

**GOVERNMENT POLYTECHNIC ,GAJAPATI**  
**Department Of Electrical Engineering**  
**LESSON PLAN**

Subject :TH-2: **Electrical Circuit**

Name of Faculty: **Sri Deepak Ku Roul,Lect(S-2)**

Semester : 3<sup>rd</sup>

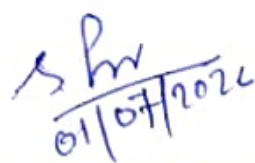
Branch : **Electrical Engineering**

No of period: 45 (3hr /week)

W.E.F :- 01.07.2026

| Week | Period | Topic to be covered                                                                                                                       | Teaching Aid to be use                  |
|------|--------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| 1    |        | <b>Single Phase A.C Series Circuits :</b>                                                                                                 |                                         |
|      | 1      | Generation of alternating voltage<br>Phasor representation of sinusoidal quantities                                                       | White board ,Marker,<br>Ref book, notes |
|      | 2      | R. L. C circuit elements its voltage and current response                                                                                 | -do-                                    |
|      | 3      | R-L combination of A.C series circuit<br>(Impedance, reactance, impedance triangle ,Power factor ,<br>Power triangle and vector diagram ) | -do-                                    |
| 2    | 4      | R-C combination of A.C series circuit                                                                                                     | -do-                                    |
|      | 5      | R-L-C combination of A.C series circuit                                                                                                   | -do-                                    |
|      | 6      | Resonance, Bandwidth                                                                                                                      | -do-                                    |
| 3    | 7      | Quality factor and voltage magnification in series R-L, R-<br>C, R-L-C circuit .                                                          | -do-                                    |
|      |        | <b>Single Phase A.C Parallel Circuits</b>                                                                                                 |                                         |
|      | 8      | R-L parallel combination of A.C. circuits                                                                                                 | White board ,Marker,<br>Ref book, notes |
|      | 9      | Impedance, reactance, phasor diagram, impedance triangle<br>power triangle                                                                | -do-                                    |
| 4    | 10     | R-C parallel combination of A.C. circuits                                                                                                 | -do-                                    |
|      | 11     | R-L-C parallel combination of A.C. circuits                                                                                               | -do-                                    |
|      | 12     | Resonance in parallel R-L circuit                                                                                                         | -do-                                    |
| 5    | 13     | Resonance in parallel R-C circuit                                                                                                         | -do-                                    |
|      | 14     | Resonance in parallel R-L-C circuit                                                                                                       | -do-                                    |
|      | 15     | Bandwidth, Quality factor and voltage magnification                                                                                       | -do-                                    |
| 6    |        | <b>Three Phase Circuits</b>                                                                                                               |                                         |
|      | 16     | Phasor and complex representation of three phase supply                                                                                   | White board ,Marker,<br>Ref book, notes |
|      | 17     | Phase sequence and polarity                                                                                                               | -do-                                    |
|      | 18     | Types of three-phase connections                                                                                                          | -do-                                    |
| 7    | 19     | Phase and line quantities in three phase star and delta<br>system                                                                         | -do-                                    |
|      | 20     | Balanced and unbalanced load                                                                                                              | -do-                                    |
|      | 21     | Neutral shift in unbalanced load                                                                                                          | -do-                                    |

| Week | Period | Topic to be covered                                                        | Teaching Aid to be use                        |
|------|--------|----------------------------------------------------------------------------|-----------------------------------------------|
| 8    | 22     | Three phase power, active, reactive and apparent power in star and system  | -do-                                          |
|      | 23     | Three phase power, active, reactive and apparent power in and delta system | -do-                                          |
|      |        | <b>Network Reduction and Principles of Circuit Analysis</b>                |                                               |
|      | 24     | Source transformation                                                      | White board ,Marker,<br>Ref book, notes       |
| 9    | 25     | Star/delta and delta/star transformation                                   | -do-                                          |
|      | 26     | Mesh Analysis                                                              | -do-                                          |
|      | 27     | Node Analysis                                                              | -do-                                          |
| 10   | 28     | Problem solving                                                            | White board ,Marker,<br>Ref book, calculator  |
|      |        | <b>Network Theorems</b>                                                    |                                               |
|      | 29     | Superposition theorem                                                      | White board ,Marker,                          |
|      | 30     | Problem on superposition theorem                                           | White board ,Marker,                          |
| 11   | 31     | Thevenin's theorem                                                         | White board ,Marker,<br>ref books ,Calculator |
|      | 32     | Problem solving                                                            |                                               |
|      | 33     | Norton's theorem                                                           | -do-                                          |
| 12   | 34     | Problem solving                                                            | -do-                                          |
|      | 35     | Maximum power transfer theorem                                             | -do-                                          |
|      | 36     | Problem solving                                                            |                                               |
| 13   | 37     | Reciprocity Theorem                                                        | White board ,Marker                           |
|      |        | <b>Two Port Network</b>                                                    |                                               |
|      | 38     | Open Circuit Impedance Parameters                                          | White board ,Marker,<br>Ref book, notes       |
|      | 39     | Open Circuit Impedance Parameters problem solve                            | -do-                                          |
| 14   | 40     | Short Circuit Admittance Parameters                                        | -do-                                          |
|      | 41     | Short Circuit Admittance Parameters problem solve                          | -do-                                          |
|      | 42     | Transmission Parameters , Hybrid Parameters                                | -do-                                          |
| 15   | 43     | Problem solving on Transmission Parameters , Hybrid Parameters             | -do-                                          |
|      | 44     | Interrelationship of Two Port Network                                      | -do-                                          |
|      | 45     | Inter Connection of Two Port Network                                       | -do-                                          |
| 16   | 46     | Previous Question Discussion                                               | White board ,Marker<br>Previous year question |
|      | 47     | Previous Question Discussion                                               |                                               |
|      | 48     | Previous Question Discussion                                               |                                               |

  
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# GOVERNMENT POLYTECHNIC ,GAJAPATI

## Department Of Electrical Engineering

### LESSON PLAN

Subject :TH-4: DC Machine & Transformers

Name of Faculty: **Sri Deepak Ku Roul,Lect(S-2)**

Semester : 3<sup>rd</sup>

Branch : Electrical Engineering

No of period: 45 (3hr /week)

W.E.F :- 01.07.2026

| Week | Period | Topic to be covered                                                                    | Teaching Aid to be use                           |
|------|--------|----------------------------------------------------------------------------------------|--------------------------------------------------|
| 1    |        | <b>DC Generators :</b>                                                                 |                                                  |
|      | 1      | D.C. generator: construction, parts, materials and their functions                     | White board ,Marker, Ref book, notes             |
|      | 2      | Principle of operation of DC generator<br>Fleming's right hand rule                    | -do-                                             |
|      | 3      | Derive the emf equation of DC Generator                                                | -do-                                             |
| 2    | 4      | Problem solving                                                                        | White board ,Marker, Ref book, notes, calculator |
|      | 5      | Schematic diagrams of different types of DC generator                                  | -do-                                             |
|      | 6      | Armature reaction                                                                      | -do-                                             |
| 3    | 7      | <b>Commutation</b>                                                                     | -do-                                             |
|      | 8      | Applications of D.C. generators                                                        |                                                  |
|      |        | <b>D.C. Motors</b>                                                                     | White board ,Marker, Ref book, notes             |
|      | 9      | D.C. motor: Types of DC motors                                                         | -do-                                             |
| 4    | 10     | Fleming's left hand rule<br>Principle of operation of Back e.m.f. and its significance | -do-                                             |
|      | 11     | Voltage equation of DC motor                                                           | -do-                                             |
|      | 12     | Torque and Speed: Armature torque, Shaft torque, BHP, Brake test, losses, efficiency   | -do-                                             |
| 5    | 13     | DC motor starters: Necessity, two point and three point starters                       | -do-                                             |
|      | 14     | Speed control of DC shunt and series motor: Flux and Armature control                  | -do-                                             |
|      | 15     | Brushless DC Motor: Construction and working                                           | -do-                                             |
| 6    |        | <b>Single Phase Transformers</b>                                                       | White board ,Marker, Ref book, notes             |
|      | 16     | Types of transformers: Shell type and core type                                        | -do-                                             |
|      | 17     | Construction: Parts and functions                                                      | -do-                                             |
|      | 18     | Materials used for different parts: CRGO, CRNGO, HRGO, amorphous cores                 | -do-                                             |
| 7    | 19     | Transformer: Principle of operation                                                    | -do-                                             |
|      | 20     | EMF equation of transformer: Derivation, Voltage transformation ratio                  | -do-                                             |

| Week | Period | Topic to be covered                                                                            | Teaching Aid to be use                          |
|------|--------|------------------------------------------------------------------------------------------------|-------------------------------------------------|
| 7    | 21     | Significance of transformer ratings                                                            | -do-                                            |
| 8    | 22     | Transformer No-load and on-load phasor diagram, Leakage reactance                              | -do-                                            |
|      | 23     | Equivalent circuit of transformer: Equivalent resistance and reactance                         | -do-                                            |
|      | 24     | Voltage regulation and Efficiency: Direct loading, OC/SC method, All day efficiency            | -do-                                            |
| 9    |        | <b>Three Phase Transformers</b>                                                                | White board ,Marker, Ref book, calculator       |
|      | 25     | Bank of three single phase transformers.(Y-Y, $\Delta$ - $\Delta$ , $\Delta$ -Y, Y- $\Delta$ ) | -do-                                            |
|      | 26     | Single unit of three phase transformer                                                         | -do-                                            |
|      | 27     | Distribution and Power transformers: Construction and cooling.                                 | -do-                                            |
| 10   | 28     | Criteria for selection of distribution transformer, and power transformer.                     | -do-                                            |
|      | 29     | Need of parallel operation of three phase transformer                                          | White board ,Marker,                            |
|      | 30     | Conditions for parallel operation.                                                             | White board ,Marker,                            |
| 11   | 31     | Polarity tests on mutually inductive coils and single phase transformers                       | White board ,Marker, ,ref books ,Calculator     |
|      | 32     | Polarity test, Phasing out test on Three-phase transformer                                     |                                                 |
|      |        | <b>Special Purpose Transformers</b>                                                            | -do-                                            |
|      | 33     | Single phase autotransformers: Construction, working and applications.                         | -do-                                            |
| 12   | 34     | Three phase autotransformers: Construction, working and applications                           | -do-                                            |
|      | 35     | Isolation transformer: Constructional Features and applications                                |                                                 |
|      | 36     | Isolation transformer: Constructional Features and applications                                | White board ,Marker                             |
| 13   | 37     | Revision Class ch-1 & Ch-2                                                                     | White board ,Marker                             |
|      | 38     | Problem solving Ch-1 & Ch2                                                                     | White board ,Marker, Ref book, notes            |
|      | 39     | Revision class Ch-3                                                                            |                                                 |
| 14   | 40     | Problem Solving Ch-3                                                                           | -do-                                            |
|      | 41     | Revision class Ch-4& Ch-5                                                                      | -do-                                            |
|      | 42     | Problem Solving                                                                                | White board ,Marker, Ref book, notes calculator |
| 15   | 43     | Previous Question Discussion                                                                   |                                                 |
|      | 44     | Previous Question Discussion                                                                   | -do-                                            |
|      | 45     | Previous Question Discussion                                                                   | -do-                                            |

  
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**Department Of Electrical Engineering**

**LESSON PLAN**

Subject : **TH:4(a)-: Switchgear & Protection**

Name of Faculty: **Sri Deepak Ku Roul,Lect(S-2)**

Semester : 5<sup>th</sup>

Branch : **Electrical Engineering**

No of period: 45 (3hr /week)

W.E.F :- 01.07.2026

| Week | Period | Topic to be covered                                                                                                  | Teaching Aid to be use                                 |
|------|--------|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| 1    |        | <b>Basics of Protection</b>                                                                                          |                                                        |
|      | 1      | Necessity, functions of protective system                                                                            | White board ,Marker,<br>Ref book, notes                |
|      | 2      | Normal and abnormal conditions.                                                                                      | -do-                                                   |
|      | 3      | Types of faults and their causes.                                                                                    | -do-                                                   |
| 2    | 4      | Protection zones and backup protection                                                                               | -do-                                                   |
|      | 5      | Short circuit fault calculations in lines fed by generators through transformers                                     | White board ,Marker,<br>Ref book, notes ,<br>Caculator |
|      | 6      | Need of current limiting reactors and their arrangements.                                                            | -do-                                                   |
| 3    |        | <b>Circuit Interruption Devices.</b>                                                                                 | White board ,Marker,<br>Ref book, notes                |
|      | 7      | Isolators- Vertical break, Horizontal break and Pantograph type                                                      |                                                        |
|      | 8      | HRC fuses – Construction, working, characteristics and applications.                                                 | White board ,Marker,<br>Ref book, notes                |
|      | 9      | Arc formation process, methods of arc extinction (High resistance and Low resistance), Arc voltage                   | -do-                                                   |
| 4    | 10     | Recovery voltage, Re-striking voltage, RRRV                                                                          | -do-                                                   |
|      | 11     | HT circuit breakers (Sulphur-hexa Fluoride (SF <sub>6</sub> ) Working, construction, specifications and applications | -do-                                                   |
|      | 12     | Vacuum circuit breaker) -                                                                                            | -do-                                                   |
| 5    | 13     | L.T. circuit breaker (Air circuit breakers (ACB)                                                                     | -do-                                                   |
|      | 14     | Miniature circuit breakers (MCB), Moulded case circuit breakers (MCCB)                                               | -do-                                                   |
|      | 15     | Earth leakage circuit breaker (ELCB)) - Working and applications                                                     | -do-                                                   |
| 6    | 16     | Selection of LT and HT circuit breakers (ratings)                                                                    | White board ,Marker,<br>Ref book, notes                |
|      | 17     | Selection of MCCB for motors                                                                                         | -do-                                                   |
|      | 18     | Gas insulated switchgear                                                                                             | -do-                                                   |
| 7    |        | <b>Protective Relays</b>                                                                                             | White board ,Marker,<br>Ref book, notes                |
|      | 19     | Fundamental quality requirements: Selectivity                                                                        | -do-                                                   |

| Week | Period | Topic to be covered                                                                                                                                                            | Teaching Aid to be use                    |
|------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| 7    | 20     | Speed, Sensitivity, Reliability, Simplicity, Economy.                                                                                                                          | -do-                                      |
|      | 21     | Basic relay terminology- Protective relay, Relay time, Pick up, Reset current, current setting, Plug setting multiplier, Time setting multiplier.                              | -do-                                      |
| 8    | 22     | Protective relays: Classification, principle of working, construction and operation of – Electromagnetic (Attracted armature type, Solenoid type, Watt-hour meter type) relay, | -do-                                      |
|      | 23     | Thermal relay. Block diagram and working of Static relay                                                                                                                       | -do-                                      |
|      | 24     | Overcurrent relay-Time current characteristics.                                                                                                                                | White board ,Marker, Ref book, calculator |
| 9    | 25     | Microprocessor based over current relays: Block diagram, working                                                                                                               | -do-                                      |
|      | 26     | Distance relaying- Principle, operation of Definite distance relays.                                                                                                           | -do-                                      |
|      | 27     | Directional relay: Need and operation                                                                                                                                          | -do-                                      |
| 10   | 28     | Operation of current and voltage differential relay                                                                                                                            | -do-                                      |
|      |        | <b>Protection of Alternator and Transformer</b>                                                                                                                                | White board ,Marker,                      |
|      | 29     | Alternator Protection Faults, Differential protection Over current, earth fault,                                                                                               | White board ,Marker,                      |
|      | 30     | overheating and field failure, protection                                                                                                                                      | White board ,Marker, ref books            |
| 11   | 31     | Reverse power protection.                                                                                                                                                      |                                           |
|      | 32     | Transformer Protection Faults, Differential, over current,                                                                                                                     | -do-                                      |
|      | 33     | earth fault, over heating protection, Limitations of differential protection                                                                                                   | -do-                                      |
| 12   | 34     | Buchholz relay: Construction, operation, merits and demerits.                                                                                                                  | -do-                                      |
|      |        | <b>Protection of Motors</b>                                                                                                                                                    |                                           |
|      | 35     | Bus-bar and Transmission Line Motor Faults                                                                                                                                     | White board ,Marker                       |
|      | 36     | •. Short circuit protection, Overload protection, Single phase preventer                                                                                                       | White board ,Marker                       |
| 13   | 37     | •. Short circuit protection, Overload protection, Single phase preventer                                                                                                       | White board ,Marker, Ref book, notes      |
|      | 38     | Faults on Bus bar and Transmission Lines                                                                                                                                       | -do-                                      |
|      | 39     | Bus bar protection: Differential and Fault bus protection.                                                                                                                     | -do-                                      |
| 14   | 40     | Transmission line: Over current                                                                                                                                                | -do-                                      |
|      | 41     | Distance and Pilot wire protection.                                                                                                                                            | -do-                                      |
|      | 42     | Previous Question Discussion                                                                                                                                                   | White board ,Marker, Ref book, calculator |
| 15   | 43     | Previous Question Discussion                                                                                                                                                   | -do-                                      |
|      | 44     | Previous Question Discussion                                                                                                                                                   | -do-                                      |
|      | 45     | Previous Question Discussion                                                                                                                                                   | -do-                                      |

  
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