximate model	2	
6.10	Multi stage transistor amplifier 6.10.1 R.C. coupled amplifier 6.10.2 Transformer coupled amplifier	2	
6.11	Feed back in amplifier 6.11.1 General theory of feed back 6.11.2 Negative feedback circuit 6.11.3 Advantage of negative feed back	2	
6.12	Power amplifier and its classification 6.12.1 Difference between voltage amplifier and power amplifier 6.12.2 Transformer coupled class A power amplifier 6.12.3 Class A push – pull amplifier 6.12.4 Class B push – pull amplifier	2	
6.13	Oscillators 6.13.1 Types of oscillators 6.13.2 Essentials of transistor oscillator 6.13.3 Principle of operation of tuned collector, Hartley, colpitt, phase shift, wein-bridge oscillator (no mathematical derivations)	2	
7	**FIELD EFFECT TRANSISTOR:**		
7.1	Classification of FET	1	
7.2	Advantages of FET over BJT	1	
7.3	Principle of operation of BJT	1	
7.4	FET parameters (no mathematical derivation) 7.4.1 DC drain resistance 7.4.2 AC drain resistance 7.4.3 Trans-conductance	2	
7.5	Biasing of FET	2	

8	**OPERATIONAL AMPLIFIERS:**		
8.1	General circuit simple of OP-AMP and IC – CA – 741 OP AMP		
8.2	Operational amplifier stages	1	
8.3	Equivalent circuit of operational amplifier	1	
8.4	Open loop OP-AMP configuration	1	
8.5	OPAMP with fed back	1	
8.6	Inverting OP-AMP	1	
8.7	Non inverting OP-AMP	1	
8.8	Voltage follower & buffer	1	
8.9	Differential amplifier 8.9.1 Adder or summing amplifier 8.9.2 Subtractor 8.9.3 Integrator 8.9.4 Differentiator 8.9.5 Comparator	2	

SUBJECT- ENERGY CONVERSION – I **SUBJECT CODE- TH1**

SEM-4TH **BRANCH-EE**

Module No.	Topic to be covered	No. of periods required	Tentative date for completion
1	**D.C GENERATOR**		
1.1	Operating principle of generator	1	
1.2	Constructional features of DC machine	1	
1.2.1	Yoke, Pole & field winding, Armature, Commutator	1	
1.2.2	Armature winding, back pitch, Front pitch, Resultant pitch and commutator- pitch.	1	
1.2.3	Simple Lap and wave winding, Dummy coils.	1	
1.3	Different types of D.C. machines (Shunt, Series and Compound)	1	
1.4	Derivation of EMF equation of DC generators. (Solve problems)	1	
1.5	Losses and efficiency of DC generator. Condition for maximum efficiency and numerical problems.	1	
1.6	Armature reaction in D.C. machine	1	
1.7	Commutation and methods of improving commutation	1	
1.7.1	Role of inter poles and compensating winding in commutation	1	
1.8	Characteristics of D.C. Generators	1	
1.9	Application of different types of D.C. Generators.	1	
1.10	Concept of critical resistance and critical speed of DC shunt generator	1	
1.11	Conditions of Build-up of emf of DC generator	1	
1.12	Parallel operation of D.C. Generators	1	
1.13	Uses of D.C generators	1	
2	**D. C. MOTORS**		
2.1	Basic working principle of DC motor	1	
2.2	Significance of back emf in D.C. Motor	1	
2.3	Voltage equation of D.C. Motor and condition for maximum power output(simple problems)	1	
2.4	Derive torque equation (solve problems)	1	
2.5	Characteristics of shunt, series and compound motors and their application.	1	
2.6	Starting method of shunt, series and compound motors	1	
2.7	Speed control of D.C shunt motors by Flux control method. Armature voltage Control method. Solve problems	2	
2.8	Speed control of D.C. series motors by Field Flux control method, Tapped field method and series-parallel method	2	
2.9	Determination of efficiency of D.C. Machine by Brake test method(solve numerical problems)	1	
2.10	Determination of efficiency of D.C. Machine by Swinburne's Test method(solve numerical problems)	2	
2.11	Losses, efficiency and power stages of D.C. motor(solve numerical problems)	1	

2.12	Uses of D.C. motors	1	
3	**SINGLE PHASE TRANSFORMER**		
3.1	Working principle of transformer	1	
3.2	Constructional feature of Transformer. 3.2.1 Arrangement of core & winding in different types of transformer. 3.2.2 Brief ideas about transformer accessories such as conservator, tank, breather, and explosion vent etc. 3.2.3 Explain types of cooling methods	2	
3.3	State the procedures for Care and maintenance	1	
3.4	EMF equation of transformer.	1	
3.5	Ideal transformer voltage transformation ratio	1	
3.6	Operation of Transformer at no load, on load with phasor diagrams.	1	
3.7	Equivalent Resistance, Leakage Reactance and Impedance of transformer.	1	
3.8	To draw phasor diagram of transformer on load, with winding Resistance and Magnetic leakage with using upf, leading pf and lagging pf load.	2	
3.9	To explain Equivalent circuit and solve numerical problems.	1	
3.10	Approximate & exact voltage drop calculation of a Transformer	1	
3.11	Regulation of transformer	1	
3.12	Different types of losses in a Transformer. Explain Open circuit and Short Circuit test.(Solve numerical problems)	2	
3.13	Explain Efficiency, efficiency at different loads and power factors, condition for maximum efficiency (solve problems)	2	
3.14	Explain All Day Efficiency (solve problems)	1	
3.15	Determination of load corresponding to Maximum efficiency.	1	
3.16	Parallel operation of single phase transformer	1	
4	**AUTO TRANSFORMER**		
4.1	Constructional features of Auto transformer.		
4.2	Working principle of single phase Auto Transformer	1	
4.3	Comparison of Auto transformer with an two winding transformer (saving of Copper).		
4.4	Uses of Auto transformer	1	
4.5	Explain Tap changer with transformer (on load and off load condition)	1	
5	**INSTRUMENT TRANSFORMERS**		
5.1	Explain Current Transformer and Potential Transformer	2	
5.2	Define Ratio error, Phase angle error, Burden.	2	
5.3	Uses of C.T. and P.T.	1	

SUBJECT- ELECTRICAL MEASUREMENT & INSTRUMENTATION SUBJECT CODE- TH3

SEM-4TH BRANCH-EE

Module No.	Topic to be covered	No. of periods required	Tentative date for completion
1	**MEASURING INSTRUMENTS**		
1.1	Define Accuracy, precision, Errors, Resolutions Sensitivity and tolerance	1	
1.2	Classification of measuring instruments	1	
1.3	Explain Deflecting, controlling and damping arrangements in indicating type of instruments.	2	
1.4	Calibration of instruments	1	
2	**ANALOG AMMETERS AND VOLTMETERS**		
2.1	Describe Construction, principle of operation, errors, ranges merits and demerits of	1	
2.1.1	Moving iron type instruments	2	
2.1.2	Permanent Magnet Moving coil type instruments	1	
2.1.3	Dynamometer type instruments	1	
2.1.4	Rectifier type instruments	1	
2.1.5	Induction type instruments	1	
2.2	Extend the range of instruments by use of shunts and Multipliers	1	
2.3	Solve Numerical	2	
3	**WATTMETERS AND MEASUREMENT OF POWER**		
3.1	Describe Construction, principle of working of Dynamometer type wattmeter. (LPF and UPF type)	3	
3.2	The Errors in Dynamometer type wattmeter and methods of their correction.	3	
3.3	Discuss Induction type watt meters.	2	
4	**ENERGYMETERS AND MEASUREMENT OF ENERGY**		
4.1	Introduction	2	
4.2	Single Phase Induction type Energy meters – construction, working principle and their compensation & adjustments	3	
4.3	Testing of Energy Meters	3	
5	**MEASUREMENT OF SPEED, FREQUENCY AND POWER FACTOR**		
5.1	Tachometers, types and working principles	2	
5.2	Principle of operation and construction of Mechanical and Electrical resonance Type frequency meters	2	
5.3	Principle of operation and working of Dynamometer type single phase and three phase power factor meters	3	
6	**MEASUREMENT OF RESISTANCE, INDUCTANCE& CAPACITANCE**		
6.1	Classification of resistance	2	

	6.1..1. Measurement of low resistance by potentiometer method. . 6.1..2. Measurement of medium resistance by wheat Stone bridge method. 6.1..3. Measurement of high resistance by loss of charge method.		
6.2	Construction, principle of operations of Megger & Earth tester for insulation resistance and earth resistance measurement respectively	2	
6.3	Construction and principles of Multimeter. (Analog and Digital)	1	
6.4	Measurement of inductance by Maxewell's Bridge method	1	
6.5	Measurement of capacitance by Schering Bridge method	2	
7	**SENSORS AND TRANSDUCER**		
7.1	Define Transducer, sensing element or detector element and transduction elements.	1	
7.2	Classify transducer. Give examples of various class of transducer.	1	
7.3	Resistive transducer 7.3.1 Linear and angular motion potentiometer. 7.3.2 Thermistor and Resistance thermometers. 7.3.3 Wire Resistance Strain Gauges	2	
7.4	Inductive Transducer 7.4.1 Principle of linear variable differential Transformer (LVDT) 7.4.2 Uses of LVDT	2	
7.5	Capacitive Transducer. 7.5.1 General principle of capacitive transducer. 7.5.2 Variable area capacitive transducer. 7.5.3 Change in distance between plate capacitive transducer.	2	
7.6	Piezo electric Transducer and Hall Effect Transducer with their applications.	1	
8	**OSCILLOSCOPE**		
8.1	Principle of operation of Cathode Ray Tube	2	
8.2	Principle of operation of Oscilloscope (with help of block diagram).	2	
8.3	Measurement of DC Voltage & current	2	
8.4	Measurement of AC Voltage, current, phase & frequency	2	

SUBJECT- GENERATION TRANSMISSION & DISTRIBUTION SUBJECT CODE- TH4

SEM-4TH BRANCH-EE

Module No.	Topic to be covered	No. of periods required	Tentative date for completion
1	**GENERATION OF ELECTRICITY**		
1.1	Elementary idea on generation of electricity from Thermal, Hydel, Nuclear, Power station.	3	
1.2	Introduction to Solar Power Plant (Photovoltaic cells).	2	
1.3	Layout diagram of generating stations	2	
2	**TRANSMISSION OF ELECTRIC POWER**		
2.1	Layout of transmission and distribution scheme	1	
2.2	Voltage Regulation & efficiency of transmission	1	
2.3	State and explain Kelvin's law for economical size of conductor	2	
2.4	Corona and corona loss on transmission lines	1	
3	**OVER HEAD LINES**		
3.1	Types of supports, size and spacing of conductor	1	
3.2	Types of conductor materials.	1	
3.3	State types of insulator and cross arms	2	
3.4	Sag in overhead line with support at same level and different level. (approximate formula effect of wind, ice and temperature on sag)	2	
3.5	Simple problem on sag.	1	
4	**PERFORMANCE OF SHORT & MEDIUM LINES**	1	
4.1	Calculation of regulation and efficiency	3	
4.1	Calculation of regulation and efficiency	3	
5	**EHV TRANSMISSION**		
5.1	EHV AC transmission	1	
5.1.1	Reasons for adoption of EHV AC transmission	2	
5.1.2	Problems involved in EHV transmission	1	
5.2	HV DC transmission. 5.2..1. Advantages and Limitations of HVDC transmission system.	3	
6	**DISTRIBUTION SYSTEMS**		
6.1	Introduction to Distribution System	1	
6.2	Connection Schemes of Distribution System: (Radial, Ring Main and Inter connected system)	2	
6.3	DC distributions 6.3.1 Distributor fed at one End. 6.3.2 Distributor fed at both the ends. 6.3.3 Ring distributors	2	
6.4	AC distribution system 6.4.1. Method of solving AC distribution problem.	2	

	6.4.2. Three phase four wire star connected system arrangement		
7	**UNDERGROUND CABLES**		
7.1	Cable insulation and classification of cables	1	
7.2	Types of L. T. & H.T. cables with constructional features	2	
7.3	Methods of cable lying	1	
7.4	Localization of cable faults: Murray and Varley loop test for short circuit fault / Earth fault.	2	
8	**ECONOMIC ASPECTS**		
8.1	Causes of low power factor and methods of improvement of power factor in power system.	1	
8.2	Factors affecting the economics of generation: (Define and explain) 8.2.1 Load curves. 8.2.2 Demand factor. 8.2.3 Maximum demand. 8.2.4 Load factor. 8.2.5 Diversity factor. 8.2.6 Plant capacity factor.	3	
8.3	Peak load and Base load on power station.	2	
9	**TYPES OF TARIFF**		
9.1	Desirable characteristic of a tariff	1	
9.2	Explain flat rate, block rate, two part and maximum demand tariff. (Solve Problems)	2	
10	**SUBSTATION**		
10.1	Layout of LT, HT and EHT substation.	2	
10.2	Earthing of Substation, transmission and distribution lines	3	

SUBJECT- ANALOG ELECTRONICS LAB **SUBJECT CODE- Pr.2**

SEM-4TH **BRANCH-EE**

Experiment No.	Experiment to be done	No. of periods required	Tentative date for completion
1	Determine the input and output Characteristics of CE & CB transistor configuration	1	
2	Determine Drain & Transfer Characteristics of JFET	1	
3	Construct Bridge Rectifier using different filter circuit and to determine Ripple factor & analyze wave form with filter & without filter.	1	
4	Construct Bridge Rectifier using different filter and to determine Ripple factor	1	
5	Construct & test the regulator using Zener diode	1	
6	Construct different types of biasing circuit and analyze the wave form (i) Fixed bias (ii) Emitter bias (iii) Voltage divider bias	1	
7	Study the single stage CE amplifier & find Gain	1	
8	Study multi stage R-C coupled amplifier & to determine frequency- response & gain.	1	
9	Construct & Find the gain (I) Class A. Amplifier (ii) Class B. Amplifier (iii) Class C Tuned Amplifier	2	
10	Construct & test push pull amplifier & observer the wave form	1	
11	Construct & calculate the frequency of (i) Hartly Oscillator (ii) Collpit's Oscillator (iii) Wein Bridge Oscillator (iv) R-C phase shift oscillator and draw wave form & calculate the frequency	2	
12	Construct & Test Differentiator and Integrator using R-C Circuit	1	
13	Study Multivibrator (Astable, Bistable, Monstable) Circuit & Draw its Wave forms	1	

SUBJECT- ELECTRICAL DRAWING **SUBJECT CODE- Pr.4**

SEM-4TH **BRANCH-EE**

Experiment No.	Experiment to be done	No. of periods required	Tentative date for completion
1	**WIRING DIAGRAM AND CONTROL CIRCUIT**		
	1.1 3 point D. C. motor starter. 1.2 4 point D.C. motor starter.	2	
	1.3 DOL starter 1.4 Star delta starter	2	
	1.5 Auto Transformer Starter. 1.6 Rotor resistance starter	2	
2	**DRAW D.C. M/C PARTS (Dimensional Drawing)**		
	2.1. Pole with pole shoes. 2.2. Commutator	2	
	2.3. Armature	1	
	2.4. DC. armature winding (a) Simple lap winding (b) Simple wave winding.	3	
3	**DRAW 1-PHASE & 3-PHASE TRANSFORMER (Assembly Drawing)**		
	3.1 Stepped core type.	2	
	3.2 Plane shell type	2	
4	**DRAW SKETCHES OF THE FOLLOWING AS PER B.I.S AND REC SPECIFICATIONS**		
	4.1 Earthing installation	3	
	4.2 Double pole structure for LT and HT distribution lines	3	
5	**DRAW SINGLE LINE DIAGRAM OF SUBSTATION**		
	5.1 Single line diagram of 33/11kV distribution substation	2	
	5.2 Single line diagram of a 11/0.4 kV distribution substation	1	
6	**COMPUTER AIDED ELECTRICAL DRAWING USING SOFT WARE**		
	6.1 Draw Electrical symbols (take Print out)	1	
	6.2 Draw D.C. m/c parts (take print out)	1	
	6.3 Draw A. C. m/c parts (take print out)	1	
	6.4 Draw electrical layout of diagram of Electrical Installation of a building.	2	

SUBJECT- ELECTRICAL MACHINE LAB-I **SUBJECT CODE- Pr.1**

SEM-4TH **BRANCH-EE**

Experiment No.	Experiment to be done	No. of periods required	Tentative date for completion
1	Identification of different terminals of a DC machine by test lamp method and multi-meter method & to measure insulation resistance by megger.	3	
2	Dimensional and material study of various parts of a DC machine.	2	
3	Plot OCC of a DC shunt generator at constant speed and determine critical resistance from the graph	2	
4	Plot External Characteristics of a DC shunt generator at constant speed.	2	
5	Study of Three point starter, connect and run a DC shunt motor & measure the no load current	2	
6	Study of Four point starter, connect and run a DC compound motor & measure no load current.	2	
7	Control the speed of a DC shunt motor by field flux control method & armature voltage control method.	2	
8	Determine the armature current vs. speed characteristic of a DC motor	2	
9	Determine the efficiency of a DC machine by brake test method.	2	
10	Identification of terminals, determination of voltage transformation ratio of a single phase transformer.	3	
11	Perform OC Test and SC test of a single phase transformer	2	
12	Determine the voltage regulation of a single phase transformer at different loads	3	
13	Polarity test of single phase transformer and parallel operation of two single phase transformers.	3	

SUBJECT- SIMULATION PRACTICE ON MATLAB SUBJECT CODE- Pr.3

SEM-4TH BRANCH-EE

Experiment No.	Experiment to be done	No. of periods required	Tentative date for completion
1	**Introduction to MATLAB programming**		
1.1	Functions and operation using variables and arrays 1.1.1. To learn algebraic, trigonometric and exponential manipulation. 1.1.2. To learn Arithmetic, Relational and Logic operator.	2	
1.2	Matrix formation and its manipulation	1	
1.3	Vector manipulation: 1.3.1. Use of linspace to create vectors. 1.3.2. To create, add and multiply vectors. 1.3.3. Use of sin and sqrt functions with vector arguments	2	
1.4	Plotting: 1.4.1. Two dimensional Plots and sub plots 1.4.2. Label the plot and printing.	2	
1.5	Write and execute a file to plot a circle, impulse, step, ramp, sine and cosine functions	1	
2	**Introduction to SIMULINK:**		
2.1	Use of Commonly used blocks, Math operation block and Display block from SIMULINK library.	2	
2.2	Use of logical and relational operator block.	1	
2.3	Use of Sim-Power system block to use Electrical sources, elements and Power electronics devices.	1	
2.4	SIMULATION: 2.4.1. Verification of Network theorems. 2.4.2. Simulation of a half wave uncontrolled rectifier. 2.4.3. Simulation of 1-phase full bridge controlled rectifier. 2.4.4. Simulation of step-down chopper.	3	