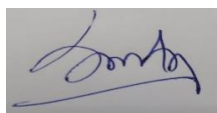


ACADEMIC LESSON PLAN OF WINTER 2026

Discipline: ELECTRICAL	Semester: 3 rd Sem	Name of the Teaching Faculty: Smruti Ranjan Mohanty
Subject: DC Machines and Transformers	No. of days/per week class allotted:3P/week	Semester from: 1 st July 2026 to 05 th Nov 2026 No. of Weeks: 15 weeks
Week	Class Day	Theory Topics
1 st	1 st	DC Generators 1.1 D.C. generator: construction, parts, materials and their functions (Contd...)
	2 nd	1.1 D.C. generator: construction, parts, materials and their functions
	3 rd	1.2 Principle of operation of DC generator 1.2.1 Fleming's right hand rule
2 nd	1 st	1.2.2 Derive the emf equation of DC Generator
	2 nd	1.2.3 Schematic diagrams of different types of DC generator
	3 rd	1.2.4 Armature reaction (Contd...)
3 rd	1 st	1.2.4 Armature reaction
	2 nd	1.2.5 Commutation (Contd...)
	3 rd	1.2.5 Commutation 1.2.6 Applications of D.C. generators
4 th	1 st	D.C. Motors 2.1 D.C. motor: Types of DC motors
	2 nd	2.1.1 Fleming's left hand rule 2.1.2 Principle of operation of Back e.m.f. and its significance
	3 rd	2.1.3 Voltage equation of DC motor
5 th	1 st	2.1.4 Torque and Speed; Armature torque, Shaft torque, BHP, Brake test, losses, efficiency (Contd...)
	2 nd	2.1.4 Torque and Speed; Armature torque, Shaft torque, BHP, Brake test, losses, efficiency
	3 rd	2.2 DC motor starters: Necessity, two point and three point starters
6 th	1 st	2.3 Speed control of DC shunt and series motor: Flux and Armature control (Contd)
	2 nd	2.3 Speed control of DC shunt and series motor: Flux and Armature control
	3 rd	2.4 Brushless DC Motor: Construction and working
7 th	1 st	Single Phase Transformers 3.1 Types of transformers: Shell type and core type
	2 nd	3.2 Construction: Parts and functions 3.3 Materials used for different parts: CRGO, CRNGO, HRGO, amorphous cores
	3 rd	3.4 Transformer: Principle of operation
8 th	1 st	3.5 EMF equation of transformer: Derivation, Voltage transformation ratio
	2 nd	3.5 EMF equation of transformer: Derivation, Voltage transformation ratio (Contd)
	3 rd	3.6 Significance of transformer ratings 3.7 Transformer No-load and on-load phasor diagram, Leakage reactance (Contd..)
9 th	1 st	3.7 Transformer No-load and on-load phasor diagram, Leakage reactance
	2 nd	3.8 Equivalent circuit of transformer: Equivalent resistance and reactance
	3 rd	3.9 Voltage regulation and Efficiency: Direct loading, OC/SC method, All day efficiency (Contd...)
10 th	1 st	3.9 Voltage regulation and Efficiency: Direct loading, OC/SC method, All day efficiency
	2 nd	Three Phase Transformers 4.1 Bank of three single phase transformers,(Y-Y, Δ - Δ , Δ -Y, Y- Δ) (Contd...)
	3 rd	4.1 Bank of three single phase transformers,(Y-Y, Δ - Δ , Δ -Y, Y- Δ)
11 th	1 st	4.2 Single unit of three phase transformer
	2 nd	4.3 Distribution and Power transformers: Construction and cooling,
	3 rd	4.4 Criteria for selection of distribution transformer, and power transformer.
12 th	1 st	4.5 Need of parallel operation of three phase transformer

	2 nd	4.6 Conditions for parallel operation.
	3 rd	4.7 Polarity tests on mutually inductive coils and single phase transformers
13 th	1 st	4.8 Polarity test, Phasing out test on Three-phase transformer
	2 nd	Special Purpose Transformers 5.1 Single phase and three phase autotransformers: Construction, working and applications. 5.2 Isolation transformer: Constructional Features and applications
	3 rd	Special Purpose Transformers 5.1 Single phase and three phase autotransformers: Construction, working and applications.(Contd...)
14 th	1 st	5.1 Single phase and three phase autotransformers: Construction, working and applications. (Contd...)
	2 nd	5.1 Single phase and three phase autotransformers: Construction, working and applications. (Contd...)
	3 rd	5.1 Single phase and three phase autotransformers: Construction, working and applications.
15 th	1 st	5.2 Isolation transformer: Constructional Features and applications (Contd...)
	2 nd	5.2 Isolation transformer: Constructional Features and application(Contd...)
	3 rd	5.2 Isolation transformer: Constructional Features and applications



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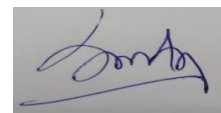
COURSE OUTCOME

CO1:	Explain the construction and working principle of dc machines.
CO2:	Explain the construction and working principle of single phase transformer.
CO3:	Describe the performance of single phase and three-phase transformer.
CO4:	Discuss about special purpose transformers

ACADEMIC LESSON PLAN OF WINTER 2026

Discipline Electrical	Semester: 3 rd	Name of the Teaching Faculty: - Smruti Ranjan Mohanty & Biswanita Sahu
Subject: -Pr-4 (DC Machines and	No of Days/per Week Class Allotted: 2d(4hr)/week	Semester from: 1 st July 2026 to 05 th Nov 2026 No. of Weeks: 15 weeks

Transformers Lab)		
Week	Class Day	Practical Topics
1 st	1 st	Dismantle a DC machine.(Contd...)
	2 nd	Dismantle a DC machine.
2 nd	1 st	Reverse the direction of rotation of the DC shunt motor.(Contd...)
	2 nd	Reverse the direction of rotation of the DC shunt motor.
3 rd	1 st	Control the speed of DC shunt motor by field flux control methods.(Contd...)
	2 nd	Control the speed of DC shunt motor by field flux control methods.
4 th	1 st	Control the speed of DC shunt motor by armature voltage control methods.(Contd...)
	2 nd	Control the speed of DC shunt motor by armature voltage control methods.
5 th	1 st	Perform the brake test on DC series motor.(Contd...)
	2 nd	Perform the brake test on DC series motor.
6 th	1 st	Check the functioning of single phase transformer (Contd...)
	2 nd	Check the functioning of single phase transformer
7 th	1 st	Determine regulation and efficiency of single phase transformer by direct loading (Contd...)
	2 nd	Determine regulation and efficiency of single phase transformer by direct loading (Contd...)
8 th	1 st	Determine regulation and efficiency of single phase transformer by direct loading (Contd...)
	2 nd	Determine regulation and efficiency of single phase transformer by direct loading
9 th	1 st	Perform open circuit and short circuit test on single phase transformer to determine equivalent circuit constants, voltage regulation and efficiency (Contd...)
	2 nd	Perform open circuit and short circuit test on single phase transformer to determine equivalent circuit constants, voltage regulation and efficiency (Contd...)
10 th	1 st	Perform open circuit and short circuit test on single phase transformer to determine equivalent circuit constants, voltage regulation and efficiency (Contd..)
	2 nd	Perform open circuit and short circuit test on single phase transformer to determine equivalent circuit constants, voltage regulation and efficiency (Contd...)
11 th	1 st	Perform open circuit and short circuit test on single phase transformer to determine equivalent circuit constants, voltage regulation and efficiency
	2 nd	Perform parallel operation of two single-phase transformers to determine the load current sharing.(Contd...)
12 th	1 st	Perform parallel operation of two single-phase transformers to determine the load current sharing.
	2 nd	Perform polarity test on a single-phase transformer whose polarity markings are masked.(Contd...)
13 th	1 st	Perform polarity test on a single-phase transformer whose polarity markings are masked.
	2 nd	Perform phasing out test on a three-phase transformer whose phase markings are masked. (Contd...)
14 th	1 st	Perform phasing out test on a three-phase transformer whose phase markings are masked.(Contd...)
	2 nd	Perform phasing out test on a three-phase transformer whose phase markings are masked.
15 th	1 st	Revision class
	2 nd	Revision class



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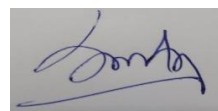
COURSE OUTCOME

CO1:	Gain hands-on expertise in dismantling DC machines, reversing rotation of DC shunt motor.
CO2:	Apply various speed control techniques in dc motors to plot the speed curve and testing of dc machines.
CO3:	Conduct various tests on single phase Transformer to nalyze parameters such as voltage regulation, load sharing, and equivalent circuit constants.
CO4:	Enhance practical skills in performing tasks such as polarity , parallel operation of single phase transformers and phasing out tests three phase transformers.

ACADEMIC LESSON PLAN OF WINTER 2026

Discipline: Electrical	Semester: 3 rd	Name of the Teaching Faculty: Smruti Ranjan Mohanty
Subject: ELECTRIC AL AND ELECTRON IC MEASURE MENTS	No. of days/per week class allotted: 3p/week	Semester from: 01.07.2026 to 05.11.2026 No. of weeks: 15 weeks
Week	Class/week	Theory Topics
1 st	1 st	1. Fundamentals of Measurements 1.1 Measurement: Significance, units, fundamental quantities and standards 1.2 Classification of Instrument Systems
	2 nd	1.3 Null and deflection type instruments 1.4 Absolute and secondary instruments 1.5 Analog and digital instruments
	3 rd	1.6 Static and dynamic characteristics 1.6.1 Types of errors 1.7 Calibration: need and procedure
2 nd	1 st	1.7 Calibration: need and procedure (Contd.) 1.8 Classification of measuring instruments: indicating, recording and integrating instruments
	2 nd	1.9 Essential requirements of an indicating instruments
	3 rd	2. Measurement of voltage and current 2.1 DC Ammeter: Basic, Multi range, Universal shunt
3 rd	1 st	2.2 DC Voltmeter: Basic, Multi-range, concept of loading effect and sensitivity
	2 nd	2.3 AC voltmeter: Rectifier type (half wave and full wave)
	3 rd	2.4 CT and PT: construction, working and applications
4 th	1 st	3. Measurement of Electric Power 3.1 Analog meters: Permanent magnet moving coil (PMMC) and Permanent magnet moving iron (PMMI) meter, their construction, working, salient features, merits and demerits
	2 nd	3.1 Analog meters: Permanent magnet moving coil (PMMC) and Permanent magnet moving iron (PMMI) meter, their construction, working, salient features, merits and demerits (Contd.) 3.2 Dynamometer type wattmeter: Construction and working
	3 rd	3.2 Dynamometer type wattmeter: Construction and working (Contd.)
5 th	1 st	3.3 Errors and compensations of PMMI, PMMC and Dynamometer type wattmeter
	2 nd	3.4 Active and reactive power measurement: One, two and three wattmeter method
	3 rd	3.5 Effect of Power factor on wattmeter reading in two wattmeter method 3.6 Maximum Demand indicator (Definition only)
6 th	1 st	3.5 Effect of Power factor on wattmeter reading in two wattmeter method (Contd.) 3.6 Maximum Demand indicator (Definition only)
	2 nd	4. Measurement of Electric Energy 4.1 Single and three phase electronic energy meter: Constructional features and working principle
	3 rd	4.1 Single and three phase electronic energy meter: Constructional features and working principle (contd.)
7 th	1 st	4.2 Errors and their compensations
	2 nd	4.2 Errors and their compensations (Contd.)
	3 rd	4.3 Calibration of single-phase electronic energy meter using direct loading.

8 th	1 st	4.3 Calibration of single-phase electronic energy meter using direct loading (Contd.)
	2 nd	5. Circuit Parameter Measurement, CRO and Other Meters
	3 rd	5.1 Measurement of resistance
9 th	1 st	5.1.1 Low resistance: Kelvin's double bridge,
	2 nd	5.1.2 Medium Resistance: Voltmeter and ammeter method
	3 rd	5.1.3 High resistance: Megger and Ohm meter: Series and shunt
10 th	1 st	5.1.3 High resistance: Megger and Ohm meter: Series and shunt (Contd.)
	2 nd	5.2 Measurement of inductance using Anderson bridge (no derivation and phasor diagram)
	3 rd	5.3 Measurement of capacitance using Schering bridge (no derivation and phasor diagram)
11 th	1 st	5.4 Single beam/single trace CRO (Working principle and block diagram only)
	2 nd	5.5 Digital storage Oscilloscope: Basic block diagram, working
	3 rd	5.5 Cathode ray tube, electrostatic deflection, vertical amplifier, time base generator, horizontal amplifier
12 th	1 st	5.5 measurement of voltage/ amplitude/ time period/ frequency/ phase angle delay line, specifications.
	2 nd	5.6 Other meters: Earth tester, Digital Multimeter
	3 rd	5.6 L-C-R meter, Frequency meter (ferromagnetic and Weston type)
13 th	1 st	5.6 Phase sequence indicator, power factor meter (single phase and three phase dynamometer type)
	2 nd	5.6 Synchro scope, Tri-vector meter
	3 rd	5.7 Signal generator: need, working and basic block diagram.
14 th	1 st	Revision (Unit-1)
	2 nd	Revision (Unit-2)
	3 rd	Revision (Unit-3)
15 th	1 st	Revision (Unit-3) (Contd.)
	2 nd	Revision (Unit-4)
	3 rd	Revision (Unit-5)
		Revision (Unit-5) (Contd.)



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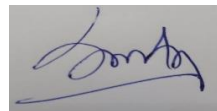
COURSE OUTCOME

CO1:	Explain the construction and working principle of different types of electrical measuring instruments.
CO2:	Connect different types of electrical measuring instruments to measure various electrical parameters.
CO3:	Illustrate different electronics measuring instruments and its working.
CO4:	Apply the appropriate technique to measure resistance, inductance and capacitance.

ACADEMIC LESSON PLAN OF WINTER 2026

Discipline: Electrical Engg.	Semester: 5TH	Name of the Teaching Faculty : Smruti Ranjan Mohanty
Subject: SWITCHGEAR AND PROTECTION	No. of Days/per week class allotted:3	Semester from date: 01.07.2026 To Date: 05.11.2026 No. of Weeks:15
Week	Class Day	Theory
1 st	1 st	1. Basics of Protection Necessity, functions of protective system.
	2 nd	Normal and abnormal conditions
	3 rd	Types of faults and their causes
2 nd	1 st	Protection zones and backup protection
	2 nd	Short circuit fault calculations in lines fed by generators through transformers
	3 rd	Problem solved of short circuit fault calculation.
3 rd	1 st	Need of current limiting reactors and their arrangements
	2 nd	2. Circuit Interruption Devices Isolators- Vertical break, Horizontal break and Pantograph type
	3 rd	HRC fuses – Construction, working, characteristics and applications.
4 th	1 st	Arc formation process, methods of arc extinction (High resistance and Low resistance)
	2 nd	Arc voltage, Recovery voltage, Re-striking voltage, RRRV
	3 rd	HT circuit breakers (Sulphur-hexa Fluoride (SF ₆) - Working, construction, specifications and applications
5 th	1 st	HT circuit breakers (Vacuum circuit breaker) - Working, construction, specifications and applications.
	2 nd	L.T. circuit breaker (Air circuit breakers (ACB) - Working and applications
	3 rd	Miniature circuit breakers (MCB) - Working and applications
6 th	1 st	Moulded case circuit breakers (MCCB) - Working and applications
	2 nd	Earth leakage circuit breaker (ELCB)) - Working and applications.
	3 rd	Selection of LT and HT circuit breakers (ratings), Selection of MCCB for motors.
7 th	1 st	Gas insulated switchgear
	2 nd	3. Protective Relays Fundamental quality requirements: Selectivity, Speed, Sensitivity, Reliability, Simplicity, Economy
	3 rd	Basic relay terminology- Protective relay, Relay time, Pick up, Reset current, current setting, Plug setting multiplier, Time setting multiplier
8 th	1 st	Principle of working, construction and operation of Attracted armature type relay
	2 nd	Principle of working, construction and operation of Solenoid type relay
	3 rd	Principle of working, construction and operation of Watt-hour meter type relay
	1 st	Thermal relay. Block diagram and working of Static relay
	2 nd	Overcurrent relay-Time current characteristics

9 th	3 rd	Microprocessor based over current relays: Block diagram, working
10 th	1 st	Distance relaying- Principle, operation of Definite distance relays.
	2 nd	Directional relay: Need and operation , Operation of current and voltage differential relay
	3 rd	4. Protection of Alternator and Transformer Differential protection of Alternator
11 th	1 st	Over current, earth fault protection of Alternator
	2 nd	Overheating and field failure protection of Alternator
	3 rd	Reverse power protection of Alternator.
12 th	1 st	Differential Protection of Transformer,
	2 nd	Over current Protection of Transformer
	3 rd	Earth fault, over heating protection of Transformer.
13 th	1 st	Limitations of differential protection.
	2 nd	Buchholz relay: Construction, operation, merits and demerits
	3 rd	5. Protection of Motors Bus-bar and Transmission Line, Motor Faults
14 th	1 st	Short circuit protection of Motor
	2 nd	Overload protection of Motor, Single phase preventer of Motor
	3 rd	Faults on Bus bar and Transmission Lines
15 th	1 st	Bus bar protection: Differential and Fault bus protection
	2 nd	Transmission line: Over current, Distance protection
	3 rd	Transmission line: Pilot wire protection



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COURSE OUTCOME

CO1:	Identify various types of faults in power system.
CO2:	Select suitable switchgears for different applications.
CO3:	Explain the test for performance of different protective relays.
CO4:	Discuss protection systems of alternators and transformers.
CO5:	Discuss protection schemes for motors and transmission lines.