



**DEPARTMENT OF ELECTRICAL ENGINEERING**  
**Govt. Polytechnic, Balasore**

**LESSON PLAN FOR ACADEMIC SESSION - 2023-24**  
**ENERGY CONVERSION-I**

Course Code : Th.1	Semester : 4th
Total Periods : 75 Periods	Examination : 3 Hours
Lecture Periods : 4 P/Week	Internal Assessment : 20 Marks
Tutorial : -1P/week	End Semester Examination : 80 Marks
Maximum Marks : 100	
Semester From Date : 16/01/2024	To Date : 07/05/24
Name of Teaching Faculty: Sri Biswajit Mallik (Sr. Lect. Electrical)	

WEEK	PERIOD	TOPIC
1 <sup>st</sup>	1 <sup>st</sup>	Introduction to electrical machine D.C Generator
	2 <sup>nd</sup>	Explain principle of operation Explain Constructional feature
	3 <sup>rd</sup>	Armature winding, back pitch, Front pitch, Resultant pitch and commutator- pitch.
	4 <sup>th</sup>	Simple Lap and wave winding (problems on winding diagram)
	5 <sup>th</sup>	Explain Different types of D.C. machines i.e. Shunt, Series machine with problem solving methods.
2 <sup>nd</sup>	1 <sup>st</sup>	Explain Different types of D.C. machines i.e. Compound machine with problem solving methods.
	2 <sup>nd</sup>	Derive EMF equation of DC generators. (Solve problems)
	3 <sup>rd</sup>	Explain Armature reaction in D.C. machine.
	4 <sup>th</sup>	Explain commutation in D.C. machine.
	5 <sup>th</sup>	Explain Methods of improving commutation (Resistance and emf commutation)
3 <sup>rd</sup>	1 <sup>st</sup>	Explain role of inter poles and compensating winding. (solve problems)
	2 <sup>nd</sup>	Characteristics of D.C. Generators with problem solving methods
	3 <sup>rd</sup>	Characteristics of D.C. Generators with problem solving methods
	4 <sup>th</sup>	State application of different types of D.C. Generators.
	5 <sup>th</sup>	Concept of critical resistance causes of failure of

4 <sup>th</sup>		development of emf.
	1 <sup>st</sup>	Explain losses of D.C. machines & numerical problems.
	2 <sup>nd</sup>	Explain efficiency of D.C. machines, condition for maximum efficiency and numerical problems.
	3 <sup>rd</sup>	Explain parallel operation of D.C. Generators.
	4 <sup>th</sup>	Explain parallel operation of D.C. Generators.
5 <sup>th</sup>	5 <sup>th</sup>	Introduction to D. C. MOTORS
	1 <sup>st</sup>	Explain basic working principle of DC motor
	2 <sup>nd</sup>	State Significance of back emf in D.C. Motor.
	3 <sup>rd</sup>	Derive voltage equation of Motor
	4 <sup>th</sup>	Derive torque (Equation of Armature Torque and shaft Torque) (solve problems)
6 <sup>th</sup>	5 <sup>th</sup>	Explain performance characteristics of shunt motors and their application (Solve problems)
	1 <sup>st</sup>	Explain performance characteristics of series motors and their application. (Solve problems)
	2 <sup>nd</sup>	Explain performance characteristics of compound motors and their application. (Solve problems)
	3 <sup>rd</sup>	Explain methods of starting shunt, series and compound motors, (solve problems)
	4 <sup>th</sup>	Solve problems on dc motors.
7 <sup>th</sup>	5 <sup>th</sup>	Explain speed control of D.C shunt motors by Flux control method
	1 <sup>st</sup>	Armature voltage (rheostatic) Control method.
	2 <sup>nd</sup>	Solve problems on speed control of D.C shunt motors .
	3 <sup>rd</sup>	Explain speed control of series motors by Flux control method.
	4 <sup>th</sup>	Explain speed control of series motors by series parallel method.
8 <sup>th</sup>	5 <sup>th</sup>	Explain determination of efficiency of D.C. Machine by break test method.
	1 <sup>st</sup>	Explain determination of efficiency of D.C. Machine by Swinburne's Test method.
	2 <sup>nd</sup>	Explain Losses & efficiency
	3 <sup>rd</sup>	Explain condition for maximum power.
	4 <sup>th</sup>	Solve numerical problems on losses, efficiency and maximum power.
9 <sup>th</sup>	5 <sup>th</sup>	<b>SINGLE PHASE TRANSFORMER</b> Explain working principle of transformer.
	1 <sup>st</sup>	Explains Transformer Construction – Arrangement of core & winding in different types of transformer
	2 <sup>nd</sup>	Brief ideas about transformer accessories such as conservator, tank, breather explosion vent etc.
	3 <sup>rd</sup>	Explain types of cooling methods
	4 <sup>th</sup>	State the procedures for Care and maintenance
10 <sup>th</sup>	5 <sup>th</sup>	Derive EMF equation
	1 <sup>st</sup>	Ideal transformer voltage transformation ratio
	2 <sup>nd</sup>	Explain Transformer on no load and on load phasor diagrams.
	3 <sup>rd</sup>	Explain phasor diagram of transformer with winding Resistance and Magnetic leakage. Phasor diagram on load using un. leading pf and lagging pf.
	4 <sup>th</sup>	Explain Equivalent circuit and solve numerical problems.

	5 <sup>th</sup>	Calculate Approximate & exact voltage drop of a Transformer.
11 <sup>th</sup>	1 <sup>st</sup>	Calculate Regulation of various loads and power factor.
	2 <sup>nd</sup>	Explain Different types of losses in a Transformer.
	3 <sup>rd</sup>	Solve problems on losses of transformer.
	4 <sup>th</sup>	Explain Open circuit test.
	5 <sup>th</sup>	Explain Short circuit test.
12 <sup>th</sup>	1 <sup>st</sup>	Explain Efficiency, efficiency at different loads and power factors, condition for maximum efficiency (solve problems)
	2 <sup>nd</sup>	Explain All Day Efficiency
13 <sup>th</sup>	3 <sup>rd</sup>	Solve problems on all day efficiency.
	4 <sup>th</sup>	Explain determination of load corresponding to Maximum efficiency.
	5 <sup>th</sup>	Explain parallel operation of single phase transformer
	1 <sup>st</sup>	<b>AUTO TRANSFORMER</b> Explain constructional features
	2 <sup>nd</sup>	Explain Working principle of single phase Auto Transformer.
14 <sup>th</sup>	3 <sup>rd</sup>	State Comparison of Auto transformer with an two winding transformer (saving of Copper)
	4 <sup>th</sup>	State Comparison of Auto transformer with an two winding transformer (saving of Copper)
	5 <sup>th</sup>	State Uses of Auto transformer.
	1 <sup>st</sup>	Explain Tap changer with transformer (on load and off load condition)
	2 <sup>nd</sup>	<b>INSTRUMENT TRANSFORMERS</b> Explain Current Transformer
15 <sup>th</sup>	3 <sup>rd</sup>	Potential Transformer
	4 <sup>th</sup>	Define Ratio error, Phase angle error, Burden
	5 <sup>th</sup>	Define Ratio error, Phase angle error, Burden
	1 <sup>st</sup>	Uses of C.T. and P.T.
	2 <sup>nd</sup>	Tutorial
	3 <sup>rd</sup>	Tutorial
	4 <sup>th</sup>	Tutorial
	5 <sup>th</sup>	Tutorial

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