

# GANDHI ACADEMY OF TECHNOLOGY AND ENGINEERING

## Department of Electrical Engineering

### Lesson Plan

Subject : <b>Circuit and Network Theory</b>			
Discipline: <b>Electrical Engineering</b>		Name of the Faculty: <b>Susanta Kumar Sahu</b>	
Course Code:	<b>TH-2</b>	Semester:	<b>3<sup>rd</sup></b>
Total Periods:	<b>60</b>	Examination:	<b>2022(Winter)</b>
Theory Periods:	4P/W	Class Test:	20
Maximum Marks:	<b>100</b>	End Semester Examination:	80

Week	Periods in week	Theory Topics
<b>1st</b>	1 <sup>st</sup>	MAGNETIC CIRCUITS 1 . 1 Introduction
	2 <sup>nd</sup>	1 . 2 Magnetizing force, Intensity, MMF, flux and their relations 1 . 3 Permeability, reluctance and permeance
	3 <sup>rd</sup>	1 . 4 Analogy between electric and Magnetic Circuits
	4 <sup>th</sup>	1 . 5 B-H Curve 1 . 6 Series & parallel magnetic circuit. 1 . 7 Hysteresis loop
<b>2nd</b>	1 <sup>st</sup>	COUPLED CIRCUITS: 2 . 1 Self Inductance and Mutual Inductance
	2 <sup>nd</sup>	2 . 2 Conductively coupled circuit and mutual impedance
	3 <sup>rd</sup>	2 . 3 Dot convention 2 . 4 Coefficient of coupling
	4 <sup>th</sup>	2 . 5 Series and parallel connection of coupled inductors. 2 . 6 Solve numerical problems
<b>3rd</b>	1 <sup>st</sup>	CIRCUIT ELEMENTS AND ANALYSIS: 3 . 1 Active, Passive, Unilateral & bilateral, Linear & Non linear elements
	2 <sup>nd</sup>	3 . 2 Mesh Analysis, Mesh Equations by inspection 3 . 3 Super mesh Analysis)
	3 <sup>rd</sup>	3 . 4 Nodal Analysis, Nodal Equations by inspection 3 . 5 Super node Analysis
	4 <sup>th</sup>	3 . 6 Source Transformation Technique 3 . 7 Solve numerical problems (With Independent Sources Only)
<b>4th</b>	1 <sup>st</sup>	NETWORK THEOREMS: 4.1 Star to delta and delta to star transformation
	2 <sup>nd</sup>	4.2 Super position Theorem
	3 <sup>rd</sup>	4.3 Thevenin's Theorem
	4 <sup>th</sup>	4.4 Norton's Theorem
<b>5th</b>	1 <sup>st</sup>	4.5 Maximum power Transfer Theorem
	2 <sup>nd</sup>	4.6 Solve numerical problems (With Independent Sources Only)
	3 <sup>rd</sup>	AC CIRCUIT AND RESONANCE: 5.1 A.C. through R-L, R-C
	4 <sup>th</sup>	A.C. through R-L-C Circuit
<b>6th</b>	1 <sup>st</sup>	5.2 Solution of problems of A.C. through R-L
	2 <sup>nd</sup>	Solution of problems of A.C. through R-C & R-L-C series Circuit by complex algebra method
	3 <sup>rd</sup>	Solution of problems of A.C. through R-L-C series Circuit by complex algebra method
	4 <sup>th</sup>	5.3 Solution of problems of A.C. through R-L, & R-L-C parallel & Composite Circuits

<b>7TH</b>	1 <sup>st</sup>	5.3 Solution of problems of A.C. through R,C
	2 <sup>nd</sup>	5.4 Power factor & power triangle
	3 <sup>rd</sup>	5.5 Deduce expression for active, reactive, apparent power.
	4 <sup>th</sup>	5.6 Derive the resonant frequency of series resonance and parallel resonance circuit
<b>8TH</b>	1 <sup>st</sup>	5.7 Define Bandwidth, Selectivity & Q-factor in series circuit
	2 <sup>nd</sup>	5.8 Solve numerical problems
	3 <sup>rd</sup>	POLYPHASE CIRCUIT 6.1 Concept of poly-phase system and phase sequence
	4 <sup>th</sup>	6.2 Relation between phase and line quantities in star & delta connection
<b>9TH</b>	1 <sup>st</sup>	6.3 Power equation in 3-phase balanced circuit.
	2 <sup>nd</sup>	6.4 Solve numerical problems 6.5 Measurement of 3-phase power by two wattmeter method.
	3 <sup>rd</sup>	6.6 Solve numerical problems.
	4 <sup>th</sup>	TRANSIENTS: 7.1 Steady state & transient state response.
<b>10TH</b>	1 <sup>st</sup>	7.2 Response to R-L, R-C & RLC circuit under DC condition.
	2 <sup>nd</sup>	7.3 Solve numerical problems
	3 <sup>rd</sup>	TWO-PORT NETWORK: 8.1 Open circuit impedance (z) parameters
	4 <sup>th</sup>	8.2 Short circuit admittance (y) parameters
<b>11TH</b>	1 <sup>st</sup>	8.3 Transmission (ABCD) parameters
	2 <sup>nd</sup>	8.4 Hybrid (h) parameters.
	3 <sup>rd</sup>	8.5 Inter relationships of different parameters. 8.6 T and $\pi$ representation.
	4 <sup>th</sup>	8.7 Solve numerical problems
<b>12th</b>	1 <sup>st</sup>	FILTERS: 9.1 Define filter
	2 <sup>nd</sup>	9.2 Classification of pass Band, stop Band and cut-off frequency
	3 <sup>rd</sup>	9.3 Classification of filters. 9.4 Constant – K low pass filter.
	4 <sup>th</sup>	9.5 Constant – K high pass filter. 9.6 Constant – K Band pass filter.
<b>13th</b>	1 <sup>st</sup>	9.7 Constant – K Band elimination filter.
	2 <sup>nd</sup>	9.8 Solve Numerical problems
	3 <sup>rd</sup>	Revisions

**GANDHI ACADEMY OF TECHNOLOGY AND ENGINEERING****Department of Electrical Engineering****Lesson Plan**

Subject : <b>ELECTRICAL ENGINEERING MATERIAL</b>			
Discipline: <b>Electrical Engineering</b>		Name of the Faculty: <b>Mahesh Kumar Mishra</b>	
Course Code:	<b>TH-4</b>	Semester:	<b>3<sup>rd</sup></b>
Total Periods:	<b>60</b>	Examination:	<b>2022(Winter)</b>
Theory Periods:	<b>4P/W</b>	Class Test:	<b>20</b>
Maximum Marks:	<b>100</b>	End Semester Examination:	<b>80</b>

<b>Week</b>	<b>Periods in week</b>	<b>Theory Topics</b>
<b>1st</b>	<b>1<sup>st</sup></b>	1 . 1 Introduction
	<b>2<sup>nd</sup></b>	1 . 2 Resistivity, factors affecting resistivity
	<b>3<sup>rd</sup></b>	1 . 3 Classification of conducting materials into low-resistivity and highresistivity materials
	<b>4<sup>th</sup></b>	1 . 4 Low Resistivity Materials and their Applications. (Copper, Silver,Gold, Aluminum, Steel)
<b>2nd</b>	<b>1<sup>st</sup></b>	1 . 5 Stranded conductors
	<b>2<sup>nd</sup></b>	1 . 6 Bundled conductors
	<b>3<sup>rd</sup></b>	1 . 7 Low resistivity copper alloys
	<b>4<sup>th</sup></b>	1 . 8 High Resistivity Materials and their Applications(Tungsten, Carbon,Platinum, Mercury)
<b>3rd</b>	<b>1<sup>st</sup></b>	1 . 9 Superconductivity 1 . 10 Superconducting materials
	<b>2<sup>nd</sup></b>	1 . 11 Application of superconductor materials
	<b>3<sup>rd</sup></b>	1 . 2 Resistivity, factors affecting resistivity
	<b>4<sup>th</sup></b>	1 . 3 Classification of conducting materials into low-resistivity and highresistivity materials
<b>4th</b>	<b>1<sup>st</sup></b>	1 . 4 Low Resistivity Materials and their Applications. (Copper, Silver,Gold, Aluminum, Steel)
	<b>2<sup>nd</sup></b>	1 . 5 Stranded conductors
	<b>3<sup>rd</sup></b>	2 . 1 Introduction
	<b>4<sup>th</sup></b>	2 . 2 Semiconductors
<b>5th</b>	<b>1<sup>st</sup></b>	2 . 3 Electron Energy and Energy Band Theory
	<b>2<sup>nd</sup></b>	2 . 4 Excitation of Atoms
	<b>3<sup>rd</sup></b>	2 . 5 Insulators, Semiconductors and Conductors
	<b>4<sup>th</sup></b>	2 . 6 Semiconductor Materials
<b>6th</b>	<b>1<sup>st</sup></b>	2 . 7 Covalent Bonds 2 . 8 Intrinsic Semiconductors 2 . 9 ExtrinsicSemiconductors
	<b>2<sup>nd</sup></b>	2 . 10 N-Type Materials
	<b>3<sup>rd</sup></b>	2 . 11 P-Type Materials
	<b>4<sup>th</sup></b>	2 . 12 Minority and Majority Carriers

<b>7TH</b>	<b>1<sup>st</sup></b>	2 . 13 Semi-Conductor Materials
	<b>2<sup>nd</sup></b>	2 . 14 Applications of Semiconductor materials
	<b>3<sup>rd</sup></b>	2.14.1 Rectifiers 2.14.2 Temperature-sensitive resistors or thermistors
	<b>4<sup>th</sup></b>	2.14.3 Photovoltaic cells
<b>8TH</b>	<b>1<sup>st</sup></b>	2.14.4 Varistors
	<b>2<sup>nd</sup></b>	2.14.5 Transistors 2.14.6 Hall effect generators 2.14.7 Solar power
	<b>3<sup>rd</sup></b>	3 . 1 Introduction
	<b>4<sup>th</sup></b>	3 . 2 General properties of Insulating Materials
<b>9TH</b>	<b>1<sup>st</sup></b>	3.2.1 Electrical properties 3.2.2 Visual properties
	<b>2<sup>nd</sup></b>	3.2.3 Mechanical properties
	<b>3<sup>rd</sup></b>	3.2.4 Thermal properties 3.2.5 Chemical properties
	<b>4<sup>th</sup></b>	3.2.6 Ageing 3.3 Insulating Materials – Classification, properties, applications
<b>10TH</b>	<b>1<sup>st</sup></b>	3.3.1 Introduction
	<b>2<sup>nd</sup></b>	3.3.2 Classification of insulating materials on the basis physical and chemical structure
	<b>3<sup>rd</sup></b>	3.4 Insulating Gases
	<b>4<sup>th</sup></b>	3.4.1 Commonly used insulating gases
<b>11TH</b>	<b>1<sup>st</sup></b>	4.1 Introduction.
	<b>2<sup>nd</sup></b>	4.2 Dielectric Constant of Permittivity
	<b>3<sup>rd</sup></b>	4.3 Polarization
	<b>4<sup>th</sup></b>	4.4 Dielectric Loss 4.5 Electric Conductivity of Dielectrics and their Break Down 4.6 Properties of Dielectrics. 4.7 Applications of Dielectrics
<b>12th</b>	<b>1<sup>st</sup></b>	5.1 Introduction
	<b>2<sup>nd</sup></b>	5.2 Classification 5.2.1 Diamagnetism 5.2.2 Para magnetism 5.2.3 Ferromagnetism
	<b>3<sup>rd</sup></b>	5.3 Magnetization Curve
	<b>4<sup>th</sup></b>	5.4 Hysteresis 5.5 Eddy Currents
<b>13th</b>	<b>1<sup>st</sup></b>	5.6 Curie Point
	<b>2<sup>nd</sup></b>	5.7 Magneto-striction
	<b>3<sup>rd</sup></b>	5.8 Soft and Hard magnetic Materials
	<b>4<sup>th</sup></b>	5.8.1 Soft magnetic materials 5.8.2 Hard magnetic materials
<b>14th</b>	<b>1<sup>st</sup></b>	6.1 Introduction
	<b>2<sup>nd</sup></b>	6.2 Structural Materials.
	<b>3<sup>rd</sup></b>	6.3 Protective Materials 6.3.1 Lead 6.3.2 Steel tapes, wires and strips
	<b>4<sup>th</sup></b>	6.4 Other Materials 6.4.1 Thermocouple materials 6.4.2 Bimetals 6.4.3 Soldering Materials
<b>15th</b>	<b>1<sup>st</sup></b>	6.4.4 Fuse and Fuse materials. 6.4.5 Dehydrating material

**GANDHI ACADEMY OF  
TECHNOLOGY AND ENGINEERING**  
Department of Electrical Engineering  
Lesson Plan

<b>Subject :</b> ENVIRONMENTAL STUDIES			
<b>Discipline:</b> Electrical Engineering		<b>Name of the Faculty:</b> Er Sudhir Kumar Das	
<b>Course Code:</b>	TH-5	<b>Semester:</b>	3 <sup>rd</sup>
<b>Total Periods:</b>	60	<b>Examination:</b>	2022(Winter)
<b>Theory Periods:</b>	4P/W	<b>Class Test:</b>	20
<b>Maximum Marks:</b>	100	<b>End Semester Examination:</b>	80

Week	Periods in week	Theory Topics
1 <sup>st</sup>	1 <sup>st</sup>	The Multidisciplinary nature of environmental studies: 1.1 Definition, scope and importance.
	2 <sup>nd</sup>	1.2 Need for public awareness.
	3 <sup>rd</sup>	Natural Resources: Renewable and non renewable resources: 2.1 Natural resources and associated problems.
	4 <sup>th</sup>	2.1.1. Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction mining, dams and their effects on forests and tribal people.
2 <sup>nd</sup>	1 <sup>st</sup>	2.1.2. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.
	2 <sup>nd</sup>	2.1.3. Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources.
	3 <sup>rd</sup>	2.1.4. Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity,.
	4 <sup>th</sup>	2.1.5. Energy Resources: Growing energy need, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
3 <sup>rd</sup>	1 <sup>st</sup>	2.1.6. Land Resources: Land source, land degradation, man induces landslides, soil erosion, and desertification.
	2 <sup>nd</sup>	2.2 Role of individual in conservation of natural resources.
	3 <sup>rd</sup>	2.3 Equitable use of resources for sustainable life styles.
	4 <sup>th</sup>	Systems: 3.1. Concept of an eco system.
4 <sup>th</sup>	1 <sup>st</sup>	3.2. Structure and function of an eco system.
	2 <sup>nd</sup>	3.3. Producers, consumers, decomposers.
	3 <sup>rd</sup>	3.4. Energy flow in the eco systems. 3.5. Ecological succession.
	4 <sup>th</sup>	3.6. Food chains, food webs and ecological pyramids.
	1 <sup>st</sup>	3.7. Introduction, types, characteristic features, structure and function of the

5 <sup>th</sup>		eco system
	<b>2<sup>nd</sup></b>	Biodiversity and it's Conservation: 4.1. Introduction-Definition: genetics, species and ecosystem diversity.
	<b>3<sup>rd</sup></b>	4.4. Biodiversity at global, national and local level.
	<b>4<sup>th</sup></b>	4.5. Threats to biodiversity: Habitats loss, poaching of wild life, man wildlife conflicts
6 <sup>th</sup>	<b>1<sup>st</sup></b>	Environmental Pollution:
	<b>2<sup>nd</sup></b>	5.1. Definition Causes, effects and control measures of: 5.1.1 Air pollution.
	<b>3<sup>rd</sup></b>	5.1.2 Water pollution
	<b>4<sup>th</sup></b>	5.1.3 Soil pollution
7 <sup>th</sup>	<b>1<sup>st</sup></b>	5.1.4 Marine pollution
	<b>2<sup>nd</sup></b>	5.1.5 Noise pollution.
	<b>3<sup>rd</sup></b>	5.1.6 Thermal pollution
	<b>4<sup>th</sup></b>	5.1.7 Nuclear hazards
8 <sup>th</sup>	<b>1<sup>st</sup></b>	5.2. Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
	<b>2<sup>nd</sup></b>	5.3. Role of an individual in prevention of pollution.
	<b>3<sup>rd</sup></b>	5.4. Disaster management: Floods, earth quake, cyclone and landslides.
	<b>4<sup>th</sup></b>	Social issues and the Environment: 6.1. Form unsustainable to sustainable development.
9 <sup>th</sup>	<b>1<sup>st</sup></b>	6.2. Urban problems related to energy.
	<b>2<sup>nd</sup></b>	6.3. Water conservation, rain water harvesting, water shed management.
	<b>3<sup>rd</sup></b>	6.4. Resettlement and rehabilitation of people; its problems and concern
	<b>4<sup>th</sup></b>	6.5. Environmental ethics: issue and possible solutions
10 <sup>th</sup>	<b>1<sup>st</sup></b>	Forest ecosystem
	<b>2<sup>nd</sup></b>	Aquatic eco systems (ponds, streams, lakes, rivers, oceans estuaries).
	<b>3<sup>rd</sup></b>	6.6. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.
	<b>4<sup>th</sup></b>	6.7. Air (prevention and control of pollution) Act.
	<b>1<sup>st</sup></b>	6.8. Water (prevention and control of pollution) Act.

11th	<b>2nd</b>	6.9. Public awareness.
	<b>3rd</b>	Human population and the environment: 7.1. Population growth and variation among nations.
	<b>4th</b>	7.2. Population explosion- family welfare program.
12th	<b>1st</b>	7.3. Environment and human health.
	<b>2nd</b>	7.4. Human rights. 7.5. Value education
	<b>3rd</b>	7.6. Role of information technology in environment and human health
	<b>4th</b>	Revisions

# GANDHI ACADEMY OF TECHNOLOGY AND ENGINEERING

## LESSON PLAN

### Session- 2022-2023

<b>Discipline:</b> Electrical Engineering.	<b>Semester:</b> 4 <sup>th</sup>	<b>Name of the Teaching Faculty:</b> Soumya Shyamali Mahapatra
<b>Subject:</b> Energy Conversion-1, Theory-1	<b>No. Of Days/Week:</b> 5	<b>End Sem :</b> 80 <b>I.A :</b> 20

Week	Class Day	Theory/Practical Topics
1st	1st	<b>DC Generator-</b> Operating principle of generator
	2nd	Constructional features of DC machine (Yoke, Pole & field winding, Armature, Commutator)
	3rd	Armature winding, back pitch, Front pitch, Resultant pitch and commutator- pitch
	4th	Simple Lap and wave winding, Dummy coils
	5 <sup>th</sup>	Review Class
2nd	1st	Different types of D.C. machines (Shunt, Series and Compound)
	2nd	Derivation of EMF equation of DC generators with problems.
	3rd	Losses and efficiency of DC generator.
	4th	Condition for maximum efficiency and numerical problems
	5 <sup>th</sup>	Review Class
3rd	1st	Armature reaction in D.C. machine
	2nd	Commutation and methods of improving commutation
	3rd	Role of inter poles and compensating winding in commutation
	4th	Characteristics of D.C. Generators
	5 <sup>th</sup>	Quiz Test
4 <sup>th</sup>	1st	Application of different types of D.C. Generators, Concept of critical resistance and critical speed of DC shunt generator
	2nd	Conditions of Build-up of emf of DC generator,
	3rd	Parallel operation of D.C. Generators,
	4th	Uses of D.C generators
	5 <sup>th</sup>	Review Class
5 <sup>th</sup>	1st	<b>DC Motor-</b> Basic working principle of DC motor, Significance of back emf in D.C. Motor



	2nd	Voltage equation of D.C. Motor and condition for maximum power output(simple problems)
	3rd	Derive torque equation (solve problems)
	4th	Characteristics of shunt, series and compound motors and their application
	5 <sup>th</sup>	Review Class
6 <sup>th</sup>	1st	Starting method of shunt, series and compound motors
	2nd	Speed control of D.C shunt motors by Flux control method. Armature voltage Control method
	3rd	Speed control of D.C. series motors by Field Flux control method, Tapped field method and series-parallel method
	4th	Determination of efficiency of D.C. Machine by Brake test method
	5 <sup>th</sup>	Quiz Test
7 <sup>th</sup>	1st	Numerical Problems
	2nd	Determination of efficiency of D.C. Machine by Swinburne's Test method
	3rd	Numerical Problems
	4th	Losses, efficiency and power stages of D.C. motor(solve numerical problems)
	5 <sup>th</sup>	Review class
8 <sup>th</sup>	1st	Uses of D.C. motors
	2nd	<b>Single Phase Transformer-</b> Working principle of transformer.
	3rd	Constructional feature of Transformer
	4th	Arrangement of core & winding in different types of transformer
	5 <sup>th</sup>	Review Class
9 <sup>th</sup>	1st	Brief ideas about transformer accessories such as conservator, tank, breather, and explosion vent etc
	2nd	Explain types of cooling methods
	3rd	State the procedures for Care and maintenance
	4th	EMF equation of transformer
	5 <sup>th</sup>	Review Class
10 <sup>th</sup>	1st	Ideal transformer voltage transformation ratio
	2nd	Operation of Transformer at no load with phasor diagram
	3rd	Operation of Transformer on load with phasor diagram
	4th	Equivalent Resistance, Leakage Reactance and Impedance of transformer.
	5 <sup>th</sup>	Review Class
11 <sup>th</sup>	1st	To draw phasor diagram of transformer on load, with winding Resistance and Magnetic leakage with using upf, leading pf and lagging pf load.
	2nd	To explain Equivalent circuit and solve numerical problems

	3rd	Approximate & exact voltage drop calculation of a Transformer
	4th	Regulation of transformer
	5 <sup>th</sup>	<i>Review Class</i>
12 <sup>th</sup>	1st	Different types of losses in a Transformer
	2nd	Review Class
	3rd	Explain Open circuit and.(Solve numerical problems)
	4th	Explain Short Circuit test .(Solve numerical problems)
	5 <sup>th</sup>	Explain Efficiency, efficiency at different loads and power factors, condition for maximum efficiency (solve problems)
13 <sup>th</sup>	1st	Explain All Day Efficiency
	2nd	Numerical Problems
	3rd	Determination of load corresponding to Maximum efficiency.
	4th	Parallel operation of single phase transformer
	5 <sup>th</sup>	Review Class
14 <sup>th</sup>	1st	<b>Autotransformer-</b> Constructional features of Auto transformer
	2nd	Working principle of single phase Auto Transformer.
	3rd	Comparison of Auto transformer with a two winding transformer (saving of Copper).
	4th	Uses of Auto transformer
	5 <sup>th</sup>	Review Class
15 <sup>th</sup>	1st	Explain Tap changer with transformer (on load and off load condition)
	2nd	<b>Instrument Transformers-</b> Explain Current Transformer and Potential Transformer
	3rd	Define Ratio error, Phase angle error, Burden
	4th	Uses of C.T. and P.T
	5 <sup>th</sup>	<i>Review Class</i>

# GANDHI ACADEMY OF TECHNOLOGY AND ENGINEERING

## LESSON PLAN

Session (2022-2023)

<b>Discipline: Electrical Engg.</b>	<b>Semester: 4th, Summer/2022</b>	<b>Name of the Teaching Faculty:</b> Mahesh Kumar Mishra (Lecturer)
<b>Subject: Electrical Measurement &amp; Instrumentation (Theory-3)</b>	<b>No. of Days/Week: 05</b>	Total mark-100 Class Test:20 End Semester Examination:80

Week	Class Day	Theory Topics
1st	1st	Define Accuracy, Precision, Errors, Resolution, Sensitivity, Tolerance.
	2nd	Classifications of measuring Instruments, Deflecting arrangements of indicating types of instruments
	3rd	Controlling arrangements of indicating type of instruments, Spring control, Gravity control
	4th	Damping arrangements of indicating type of instruments
	5th	Calibration of instruments
2nd	1st	Construction and principle of operation of PMMC instruments
	2nd	Construction and principle of operation of PMMC instruments
	3rd	Construction and principle of operation of MI type instruments (Attraction type)
	4th	Construction and principle of operation of MI type instruments (Repulsion type)
	5th	Rectifier type Instruments
3rd	1st	<i>Doubt Clearing class</i>
	2nd	Dynamo meter type watt meter, errors and correction.
	3rd	<i>Assignment Evaluation &amp; Class Test</i>
	4th	Principles of Dynamo meter type of instruments
	5th	Dynamo meter type watt meter
4th	1st	Dynamo meter type watt meter, errors and correction
	2nd	Dynamo meter type watt meter, errors and correction
	3rd	<i>Doubt Clearing class</i>
	4th	<i>Assignment Evaluation &amp; Class Test</i>
	5th	<i>QUIZ Test-1</i>
5th	1st	Principles of Induction type of instrument
	2nd	Induction type watt meter
	3rd	Induction type watt meter errors and correction
	4th	LPF type Watt meter/UPF type watt meter
	5th	Induction type watt meter

6th	1st	Errors & compensation
	2nd	Extension of range of instruments by shunts
		Extension of range of instruments by multipliers
	3rd	Construction and principle of operation of Energy meter.
	4th	Errors of energy meter,compension,adjustments
	5th	Testing of energy meter.
7th	1st	Testing of energy meter.
	2nd	Electrical Resonance type frequency meter
	3rd	Single phase power factor meter
	4th	Three phase power factor meter
	5th	Mechanical Resonance type frequency meter
8th	1st	<i>Assignment Evaluation &amp; Class Test</i>
	2nd	Electrical Resonance type frequency meter
	3rd	Single phase power factor meter
	4th	Three phase power factor meter
	5th	Classification of resistance, Different methods used for measurement of resistance.
9th	1st	<i>QUIZ Test-2</i>
	2nd	Measurement of low resistance by potentiometer method.
	3rd	Loss of charge method
	4th	Construction and working principles of Megger
	5th	Construction and working principles of Earth tester
10th	1st	Measurement of inductance by Maxwell's bridge method.
	2nd	Measurement of inductance by Anderson bridge method
	3rd	Measurement of inductance by Owens bridge method.
	4th	Measurement of capacitance by Shearing bridge method
	5th	Measurement of capacitance by Shearing bridge method
11th	1st	Define Transducer, sensing element, transduction element
	2nd	classification of Transducer,
	3rd	Resistive transducer, linear potentiometer
	4th	Angular potentiometer
	5th	Resistance thermometer
12th	1st	Thermistor
	2nd	Linear variable differential Transformer
	3rd	General principle of Capacitive Transducer.
	4th	<i>Assignment Evaluation &amp; Class Test</i>
	5th	Variable area capacitive Transducer

13th	1st	Wire resistance strain gauge
	2nd	Piezo electric Transducer
	3rd	Hall Effect Transducer.
	4th	<i>Assignment Evaluation &amp; Class Test</i>
	5th	Principle of operation of CRT
14th	1st	Principle of CRO
	2nd	Measurement of DC voltage
	3rd	Measurement of DC current
	4th	Measurement of A.C voltage and current
	5th	Measurement of AC voltage, current and frequency.
15th	1st	Assignment Evaluation & Class Test
	2nd	Discussion of Previous year questions
	3rd	Discussion of Previous year questions
	4th	Discussion of Previous year questions
	5th	Discussion of Previous year questions

# GANDHI ACADEMY OF TECHNOLOGY AND ENGINEERING

## LESSON PLAN Session (2022-2023)

<b>Discipline:</b> Electrical	<b>Semester:</b> 4 <sup>th</sup> 2022-2023	<b>Name of the Faculty:</b> Susanta Kumar Sahu  <b>Email ID:</b> susantakumarsahu00@gmail.com
<b>Subject:</b> Generation, Transmission & Distribution (Theory-4)	<b>No. of Days/week</b> : 04	<b>End Sem: 80</b> <b>IA:20</b>

Week	Class Day	Theory Topics
1st	1st	<b>GENERATION OF ELECTRICITY</b> Elementary idea on generation of electricity from Thermal, Hydel power station.
	2nd	Introduction to Nuclear Power station.
	3rd	Introduction to Solar Power Plant (Photovoltaic cells)
	4th	Layout diagram of generating stations.
2nd	1st	Draw layout of transmission and distribution scheme.
	2nd	<b>TRANSMISSION OF ELECTRIC POWER</b> Voltage Regulation & efficiency of transmission.
	3rd	Corona and Corona loss on transmission lines.
	4th	<b>OVER HEAD LINES</b> Kelvin's law for economical size of conductor
3rd	1st	State types of supports, size and spacing of conductor.
	2nd	Types of conductor materials
	3rd	State types of insulator and cross arms.

	4th	Derive for sag in overhead line with support at same level.
4th	1st	Derive for sag in overhead line with support at different level.
	2nd	Approximate formula effect of wind, ice and temperature on sag simple problem.
	3rd	Problems on sag with support at different level.
	4th	Problems on sag on taking the effect of wind, ice and temperature.
5th	1st	<b>PERFORMANCE OF SHORT &amp; MEDIUM LINES</b> Calculation of regulation and efficiency of short transmission line.
	2nd	Calculation of regulation and efficiency of medium transmission line by nominal T-method
	3rd	Calculation of regulation and efficiency of medium transmission line by nominal pie-method, Problems on Nominal-T & Nominal- $\pi$ method.
	4th	Quiz Test-2
6th	1st	<b>EHV TRANSMISSION</b> Explain EHV AC transmission. Explain HVDC transmission.
	2nd	Reasons for adoption of EHV AC transmission
	3rd	Problems involved in EHV transmission.
	4th	Advantages and Limitations of HVDC transmission system
7th	1st	<b>DISTRIBUTION SYSTEMS</b> Introduction to Distribution System.
	2nd	Connection Schemes of Distribution System (Radial, Ring Main)
	3rd	Connection Schemes of Inter connected system Distribution System
	4th	DC Distributor- Distributor fed at one end & problems
8th	1st	DC Distributor- Distributor fed at both end & problems
	2nd	Ring Distributors & Problems.
	3rd	Method of solving AC distribution & problems

	4th	Three phase -four wire star connected system arrangement.
9th	1st	Numerical problem on D.C distributor
	2nd	<b>UNDERGROUND CABLES</b> Cable insulation and classification of cables
	3rd	Types of L. T. & H.T. cables with constructional feature.
	4th	Explain Methods of cable lying
10th	1st	Localization of cable faults – Murray loop test for short circuit fault
	2nd	Localization of cable faults – Murray loop test for Earth fault.
	3rd	<b>ECONOMIC ASPECTS</b> Causes of low power factor
	4th	Methods of improvement of power factor
11th	1st	Factors affecting the economics of generation: (Define and explain) Load curves, Demand factor, Maximum demand, Load factor.
	2nd	Diversity factor, Plant capacity factor.
	3rd	Numerical problems on different factors
	4th	Numerical problems on different factors.
12th	1st	Peak load and Base load on power station.
	2nd	<b>TYPES OF TARIFF</b> Desirable characteristic of a tariff.
	3rd	flat rate and two part tariff
	4th	block rate tariff with problems
13th	1st	Numerical problem on tariff
	2nd	Numerical problem on tariff
	3rd	<b>SUBSTATION</b> Layout of LT substation.
	4th	Layout of HT substation.
14th	1st	Layout of EHT substation.
	2nd	Earthling of Substation, transmission and distribution lines
	3rd	Review Class
	4th	Quiz Test-2



15th	1st	Expected Questions Discussion & Practice Test 1
	2nd	Expected Questions Discussion & Practice Test 2
	3rd	Expected Questions Discussion & Practice Test 3
	4th	Expected Questions Discussion & Practice Test 4

**GANDHI ACADEMY OF TECHNOLOGY AND ENGINEERING**  
**Department of Electrical Engineering**  
Lesson Plan

Subject : <b>ENERGY CONVERSION-II</b>			
Discipline: <b>Electrical Engineering</b>		Name of the Faculty: <b>Er. Mahesh Kumar Mishra</b>	
Course Code:	<b>TH-2</b>	Semester:	<b>5<sup>th</sup></b>
Total Periods:	<b>60</b>	Examination:	<b>2022(Winter)</b>
Theory Periods:	<b>4P/W</b>	Class Test:	<b>20</b>
Maximum Marks:	<b>100</b>	End Semester Examination:	<b>80</b>

Week	Periods in week	Theory Topics
1st	1 <sup>st</sup>	<b>ALTERNATOR:</b> Types of alternator and their constructional features.
	2 <sup>nd</sup>	Basic working principle of alternator and the relation between speed and frequency
	3 <sup>rd</sup>	Terminology in armature winding and expressions for winding factors (Pitch factor, Distribution factor).
	4 <sup>th</sup>	Explain harmonics, its causes and impact on winding factor.
2nd	1 <sup>st</sup>	E.M.F equation of alternator. (Solve numerical problems).
	2 <sup>nd</sup>	Explain Armature reaction and its effect on emf at different power factor of load.
	3 <sup>rd</sup>	Explain Armature reaction and its effect on emf at different power factor of load.
	4 <sup>th</sup>	The vector diagram of loaded alternator. (Solve numerical problems)
3rd	1 <sup>st</sup>	Testing of alternator (Solve numerical problems) Open circuit test.
	2 <sup>nd</sup>	Short circuit test
	3 <sup>rd</sup>	Determination of voltage regulation of Alternator by direct loading and synchronous impedance method. (Solve numerical problems)
	4 <sup>th</sup>	(Solve numerical problems)
4th	1 <sup>st</sup>	Parallel operation of alternator using synchro-scope and dark & bright lamp method.
	2 <sup>nd</sup>	Explain distribution of load by parallel connected alternators
	3 <sup>rd</sup>	<b>SYNCHRONOUS MOTOR:</b> Constructional feature of Synchronous Motor.
	4 <sup>th</sup>	Principles of operation, concept of load angle Derive torque, power developed.
5th	1 <sup>st</sup>	Effect of varying load with constant excitation.
	2 <sup>nd</sup>	Effect of varying excitation with constant load.
	3 <sup>rd</sup>	Power angle characteristics of cylindrical rotor motor.
	4 <sup>th</sup>	Explain effect of excitation on Armature current and power factor.
6th	1 <sup>st</sup>	Hunting in Synchronous Motor. Function of Damper Bars in synchronous motor and generator.
	2 <sup>nd</sup>	Describe method of starting of Synchronous motor. State application of synchronous motor.
	3 <sup>rd</sup>	<b>COMMUTATOR MOTORS:</b> Construction, working principle,
	4 <sup>th</sup>	Running characteristic and application of single phase series motor.

<b>7th</b>	<b>1st</b>	Construction, working principle and application of Universal motors.
	<b>2nd</b>	Working principle of Repulsion start Motor,
	<b>3rd</b>	Repulsion start Induction run motor,
	<b>4th</b>	Repulsion Induction motor.
<b>8th</b>	<b>1st</b>	SPECIAL ELECTRICAL MACHINE: Principle of Stepper motor.
	<b>2nd</b>	Classification of Stepper motor.
	<b>3rd</b>	Principle of variable reluctant stepper motor
	<b>4th</b>	Principle of Permanent magnet stepper motor
<b>9th</b>	<b>1st</b>	Principle of hybrid stepper motor. Applications of Stepper motor.
	<b>2nd</b>	<b>THREE PHASE TRANSFORMERS:</b> Explain Grouping of winding, Advantages.
	<b>3rd</b>	Explain parallel operation of the three phase transformers.
	<b>4th</b>	Explain changer (On/Off load tap changing) tap
<b>10th</b>	<b>1st</b>	Explain changer (On/Off load tap changing) tap
	<b>2nd</b>	Maintenance Schedule of Power Transformers
	<b>3rd</b>	SINGLE PHASE INDUCTION MOTOR Explain Ferrari's principle
	<b>4th</b>	Explain double revolving field theory and Cross-field theory to analyze starting torque of 1-phase induction motor.
<b>11th</b>	<b>1st</b>	Explain Working principle, Torque speed characteristics, performance characteristics and application of following single phase motors. Split phase motor.
	<b>2nd</b>	Capacitor Start motor.
	<b>3rd</b>	Capacitor start, capacitor run motor.
	<b>4th</b>	Permanent capacitor type motor.
<b>12th</b>	<b>1st</b>	Shaded pole motor
	<b>2nd</b>	Explain the method to change the direction of rotation of above motors.
	<b>3rd</b>	<b>THREE PHASE INDUCTION MOTOR:</b> Production of rotating magnetic field.
	<b>4th</b>	Constructional feature of Squirrel cage and Slip ring induction motors.
<b>13th</b>	<b>1st</b>	Working principles of operation of 3-phase Induction motor.
	<b>2nd</b>	Define slip speed, slip and establish the relation of slip with rotor quantities.
	<b>3rd</b>	Derive expression for torque during starting and running conditions and derive conditions for maximum torque. (solve numerical problems)
	<b>4th</b>	Torque-slip characteristics.
<b>14th</b>	<b>1st</b>	Derive relation between full load torque and starting torque etc. (solve numerical problems)
	<b>2nd</b>	Establish the relations between Rotor Copper loss, Rotor output and Gross Torque and relationship of slip with rotor copper loss.
	<b>3rd</b>	solve numerical problems
	<b>4th</b>	Methods of starting and different types of starters used for three phase Induction motor
<b>15th</b>	<b>1st</b>	Explain speed control by Voltage Control, Rotor resistance control, Pole changing, frequency control methods.
	<b>2nd</b>	Plugging as applicable to three phase induction motor.
	<b>3rd</b>	Describe different types of motor enclosures.
	<b>4th</b>	Explain principle of Induction Generator and state its applications.

# GANDHI ACADEMY OF TECHNOLOGY AND ENGINEERING

## Department of Electrical Engineering

### Lesson Plan

<b>Subject : POWER ELECTRONICS AND PLC</b>			
<b>Discipline: Electrical Engineering</b>		<b>Name of the Faculty: Soumya Shyamalai Mahapatra</b>	
<b>Course Code:</b>	<b>TH-5</b>	<b>Semester:</b>	<b>5<sup>TH</sup></b>
<b>Total Periods:</b>	<b>60</b>	<b>Examination:</b>	<b>2022(Winter)</b>
<b>Theory Periods:</b>	<b>4P/W</b>	<b>Class Test:</b>	<b>20</b>
<b>Maximum Marks:</b>	<b>100</b>	<b>End Semester Examination:</b>	<b>80</b>

Week	Periods in week	Theory Topics
<b>1<sup>st</sup></b>	1 <sup>st</sup>	1.1 Construction, Operation, V-I characteristics & application of power diode, SCR, DIAC, TRIAC, Power MOSFET, GTO & IGBT
	2 <sup>nd</sup>	1.2 Two transistor analogy of SCR.
	3 <sup>rd</sup>	1.3 Gate characteristics of SCR.
	4 <sup>th</sup>	1.4 Switching characteristic of SCR during turn on and turn off.
<b>2<sup>nd</sup></b>	1 <sup>st</sup>	1.5 Turn on methods of SCR.
	2 <sup>nd</sup>	1.6 Turn off methods of SCR (Line commutation and Forced commutation) 1.6.1 Load Commutation 1.6.2 Resonant pulse commutation
	3 <sup>rd</sup>	1.7 Voltage and Current ratings of SCR.
	4 <sup>th</sup>	1.8 Protection of SCR 1.8.1 Over voltage protection 1.8.2 Over current protection 1.8.3 Gate protection
<b>3<sup>rd</sup></b>	1 <sup>st</sup>	1.9 Firing Circuits 1.9.1 General layout diagram of firing circuit 1.9.2 R firing circuits 1.9.3 R-C firing circuit 1.9.4 UJT pulse trigger circuit 1.9.5 Synchronous triggering (Ramp Triggering )
	2 <sup>nd</sup>	1.10 Design of Snubber Circuits
	3 <sup>rd</sup>	2.1 Controlled rectifiers Techniques(Phase Angle, Extinction Angle control), Single quadrant semi converter, two quadrant full converter and dual Converter.
	4 <sup>th</sup>	2.2 Working of single-phase half wave controlled converter with Resistive and R-L loads
<b>4<sup>th</sup></b>	1 <sup>st</sup>	. 2.3 Understand need of freewheeling diode
	2 <sup>nd</sup>	. 2.4 Working of single phase fully controlled converter with resistive and R- L loads
	3 <sup>rd</sup>	2.5 Working of three-phase half wave controlled converter with Resistive load
	4 <sup>th</sup>	2.6 Working of three phase fully controlled converter with resistive load.
<b>5<sup>th</sup></b>	1 <sup>st</sup>	. 2.7 Working of single phase AC regulator. 2.8 Working principle of step up & step down chopper
	2 <sup>nd</sup>	2. 2.10 Operation of chopper in all four quadrants 9 Control modes of chopper
	3 <sup>rd</sup>	3.1 Classify inverters.
	4 <sup>th</sup>	3.2 Explain the working of series inverter. 3.3 Explain the working of parallel inverter
<b>6<sup>th</sup></b>	1 <sup>st</sup>	3.4 Explain the working of single-phase bridge inverter. V- Semester Electrical
	2 <sup>nd</sup>	3.5 Explain the basic principle of Cyclo-converter
	3 <sup>rd</sup>	3.6 Explain the working of single-phase step up & step down Cyclo-converter
	4 <sup>th</sup>	... 3.7 Applications of Cyclo-converter

<b>7TH</b>	1 <sup>st</sup>	4.1 List applications of power electronic circuits.
	2 <sup>nd</sup>	4.2 List the factors affecting the speed of DC Motors.
	3 <sup>rd</sup>	4.3 Speed control for DC Shunt motor using converter.
	4 <sup>th</sup>	4.4 Speed control for DC Shunt motor using chopper.
<b>8TH</b>	1 <sup>st</sup>	4.5 List the factors affecting speed of the AC Motors.
	2 <sup>nd</sup>	4.6 Speed control of Induction Motor by using AC voltage regulator.
	3 <sup>rd</sup>	4.7 Speed control of induction motor by using converters and inverters (V/F control).
	4 <sup>th</sup>	4.8 Working of UPS with block diagram.
<b>9TH</b>	1 <sup>st</sup>	4.9 Battery charger circuit using SCR with the help of a diagram.
	2 <sup>nd</sup>	4.10 Basic Switched mode power supply (SMPS) - explain its working & applications
	3 <sup>rd</sup>	5.1 Introduction of Programmable Logic Controller(PLC)
	4 <sup>th</sup>	5.2 Advantages of PLC
<b>10TH</b>	1 <sup>st</sup>	5.3 Different parts of PLC by drawing the Block diagram and purpose of each part of PLC.
	2 <sup>nd</sup>	5.4 Applications of PLC
	3 <sup>rd</sup>	5.5 Ladder diagram.
	4 <sup>th</sup>	5.6 Description of contacts and coils in the following states i) Normally open ii) Normally closed iii) Energized output iv) latched Output v) branching
<b>11TH</b>	1 <sup>st</sup>	5.7 Ladder diagrams for i) AND gate ii) OR gate and iii) NOT gate.
	2 <sup>nd</sup>	5.8 Ladder diagrams for combination circuits using NAND, NOR, AND, OR and NOT
	3 <sup>rd</sup>	5.9 Timers-i) T ON ii) T OFF and iii) Retentive timer
	4 <sup>th</sup>	5.10 Counters-CTU, CTD
<b>12TH</b>	1 <sup>st</sup>	5.11 Ladder diagrams using Timers and counters
	2 <sup>nd</sup>	5.12 PLC Instruction set
	3 <sup>rd</sup>	5.13 Ladder diagrams for following (i) DOL starter and STAR-DELTA starter (ii) Stair case lighting (iii) Traffic light Control (iv) Temperature Controller
	4 <sup>th</sup>	5.14 Special control systems- Basics DCS & SCADA systems
<b>13TH</b>	1 <sup>st</sup>	5.15 Computer Control–Data Acquisition, Direct Digital Control System (Basics only)
	2 <sup>nd</sup>	Revisions
	3 <sup>rd</sup>	Revisions
	4 <sup>th</sup>	Revisions



# GANDHI ACADEMY OF TECHNOLOGY AND ENGINEERING

## Department of Electrical Engineering

### Lesson Plan

<b>Subject : POWER ELECTRONICS AND PLC</b>			
<b>Discipline: E&amp;TC Engg.</b>		<b>Name of the Faculty: Soumya Shyamalai Mahapatra</b>	
<b>Course Code:</b>	<b>TH-5</b>	<b>Semester:</b>	<b>5<sup>TH</sup></b>
<b>Total Periods:</b>	<b>60</b>	<b>Examination:</b>	<b>2022(Winter)</b>
<b>Theory Periods:</b>	<b>4P/W</b>	<b>Class Test:</b>	<b>20</b>
<b>Maximum Marks:</b>	<b>100</b>	<b>End Semester Examination:</b>	<b>80</b>

Week	Periods in week	Theory Topics
<b>1<sup>st</sup></b>	1 <sup>st</sup>	1.1 Construction, Operation, V-I characteristics & application of power diode, SCR, DIAC, TRIAC, Power MOSFET, GTO & IGBT
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	4 <sup>th</sup>	2.2 Working of single-phase half wave controlled converter with Resistive and R-L loads
<b>4<sup>th</sup></b>	1 <sup>st</sup>	. 2.3 Understand need of freewheeling diode
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	4 <sup>th</sup>	2.6 Working of three phase fully controlled converter with resistive load.
<b>5<sup>th</sup></b>	1 <sup>st</sup>	. 2.7 Working of single phase AC regulator. 2.8 Working principle of step up & step down chopper
	2 <sup>nd</sup>	2. 2.10 Operation of chopper in all four quadrants 9 Control modes of chopper
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	4 <sup>th</sup>	3.2 Explain the working of series inverter. 3.3 Explain the working of parallel inverter
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	4 <sup>th</sup>	5.6 Description of contacts and coils in the following states i) Normally open ii) Normally closed iii) Energized output iv) latched Output v) branching
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	2 <sup>nd</sup>	5.8 Ladder diagrams for combination circuits using NAND, NOR, AND, OR and NOT
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	4 <sup>th</sup>	Revisions



**GANDHI ACADEMY OF TECHNOLOGY AND ENGINEERING****Department of Electrical Engineering****Lesson Plan**

Subject : <b>UTILISATION OF ELECTRICAL ENERGY AND TRACTION</b>			
Discipline: <b>Electrical Engineering</b>		Name of the Faculty: <b>Susanta Kumar Sahu</b>	
Course Code:	<b>TH-4</b>	Semester:	<b>5<sup>TH</sup></b>
Total Periods:	<b>60</b>	Examination:	<b>2022(Winter)</b>
Theory Periods:	<b>4P/W</b>	Class Test:	<b>20</b>
Maximum Marks:	<b>100</b>	End Semester Examination:	<b>80</b>

<b>Week</b>	<b>Class Day</b>	<b>Theory Topics</b>
<b>1st</b>	1 <sup>st</sup>	ELECTROLYTIC PROCESS: Definition and Basic principle of Electro Deposition.
	2 <sup>nd</sup>	Important terms regarding electrolysis. Faradays Laws of Electrolysis.
	3 <sup>rd</sup>	Definitions of current efficiency, Energy efficiency.
	4 <sup>th</sup>	Principle of Electro Deposition.
<b>2nd</b>	1 <sup>st</sup>	Factors affecting the amount of Electro Deposition.
	2 <sup>nd</sup>	Factors governing the electro deposition
	3 <sup>rd</sup>	State simple example of extraction of metals.
	4 <sup>th</sup>	Application of Electrolysis
<b>3rd</b>	1 <sup>st</sup>	ELECTRICAL HEATING: Advantages of electrical heating.
	2 <sup>nd</sup>	Mode of heat transfer and Stephen's Law.
	3 <sup>rd</sup>	Principle of Resistance heating. (Direct resistance and indirect resistance heating.)
	4 <sup>th</sup>	Discuss working principle of direct arc furnace and indirect arc furnace.
<b>4th</b>	1 <sup>st</sup>	Principle of Induction heating. Working principle of direct core type, vertical core type and indirect coretype Induction furnace.
	2 <sup>nd</sup>	Principle of coreless induction furnace and skin effect.
	3 <sup>rd</sup>	Principle of dielectric heating and its application.
	4 <sup>th</sup>	Principle of Microwave heating and its application
<b>5th</b>	1 <sup>st</sup>	PRINCIPLES OF ARC WELDING: Explain principle of arc welding.
	2 <sup>nd</sup>	Discuss D. C. & A. C. Arc phenomena.
	3 <sup>rd</sup>	D.C. & A. C. arc welding plants of single and multi-operation type.

	4 <sup>th</sup>	Types of arc welding.
<b>6<sup>th</sup></b>	1 <sup>st</sup>	Continue with arc welding.
	2 <sup>nd</sup>	Explain principles of resistance welding.
	3 <sup>rd</sup>	Descriptive study of different resistance welding methods.
	4 <sup>th</sup>	Descriptive study of different resistance welding methods.
<b>7<sup>th</sup></b>	1 <sup>st</sup>	ILLUMINATION: Nature of Radiation and its spectrum.
	2 <sup>nd</sup>	Terms used in Illuminations. [Lumen, Luminous intensity, Intensity of illumination, MHCP, MSCP, MHSCP, Solid angle, Brightness, Luminous efficiency.]
	3 <sup>rd</sup>	Explain the inverse square law and the cosine law.
	4 <sup>th</sup>	Explain polar curves. Describe light distribution and control. Explain related definitions like maintenance factor and depreciation factors.
<b>8<sup>th</sup></b>	1 <sup>st</sup>	Design simple lighting schemes and depreciation factor.
	2 <sup>nd</sup>	Constructional feature and working of Filament lamps, effect of variation of voltage on working of filament lamps.
	3 <sup>rd</sup>	Explain Discharge lamps.
	4 <sup>th</sup>	State Basic idea about excitation in gas discharge lamps.
<b>9<sup>th</sup></b>	1 <sup>st</sup>	State constructional features and operation of Fluorescent lamp. (PL and PLL Lamps)
	2 <sup>nd</sup>	Sodium vapor lamps
	3 <sup>rd</sup>	High pressure mercury vapor lamps.
	4 <sup>th</sup>	Neon sign lamps. High lumen output & low consumption fluorescent lamps
<b>10<sup>th</sup></b>	1 <sup>st</sup>	INDUSTRIAL DRIVES: State group and individual drive.
	2 <sup>nd</sup>	Method of choice of electric drives.
	3 <sup>rd</sup>	Explain starting and running characteristics of DC motor.
	4 <sup>th</sup>	Explain starting and running characteristics of AC motor.
<b>11<sup>th</sup></b>	1 <sup>st</sup>	State Application of: DC motor.
	2 <sup>nd</sup>	3-phase induction motor.
	3 <sup>rd</sup>	3 phase synchronous motors.

	4th	Single phase induction
<b>12th</b>	1st	series motor
	2nd	universal motor and repulsion motor.
	3rd	ELECTRIC TRACTION: Explain system of traction.
	4th	Explain system of traction.
<b>13th</b>	1st	System of Track electrification.
	2nd	System of Track electrification.
	3rd	Running Characteristics of DC traction motor
	4th	Running Characteristics of AC traction motor
<b>14th</b>	1st	Explain control of motor: Tapped field control.
	2nd	Rheostatic control.
	3rd	Series parallel control.
	4th	Multi-unit control.
<b>15th</b>	1st	Metadyne control.
	2nd	Explain Braking of the following types: Regenerative Braking.
	3rd	Braking with 1-phase series motor.
	4th	Magnetic Braking.

# GANDHI ACADEMY OF TECHNOLOGY AND ENGINEERING

## LESSON PLAN

Session (2022-2023)

<b>Discipline: Electrical Engineering.</b>	<b>Semester:</b> 6th, Summer/2023	<b>Name of the Teaching Faculty:</b> Mahesh Kumar Mishra Lecturer
<b>Subject: Electrical Installation &amp; Estimating.</b> Theory-1	<b>No. of Days/Week: 05</b>	Total mark-100 Class Test:20 End Semester Examination:80

<b>Week</b>	<b>Class Day</b>	<b>Theory Topics</b>
1st	1st	Electrical Installation, domestic & industrial wiring system.
	2nd	System of distribution of electric energy, Tree system & Distribution system.
	3rd	Methods of wiring, Tee system ,Loop in system
	4th	Types of internal wiring. . Main switch ,BDB,,MCB
	5th	Cleat wiring ,Batten wiring
2nd	1st	Condit wiring, concealed wiring
	2nd	Casing and capping wiring, Comparison among different types of wiring.
	3rd	Types of cable required for wiring Accessories required for wiring,
	4th	Multistrand cable, Voltage grading of cable, General specification of cable.
	5th	Indian Electricity Rules
3rd	1st	<i>Doubt Clearing class</i>
	2nd	Indian Electricity Rules.
	3rd	<i>Assignment Evaluation &amp; Class Test</i>
	4th	Types of fuse, different types of fuse wire
	5th	Earthing, plate earthing and pipe earthing, Points to be earthed.

4th	1st	Materials required for plate earthing
	2nd	Materials required for pipe earthing
	3rd	<i>Doubt Clearing class</i>
	4th	<i>Assignment Evaluation &amp; Class Test</i>
	5th	<i>QUIZ Test-1</i>
5th	1st	General safety precaution Rule, General condition relating to supply and use energy, OH Lines Rules.
	2nd	Lighting Scheme, Types, Factory lighting, Street lighting, Public lighting,
	3rd	Component of service line, Conductor, Ariel fuse, Service support, Bearer wire
	4th	Class test
	5th	Prepare an Estimate for providing single phase service connection to a building having load of 3 KW to a single stored building having separate energy meter.
6th	1st	Prepare an Estimate for providing single phase service connection to a building having load of 3 KW to a single stored building having separate energy meter.
	2nd	Prepare an Estimate for providing single phase supply load of 5 KW to a double stored building having separate energy meter.
		Prepare an Estimate for providing single phase supply load of 5 KW to a double stored building having separate energy meter.
	3rd	Prepare an Estimate for providing service connection to a factory building within 15 KW using insulated wire.
	4th	Prepare an Estimate for providing service connection to a factory building within 15 KW using insulated wire and bare conductor.
	5th	Prepare an Estimate for providing service connection to a factory building within 25 KW using insulated wire and bare conductor.
7th	1st	Prepare an Estimate for providing service connection to a factory building within 25 KW using insulated wire and bare conductor.
	2nd	Estimate of materials for Stay.
	3rd	Main components of overhead line, Line support, Factors governing height of pole, Cross arm
	4th	Aspects of good lighting schemes, Types of Lighting schemes,
	5th	Factory lighting installation,
8th	1st	Assignment Evaluation & Class Test

	2nd	Public Lighting installation, Factory lighting, Street lighting.
	3rd	Prepare an estimate of materials required for LT distribution line within a load of 80 kw and standard spans, calculation of size of conductor, find voltage regulation using AAA conductor.
	4th	Prepare an estimate of materials required for LT distribution line within a load of 100kw and standard spans, calculation of size of conductor, find voltage regulation using AAA conductor.
	5th	Prepare an estimate of materials required for LT distribution line within a load of 100kw and standard spans, calculation of size of conductor, find voltage regulation using AAA conductor.
9th	1st	<i>QUIZ Test-2</i>
	2nd	Prepare an estimate of materials required for HT distribution line within a load of 100kw and standard spans, calculation of size of conductor, find voltage regulation using ACSR conductor.
	3rd	Prepare an estimate of materials required for HT distribution line within a load of 100kw and standard spans, calculation of size of conductor, find voltage regulation using ACSR conductor.
	4th	Prepare an estimate of materials required for HT distribution line within a load of 100kw and standard spans, calculation of size of conductor, find voltage regulation using ACSR conductor.
	5th	Prepare an estimate of materials required for conduit wiring for small domestic installation of one room one veranda with given light ,fan and plug point.
10th	1st	Prepare an estimate of materials required for conduit wiring for small domestic installation of two room one veranda with given light ,fan and plug point.
	2nd	Prepare an estimate of materials required for conduit wiring for small domestic installation of three room one veranda with given light ,fan and plug point.
	3rd	Prepare an estimate of materials required for conduit wiring for small domestic installation of two room one bath, kitchen, veranda with given light ,fan and plug point.
	4th	Prepare an estimate of materials required for erection of conduit wiring to a small work shop installation and load about 10 KW.
	5th	Prepare an estimate of materials required for erection of conduit wiring to a small work shop installation and load about 10 KW.
11th	1st	Prepare an Estimate for providing service connection to a factory building within 15 KW using insulated wire.
	2nd	Prepare an Estimate for providing service connection to a factory building within 15 KW using insulated wire.

	3rd	Prepare an Estimate for providing service connection to a factory building within 50 KW using insulated wire.
	4th	Prepare an estimate of material required for HT distribution line (11KV) within 2km and a load of 1000 KVA. Find size of conductor, voltage regulation using ACSR conductor.
	5th	Prepare an estimate of material required for HT distribution line (11KV) within 10 km and a load of 1000 KVA. Find size of conductor, voltage regulation using ACSR conductor.
12th	1st	Prepare an estimate of material required for HT distribution line (11KV) within 10 km and a load of 2000 KVA. Find size of conductor, voltage regulation using ACSR conductor.
	2nd	Prepare an estimate of material required for HT distribution line (11KV) within 10 km and a load of 2000 KVA. Find size of conductor, voltage regulation using ACSR conductor.
	3rd	Determination of size of conductor for transmission line,
	4th	Insulators used for transmission line
	5th	Prepare an estimate of materials required for erection of conduit wiring to a small work shop installation and load about 10KW
13th	1st	Prepare an estimate of materials required for erection of conduit wiring to a small work shop installation and load about 10KW
	2nd	Prepare an estimate of materials required for erection of conduit wiring to a small work shop installation and load about 30KW
	3rd	Prepare an estimate of materials required for erection of conduit wiring to a small work shop installation and load about 30KW
	4th	<i>Assignment Evaluation &amp; Class Test</i>
	5th	Types of substation
14th	1st	Estimate the materials required for Pole mounted sub station
	2nd	Estimate the materials required for Pole mounted sub station
	3rd	Estimate the materials required for Plinth mounted sub station
	4th	Estimate the materials required for Plinth mounted sub station
	5th	Estimate the materials required for Plinth mounted sub station
15th	1st	<i>Assignment Evaluation &amp; Class Test</i>
	2nd	<i>Discussion of Previous year questions</i>
	3rd	<i>Discussion of Previous year questions</i>
	4th	<i>Discussion of Previous year questions</i>
	5th	<i>Discussion of Previous year questions</i>

# GANDHI ACADEMY OF TECHNOLOGY AND ENGINEERING

## LESSON PLAN Session (2022-2023)

<b>Discipline:</b> Electrical Engg.	<b>Semester:</b> 6 <sup>th</sup> , 2022-2023	<b>Name of the Faculty:</b> Susanta Kumar Sahu  <a href="mailto:susantakumarsahu00@gmail.com">susantakumarsahu00@gmail.com</a>
<b>Subject:</b> Control Systems Engineering  Theory-3	<b>No. of Days/week:</b> 05	End Semester Examination: 80  IA:20

Week	Class Day	Theory Topics
1st	1st	Classification of Control system.
	2nd	Open loop system & Closed loop system and its comparison.
	3rd	Effects of Feedback.
	4th	Standard test Signals (Step, Ramp, Parabolic, and Impulse Functions).
	5th	Standard test Signals (Step, Ramp, Parabolic, and Impulse Functions).
2nd	1st	Servomechanism.
	2nd	Regulators ( Regulating systems)
	3rd	<b>Revision and Doubt clearing.</b>
	4th	Transfer Function of a system.
	5th	Transfer Function of a system.
3rd	1st	Impulse response of a system.
	2nd	Properties, Advantages& Disadvantages of Transfer Function.
	3rd	Poles & Zeroes of transfer Function.
	4th	Representation of poles & Zero on the s-plane.
	5th	Representation of poles & Zero on the s-plane.
4th	1st	Simple problems of transfer function of network.



	2nd	<b>Doubt clearing and Class test.</b>
	3dr	Close loop transfer function.
	4th	Concept of characteristics equation
	5th	Concept of characteristics equation
5th	1st	Block Diagram reduction technique.
	2nd	Block Diagram reduction technique.
	3rd	Stability of system.
	4th	Block diagram reduction problem.
	5th	Block Diagram reduction technique
6th	1st	Modeling of Electrical Systems(R, L, C, Analogous systems).
	2nd	<b>Revision and Doubt clearing.</b>
	3rd	Definition of Basic Elements of a Block Diagram.
	4th	Canonical Form of Closed loop Systems.
	5th	Canonical Form of Closed loop Systems.
7th	1st	Rules for Block diagram Reduction part-I
	2nd	Rules for Block diagram Reduction part-II
	3rd	Procedure for of Reduction of Block Diagram.
	4th	Simple Problem for equivalent transfer function.
	5th	Simple Problem for equivalent transfer function.
8th	1st	Basic Definition in SFG & properties.
	2nd	Mason's Gain formula.
	3rd	Steps for solving Signal flow Graph.
	4th	Simple problems in Signal flow graph for network.
	5th	Simple problems in Signal flow graph for network.
9th	1st	<b>Doubt clearing and Class test.</b>
	2nd	Definition of Time, Stability, steady-state response, accuracy, transient accuracy, In-sensitivity and robustness.
	3rd	System Time Response.
	4th	Frequency response analysis.

	5th	Analysis of Steady State Error.
10th	1st	Types of Input & Steady state Error (Step, Ramp, Parabolic).
	2nd	Parameters of first order system & second-order systems.
	3rd	Derivation of time response Specification (Delay time, Rise time, Peak time, Setting time, Peak over shoot).
	4th	<b>Revision and Doubt clearing.</b>
	5th	<b>Revision and Doubt clearing.</b>
11th	1st	Effect of parameter variation in Open loop System & Closed loop Systems.
	2nd	Introduction to Basic control Action& Basic modes of feedback control: proportional, integral and derivative.
	3rd	Effect of feedback on overall gain, Stability.
	4th	Realization of Controllers (P, PI, PD, PID) with OPAMP.
	5th	Realization of Controllers (P, PI, PD, PID) with OPAMP
12th	1st	<b>Revision and Doubt clearing.</b>
	2nd	Effect of location of poles on stability.
	3rd	Routh-Hurwitz stability criterion.
	4th	Steps for Root locus method.
	5th	Steps for Root locus method.
13th	1st	Root locus method of design (Simple problem).
	2nd	<b>Revision and Doubt clearing.</b>
	3rd	Frequency response, Relationship between time & frequency response.
	4th	Methods of Frequency response.
	5th	Methods of Frequency response.
14th	1st	Polar plots & steps for polar plot.
	2nd	Bodes plot & steps for Bode plots.
	3rd	Stability in frequency domain, Gain Margin& Phase margin.
	4th	Nyquist plots. Nyquist stability criterion.
	5th	Nyquist plots. Nyquist stability criterion.
15th	1st	Simple problems as above.

2nd	Concepts of state, state variable, state model.
3rd	State models for linear continuous time functions (Simple).
4th	<b>Doubt clearing and Class test.</b>
5th	<b>Doubt clearing and Class test.</b>

# GANDHI ACADEMY OF TECHNOLOGY AND ENGINEERING

## LESSON PLAN

Session (2022-2023)

<b>Discipline:</b> Electrical ENGG	<b>Semester:</b> 6 <sup>th</sup>	<b>Name of the Teaching Faculty:</b>  Sudhir Kumar Das
<b>Subject:</b> Renewable Energy System , Theory-TH-4 (b)	<b>No. of Days/Week:</b> 05	<b>End Sem:</b> 80 <b>I.A:</b> 20

Week	Class Day	Theory Topics
1st	1st	Introduction to Renewable energy: Environmental consequences of fossil fuel use
	2nd	Importance of renewable sources of energy.. Sustainable Design and development.
	3rd	Types of RE sources. Limitations of RE sources
	4th	Present Indian and international energy scenario of conventional and RE sources
	5th	Introduction to solar Energy
2nd	1st	Solar photovoltaic system-Operating principle
	2nd	Photovoltaic cell concepts Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT).
	3rd	Classification of energy Sources. Extra-terrestrial and terrestrial Radiation
	4th	Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant.
	5th	Solar collectors Types

3rd	1st	Solar collectors Types
	2nd	Solar collectors performance characteristics
	3rd	<i>Doubt Clearing class</i>
	4th	Flat plate type solar collector
	5th	Concentrating type solar collector
4th	1st	Applications: Photovoltaic - battery charger, domestic lighting, street lighting, water pumping,.
	2nd	Working of solar cooker, Solar Pond
	3rd	Introduction to Wind energy. Wind energy conversion.
	4th	Types of wind turbines
	5th	Aerodynamics of wind rotors
5th	1st	<i>Doubt Clearing class</i>
	2nd	Wind turbine control systems; conversion to electrical power
	3rd	<i>Assignment Evaluation &amp; Class Test</i>
	4th	<i>QUIZ Test-1</i>
	5th	Main parts of wind turbines
6th	1st	Vertical and horizontal type wind turbine.
	2nd	Types of winds turbine rotors
	3rd	Grid connected and self excited induction generator operation.
	4th	Grid connected and self excited induction generator operation.
	5th	Constant voltage and constant frequency generation with power electronic control.
7th	1st	Single and double output systems.
	2nd	Constant voltage and constant frequency generation with power electronic control.
	3rd	Single and double output systems.
	4th	Characteristics of wind power plant.
	5th	<i>Doubt Clearing class</i>
8th	1st	<i>Assignment Evaluation &amp; Class Test</i>
	2nd	Energy from Biomass. Biomass as Renewable Energy Source
	3rd	Types of Biomass Fuels - Solid, Liquid and Gas
	4th	Combustion and fermentation in biomass
	5th	Conversion of bio-gas

9th	1st	Anaerobic digestion.
	2nd	Types of biogas digester Wood gassifier
	3rd	Explain Pyrolysis
	4th	Applications: Bio gas, Bio diesel
	5 <sup>th</sup>	Tidal Energy: Energy from the tides, Barrage and Non Barrage
10th	1st	Working of Tidal power systems
	2nd	Ocean Thermal Energy Conversion (OTEC).
	3rd	Ocean Thermal Energy – Classification
	4th	Geothermal Energy – Classification.
	5 <sup>th</sup>	Hybrid Energy Systems.
11th	1st	<i>Doubt Clearing class</i>
	2nd	<i>Assignment Evaluation &amp; Class Test</i>
	3rd	Need for Hybrid Systems
	4th	Explain Diesel-PV.
	5 <sup>th</sup>	Explain Wind-PV
12th	1st	Explain Wind-PV
	2nd	Explain Micro-hydel-PV
	3rd	Case studies on wind energy
	4th	<i>Doubt Clearing class</i>
	5 <sup>th</sup>	<i>Assignment Evaluation &amp; Class Test</i>
13th	1st	<i>QUIZ Test-1</i>
	2nd	Explain Micro-hydel energy
	3rd	Explain Micro-hydel-PV
	4th	Electric vehicles
	5 <sup>th</sup>	hybrid electric vehicles
14th	1st	Electric and hybrid electric vehicles
	2nd	Electric and hybrid electric vehicles
	3rd	<i>Doubt Clearing class</i>
	4th	<i>Doubt Clearing class</i>
	5 <sup>th</sup>	<i>Assignment Evaluation &amp; Class Test</i>
15th	1st	<i>Assignment Evaluation &amp; Class Test</i>
	2nd	<i>Discussion of Previous year questions</i>
	3rd	<i>Discussion of Previous year questions</i>
	4th	<i>Discussion of Previous year questions</i>
	5 <sup>th</sup>	<i>Discussion of Previous year questions</i>



# GANDHI ACADEMY OF TECHNOLOGY AND ENGINEERING

## LESSON PLAN

Session-(2022-2023)

<b>Discipline:</b> Electrical Engineering.	<b>Semester:</b> 6 <sup>th</sup>	<b>Name of the Teaching Faculty:</b> Soumya Shyamali Mahapatra
<b>Subject :</b> Switch Gear & Protective Devices, Theory-2	<b>No. Of Days/Week:</b> 5	<b>End Sem :</b> 80 <b>IA:</b> 20

Week	Class Day	Theory/Practical Topics
1st	1st	Essential Features of switchgear equipment
	2nd	Bus-Bar Arrangement. Switchgear Accommodation.
	3rd	Short Circuit & Short circuit faults
	4th	Fault in power system
	5th	TUTORIAL CLASS
2nd	1st	ASSIGNMENT QUESTION DISCUSSION
	2nd	Symmetrical faults on 3-phase system. And Limitation of fault current
	3rd	Percentage Reactance. Percentage Reactance and Base KVA. Short – circuit KVA.
		Percentage Reactance and Base KVA. Short–circuit KVA.
	4th	Reactor control of short circuit currents.
	5th	TUTORIAL PROBLEM
3rd	1st	Location of reactors
	2nd	Steps for symmetrical Fault calculations..
	3rd	Solve numerical problems on symmetrical fault.
	4th	Fuse Element material
	5th	QUIZ TEST
4th	1st	Desirable characteristics of fuse element.
	2nd	Types of Fuses and important terms used for fuses.



	3rd	Low and High voltage fuses.
	4th	Current carrying capacity of fuse element.
	5th	TUTORIAL CLASS
5th	1st	Difference Between a Fuse and Circuit Breaker
	2nd	Definition and principle of Circuit Breaker & Arc phenomenon and principle of Arc Extinction
	3rd	Methods of Arc Extinction. Definitions of Arc voltage, Restriking voltage and Recovery voltage.
	4th	Classification of circuit Breakers Oil circuit Breaker and its classification
	5th	Plain break oil circuit breaker & Arc control oil circuit breaker
6th	1st	Low oil circuit breaker. & Maintenance of oil circuit breaker
	2nd	Air-Blast circuit breaker and its classification.
	3rd	Sulphur Hexafluoride (SF <sub>6</sub> ) circuit breaker & Problems of circuit interruption.
	4th	Vacuum circuit breakers. & Switchgear components
	5th	TUTORIAL CLASS
7th	1st	Resistance switching. & circuit Breaker Rating.
	2nd	Class test
	3rd	Definition of Protective Relay & Fundamental requirement of protective relay.
	4th	Basic Relay operation a) Electromagnetic Attraction type b) Induction type
	5th	TUTORIAL CLASS
8th	1st	Definition of following important terms of relay.
	2nd	Definition of following important terms. a) Pick-up current .b) Current setting. c) Play setting Multiplier. d) Time setting Multiplier.

	3rd	Classification of functional relays
	4th	Induction type over-current relay(Non-directional)
	5th	TUTORIAL CLASS
9th	1st	Induction type directional power relay
	2nd	Induction type directional over current relay.
	3rd	Differential relay a)Current differential relay b)Voltage balance differential 5.11
	4th	Types of protection
	5th	TUTORIAL CLASS
10th	1st	Protection of alternator &Differential protection of alternators.
	2nd	Balanced earth fault protection
	3rd	Protection systems for transformer.
	4th	Buchholz relay &Protection of Bus bar.
	5th	TUTORIALCLASS
11th	1st	Protection of Transmission line
	2nd	Different pilot wire protection (Merz-price voltage Balance system)
	3rd	Explain protection of feeder by overcurrent and earth fault relay
	4th	Voltage surge and causes of overvoltage
	5th	TUTORIALCLASS
12th	1st	Internal cause of over voltage
	2nd	External cause of overvoltage
	3rd	Mechanism of lightning discharge.
	4th	Types of lightning strokes. Harmful effect of lightning.& Lightning arresters.
	5th	TUTORIALCLASS
13th	1st	External cause of overvoltage
	3rd	Type of lightning Arrestors. a)Rod-gap lightning arrester.
	4th	b)Horn-gap arrester. c)Valve type arrester.
	5th	TUTORIALCLASS

14th	1st	Surge Absorber
	2nd	Advantage of static relay.
	3rd	Instantaneous over current relay.
	4th	Principle of IDMT relay
	5th	TUTORIAL CLASS
15th	1st	REVIEW CLASS
	2nd	REVIEW CLASS
	3rd	VERY SIMILAR TEST
	4th	VERY SIMILAR TEST
	5th	VERY SIMILAR TEST