

GOVERNMENT POLYTECHNIC JAGATASINGHPUR
ACADEMIC LESSON PLAN OF ELECTRICAL CIRCUIT (WINTER -2026)

Discipline: Electrical	Semester:3 rd	Name of the Teaching Faculty: Er.SHUBHRANSU RANJAN SWAIN
Subject: Elect.Circuit	No. of days/per week class allotted:3 p/ week	Semester From: 01 JULY 2026 TO 5th NOVEMBER 2026 No. of weeks:15 weeks
Week	Class Day	Theory Topics
1 st	1st	Single Phase A.C Series Circuits 1.1 Generation of alternating voltage . 1.2 Phasor representation of sinusoidal quantities.
	2nd	1.3 - R, L, C circuit elements its voltage and current response
	3rd	1.4 - R-L, R-C, R-L-C combination of A.C series circuit
2 nd	1st	1.4.1 Impedance, reactance, impedance triangle
	2nd	1.4.2 Power factor, active power, reactive power, apparent power
	3rd	1.4.3 Power triangle and vector diagram 1.4.4 Resonance, Bandwidth
3 rd	1st	1.4.5 Quality factor and voltage magnification in series R-L, R-C, R-L-C circuit
	2nd	Single Phase A.C Parallel Circuits 2.1 R-L, R-C and R-L-C parallel combination of A.C. circuits
	3rd	2.1 R-L, R-C and R-L-C parallel combination of A.C.
4 th	1st	2.1.1 Impedance, reactance, phasor diagram, impedance triangle
	2nd	2.1.2 Power factor, active power, apparent power, reactive power, power triangle.
	3rd	2.1.2 Power factor, active power, apparent power, reactive power, power triangle.
5 th	1st	2.2 Resonance in parallel R-L, R-C, R-L-C circuit
	2nd	2.2 Resonance in parallel R-L, R-C, R-L-C circuit
	3rd	2.3 Bandwidth, Quality factor and voltage magnification
6 th	1st	Three Phase Circuits 3.1 Phasor and complex representation of three phase supply
	2nd	3.2 Phase sequence and polarity
	3rd	3.3 Types of three-phase connections
7 th	1 st	3.4 Phase and line quantities in three phase star and delta system
	2 nd	3.5 Balanced and unbalanced load
	3 rd	3.6 Neutral shift in unbalanced load
8 th	1st	3.7 Three phase power, active, reactive and apparent power in star and delta system
	2nd	3.7 Three phase power, active, reactive and apparent power in star and delta system
	3rd	Network Reduction and Principles of Circuit Analysis 4.1 Source transformation

9 th	1st	4.2 Star/delta and delta/star transformation
	2nd	4.2 Star/delta and delta/star transformation
	3rd	4.3 Mesh Analysis
10 th	1st	4.4 Node Analysis
	2nd	Network Theorems 5.1 Superposition theorem
	3rd	5.1 Superposition theorem
11 th	1st	5.2 Thevenin's theorem
	2nd	5.2 Thevenin's theorem
	3rd	5.3 Norton's theorem
12 th	1st	5.3 Norton's theorem
	2 nd	5.4 Maximum power transfer theorem
	3 rd	5.4 Maximum power transfer theorem
13 th	1st	5.5 Reciprocity Theorem
	2 nd	Two Port Network 6.1 Open Circuit Impedance Parameters
	3 rd	6.1 Open Circuit Impedance Parameters
14 th	1st	6.2 Short Circuit Admittance Parameters, Transmission Parameters, Hybrid Parameters
	2 nd	6.2 Short Circuit Admittance Parameters, Transmission Parameters, Hybrid Parameters
	3 rd	6.3 Interrelationship of Two Port Network
15 th	1st	6.3 Interrelationship of Two Port Network
	2 nd	6.4 Inter Connection of Two Port Network
	3 rd	6.4 Inter Connection of Two Port Network

Shubhanshu Ramdasam

Signature of Teaching Faculty

GOVERNMENT POLYTECHNIC, JAGATSINGH PUR
ACADEMIC LESSON PLAN OF D.C m/c & Transformer. (WINTER)

Discipline: Electrical	Semester: THIRD(3rd)	Name of the Teaching Faculty: Er.SHUBHRANSHU RANJAN SWAIN
Subject: DCM&T	No. of days/per week class allotted:3 Period/ week	Semester From: 01 JULY 2026 TO 5th NOVEMBER 2026 No. of weeks:15 weeks
Week	Class Day	Theory Topics
1 st	1st	DC Generators 1.1 D.C. generator: construction, parts, materials and their functions
	2nd	1.1 D.C. generator: construction, parts, materials and their functions
	3rd	1.2 Principle of operation of DC generator 1.2.1 Fleming's right hand rule
2 nd	1st	1.2.2 Derive the emf equation of DC Generator
	2nd	1.2.3 Schematic diagrams of different types of DC generator
	3rd	1.2.4 Armature reaction
3 rd	1st	1.2.4 Armature reaction
	2nd	1.2.5 Commutation
	3rd	1.2.6 Applications of D.C. generators
4 th	1st	D.C. Motors 2.1 D.C. motor: Types of DC motors
	2nd	2.1.1 Fleming's left hand rule
	3rd	2.1.2 Principle of operation of Back e.m.f. and its significance
5 th	1st	2.1.3 Voltage equation of DC motor
	2nd	2.1.4 Torque and Speed; Armature torque, Shaft torque, BHP, Brake test, losses, efficiency
	3rd	2.2 DC motor starters: Necessity, two point and three point starters
6 th	1st	2.3 Speed control of DC shunt and series motor: Flux and Armature control
	2nd	2.3 Speed control of DC shunt and series motor: Flux and Armature control
	3rd	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 rd	3.3 Materials used for different parts: CRGO, CRNGO, HRGO, amorphous cores
8 th	1st	3.4 Transformer: Principle of operation
	2nd	3.5 EMF equation of transformer: Derivation, Voltage transformation ratio 3.6 Significance of transformer ratings
	3rd	3.7 Transformer No-load and on-load phasor diagram, Leakage reactance
9 th	1st	3.7 Transformer No-load and on-load phasor diagram, Leakage reactance
	2nd	3.8 Equivalent circuit of transformer: Equivalent resistance and reactance

	3rd	3.9 Voltage regulation and Efficiency: Direct loading, OC/SC method, All day efficiency
0 th	1st	3.9 Voltage regulation and Efficiency: Direct loading, OC/SC method, All day efficiency
	2nd	Three Phase Transformers 4.1 Bank of three single phase transformers, (Y-Y, Δ - Δ , Δ -Y, Y- Δ)
	3rd	4.2 Single unit of three phase transformer
1 st	1st	4.3 Distribution and Power transformers: Construction and cooling
	2nd	4.4 Criteria for selection of distribution transformer, and power transformer.
	3rd	4.5 Need of parallel operation of three phase transformer
12 th	1st	4.6 Conditions for parallel operation.
	2 nd	4.7 Polarity tests on mutually inductive coils and single phase transformers
	3 rd	4.8 Polarity test, Phasing out test on Three-phase transformer
13 th	1st	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.
	3 rd	5.1 Single phase and three phase autotransformers: Construction, working and applications. 5.2 Isolation transformer: Constructional Features and applications
14 th	1st	5.1 Single phase and three phase autotransformers: Construction, working and applications.
	2 nd	5.1 Single phase and three phase autotransformers: Construction, working and applications.
	3 rd	5.2 Isolation transformer: Constructional Features and applications
15 th	1st	5.2 Isolation transformer: Constructional Features and applications
	2 nd	5.2 Isolation transformer: Constructional Features and applications
	3 rd	5.2 Isolation transformer: Constructional Features and applications

Shubhramshu Ramdan Sircar

Signature of Teaching Faculty

GOVERNMENT POLYTECHNIC JAGATASINGHPUR
ACADEMIC LESSON PLAN SG&PD (WINTER-2026)

Discipline: Electrical	Semester:5th	Name of the Teaching Faculty: Er.SHUBHRANSU RANJAN SWAIN
Subject: SG & PD	No. of days/per week class allotted:3 p/ week	Semester From: 01 JULY 2026 TO 5th NOVEMBER No. of weeks:15 weeks
Week	Class Day	Theory Topics
1 st	1 st	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	• Protection zones and backup protection.
	3 rd	• Short circuit fault calculations in lines fed by generators through transformers
3 rd	1 st	• Need of current limiting reactors and their arrangements.
	2 nd	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), Arc voltage, Recovery voltage, Re-striking voltage, RRRV.
	2 nd	• Arc formation process, methods of arc extinction (High resistance and Low resistance), 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 (Sulphur-hexa Fluoride (SF ₆)). Working, construction, specifications and applications.
	2 nd	Vacuum circuit breaker- Working, construction, specifications and applications.
	3 rd	Vacuum circuit breaker - Working, construction, specifications and applications.
6 th	1 st	• L.T. circuit breaker (Air circuit breakers (ACB), Miniature circuit breakers (MCB), Moulded case circuit breakers (MCCB)
	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	Protective Relays • Fundamental quality requirements: Selectivity, Speed, Sensitivity,

		Reliability, Simplicity, Economy...
	3 rd	• Basic relay terminology- Protective relay, Relay time, Pick up, Reset current setting, Plug setting multiplier, Time setting multiplier.
8 th	1st	• Protective relays: Classification, principle of working, construction and operation of – Electromagnetic (Attracted armature type, Solenoid type, Watt-hour meter type) relay.
	2nd	• Protective relays: Classification, principle of working, construction and operation of – Electromagnetic (Attracted armature type, Solenoid type, Watt-hour meter type) relay.
	3rd	• Thermal relay. Block diagram and working of Static relay
9 th	1st	• Overcurrent relay-Time current characteristics.
	2nd	• Microprocessor based over current relays: Block diagram, working
	3rd	• Distance relaying- Principle, operation of Definite distance relays.
10 th	1st	• Directional relay: Need and operation.
	2nd	• Operation of current and voltage differential relay
	3rd	Protection of Alternator and Transformer • Alternator Protection Faults, Differential protection Over current, earth fault, overheating and field failure, protection
11 th	1st	• Alternator Protection Faults, Differential protection Over current, earth fault, overheating and field failure, protection
	2nd	• Alternator Protection Faults, Differential protection Over current, earth fault, overheating and field failure, protection.
	3rd	• Reverse power protection.
12 th	1st	• Reverse power protection.
	2 nd	• Transformer Protection Faults, Differential, over current, earth fault, over heating protection, Limitations of differential protection.
	3 rd	• Transformer Protection Faults, Differential, over current, earth fault, over heating protection, Limitations of differential protection.
13 th	1st	• Buchholz relay: Construction, operation, merits and demerits.
	2 nd	• Buchholz relay: Construction, operation, merits and demerits.
	3 rd	Protection of Motors • Bus-bar and Transmission Line Motor Faults. Short circuit protection, Overload protection, Single phase preventer.
14 th	1st	• Bus-bar and Transmission Line Motor Faults. Short circuit protection, Overload protection, Single phase preventer.
	2 nd	• Bus bar and Transmission line
	3 rd	• Faults on Bus bar and Transmission Lines.

1st	• Faults on Bus bar and Transmission Lines.
2 nd	• Bus bar protection: Differential and Fault bus protection.
3 rd	• Transmission line: Over current, Distance and Pilot wire protection

Shubhraman Rantan Saven.

Signature of Teaching Faculty

GOVERNMENT POLYTECHNIC, JAGATSINGHPUR

DEPARTMENT: ELECTRICAL ENGINEERING ACADEMIC

LESSON PLAN OF

UNIVERSAL HUMAN VALUES

(WINTER-2026)(5TH SEM)

Discipline: Electrical	Semester:5 th	Name of the Teaching Faculty: SHUBHURANSHU RANJAN SWAIN
Subject: UHV	No. of days/per week class allotted:3p/week	Semester From: 01 JULY 2026 TO 5 th NOVEMBER 2026 No. of weeks:15 weeks
Week	Class Day	Theory Topics
1 st	1 st	Introduction to Value Education and Human Values - Concept and Need for Value Education - Understanding the importance of value education in personal and professional life, Differentiating between values and skills.
	2 nd	Concept and Need for Value Education - Understanding the importance of value education in personal and professional life, Differentiating between values and skills.
	3 rd	Concept and Need for Value Education - Understanding the importance of value education in personal and professional life, Differentiating between values and skills.
2 nd	1 st	Concept and Need for Value Education - Understanding the importance of value education in personal and professional life, Differentiating between values and skills.
	2 nd	Basic Human Aspirations - Exploring fundamental human aspirations: happiness and prosperity, Methods to achieve these aspirations through right understanding and relationships.
	3 rd	Basic Human Aspirations - Exploring fundamental human aspirations: happiness and prosperity, Methods to achieve these aspirations through right understanding and relationships.
3 rd	1 st	Basic Human Aspirations - Exploring fundamental human aspirations: happiness and prosperity, Methods to achieve these aspirations through right understanding and relationships.
	2 nd	Basic Human Aspirations - Exploring fundamental human aspirations: happiness and prosperity, Methods to achieve these aspirations through right understanding and relationships.
	3 rd	Harmony in the Human Being - Understanding the Self - Differentiating between the 'Self' (I) and the Body, Understanding the needs of the Self and the Body
4 th	1 st	Understanding the Self - Differentiating between the 'Self' (I) and the Body, Understanding the needs of the Self and the Body
	2 nd	Understanding the Self - Differentiating between the 'Self' (I) and the Body, Understanding the needs of the Self and the Body
	3 rd	Understanding the Self - Differentiating between the 'Self' (I) and the Body, Understanding the needs of the Self and the Body
	1 st	Harmony of the Self with the Body - Ensuring the harmony of 'I' with the Body, Practices for mental and physical well-being.

5 th	2 nd	Harmony of the Self with the Body - Ensuring the harmony of 'I' with the Body, Practices for mental and physical well-being.
	3 rd	Harmony of the Self with the Body - Ensuring the harmony of 'I' with the Body, Practices for mental and physical well-being.
6 th	1 st	Harmony of the Self with the Body - Ensuring the harmony of 'I' with the Body, Practices for mental and physical well-being.
	2 nd	Harmony in the Family and Society - Family as the Basic Unit of Society - Understanding values in human relationships, Trust and respect as the foundational values in relationships

	3 rd	Family as the Basic Unit of Society -Understanding values in human relationships, Trust and respect as the foundational values in relationships
7 th	1 st	Family as the Basic Unit of Society - Understanding values in human relationships, Trust and respect as the foundational values in relationships
	2 nd	Family as the Basic Unit of Society -Understanding values in human relationships, Trust and respect as the foundational values in relationships
	3 rd	Harmony in Society - The concept of an undivided society, Universal human order and world family.
8 th	1 st	Harmony in Society - The concept of an undivided society, Universal human order and world family.
	2 nd	Harmony in Society - The concept of an undivided society, Universal human order and world family.
	3 rd	Harmony in Society - The concept of an undivided society, Universal human order and world family.
9 th	1 st	Harmony in Nature and Existence - Interconnectedness in Nature -Understanding the four orders of nature: material, plant, animal, and human, Mutual fulfillment among these orders
	2 nd	Interconnectedness in Nature -Understanding the four orders of nature: material, plant, animal, and human, Mutual fulfillment among these orders
	3 rd	Interconnectedness in Nature -Understanding the four orders of nature: material, plant, animal, and human, Mutual fulfillment among these orders
10 th	1 st	Interconnectedness in Nature -Understanding the four orders of nature: material, plant, animal, and human, Mutual fulfillment among these orders
	2 nd	Co-existence in Existence - Holistic perception of harmony in existence, Role of human beings in maintaining environmental balance.
	3 rd	Co-existence in Existence - Holistic perception of harmony in existence, Role of human beings in maintaining environmental balance.
	1 st	Co-existence in Existence - Holistic perception of harmony in existence, Role of human beings in maintaining environmental balance.

11 th	2 nd	Co-existence in Existence - Holistic perception of harmony in existence, Role of human beings in maintaining environmental balance.
	3 rd	Professional Ethics - Ethical Human Conduct - Integrating values into professional life, Concept of professional ethics and accountability
12 th	1 st	Ethical Human Conduct - Integrating values into professional life, Concept of professional ethics and accountability
	2 nd	Ethical Human Conduct - Integrating values into professional life, Concept of professional ethics and accountability
	3 rd	Case Studies in Professional Ethics - Analyzing real-life scenarios to understand ethical dilemmas
13 th	1 st	Case Studies in Professional Ethics - Analyzing real-life scenarios to understand ethical dilemmas
	2 nd	Case Studies in Professional Ethics - Analyzing real-life scenarios to understand ethical dilemmas
	3 rd	Developing solutions based on universal human values.
14 th	1 st	Developing solutions based on universal human values.

	2 nd	Personal Development and Social Responsibility - Self-Reflection and Self- Exploration - Techniques for self-assessment and personal growth
	3 rd	Self-Reflection and Self- Exploration - Techniques for self-assessment and personal growth
15 th	1 st	Setting personal goals aligned with universal values,
	2 nd	Social Responsibility - Understanding one's role in society, Participating in community service and social initiatives.
	3 rd	Social Responsibility - Understanding one's role in society, Participating in community service and social initiatives.

Shubhramshu Ramitam Sahoo

Lecturer.(S-II) Ele.Engg Dept
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