VOLTBOOK / GTU DIPLOMA ELECTRICAL

Electrical Power Transmission and Distribution

DETAILED OUTCOME-BASED PRACTICAL MANUAL

COURSE CODE	SEMESTER	PRACTICALS	EFFECTIVE FROM
DI03000101	3	16	2024-25

Prepared from the Suggested Course Practical List in the current GTU DI-series syllabus, effective 2024-25.

The organization follows the familiar outcome-based pattern used in legacy DTE laboratory manuals. All instructional text is independently written for this edition. This is not an official GTU, DTE or CTE publication.

Student name: _____

Enrollment no.: _____ Batch: _____

Institute: _____

UNIVERSITY-DRAFTED FIGURE EDITION 6.0 / 20 JULY 2026

Certificate

This is to certify that _____, enrollment number _____, has satisfactorily completed the prescribed practical work for Electrical Power Transmission and Distribution (DI03000101) during the academic term _____ under the supervision of the department.

Laboratory faculty	Head of department	Principal
Signature and date	Signature and date	Signature and date

Preface

This manual turns the current syllabus practical list into a usable student record. Each practical includes an original experiment-specific vector diagram and is arranged from objective and outcomes through prerequisite theory, setup, resources, safety, procedure, observations, interpretation, questions, references and a 25-mark assessment rubric.

Students should complete pre-lab preparation before the session and record actual readings during the session. Faculty may adapt component values, instrument ranges, software versions and local assessment requirements without changing the intended practical outcome.

Diagram drafting benchmarks were reviewed from Aurora's Electrical Circuits and Simulation manual, MITS Electronic Devices and Circuits manual, Sree Vahini's Electrical Measurements manual, and MSBTE Electrical Estimating and Contracting practice. Edition 6.0 applies stricter university drafting: complete current paths, IEC-style junctions and terminals, protection, instrument coils, test points, load terminals and measurement notes. Every figure is newly drawn and aligned to the current GTU practical title.

Official syllabus reference

Open the referenced GTU syllabus PDF

Programme outcomes and course outcomes

Programme outcomes

Code	Outcome
PO1	Basic and discipline-specific knowledge: apply mathematics, science and engineering fundamentals.
PO2	Problem analysis: identify and analyze well-defined engineering problems using standard methods.
PO3	Design/development of solutions: develop solutions for well-defined technical problems.
PO4	Engineering tools, experimentation and testing: use modern tools and interpret test results.
PO5	Engineering practices for society, sustainability and environment: apply safe and responsible practice.
PO6	Project management: apply engineering management principles individually and in teams.
PO7	Lifelong learning: recognize the need for independent learning in changing technology.

Course competency

Analyze and document transmission and distribution components, configurations and performance.

Course outcomes

CO	Course outcome
CO1	Apply mechanical and electrical design aspects of conductors, supports and insulators.
CO2	Analyze transmission-line performance.
CO3	Illustrate the configuration and operation of HVDC systems.
CO4	Identify the components and configurations of power-distribution systems.

Practical outcome to course outcome matrix

The mapping below is for learning guidance. Faculty should use the assessment scheme prescribed by the institute.

No.	Suggested practical	Mapped CO
1	Demonstrate conductors used in overhead transmission lines	CO1
2	Demonstrate line supports used in transmission and distribution systems	CO1
3	Demonstrate insulators used in overhead transmission and distribution systems	CO1
4	Calculate sag in an overhead transmission line for given data	CO1
5	Determine string efficiency of a suspension insulator for given data	CO1
6	Determine voltage regulation and efficiency of a short transmission line	CO2
7	Determine voltage regulation and efficiency of a medium transmission line	CO2
8	Prepare a technical report on a load dispatch center	CO2
9	Prepare a report on EHV AC transmission systems in India	CO3
10	Prepare a report on HVDC transmission systems in India	CO3
11	Study FACTS and its devices	CO3
12	Prepare a report after studying a residential colony distribution system	CO4
13	Study an AC distribution system in radial and ring-main configurations	CO4
14	Solve voltage-drop and sending/receiving-end voltage problems for a distribution line	CO4
15	Prepare a report on distribution cables using supplier, industry or verified online study	CO4
16	Study cable recycling and electrical/electronic waste management	CO4

Industry skills and laboratory guidance

Industry-relevant skills

- Identification from samples and nameplates
- Transmission-line performance calculation
- Technical reporting from verified sources
- Distribution-system survey and diagramming

Guidelines for instructors

1. Confirm the practical outcome, risk controls, apparatus readiness and emergency arrangements before the session.
2. Demonstrate only the critical connection, software or measurement steps; require students to reason through the remaining work.
3. Check circuit polarity, earthing, isolation, ranges and ratings before energization.
4. Assess both process and result. Give credit for safe practice, honest data, teamwork and technically sound interpretation.
5. Adapt values and equipment to local facilities while preserving the mapped course outcome.

Instructions for students

1. Read the practical, write the prediction and prepare the setup before entering the laboratory.
2. Record instrument identification, range, least count and component ratings before use.
3. Enter raw readings directly with units. Strike through errors once; do not erase or fabricate data.
4. Switch OFF and verify isolation before changing a connection. Report damage, heating, smell or unstable readings immediately.
5. Attach graphs, code listings, drawings, estimates and technical evidence behind the relevant practical.

Progressive assessment rubric

Each practical is assessed out of 25 marks. The practical-specific rubric repeats at the end of every experiment.

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct circuit/interface/drawing interpretation	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Practical skill, measurement and safety	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Suggested interpretation

Total	Level	Interpretation
21-25	Excellent	Independent, accurate, safe and well interpreted
16-20	Good	Sound performance with minor correction
11-15	Satisfactory	Outcome achieved with guidance
0-10	Needs improvement	Repeat preparation or practical work as directed

Safety acknowledgement

I understand that institute rules and faculty instructions take priority over this manual. I will not energize, modify or touch a circuit without authorization.

Student signature and date	Faculty signature and date

Continuous assessment record

Practical	Date	Marks /25	Faculty initials
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			
13			
14			
15			
16			
TOTAL		/400	

Experiment index

PRACTICAL 01

Demonstrate conductors used in overhead transmission lines

DATE	BATCH	ROLL / ENROLLMENT NO.	FACULTY SIGN

A. Objective

Demonstrate conductors used in overhead transmission lines.

B. Expected programme outcomes

PO1, PO2, PO4, PO7.

C. Expected competency

Analyze and document transmission and distribution components, configurations and performance.

D. Expected course outcome

CO1: Apply mechanical and electrical design aspects of conductors, supports and insulators.

E. Practical learning outcomes

1. Identify construction, rating, operating principle and application of the item or system.
2. Record observations in a labelled diagram and comparative technical table.
3. Form a justified conclusion using verified technical evidence.

F. Affective-domain outcomes

1. Follow electrical safety, laboratory discipline and good housekeeping.
2. Record observations honestly with units, dates and traceable corrections.
3. Share instruments responsibly and complete the work within the allotted time.

G. Prerequisite theory

This is an identification and engineering-observation exercise. Record construction, ratings, operating principle, application, limitations and safety requirements for every item or system studied. Use nameplate data and current manufacturer or utility information; clearly distinguish observation from inference.

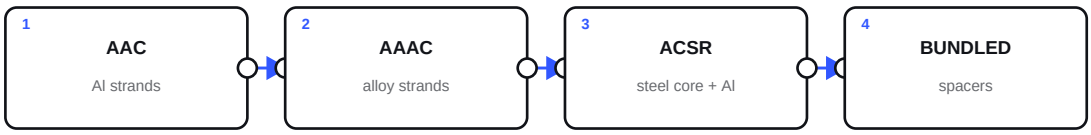
Key relations / checks

- Regulation = (|VS no-load| - |VR full-load|)/|VR full-load| x 100
- Efficiency = PR/PS x 100
- Use the specified short- or nominal-pi model

H. Experimental setup / drawing

Study the labelled constructional, single-line or system diagram below and add the verified ratings, terminal designations and functional details for the item observed.

FIG. H.1 - OVERHEAD CONDUCTOR CONSTRUCTION VERIFY VALUES BEFORE USE



Engineering-diagram note: Confirm the actual component values, ratings, terminal numbers, instrument ranges and protective measures issued by your laboratory. Faculty approval is mandatory before energizing.

I. Resources and equipment required

Resource	Specification / range	Quantity
Trainer / approved model	Low-voltage line model where used	1
Samples / nameplate data	Conductor, support, insulator or cable	As req.
Meters	Suitable ranges	1 set
Calculator	Scientific	1
Technical reference	Utility/manufacturer/standard	As req.

J. Safety and precautions

1. Do not energize or alter a circuit without instructor approval.
2. Use intact leads, correct instrument ranges, rated components and required PPE.
3. Switch OFF, isolate and verify absence of voltage before touching conductors.
4. Keep exposed live parts guarded and use only the approved laboratory supply.

K. Procedure

1. Collect only instructor-approved de-energized samples, models, data sheets or trainer modules.
2. Read markings and nameplate information; record type, material, rating, construction and relevant standard symbol.
3. Inspect each item and identify terminals or functional parts without dismantling sealed or energized equipment.
4. Explain the operating principle and match each type to a suitable application.
5. Compare advantages, limitations, failure modes and safe handling requirements in the observation table.
6. Have the instructor verify the identification and record the final conclusion.

L. Observations and calculations

Record verified ratings and constructional observations. Identify the source of any information not obtained directly from the sample or site.

Item / parameter	Rating / value	Construction / principle	Application	Remarks

LABELLED SKETCH / SINGLE-LINE DIAGRAM / COMPARATIVE NOTES

M. Interpretation of results

COMPARE OBSERVED AND EXPECTED BEHAVIOUR; EXPLAIN ERROR, LIMITATIONS OR DESIGN TRADE-OFFS

N. Conclusion

STATE WHETHER THE PRACTICAL OUTCOME WAS ACHIEVED AND SUPPORT IT WITH KEY EVIDENCE

O. Practical-related questions

No.	Question / answer
1	What physical principle or engineering rule is verified in 'Demonstrate conductors used in overhead transmission lines'? Answer: _____
2	Why was the selected instrument range, component rating or data source suitable? Answer: _____
3	Which two errors or uncertainties have the greatest effect on this result? Answer: _____
4	What safety step must be completed before changing a connection or configuration? Answer: _____

P. References and suggestions

1. C. L. Wadhwa, Electrical Power Systems
2. S. N. Singh, Electric Power Generation, Transmission and Distribution
3. Current GTU syllabus DI03000101 and institute laboratory instructions

Q. Assessment rubric (25 marks)

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct circuit/interface/drawing interpretation	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Practical skill, measurement and safety	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Faculty remarks	Student response / correction completed

PRACTICAL 02

Demonstrate line supports used in transmission and distribution systems

DATE	BATCH	ROLL / ENROLLMENT NO.	FACULTY SIGN

A. Objective

Demonstrate line supports used in transmission and distribution systems.

B. Expected programme outcomes

PO1, PO2, PO4, PO7.

C. Expected competency

Analyze and document transmission and distribution components, configurations and performance.

D. Expected course outcome

CO1: Apply mechanical and electrical design aspects of conductors, supports and insulators.

E. Practical learning outcomes

1. Identify construction, rating, operating principle and application of the item or system.
2. Record observations in a labelled diagram and comparative technical table.
3. Form a justified conclusion using verified technical evidence.

F. Affective-domain outcomes

1. Follow electrical safety, laboratory discipline and good housekeeping.
2. Record observations honestly with units, dates and traceable corrections.
3. Share instruments responsibly and complete the work within the allotted time.

G. Prerequisite theory

This is an identification and engineering-observation exercise. Record construction, ratings, operating principle, application, limitations and safety requirements for every item or system studied. Use nameplate data and current manufacturer or utility information; clearly distinguish observation from inference.

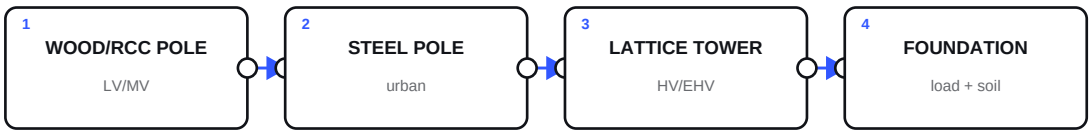
Key relations / checks

- State the governing relation before substitution
- Use consistent SI units
- % difference = |observed - expected|/expected x 100

H. Experimental setup / drawing

Study the labelled constructional, single-line or system diagram below and add the verified ratings, terminal designations and functional details for the item observed.

FIG. H.2 - LINE-SUPPORT COMPARISON VERIFY VALUES BEFORE USE



Engineering-diagram note: Confirm the actual component values, ratings, terminal numbers, instrument ranges and protective measures issued by your laboratory. Faculty approval is mandatory before energizing.

I. Resources and equipment required

Resource	Specification / range	Quantity
Trainer / approved model	Low-voltage line model where used	1
Samples / nameplate data	Conductor, support, insulator or cable	As req.
Meters	Suitable ranges	1 set
Calculator	Scientific	1
Technical reference	Utility/manufacturer/standard	As req.

J. Safety and precautions

1. Do not energize or alter a circuit without instructor approval.
2. Use intact leads, correct instrument ranges, rated components and required PPE.
3. Switch OFF, isolate and verify absence of voltage before touching conductors.
4. Keep exposed live parts guarded and use only the approved laboratory supply.

K. Procedure

1. Collect only instructor-approved de-energized samples, models, data sheets or trainer modules.
2. Read markings and nameplate information; record type, material, rating, construction and relevant standard symbol.
3. Inspect each item and identify terminals or functional parts without dismantling sealed or energized equipment.
4. Explain the operating principle and match each type to a suitable application.
5. Compare advantages, limitations, failure modes and safe handling requirements in the observation table.
6. Have the instructor verify the identification and record the final conclusion.

L. Observations and calculations

Record verified ratings and constructional observations. Identify the source of any information not obtained directly from the sample or site.

Item / parameter	Rating / value	Construction / principle	Application	Remarks

LABELLED SKETCH / SINGLE-LINE DIAGRAM / COMPARATIVE NOTES

M. Interpretation of results

COMPARE OBSERVED AND EXPECTED BEHAVIOUR; EXPLAIN ERROR, LIMITATIONS OR DESIGN TRADE-OFFS

N. Conclusion

STATE WHETHER THE PRACTICAL OUTCOME WAS ACHIEVED AND SUPPORT IT WITH KEY EVIDENCE

O. Practical-related questions

No.	Question / answer
1	What physical principle or engineering rule is verified in 'Demonstrate line supports used in transmission and distribution systems'? Answer: _____
2	Why was the selected instrument range, component rating or data source suitable? Answer: _____
3	Which two errors or uncertainties have the greatest effect on this result? Answer: _____
4	What safety step must be completed before changing a connection or configuration? Answer: _____

P. References and suggestions

1. C. L. Wadhwa, Electrical Power Systems
2. S. N. Singh, Electric Power Generation, Transmission and Distribution
3. Current GTU syllabus DI03000101 and institute laboratory instructions

Q. Assessment rubric (25 marks)

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct circuit/interface/drawing interpretation	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Practical skill, measurement and safety	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Faculty remarks	Student response / correction completed

PRACTICAL 03

Demonstrate insulators used in overhead transmission and distribution systems

DATE	BATCH	ROLL / ENROLLMENT NO.	FACULTY SIGN

A. Objective

Demonstrate insulators used in overhead transmission and distribution systems.

B. Expected programme outcomes

PO1, PO2, PO4, PO7.

C. Expected competency

Analyze and document transmission and distribution components, configurations and performance.

D. Expected course outcome

CO1: Apply mechanical and electrical design aspects of conductors, supports and insulators.

E. Practical learning outcomes

1. Identify construction, rating, operating principle and application of the item or system.
2. Record observations in a labelled diagram and comparative technical table.
3. Form a justified conclusion using verified technical evidence.

F. Affective-domain outcomes

1. Follow electrical safety, laboratory discipline and good housekeeping.
2. Record observations honestly with units, dates and traceable corrections.
3. Share instruments responsibly and complete the work within the allotted time.

G. Prerequisite theory

This is an identification and engineering-observation exercise. Record construction, ratings, operating principle, application, limitations and safety requirements for every item or system studied. Use nameplate data and current manufacturer or utility information; clearly distinguish observation from inference.

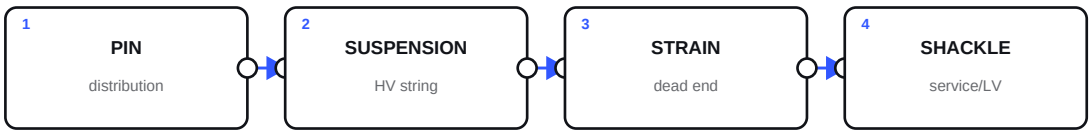
Key relations / checks

- State the governing relation before substitution
- Use consistent SI units
- % difference = |observed - expected|/expected x 100

H. Experimental setup / drawing

Study the labelled constructional, single-line or system diagram below and add the verified ratings, terminal designations and functional details for the item observed.

FIG. H.3 - INSULATOR TYPES AND APPLICATION VERIFY VALUES BEFORE USE



Engineering-diagram note: Confirm the actual component values, ratings, terminal numbers, instrument ranges and protective measures issued by your laboratory. Faculty approval is mandatory before energizing.

I. Resources and equipment required

Resource	Specification / range	Quantity
Trainer / approved model	Low-voltage line model where used	1
Samples / nameplate data	Conductor, support, insulator or cable	As req.
Meters	Suitable ranges	1 set
Calculator	Scientific	1
Technical reference	Utility/manufacturer/standard	As req.

J. Safety and precautions

1. Do not energize or alter a circuit without instructor approval.
2. Use intact leads, correct instrument ranges, rated components and required PPE.
3. Switch OFF, isolate and verify absence of voltage before touching conductors.
4. Keep exposed live parts guarded and use only the approved laboratory supply.

K. Procedure

1. Collect only instructor-approved de-energized samples, models, data sheets or trainer modules.
2. Read markings and nameplate information; record type, material, rating, construction and relevant standard symbol.
3. Inspect each item and identify terminals or functional parts without dismantling sealed or energized equipment.
4. Explain the operating principle and match each type to a suitable application.
5. Compare advantages, limitations, failure modes and safe handling requirements in the observation table.
6. Have the instructor verify the identification and record the final conclusion.

L. Observations and calculations

Record verified ratings and constructional observations. Identify the source of any information not obtained directly from the sample or site.

Item / parameter	Rating / value	Construction / principle	Application	Remarks

LABELLED SKETCH / SINGLE-LINE DIAGRAM / COMPARATIVE NOTES

M. Interpretation of results

COMPARE OBSERVED AND EXPECTED BEHAVIOUR; EXPLAIN ERROR, LIMITATIONS OR DESIGN TRADE-OFFS

N. Conclusion

STATE WHETHER THE PRACTICAL OUTCOME WAS ACHIEVED AND SUPPORT IT WITH KEY EVIDENCE

O. Practical-related questions

No.	Question / answer
1	What physical principle or engineering rule is verified in 'Demonstrate insulators used in overhead transmission and distribution systems'? Answer: _____
2	Why was the selected instrument range, component rating or data source suitable? Answer: _____
3	Which two errors or uncertainties have the greatest effect on this result? Answer: _____
4	What safety step must be completed before changing a connection or configuration? Answer: _____

P. References and suggestions

1. C. L. Wadhwa, Electrical Power Systems
2. S. N. Singh, Electric Power Generation, Transmission and Distribution
3. Current GTU syllabus DI03000101 and institute laboratory instructions

Q. Assessment rubric (25 marks)

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct circuit/interface/drawing interpretation	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Practical skill, measurement and safety	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Faculty remarks	Student response / correction completed

PRACTICAL 04

Calculate sag in an overhead transmission line for given data

DATE	BATCH	ROLL / ENROLLMENT NO.	FACULTY SIGN

A. Objective

Calculate sag in an overhead transmission line for given data.

B. Expected programme outcomes

PO1, PO2, PO4, PO7.

C. Expected competency

Analyze and document transmission and distribution components, configurations and performance.

D. Expected course outcome

CO1: Apply mechanical and electrical design aspects of conductors, supports and insulators.

E. Practical learning outcomes

1. Prepare the circuit, select suitable ranges and predict the expected response.
2. Perform controlled measurements safely and record readings with correct units.
3. Compare measured and calculated results and explain the observed difference.

F. Affective-domain outcomes

1. Follow electrical safety, laboratory discipline and good housekeeping.
2. Record observations honestly with units, dates and traceable corrections.
3. Share instruments responsibly and complete the work within the allotted time.

G. Prerequisite theory

Transmission and distribution performance is governed by conductor parameters, configuration, line length, load current and power factor. Record all assumptions, use the appropriate short- or medium-line model, and compare calculated sending-end quantities, regulation and efficiency with measured or reference values.

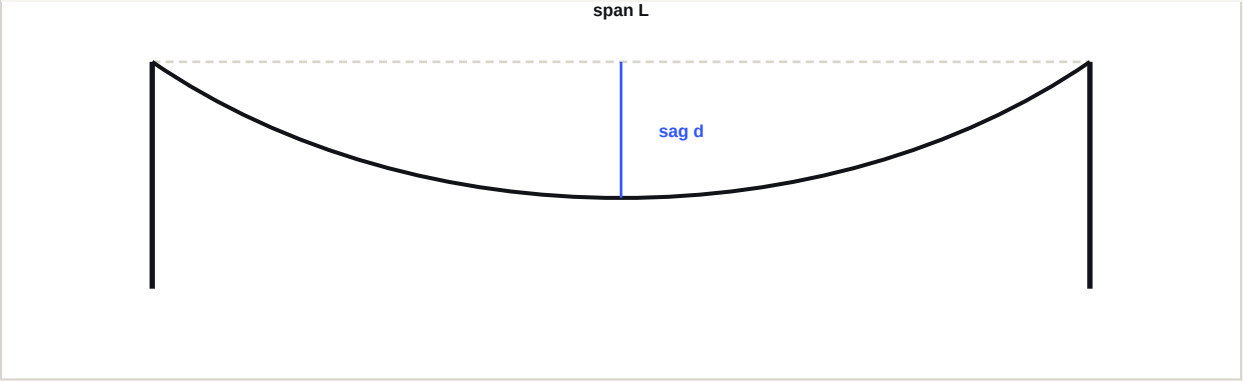
Key relations / checks

- Level supports: sag = w L^2/(8 T)
- Keep units consistent
- State whether wind/ice effects are neglected

H. Experimental setup / drawing

Study the experimental circuit below. Enter the component values, instrument ranges, terminal polarity and protection used in your laboratory, then obtain instructor approval before connection.

FIG. H.4 - SAG GEOMETRY BETWEEN LEVEL SUPPORTS VERIFY VALUES BEFORE USE



Engineering-diagram note: Confirm the actual component values, ratings, terminal numbers, instrument ranges and protective measures issued by your laboratory. Faculty approval is mandatory before energizing.

I. Resources and equipment required

Resource	Specification / range	Quantity
Trainer / approved model	Low-voltage line model where used	1
Samples / nameplate data	Conductor, support, insulator or cable	As req.
Meters	Suitable ranges	1 set
Calculator	Scientific	1
Technical reference	Utility/manufacturer/standard	As req.

J. Safety and precautions

1. Do not energize or alter a circuit without instructor approval.
2. Use intact leads, correct instrument ranges, rated components and required PPE.
3. Switch OFF, isolate and verify absence of voltage before touching conductors.
4. Keep exposed live parts guarded and use only the approved laboratory supply.

K. Procedure

1. Copy the given line data, units, model assumptions, conductor arrangement, length, load and power factor.
2. Draw the appropriate equivalent circuit and state the formulas before substitution.
3. Convert all values to a consistent unit system and calculate intermediate line parameters.
4. Determine the requested sag, string efficiency, sending-end quantity, regulation, efficiency or voltage drop.
5. If a trainer is used, keep it de-energized until checked, then record measured values at approved low voltage.
6. Compare calculated and measured/reference values, calculate percentage difference and explain likely causes.

L. Observations and calculations

Record instrument ranges and least counts. Enter observed readings first, then calculated values. Do not replace actual readings with expected values.

Trial	Applied value	Measured value 1	Measured value 2	Calculated result

SAMPLE CALCULATION WITH UNITS AND PERCENTAGE ERROR

GRAPH / PHASOR / CHARACTERISTIC / ADDITIONAL READINGS

M. Interpretation of results

COMPARE OBSERVED AND EXPECTED BEHAVIOUR; EXPLAIN ERROR, LIMITATIONS OR DESIGN TRADE-OFFS

N. Conclusion

STATE WHETHER THE PRACTICAL OUTCOME WAS ACHIEVED AND SUPPORT IT WITH KEY EVIDENCE

O. Practical-related questions

No.	Question / answer
1	What physical principle or engineering rule is verified in 'Calculate sag in an overhead transmission line for given data'? Answer: _____
2	Why was the selected instrument range, component rating or data source suitable? Answer: _____
3	Which two errors or uncertainties have the greatest effect on this result? Answer: _____
4	What safety step must be completed before changing a connection or configuration? Answer: _____

P. References and suggestions

1. C. L. Wadhwa, Electrical Power Systems
2. S. N. Singh, Electric Power Generation, Transmission and Distribution
3. Current GTU syllabus DI03000101 and institute laboratory instructions

Q. Assessment rubric (25 marks)

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct circuit/interface/drawing interpretation	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Practical skill, measurement and safety	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Faculty remarks	Student response / correction completed

PRACTICAL 05

Determine string efficiency of a suspension insulator for given data

DATE	BATCH	ROLL / ENROLLMENT NO.	FACULTY SIGN

A. Objective

Determine string efficiency of a suspension insulator for given data.

B. Expected programme outcomes

PO1, PO2, PO4, PO7.

C. Expected competency

Analyze and document transmission and distribution components, configurations and performance.

D. Expected course outcome

CO1: Apply mechanical and electrical design aspects of conductors, supports and insulators.

E. Practical learning outcomes

1. Prepare the circuit, select suitable ranges and predict the expected response.
2. Perform controlled measurements safely and record readings with correct units.
3. Compare measured and calculated results and explain the observed difference.

F. Affective-domain outcomes

1. Follow electrical safety, laboratory discipline and good housekeeping.
2. Record observations honestly with units, dates and traceable corrections.
3. Share instruments responsibly and complete the work within the allotted time.

G. Prerequisite theory

Transmission and distribution performance is governed by conductor parameters, configuration, line length, load current and power factor. Record all assumptions, use the appropriate short- or medium-line model, and compare calculated sending-end quantities, regulation and efficiency with measured or reference values.

Key relations / checks

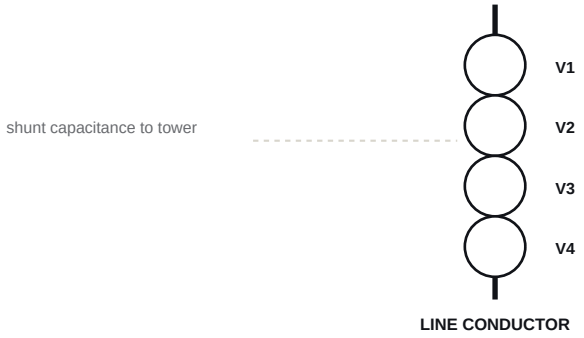
- String efficiency = total string voltage/(n x maximum unit voltage) x 100
- Unequal shunt capacitance causes non-uniform voltage distribution

H. Experimental setup / drawing

Study the experimental circuit below. Enter the component values, instrument ranges, terminal polarity and protection used in your laboratory, then obtain instructor approval before connection.

FIG. H.5 - SUSPENSION-INSULATOR STRING VOLTAGE DISTRIBUTION

VERIFY VALUES BEFORE USE



Engineering-diagram note: Confirm the actual component values, ratings, terminal numbers, instrument ranges and protective measures issued by your laboratory. Faculty approval is mandatory before energizing.

I. Resources and equipment required

Resource	Specification / range	Quantity
Trainer / approved model	Low-voltage line model where used	1
Samples / nameplate data	Conductor, support, insulator or cable	As req.
Meters	Suitable ranges	1 set
Calculator	Scientific	1
Technical reference	Utility/manufacturer/standard	As req.

J. Safety and precautions

1. Do not energize or alter a circuit without instructor approval.
2. Use intact leads, correct instrument ranges, rated components and required PPE.
3. Switch OFF, isolate and verify absence of voltage before touching conductors.
4. Keep exposed live parts guarded and use only the approved laboratory supply.

K. Procedure

1. Copy the given line data, units, model assumptions, conductor arrangement, length, load and power factor.
2. Draw the appropriate equivalent circuit and state the formulas before substitution.
3. Convert all values to a consistent unit system and calculate intermediate line parameters.
4. Determine the requested sag, string efficiency, sending-end quantity, regulation, efficiency or voltage drop.
5. If a trainer is used, keep it de-energized until checked, then record measured values at approved low voltage.
6. Compare calculated and measured/reference values, calculate percentage difference and explain likely causes.

L. Observations and calculations

Record instrument ranges and least counts. Enter observed readings first, then calculated values. Do not replace actual readings with expected values.

Trial	Applied value	Measured value 1	Measured value 2	Calculated result

SAMPLE CALCULATION WITH UNITS AND PERCENTAGE ERROR

GRAPH / PHASOR / CHARACTERISTIC / ADDITIONAL READINGS

M. Interpretation of results

COMPARE OBSERVED AND EXPECTED BEHAVIOUR; EXPLAIN ERROR, LIMITATIONS OR DESIGN TRADE-OFFS

N. Conclusion

STATE WHETHER THE PRACTICAL OUTCOME WAS ACHIEVED AND SUPPORT IT WITH KEY EVIDENCE

O. Practical-related questions

No.	Question / answer
1	What physical principle or engineering rule is verified in 'Determine string efficiency of a suspension insulator for given data'? Answer: _____
2	Why was the selected instrument range, component rating or data source suitable? Answer: _____
3	Which two errors or uncertainties have the greatest effect on this result? Answer: _____
4	What safety step must be completed before changing a connection or configuration? Answer: _____

P. References and suggestions

1. C. L. Wadhwa, Electrical Power Systems
2. S. N. Singh, Electric Power Generation, Transmission and Distribution
3. Current GTU syllabus DI03000101 and institute laboratory instructions

Q. Assessment rubric (25 marks)

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct circuit/interface/drawing interpretation	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Practical skill, measurement and safety	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Faculty remarks	Student response / correction completed

PRACTICAL 06

Determine voltage regulation and efficiency of a short transmission line

DATE	BATCH	ROLL / ENROLLMENT NO.	FACULTY SIGN

A. Objective

Determine voltage regulation and efficiency of a short transmission line.

B. Expected programme outcomes

PO1, PO2, PO4, PO7.

C. Expected competency

Analyze and document transmission and distribution components, configurations and performance.

D. Expected course outcome

CO2: Analyze transmission-line performance.

E. Practical learning outcomes

1. Prepare the circuit, select suitable ranges and predict the expected response.
2. Perform controlled measurements safely and record readings with correct units.
3. Compare measured and calculated results and explain the observed difference.

F. Affective-domain outcomes

1. Follow electrical safety, laboratory discipline and good housekeeping.
2. Record observations honestly with units, dates and traceable corrections.
3. Share instruments responsibly and complete the work within the allotted time.

G. Prerequisite theory

Transmission and distribution performance is governed by conductor parameters, configuration, line length, load current and power factor. Record all assumptions, use the appropriate short- or medium-line model, and compare calculated sending-end quantities, regulation and efficiency with measured or reference values.

Key relations / checks

- Regulation = (|VS no-load| - |VR full-load|)/|VR full-load| x 100
- Efficiency = PR/PS x 100
- Use the specified short- or nominal-pi model

H. Experimental setup / drawing

Study the experimental circuit below. Enter the component values, instrument ranges, terminal polarity and protection used in your laboratory, then obtain instructor approval before connection.

FIG. H.6 - SHORT TRANSMISSION-LINE MODEL VERIFY VALUES BEFORE USE

Engineering-diagram note: Confirm the actual component values, ratings, terminal numbers, instrument ranges and protective measures issued by your laboratory. Faculty approval is mandatory before energizing.

I. Resources and equipment required

Resource	Specification / range	Quantity
Trainer / approved model	Low-voltage line model where used	1
Samples / nameplate data	Conductor, support, insulator or cable	As req.
Meters	Suitable ranges	1 set
Calculator	Scientific	1
Technical reference	Utility/manufacturer/standard	As req.

J. Safety and precautions

1. Do not energize or alter a circuit without instructor approval.
2. Use intact leads, correct instrument ranges, rated components and required PPE.
3. Switch OFF, isolate and verify absence of voltage before touching conductors.
4. Keep exposed live parts guarded and use only the approved laboratory supply.

K. Procedure

1. Copy the given line data, units, model assumptions, conductor arrangement, length, load and power factor.
2. Draw the appropriate equivalent circuit and state the formulas before substitution.
3. Convert all values to a consistent unit system and calculate intermediate line parameters.
4. Determine the requested sag, string efficiency, sending-end quantity, regulation, efficiency or voltage drop.
5. If a trainer is used, keep it de-energized until checked, then record measured values at approved low voltage.
6. Compare calculated and measured/reference values, calculate percentage difference and explain likely causes.

L. Observations and calculations

Record instrument ranges and least counts. Enter observed readings first, then calculated values. Do not replace actual readings with expected values.

Trial	Applied value	Measured value 1	Measured value 2	Calculated result

SAMPLE CALCULATION WITH UNITS AND PERCENTAGE ERROR

GRAPH / PHASOR / CHARACTERISTIC / ADDITIONAL READINGS

M. Interpretation of results

COMPARE OBSERVED AND EXPECTED BEHAVIOUR; EXPLAIN ERROR, LIMITATIONS OR DESIGN TRADE-OFFS

N. Conclusion

STATE WHETHER THE PRACTICAL OUTCOME WAS ACHIEVED AND SUPPORT IT WITH KEY EVIDENCE

O. Practical-related questions

No.	Question / answer
1	What physical principle or engineering rule is verified in 'Determine voltage regulation and efficiency of a short transmission line'? Answer: _____
2	Why was the selected instrument range, component rating or data source suitable? Answer: _____
3	Which two errors or uncertainties have the greatest effect on this result? Answer: _____
4	What safety step must be completed before changing a connection or configuration? Answer: _____

P. References and suggestions

1. C. L. Wadhwa, Electrical Power Systems
2. S. N. Singh, Electric Power Generation, Transmission and Distribution
3. Current GTU syllabus DI03000101 and institute laboratory instructions

Q. Assessment rubric (25 marks)

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct circuit/interface/drawing interpretation	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Practical skill, measurement and safety	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Faculty remarks	Student response / correction completed

PRACTICAL 07

Determine voltage regulation and efficiency of a medium transmission line

DATE	BATCH	ROLL / ENROLLMENT NO.	FACULTY SIGN

A. Objective

Determine voltage regulation and efficiency of a medium transmission line.

B. Expected programme outcomes

PO1, PO2, PO4, PO7.

C. Expected competency

Analyze and document transmission and distribution components, configurations and performance.

D. Expected course outcome

CO2: Analyze transmission-line performance.

E. Practical learning outcomes

1. Prepare the circuit, select suitable ranges and predict the expected response.
2. Perform controlled measurements safely and record readings with correct units.
3. Compare measured and calculated results and explain the observed difference.

F. Affective-domain outcomes

1. Follow electrical safety, laboratory discipline and good housekeeping.
2. Record observations honestly with units, dates and traceable corrections.
3. Share instruments responsibly and complete the work within the allotted time.

G. Prerequisite theory

Transmission and distribution performance is governed by conductor parameters, configuration, line length, load current and power factor. Record all assumptions, use the appropriate short- or medium-line model, and compare calculated sending-end quantities, regulation and efficiency with measured or reference values.

Key relations / checks

- Regulation = (|VS no-load| - |VR full-load|)/|VR full-load| x 100
- Efficiency = PR/PS x 100
- Use the specified short- or nominal-pi model

H. Experimental setup / drawing

Study the experimental circuit below. Enter the component values, instrument ranges, terminal polarity and protection used in your laboratory, then obtain instructor approval before connection.

FIG. H.7 - NOMINAL-PI MEDIUM-LINE MODEL VERIFY VALUES BEFORE USE

Engineering-diagram note: Confirm the actual component values, ratings, terminal numbers, instrument ranges and protective measures issued by your laboratory. Faculty approval is mandatory before energizing.

I. Resources and equipment required

Resource	Specification / range	Quantity
Trainer / approved model	Low-voltage line model where used	1
Samples / nameplate data	Conductor, support, insulator or cable	As req.
Meters	Suitable ranges	1 set
Calculator	Scientific	1
Technical reference	Utility/manufacturer/standard	As req.

J. Safety and precautions

1. Do not energize or alter a circuit without instructor approval.
2. Use intact leads, correct instrument ranges, rated components and required PPE.
3. Switch OFF, isolate and verify absence of voltage before touching conductors.
4. Keep exposed live parts guarded and use only the approved laboratory supply.

K. Procedure

1. Copy the given line data, units, model assumptions, conductor arrangement, length, load and power factor.
2. Draw the appropriate equivalent circuit and state the formulas before substitution.
3. Convert all values to a consistent unit system and calculate intermediate line parameters.
4. Determine the requested sag, string efficiency, sending-end quantity, regulation, efficiency or voltage drop.
5. If a trainer is used, keep it de-energized until checked, then record measured values at approved low voltage.
6. Compare calculated and measured/reference values, calculate percentage difference and explain likely causes.

L. Observations and calculations

Record instrument ranges and least counts. Enter observed readings first, then calculated values. Do not replace actual readings with expected values.

Trial	Applied value	Measured value 1	Measured value 2	Calculated result

SAMPLE CALCULATION WITH UNITS AND PERCENTAGE ERROR

GRAPH / PHASOR / CHARACTERISTIC / ADDITIONAL READINGS

M. Interpretation of results

COMPARE OBSERVED AND EXPECTED BEHAVIOUR; EXPLAIN ERROR, LIMITATIONS OR DESIGN TRADE-OFFS

N. Conclusion

STATE WHETHER THE PRACTICAL OUTCOME WAS ACHIEVED AND SUPPORT IT WITH KEY EVIDENCE

O. Practical-related questions

No.	Question / answer
1	What physical principle or engineering rule is verified in 'Determine voltage regulation and efficiency of a medium transmission line'? Answer: _____
2	Why was the selected instrument range, component rating or data source suitable? Answer: _____
3	Which two errors or uncertainties have the greatest effect on this result? Answer: _____
4	What safety step must be completed before changing a connection or configuration? Answer: _____

P. References and suggestions

1. C. L. Wadhwa, Electrical Power Systems
2. S. N. Singh, Electric Power Generation, Transmission and Distribution
3. Current GTU syllabus DI03000101 and institute laboratory instructions

Q. Assessment rubric (25 marks)

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct circuit/interface/drawing interpretation	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Practical skill, measurement and safety	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Faculty remarks	Student response / correction completed

PRACTICAL 08

Prepare a technical report on a load dispatch center

DATE	BATCH	ROLL / ENROLLMENT NO.	FACULTY SIGN

A. Objective

Prepare a technical report on a load dispatch center.

B. Expected programme outcomes

PO1, PO2, PO3, PO5, PO6, PO7.

C. Expected competency

Analyze and document transmission and distribution components, configurations and performance.

D. Expected course outcome

CO2: Analyze transmission-line performance.

E. Practical learning outcomes

1. Identify construction, rating, operating principle and application of the item or system.
2. Record observations in a labelled diagram and comparative technical table.
3. Form a justified conclusion using verified technical evidence.

F. Affective-domain outcomes

1. Follow electrical safety, laboratory discipline and good housekeeping.
2. Record observations honestly with units, dates and traceable corrections.
3. Acknowledge sources, state assumptions and contribute responsibly to team work.

G. Prerequisite theory

This is an identification and engineering-observation exercise. Record construction, ratings, operating principle, application, limitations and safety requirements for every item or system studied. Use nameplate data and current manufacturer or utility information; clearly distinguish observation from inference.

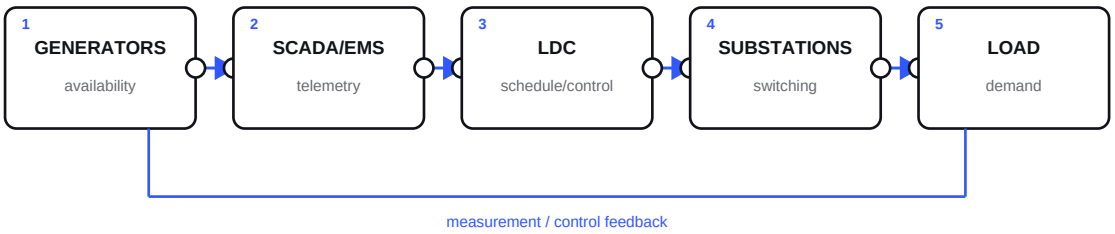
Key relations / checks

- State the governing relation before substitution
- Use consistent SI units
- % difference = |observed - expected|/expected x 100

H. Experimental setup / drawing

Study the labelled constructional, single-line or system diagram below and add the verified ratings, terminal designations and functional details for the item observed.

FIG. H.8 - LOAD-DISPATCH CENTER INFORMATION FLOW VERIFY VALUES BEFORE USE



Engineering-diagram note: Confirm the actual component values, ratings, terminal numbers, instrument ranges and protective measures issued by your laboratory. Faculty approval is mandatory before energizing.

I. Resources and equipment required

Resource	Specification / range	Quantity
Given plan / data	Instructor-issued, dimensioned	1
Rules and data sheets	Current approved references	As req.
Rate source	Current SOR or verified quotation	1
Calculator / spreadsheet	Formulae visible and checked	1
Drawing tools	Scale, symbols and labels	1 set

J. Safety and precautions

1. Do not energize or alter a circuit without instructor approval.
2. Use intact leads, correct instrument ranges, rated components and required PPE.
3. Switch OFF, isolate and verify absence of voltage before touching conductors.
4. Keep exposed live parts guarded and use only the approved laboratory supply.

K. Procedure

1. Define the study boundary, required evidence and the current technical sources or approved site to be used.
2. Prepare a checklist covering configuration, ratings, equipment, protection, control, safety and environmental aspects.
3. Collect observations without touching live equipment; photographs require site and instructor permission.
4. Verify key facts against a utility, manufacturer, standard or other authoritative technical source.
5. Prepare a labelled diagram and a concise comparison table; include calculations where the syllabus outcome requires them.
6. Write findings, limitations and recommendations, then list the sources and date accessed.

L. Observations and calculations

Record verified ratings and constructional observations. Identify the source of any information not obtained directly from the sample or site.

Item / parameter	Rating / value	Construction / principle	Application	Remarks

LABELLED SKETCH / SINGLE-LINE DIAGRAM / COMPARATIVE NOTES

M. Interpretation of results

COMPARE OBSERVED AND EXPECTED BEHAVIOUR; EXPLAIN ERROR, LIMITATIONS OR DESIGN TRADE-OFFS

N. Conclusion

STATE WHETHER THE PRACTICAL OUTCOME WAS ACHIEVED AND SUPPORT IT WITH KEY EVIDENCE

O. Practical-related questions

No.	Question / answer
1	What physical principle or engineering rule is verified in 'Prepare a technical report on a load dispatch center'? Answer: _____
2	Why was the selected instrument range, component rating or data source suitable? Answer: _____
3	Which two errors or uncertainties have the greatest effect on this result? Answer: _____
4	What safety step must be completed before changing a connection or configuration? Answer: _____

P. References and suggestions

1. C. L. Wadhwa, Electrical Power Systems
2. S. N. Singh, Electric Power Generation, Transmission and Distribution
3. Current GTU syllabus DI03000101 and institute laboratory instructions

Q. Assessment rubric (25 marks)

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct interpretation of data, scope and standards	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Technical method, calculations and documentation	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Faculty remarks	Student response / correction completed

PRACTICAL 09

Prepare a report on EHV AC transmission systems in India

DATE	BATCH	ROLL / ENROLLMENT NO.	FACULTY SIGN

A. Objective

Prepare a report on EHV AC transmission systems in India.

B. Expected programme outcomes

PO1, PO2, PO3, PO5, PO6, PO7.

C. Expected competency

Analyze and document transmission and distribution components, configurations and performance.

D. Expected course outcome

CO3: Illustrate the configuration and operation of HVDC systems.

E. Practical learning outcomes

1. Identify construction, rating, operating principle and application of the item or system.
2. Record observations in a labelled diagram and comparative technical table.
3. Form a justified conclusion using verified technical evidence.

F. Affective-domain outcomes

1. Follow electrical safety, laboratory discipline and good housekeeping.
2. Record observations honestly with units, dates and traceable corrections.
3. Acknowledge sources, state assumptions and contribute responsibly to team work.

G. Prerequisite theory

This is an identification and engineering-observation exercise. Record construction, ratings, operating principle, application, limitations and safety requirements for every item or system studied. Use nameplate data and current manufacturer or utility information; clearly distinguish observation from inference.

Key relations / checks

- State the governing relation before substitution
- Use consistent SI units
- % difference = |observed - expected|/expected x 100

H. Experimental setup / drawing

Study the labelled constructional, single-line or system diagram below and add the verified ratings, terminal designations and functional details for the item observed.

FIG. H.9 - EHV AC TRANSMISSION SYSTEM VERIFY VALUES BEFORE USE

Engineering-diagram note: Confirm the actual component values, ratings, terminal numbers, instrument ranges and protective measures issued by your laboratory. Faculty approval is mandatory before energizing.

I. Resources and equipment required

Resource	Specification / range	Quantity
Given plan / data	Instructor-issued, dimensioned	1
Rules and data sheets	Current approved references	As req.
Rate source	Current SOR or verified quotation	1
Calculator / spreadsheet	Formulae visible and checked	1
Drawing tools	Scale, symbols and labels	1 set

J. Safety and precautions

1. Do not energize or alter a circuit without instructor approval.
2. Use intact leads, correct instrument ranges, rated components and required PPE.
3. Switch OFF, isolate and verify absence of voltage before touching conductors.
4. Keep exposed live parts guarded and use only the approved laboratory supply.

K. Procedure

1. Define the study boundary, required evidence and the current technical sources or approved site to be used.
2. Prepare a checklist covering configuration, ratings, equipment, protection, control, safety and environmental aspects.
3. Collect observations without touching live equipment; photographs require site and instructor permission.
4. Verify key facts against a utility, manufacturer, standard or other authoritative technical source.
5. Prepare a labelled diagram and a concise comparison table; include calculations where the syllabus outcome requires them.
6. Write findings, limitations and recommendations, then list the sources and date accessed.

L. Observations and calculations

Record verified ratings and constructional observations. Identify the source of any information not obtained directly from the sample or site.

Item / parameter	Rating / value	Construction / principle	Application	Remarks

LABELLED SKETCH / SINGLE-LINE DIAGRAM / COMPARATIVE NOTES

M. Interpretation of results

COMPARE OBSERVED AND EXPECTED BEHAVIOUR; EXPLAIN ERROR, LIMITATIONS OR DESIGN TRADE-OFFS

N. Conclusion

STATE WHETHER THE PRACTICAL OUTCOME WAS ACHIEVED AND SUPPORT IT WITH KEY EVIDENCE

O. Practical-related questions

No.	Question / answer
1	What physical principle or engineering rule is verified in 'Prepare a report on EHV AC transmission systems in India'? Answer: _____
2	Why was the selected instrument range, component rating or data source suitable? Answer: _____
3	Which two errors or uncertainties have the greatest effect on this result? Answer: _____
4	What safety step must be completed before changing a connection or configuration? Answer: _____

P. References and suggestions

1. C. L. Wadhwa, Electrical Power Systems
2. S. N. Singh, Electric Power Generation, Transmission and Distribution
3. Current GTU syllabus DI03000101 and institute laboratory instructions

Q. Assessment rubric (25 marks)

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct interpretation of data, scope and standards	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Technical method, calculations and documentation	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Faculty remarks	Student response / correction completed

PRACTICAL 10

Prepare a report on HVDC transmission systems in India

DATE	BATCH	ROLL / ENROLLMENT NO.	FACULTY SIGN

A. Objective

Prepare a report on HVDC transmission systems in India.

B. Expected programme outcomes

PO1, PO2, PO3, PO5, PO6, PO7.

C. Expected competency

Analyze and document transmission and distribution components, configurations and performance.

D. Expected course outcome

CO3: Illustrate the configuration and operation of HVDC systems.

E. Practical learning outcomes

1. Identify construction, rating, operating principle and application of the item or system.
2. Record observations in a labelled diagram and comparative technical table.
3. Form a justified conclusion using verified technical evidence.

F. Affective-domain outcomes

1. Follow electrical safety, laboratory discipline and good housekeeping.
2. Record observations honestly with units, dates and traceable corrections.
3. Acknowledge sources, state assumptions and contribute responsibly to team work.

G. Prerequisite theory

This is an identification and engineering-observation exercise. Record construction, ratings, operating principle, application, limitations and safety requirements for every item or system studied. Use nameplate data and current manufacturer or utility information; clearly distinguish observation from inference.

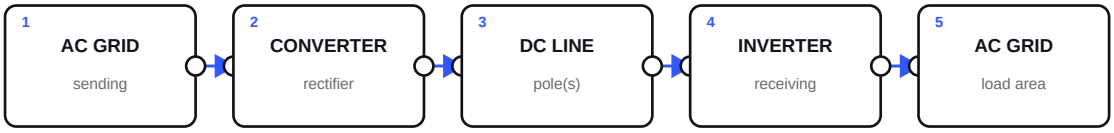
Key relations / checks

- State the governing relation before substitution
- Use consistent SI units
- % difference = |observed - expected|/expected x 100

H. Experimental setup / drawing

Study the labelled constructional, single-line or system diagram below and add the verified ratings, terminal designations and functional details for the item observed.

FIG. H.10 - HVDC TRANSMISSION SYSTEM VERIFY VALUES BEFORE USE



Engineering-diagram note: Confirm the actual component values, ratings, terminal numbers, instrument ranges and protective measures issued by your laboratory. Faculty approval is mandatory before energizing.

I. Resources and equipment required

Resource	Specification / range	Quantity
Given plan / data	Instructor-issued, dimensioned	1
Rules and data sheets	Current approved references	As req.
Rate source	Current SOR or verified quotation	1
Calculator / spreadsheet	Formulae visible and checked	1
Drawing tools	Scale, symbols and labels	1 set

J. Safety and precautions

1. Do not energize or alter a circuit without instructor approval.
2. Use intact leads, correct instrument ranges, rated components and required PPE.
3. Switch OFF, isolate and verify absence of voltage before touching conductors.
4. Keep exposed live parts guarded and use only the approved laboratory supply.

K. Procedure

1. Define the study boundary, required evidence and the current technical sources or approved site to be used.
2. Prepare a checklist covering configuration, ratings, equipment, protection, control, safety and environmental aspects.
3. Collect observations without touching live equipment; photographs require site and instructor permission.
4. Verify key facts against a utility, manufacturer, standard or other authoritative technical source.
5. Prepare a labelled diagram and a concise comparison table; include calculations where the syllabus outcome requires them.
6. Write findings, limitations and recommendations, then list the sources and date accessed.

L. Observations and calculations

Record verified ratings and constructional observations. Identify the source of any information not obtained directly from the sample or site.

Item / parameter	Rating / value	Construction / principle	Application	Remarks

LABELLED SKETCH / SINGLE-LINE DIAGRAM / COMPARATIVE NOTES

M. Interpretation of results

COMPARE OBSERVED AND EXPECTED BEHAVIOUR; EXPLAIN ERROR, LIMITATIONS OR DESIGN TRADE-OFFS

N. Conclusion

STATE WHETHER THE PRACTICAL OUTCOME WAS ACHIEVED AND SUPPORT IT WITH KEY EVIDENCE

O. Practical-related questions

No.	Question / answer
1	What physical principle or engineering rule is verified in 'Prepare a report on HVDC transmission systems in India'? Answer: _____
2	Why was the selected instrument range, component rating or data source suitable? Answer: _____
3	Which two errors or uncertainties have the greatest effect on this result? Answer: _____
4	What safety step must be completed before changing a connection or configuration? Answer: _____

P. References and suggestions

1. C. L. Wadhwa, Electrical Power Systems
2. S. N. Singh, Electric Power Generation, Transmission and Distribution
3. Current GTU syllabus DI03000101 and institute laboratory instructions

Q. Assessment rubric (25 marks)

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct interpretation of data, scope and standards	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Technical method, calculations and documentation	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Faculty remarks	Student response / correction completed

PRACTICAL 11

Study FACTS and its devices

DATE	BATCH	ROLL / ENROLLMENT NO.	FACULTY SIGN

A. Objective

Study FACTS and its devices.

B. Expected programme outcomes

PO1, PO2, PO4, PO7.

C. Expected competency

Analyze and document transmission and distribution components, configurations and performance.

D. Expected course outcome

CO3: Illustrate the configuration and operation of HVDC systems.

E. Practical learning outcomes

1. Identify construction, rating, operating principle and application of the item or system.
2. Record observations in a labelled diagram and comparative technical table.
3. Form a justified conclusion using verified technical evidence.

F. Affective-domain outcomes

1. Follow electrical safety, laboratory discipline and good housekeeping.
2. Record observations honestly with units, dates and traceable corrections.
3. Share instruments responsibly and complete the work within the allotted time.

G. Prerequisite theory

This is an identification and engineering-observation exercise. Record construction, ratings, operating principle, application, limitations and safety requirements for every item or system studied. Use nameplate data and current manufacturer or utility information; clearly distinguish observation from inference.

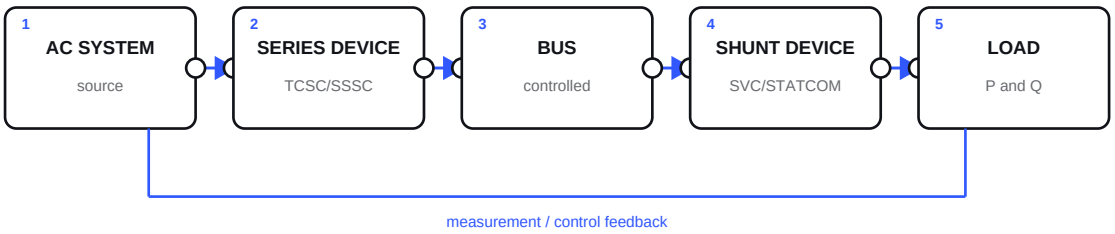
Key relations / checks

- State the governing relation before substitution
- Use consistent SI units
- % difference = |observed - expected|/expected x 100

H. Experimental setup / drawing

Study the labelled constructional, single-line or system diagram below and add the verified ratings, terminal designations and functional details for the item observed.

FIG. H.11 - FACTS CONTROLLER LOCATION VERIFY VALUES BEFORE USE



Engineering-diagram note: Confirm the actual component values, ratings, terminal numbers, instrument ranges and protective measures issued by your laboratory. Faculty approval is mandatory before energizing.

I. Resources and equipment required

Resource	Specification / range	Quantity
Given plan / data	Instructor-issued, dimensioned	1
Rules and data sheets	Current approved references	As req.
Rate source	Current SOR or verified quotation	1
Calculator / spreadsheet	Formulae visible and checked	1
Drawing tools	Scale, symbols and labels	1 set

J. Safety and precautions

1. Do not energize or alter a circuit without instructor approval.
2. Use intact leads, correct instrument ranges, rated components and required PPE.
3. Switch OFF, isolate and verify absence of voltage before touching conductors.
4. Keep exposed live parts guarded and use only the approved laboratory supply.

K. Procedure

1. Define the study boundary, required evidence and the current technical sources or approved site to be used.
2. Prepare a checklist covering configuration, ratings, equipment, protection, control, safety and environmental aspects.
3. Collect observations without touching live equipment; photographs require site and instructor permission.
4. Verify key facts against a utility, manufacturer, standard or other authoritative technical source.
5. Prepare a labelled diagram and a concise comparison table; include calculations where the syllabus outcome requires them.
6. Write findings, limitations and recommendations, then list the sources and date accessed.

L. Observations and calculations

Record verified ratings and constructional observations. Identify the source of any information not obtained directly from the sample or site.

Item / parameter	Rating / value	Construction / principle	Application	Remarks

LABELLED SKETCH / SINGLE-LINE DIAGRAM / COMPARATIVE NOTES

M. Interpretation of results

COMPARE OBSERVED AND EXPECTED BEHAVIOUR; EXPLAIN ERROR, LIMITATIONS OR DESIGN TRADE-OFFS

N. Conclusion

STATE WHETHER THE PRACTICAL OUTCOME WAS ACHIEVED AND SUPPORT IT WITH KEY EVIDENCE

O. Practical-related questions

No.	Question / answer
1	What physical principle or engineering rule is verified in 'Study FACTS and its devices'? Answer: _____
2	Why was the selected instrument range, component rating or data source suitable? Answer: _____
3	Which two errors or uncertainties have the greatest effect on this result? Answer: _____
4	What safety step must be completed before changing a connection or configuration? Answer: _____

P. References and suggestions

1. C. L. Wadhwa, Electrical Power Systems
2. S. N. Singh, Electric Power Generation, Transmission and Distribution
3. Current GTU syllabus DI03000101 and institute laboratory instructions

Q. Assessment rubric (25 marks)

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct interpretation of data, scope and standards	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Technical method, calculations and documentation	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Faculty remarks	Student response / correction completed

PRACTICAL 12

Prepare a report after studying a residential colony distribution system

DATE	BATCH	ROLL / ENROLLMENT NO.	FACULTY SIGN

A. Objective

Prepare a report after studying a residential colony distribution system.

B. Expected programme outcomes

PO1, PO2, PO3, PO5, PO6, PO7.

C. Expected competency

Analyze and document transmission and distribution components, configurations and performance.

D. Expected course outcome

CO4: Identify the components and configurations of power-distribution systems.

E. Practical learning outcomes

1. Identify construction, rating, operating principle and application of the item or system.
2. Record observations in a labelled diagram and comparative technical table.
3. Form a justified conclusion using verified technical evidence.

F. Affective-domain outcomes

1. Follow electrical safety, laboratory discipline and good housekeeping.
2. Record observations honestly with units, dates and traceable corrections.
3. Acknowledge sources, state assumptions and contribute responsibly to team work.

G. Prerequisite theory

This is an identification and engineering-observation exercise. Record construction, ratings, operating principle, application, limitations and safety requirements for every item or system studied. Use nameplate data and current manufacturer or utility information; clearly distinguish observation from inference.

Key relations / checks

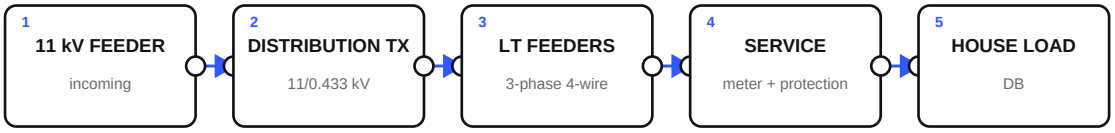
- State the governing relation before substitution
- Use consistent SI units
- % difference = |observed - expected|/expected x 100

H. Experimental setup / drawing

Study the labelled constructional, single-line or system diagram below and add the verified ratings, terminal designations and functional details for the item observed.

FIG. H.12 - RESIDENTIAL COLONY DISTRIBUTION

VERIFY VALUES BEFORE USE



Engineering-diagram note: Confirm the actual component values, ratings, terminal numbers, instrument ranges and protective measures issued by your laboratory. Faculty approval is mandatory before energizing.

I. Resources and equipment required

Resource	Specification / range	Quantity
Given plan / data	Instructor-issued, dimensioned	1
Rules and data sheets	Current approved references	As req.
Rate source	Current SOR or verified quotation	1
Calculator / spreadsheet	Formulae visible and checked	1
Drawing tools	Scale, symbols and labels	1 set

J. Safety and precautions

1. Do not energize or alter a circuit without instructor approval.
2. Use intact leads, correct instrument ranges, rated components and required PPE.
3. Switch OFF, isolate and verify absence of voltage before touching conductors.
4. Keep exposed live parts guarded and use only the approved laboratory supply.

K. Procedure

1. Define the study boundary, required evidence and the current technical sources or approved site to be used.
2. Prepare a checklist covering configuration, ratings, equipment, protection, control, safety and environmental aspects.
3. Collect observations without touching live equipment; photographs require site and instructor permission.
4. Verify key facts against a utility, manufacturer, standard or other authoritative technical source.
5. Prepare a labelled diagram and a concise comparison table; include calculations where the syllabus outcome requires them.
6. Write findings, limitations and recommendations, then list the sources and date accessed.

L. Observations and calculations

Record verified ratings and constructional observations. Identify the source of any information not obtained directly from the sample or site.

Item / parameter	Rating / value	Construction / principle	Application	Remarks

LABELLED SKETCH / SINGLE-LINE DIAGRAM / COMPARATIVE NOTES

M. Interpretation of results

COMPARE OBSERVED AND EXPECTED BEHAVIOUR; EXPLAIN ERROR, LIMITATIONS OR DESIGN TRADE-OFFS

N. Conclusion

STATE WHETHER THE PRACTICAL OUTCOME WAS ACHIEVED AND SUPPORT IT WITH KEY EVIDENCE

O. Practical-related questions

No.	Question / answer
1	What physical principle or engineering rule is verified in 'Prepare a report after studying a residential colony distribution system'? Answer: _____
2	Why was the selected instrument range, component rating or data source suitable? Answer: _____
3	Which two errors or uncertainties have the greatest effect on this result? Answer: _____
4	What safety step must be completed before changing a connection or configuration? Answer: _____

P. References and suggestions

1. C. L. Wadhwa, Electrical Power Systems
2. S. N. Singh, Electric Power Generation, Transmission and Distribution
3. Current GTU syllabus DI03000101 and institute laboratory instructions

Q. Assessment rubric (25 marks)

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct interpretation of data, scope and standards	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Technical method, calculations and documentation	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Faculty remarks	Student response / correction completed

PRACTICAL 13

Study an AC distribution system in radial and ring-main configurations

DATE	BATCH	ROLL / ENROLLMENT NO.	FACULTY SIGN

A. Objective

Study an AC distribution system in radial and ring-main configurations.

B. Expected programme outcomes

PO1, PO2, PO4, PO7.

C. Expected competency

Analyze and document transmission and distribution components, configurations and performance.

D. Expected course outcome

CO4: Identify the components and configurations of power-distribution systems.

E. Practical learning outcomes

1. Identify construction, rating, operating principle and application of the item or system.
2. Record observations in a labelled diagram and comparative technical table.
3. Form a justified conclusion using verified technical evidence.

F. Affective-domain outcomes

1. Follow electrical safety, laboratory discipline and good housekeeping.
2. Record observations honestly with units, dates and traceable corrections.
3. Share instruments responsibly and complete the work within the allotted time.

G. Prerequisite theory

This is an identification and engineering-observation exercise. Record construction, ratings, operating principle, application, limitations and safety requirements for every item or system studied. Use nameplate data and current manufacturer or utility information; clearly distinguish observation from inference.

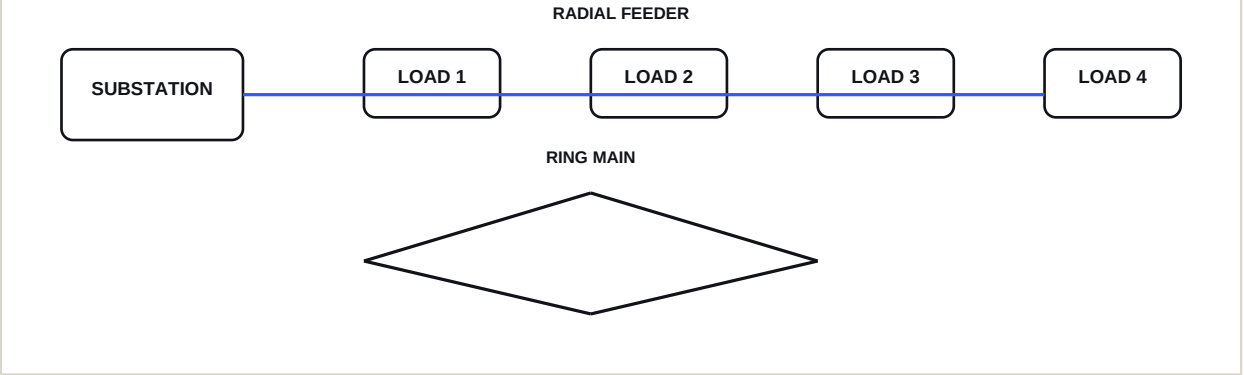
Key relations / checks

- State the governing relation before substitution
- Use consistent SI units
- % difference = |observed - expected|/expected x 100

H. Experimental setup / drawing

Study the labelled constructional, single-line or system diagram below and add the verified ratings, terminal designations and functional details for the item observed.

FIG. H.13 - RADIAL AND RING-MAIN DISTRIBUTION VERIFY VALUES BEFORE USE



Engineering-diagram note: Confirm the actual component values, ratings, terminal numbers, instrument ranges and protective measures issued by your laboratory. Faculty approval is mandatory before energizing.

I. Resources and equipment required

Resource	Specification / range	Quantity
Given plan / data	Instructor-issued, dimensioned	1
Rules and data sheets	Current approved references	As req.
Rate source	Current SOR or verified quotation	1
Calculator / spreadsheet	Formulae visible and checked	1
Drawing tools	Scale, symbols and labels	1 set

J. Safety and precautions

1. Do not energize or alter a circuit without instructor approval.
2. Use intact leads, correct instrument ranges, rated components and required PPE.
3. Switch OFF, isolate and verify absence of voltage before touching conductors.
4. Keep exposed live parts guarded and use only the approved laboratory supply.

K. Procedure

1. Define the study boundary, required evidence and the current technical sources or approved site to be used.
2. Prepare a checklist covering configuration, ratings, equipment, protection, control, safety and environmental aspects.
3. Collect observations without touching live equipment; photographs require site and instructor permission.
4. Verify key facts against a utility, manufacturer, standard or other authoritative technical source.
5. Prepare a labelled diagram and a concise comparison table; include calculations where the syllabus outcome requires them.
6. Write findings, limitations and recommendations, then list the sources and date accessed.

L. Observations and calculations

Record verified ratings and constructional observations. Identify the source of any information not obtained directly from the sample or site.

Item / parameter	Rating / value	Construction / principle	Application	Remarks

LABELLED SKETCH / SINGLE-LINE DIAGRAM / COMPARATIVE NOTES

M. Interpretation of results

COMPARE OBSERVED AND EXPECTED BEHAVIOUR; EXPLAIN ERROR, LIMITATIONS OR DESIGN TRADE-OFFS

N. Conclusion

STATE WHETHER THE PRACTICAL OUTCOME WAS ACHIEVED AND SUPPORT IT WITH KEY EVIDENCE

O. Practical-related questions

No.	Question / answer
1	What physical principle or engineering rule is verified in 'Study an AC distribution system in radial and ring-main configurations'? Answer: _____
2	Why was the selected instrument range, component rating or data source suitable? Answer: _____
3	Which two errors or uncertainties have the greatest effect on this result? Answer: _____
4	What safety step must be completed before changing a connection or configuration? Answer: _____

P. References and suggestions

1. C. L. Wadhwa, Electrical Power Systems
2. S. N. Singh, Electric Power Generation, Transmission and Distribution
3. Current GTU syllabus DI03000101 and institute laboratory instructions

Q. Assessment rubric (25 marks)

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct interpretation of data, scope and standards	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Technical method, calculations and documentation	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Faculty remarks	Student response / correction completed

PRACTICAL 14

Solve voltage-drop and sending/receiving-end voltage problems for a distribution line

DATE	BATCH	ROLL / ENROLLMENT NO.	FACULTY SIGN

A. Objective

Solve voltage-drop and sending/receiving-end voltage problems for a distribution line.

B. Expected programme outcomes

PO1, PO2, PO4, PO7.

C. Expected competency

Analyze and document transmission and distribution components, configurations and performance.

D. Expected course outcome

CO4: Identify the components and configurations of power-distribution systems.

E. Practical learning outcomes

1. Prepare the circuit, select suitable ranges and predict the expected response.
2. Perform controlled measurements safely and record readings with correct units.
3. Compare measured and calculated results and explain the observed difference.

F. Affective-domain outcomes

1. Follow electrical safety, laboratory discipline and good housekeeping.
2. Record observations honestly with units, dates and traceable corrections.
3. Share instruments responsibly and complete the work within the allotted time.

G. Prerequisite theory

Transmission and distribution performance is governed by conductor parameters, configuration, line length, load current and power factor. Record all assumptions, use the appropriate short- or medium-line model, and compare calculated sending-end quantities, regulation and efficiency with measured or reference values.

Key relations / checks

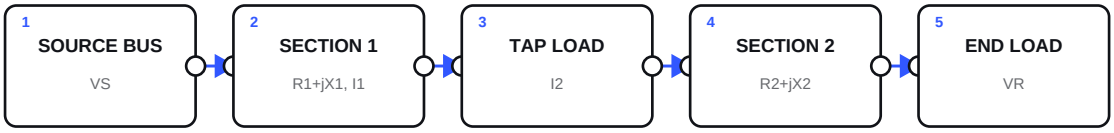
- State the governing relation before substitution
- Use consistent SI units
- % difference = |observed - expected|/expected x 100

H. Experimental setup / drawing

Study the experimental circuit below. Enter the component values, instrument ranges, terminal polarity and protection used in your laboratory, then obtain instructor approval before connection.

FIG. H.14 - DISTRIBUTION VOLTAGE-DROP CALCULATION

VERIFY VALUES BEFORE USE



Engineering-diagram note: Confirm the actual component values, ratings, terminal numbers, instrument ranges and protective measures issued by your laboratory. Faculty approval is mandatory before energizing.

I. Resources and equipment required

Resource	Specification / range	Quantity
Trainer / approved model	Low-voltage line model where used	1
Samples / nameplate data	Conductor, support, insulator or cable	As req.
Meters	Suitable ranges	1 set
Calculator	Scientific	1
Technical reference	Utility/manufacturer/standard	As req.

J. Safety and precautions

1. Do not energize or alter a circuit without instructor approval.
2. Use intact leads, correct instrument ranges, rated components and required PPE.
3. Switch OFF, isolate and verify absence of voltage before touching conductors.
4. Keep exposed live parts guarded and use only the approved laboratory supply.

K. Procedure

1. Copy the given line data, units, model assumptions, conductor arrangement, length, load and power factor.
2. Draw the appropriate equivalent circuit and state the formulas before substitution.
3. Convert all values to a consistent unit system and calculate intermediate line parameters.
4. Determine the requested sag, string efficiency, sending-end quantity, regulation, efficiency or voltage drop.
5. If a trainer is used, keep it de-energized until checked, then record measured values at approved low voltage.
6. Compare calculated and measured/reference values, calculate percentage difference and explain likely causes.

L. Observations and calculations

Record instrument ranges and least counts. Enter observed readings first, then calculated values. Do not replace actual readings with expected values.

Trial	Applied value	Measured value 1	Measured value 2	Calculated result

SAMPLE CALCULATION WITH UNITS AND PERCENTAGE ERROR

GRAPH / PHASOR / CHARACTERISTIC / ADDITIONAL READINGS

M. Interpretation of results

COMPARE OBSERVED AND EXPECTED BEHAVIOUR; EXPLAIN ERROR, LIMITATIONS OR DESIGN TRADE-OFFS

N. Conclusion

STATE WHETHER THE PRACTICAL OUTCOME WAS ACHIEVED AND SUPPORT IT WITH KEY EVIDENCE

O. Practical-related questions

No.	Question / answer
1	What physical principle or engineering rule is verified in 'Solve voltage-drop and sending/receiving-end voltage problems for a distribution line'? Answer: _____
2	Why was the selected instrument range, component rating or data source suitable? Answer: _____
3	Which two errors or uncertainties have the greatest effect on this result? Answer: _____
4	What safety step must be completed before changing a connection or configuration? Answer: _____

P. References and suggestions

1. C. L. Wadhwa, Electrical Power Systems
2. S. N. Singh, Electric Power Generation, Transmission and Distribution
3. Current GTU syllabus DI03000101 and institute laboratory instructions

Q. Assessment rubric (25 marks)

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct circuit/interface/drawing interpretation	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Practical skill, measurement and safety	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Faculty remarks	Student response / correction completed

PRACTICAL 15

Prepare a report on distribution cables using supplier, industry or verified online study

DATE	BATCH	ROLL / ENROLLMENT NO.	FACULTY SIGN

A. Objective

Prepare a report on distribution cables using supplier, industry or verified online study.

B. Expected programme outcomes

PO1, PO2, PO3, PO5, PO6, PO7.

C. Expected competency

Analyze and document transmission and distribution components, configurations and performance.

D. Expected course outcome

CO4: Identify the components and configurations of power-distribution systems.

E. Practical learning outcomes

1. Identify construction, rating, operating principle and application of the item or system.
2. Record observations in a labelled diagram and comparative technical table.
3. Form a justified conclusion using verified technical evidence.

F. Affective-domain outcomes

1. Follow electrical safety, laboratory discipline and good housekeeping.
2. Record observations honestly with units, dates and traceable corrections.
3. Acknowledge sources, state assumptions and contribute responsibly to team work.

G. Prerequisite theory

This is an identification and engineering-observation exercise. Record construction, ratings, operating principle, application, limitations and safety requirements for every item or system studied. Use nameplate data and current manufacturer or utility information; clearly distinguish observation from inference.

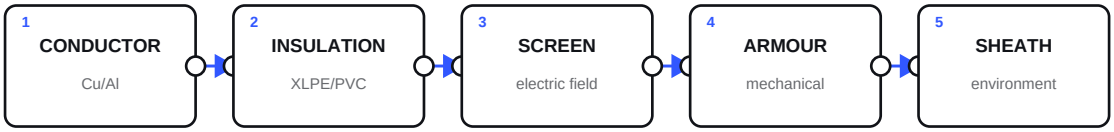
Key relations / checks

- State the governing relation before substitution
- Use consistent SI units
- % difference = |observed - expected|/expected x 100

H. Experimental setup / drawing

Study the labelled constructional, single-line or system diagram below and add the verified ratings, terminal designations and functional details for the item observed.

FIG. H.15 - POWER-CABLE CONSTRUCTION VERIFY VALUES BEFORE USE



Engineering-diagram note: Confirm the actual component values, ratings, terminal numbers, instrument ranges and protective measures issued by your laboratory. Faculty approval is mandatory before energizing.

I. Resources and equipment required

Resource	Specification / range	Quantity
Given plan / data	Instructor-issued, dimensioned	1
Rules and data sheets	Current approved references	As req.
Rate source	Current SOR or verified quotation	1
Calculator / spreadsheet	Formulae visible and checked	1
Drawing tools	Scale, symbols and labels	1 set

J. Safety and precautions

1. Do not energize or alter a circuit without instructor approval.
2. Use intact leads, correct instrument ranges, rated components and required PPE.
3. Switch OFF, isolate and verify absence of voltage before touching conductors.
4. Keep exposed live parts guarded and use only the approved laboratory supply.

K. Procedure

1. Define the study boundary, required evidence and the current technical sources or approved site to be used.
2. Prepare a checklist covering configuration, ratings, equipment, protection, control, safety and environmental aspects.
3. Collect observations without touching live equipment; photographs require site and instructor permission.
4. Verify key facts against a utility, manufacturer, standard or other authoritative technical source.
5. Prepare a labelled diagram and a concise comparison table; include calculations where the syllabus outcome requires them.
6. Write findings, limitations and recommendations, then list the sources and date accessed.

L. Observations and calculations

Record verified ratings and constructional observations. Identify the source of any information not obtained directly from the sample or site.

Item / parameter	Rating / value	Construction / principle	Application	Remarks

LABELLED SKETCH / SINGLE-LINE DIAGRAM / COMPARATIVE NOTES

M. Interpretation of results

COMPARE OBSERVED AND EXPECTED BEHAVIOUR; EXPLAIN ERROR, LIMITATIONS OR DESIGN TRADE-OFFS

N. Conclusion

STATE WHETHER THE PRACTICAL OUTCOME WAS ACHIEVED AND SUPPORT IT WITH KEY EVIDENCE

O. Practical-related questions

No.	Question / answer
1	What physical principle or engineering rule is verified in 'Prepare a report on distribution cables using supplier, industry or verified online study'? Answer: _____
2	Why was the selected instrument range, component rating or data source suitable? Answer: _____
3	Which two errors or uncertainties have the greatest effect on this result? Answer: _____
4	What safety step must be completed before changing a connection or configuration? Answer: _____

P. References and suggestions

1. C. L. Wadhwa, Electrical Power Systems
2. S. N. Singh, Electric Power Generation, Transmission and Distribution
3. Current GTU syllabus DI03000101 and institute laboratory instructions

Q. Assessment rubric (25 marks)

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct interpretation of data, scope and standards	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Technical method, calculations and documentation	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Faculty remarks	Student response / correction completed

PRACTICAL 16

Study cable recycling and electrical/electronic waste management

DATE	BATCH	ROLL / ENROLLMENT NO.	FACULTY SIGN

A. Objective

Study cable recycling and electrical/electronic waste management.

B. Expected programme outcomes

PO1, PO2, PO4, PO7.

C. Expected competency

Analyze and document transmission and distribution components, configurations and performance.

D. Expected course outcome

CO4: Identify the components and configurations of power-distribution systems.

E. Practical learning outcomes

1. Identify construction, rating, operating principle and application of the item or system.
2. Record observations in a labelled diagram and comparative technical table.
3. Form a justified conclusion using verified technical evidence.

F. Affective-domain outcomes

1. Follow electrical safety, laboratory discipline and good housekeeping.
2. Record observations honestly with units, dates and traceable corrections.
3. Share instruments responsibly and complete the work within the allotted time.

G. Prerequisite theory

This is an identification and engineering-observation exercise. Record construction, ratings, operating principle, application, limitations and safety requirements for every item or system studied. Use nameplate data and current manufacturer or utility information; clearly distinguish observation from inference.

Key relations / checks

- State the governing relation before substitution
- Use consistent SI units
- % difference = |observed - expected|/expected x 100

H. Experimental setup / drawing

Study the labelled constructional, single-line or system diagram below and add the verified ratings, terminal designations and functional details for the item observed.

FIG. H.16 - CABLE AND E-WASTE RECOVERY FLOW

VERIFY VALUES BEFORE USE

Engineering-diagram note: Confirm the actual component values, ratings, terminal numbers, instrument ranges and protective measures issued by your laboratory. Faculty approval is mandatory before energizing.

I. Resources and equipment required

Resource	Specification / range	Quantity
Given plan / data	Instructor-issued, dimensioned	1
Rules and data sheets	Current approved references	As req.
Rate source	Current SOR or verified quotation	1
Calculator / spreadsheet	Formulae visible and checked	1
Drawing tools	Scale, symbols and labels	1 set

J. Safety and precautions

1. Do not energize or alter a circuit without instructor approval.
2. Use intact leads, correct instrument ranges, rated components and required PPE.
3. Switch OFF, isolate and verify absence of voltage before touching conductors.
4. Keep exposed live parts guarded and use only the approved laboratory supply.

K. Procedure

1. Define the study boundary, required evidence and the current technical sources or approved site to be used.
2. Prepare a checklist covering configuration, ratings, equipment, protection, control, safety and environmental aspects.
3. Collect observations without touching live equipment; photographs require site and instructor permission.
4. Verify key facts against a utility, manufacturer, standard or other authoritative technical source.
5. Prepare a labelled diagram and a concise comparison table; include calculations where the syllabus outcome requires them.
6. Write findings, limitations and recommendations, then list the sources and date accessed.

L. Observations and calculations

Record verified ratings and constructional observations. Identify the source of any information not obtained directly from the sample or site.

Item / parameter	Rating / value	Construction / principle	Application	Remarks

LABELLED SKETCH / SINGLE-LINE DIAGRAM / COMPARATIVE NOTES

M. Interpretation of results

COMPARE OBSERVED AND EXPECTED BEHAVIOUR; EXPLAIN ERROR, LIMITATIONS OR DESIGN TRADE-OFFS

N. Conclusion

STATE WHETHER THE PRACTICAL OUTCOME WAS ACHIEVED AND SUPPORT IT WITH KEY EVIDENCE

O. Practical-related questions

No.	Question / answer
1	What physical principle or engineering rule is verified in 'Study cable recycling and electrical/electronic waste management'? Answer: _____
2	Why was the selected instrument range, component rating or data source suitable? Answer: _____
3	Which two errors or uncertainties have the greatest effect on this result? Answer: _____
4	What safety step must be completed before changing a connection or configuration? Answer: _____

P. References and suggestions

1. C. L. Wadhwa, Electrical Power Systems
2. S. N. Singh, Electric Power Generation, Transmission and Distribution
3. Current GTU syllabus DI03000101 and institute laboratory instructions

Q. Assessment rubric (25 marks)

Assessment criterion	5 - Excellent	4 - Good	3 - Satisfactory	2/1/0 - Needs improvement	Marks
Correct interpretation of data, scope and standards	Complete, correct and independently prepared	Minor correction needed	Adequate with guidance	Major error, unsafe or incomplete	/5
Technical method, calculations and documentation	Systematic, accurate and safe	Sound method; small lapse	Acceptable with guidance	Weak method or unsafe practice	/5
Professional conduct and team contribution	Ethical, orderly and constructive	Responsible with minor lapse	Generally acceptable	Poor discipline or contribution	/5
Result interpretation and conclusion	Evidence-based and insightful	Correct with minor omission	Basic valid conclusion	Unsupported or incorrect	/5
Timely completion and record quality	Complete, neat and on time	Nearly complete and timely	Usable record	Late, unclear or incomplete	/5
TOTAL					/25

Faculty remarks	Student response / correction completed

Final submission checklist

1. Every practical has a date, mapped outcome, actual readings or evidence, calculations and a signed conclusion.
2. Circuit diagrams, programs, graphs, estimates, reports and test sheets are attached where required.
3. Instrument ranges, component ratings, source dates and safety precautions are recorded.
4. Technical sources are acknowledged and all assumptions are stated.
5. Faculty feedback and required corrections have been completed.

FACULTY REMARKS