

Assignments for

**Basics Electrical
Engineering
(BE01R00051)**

B.E. Semester-II (All Branches)



**Directorate of Technical Education, Gandhinagar,
Gujarat**

Government Engineering College, Bhuj

Certificate

This is to certify that Mr./Ms. _____
Enrollment No. _____ of B.E. Semester-II
_____ **Engineering** of this Institute (GTU Code: 015)
has satisfactorily completed the Assignment work for the subject **Basics
Electrical Engineering (BE01R00051)** for the academic year _____

Place: _____

Date: _____

Name and Sign of Faculty member

Head of the Department

Preface

Main motto of any laboratory / practical / assignment / field work is for enhancing required skills as well as creating ability amongst students to solve real time problem by developing relevant competencies in psycho-motor domain. By keeping in view, GTU has designed competency focused outcome-based curriculum for engineering degree programs where sufficient weightage is given to practical work. It shows importance of enhancement of skills amongst the students. It is must for effective implementation of competency focused outcome-based curriculum that every practical / assignment is keenly designed to serve as a tool to develop and enhance relevant competency required by the various industry among every student.

By solving these assignments students can try to develop a better understanding of the subject. This in turn enhances pre-determined outcomes amongst students.

Basics Electrical Engineering assignment is designed to supplement the theoretical knowledge gained in this subject. It provides hands-on experience to reinforce concepts such as Ohm's Law, Various laws and theorems, AC/DC circuits, Electrical Machines and safety & protection. The assignments have been carefully selected to cover the key topics in Basics Electrical Engineering and to help students develop critical thinking, problem-solving, and troubleshooting skills.

The utmost care has been taken while preparing these assignments however always there is chances of improvement. Therefore, we welcome constructive suggestions for improvement and removal of errors if any.

Note:

The theory, questions and figures used in this manual are used from the prescribed texts and references as mentioned in the GTU syllabus:

1. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
2. Basic Electrical Engineering- U. A. Bakshi, H. N. Raval, Technical Publication, 2024.
3. Website: nptel.ac.in
4. Google sites

Government Engineering College, Bhuj Institute Vision and Mission

Vision

To optimize perseverance, quality and ethics in the higher technical education and research as can groom the learners into the owners of global trends in engineering.

Mission

- To facilitate the learners with fundamental and advanced technical knowledge in theory and practice
- To facilitate the learning with concerned industrial exposure to the obtaining technology
- To help the learners acquire professional ethics, acumen and zeal for research and entrepreneurship

Government Engineering College, Bhuj
Electrical Engineering Department
Department Vision and Mission, PEOs and PSOs

Vision

To empower Electrical Engineers with technical expertise, social responsibility and adaptability to vibrant industries.

Mission

M1: To provide sound fundamental knowledge and skill of electrical engineering field.

M2: To provide platform for higher study, entrepreneurship and placement.

M3: To produce Electrical Engineers with an attitude to adapt themselves to changing technological environment.

M4: To create lifelong learning environment in department.

Program Educational Objectives (PEOs)

Within few years after Graduation, the Student will be able:

PEO1: To implant a strong foundation in the Electrical Engineering fundamentals to solve and analyze the Electrical Engineering problems. (Core Technical)

PEO2: To produce graduates who are well placed in the field of Electrical Engineering and contributing towards nation development. (Placement and Entrepreneurship)

PEO3: Building a professional culture within the department community that embodies the ethics and honesty. (Ethics)

Program Specific Outcomes (PSOs)

PSO 1: Graduates will be able to demonstrate fundamental knowledge of electrical power system, electrical machines, power electronics using appropriate concepts.

PSO 2: Graduates will be able to design electrical machines, transmission lines and Power apparatus.

PSO 3: Graduates will be able to develop support system based on renewable and sustainable energy sources.

Program Outcomes (POs)

- POs are statements that describe what students are expected to know and be able to do upon graduating from the program. These relate to the skills, knowledge, analytical ability, attitude and behavior that students acquire through the program.
- The POs essentially indicate what the students can do from subject-wise knowledge acquired by them during the program. As such, POs define the professional profile of an engineering graduate.
- NBA has defined the following eleven POs for an engineering graduate. These are in line with the Graduate Attributes as defined by the Washington Accord:

1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

3. Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems:

5. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the

knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Course Outcome (COs):

After learning the course, the students should be able to:

CO-1 : Apply fundamental electrical laws and circuit theorems to electrical circuits.

CO-2 : Analyze single phase and three phase AC circuits.

CO-3 : Describe operating principle and applications of static and rotating electrical machines.

CO-4 : Understand the LT switchgear, earthing and safety of electrical appliances.

CO-5 :Comprehend illumination system, batteries, electrical consumption & billing and electrical measuring instruments.

Assignments – Course Outcome matrix

| Course Outcomes (COs): | | | | | | |
|--|--------------|-----|-----|-----|-----|-----|
| CO-1 : Apply fundamental electrical laws and circuit theorems to electrical circuits. | | | | | | |
| CO-2 : Analyze single phase and three phase AC circuits. | | | | | | |
| CO-3 : Describe operating principle and applications of static and rotating electrical machines. | | | | | | |
| CO-4 : Understand the LT switchgear, earthing and safety of electrical appliances. | | | | | | |
| CO-5 : Comprehend illumination system, batteries, electrical consumption & billing and electrical measuring instruments. | | | | | | |
| Sr. No | Assignment | CO1 | CO2 | CO3 | CO4 | CO5 |
| 1. | Assignment-1 | √ | | | | |
| 2. | Assignment-2 | | √ | | | |
| 3. | Assignment-3 | | | √ | | |
| 4. | Assignment-4 | | | | √ | |
| 5. | Assignment-5 | | | | | √ |

Government Engineering College, Bhuj
Department of Electrical Engineering
Subject: Basic Electrical Engineering (BE01R00051)
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| Exp. No. | Title of Experiment | Date of Performance | Date of Submission | Marks | Sign |
|-----------------|----------------------------|----------------------------|---------------------------|--------------|-------------|
| 1 | Assignment-1 | | | | |
| 2 | Assignment-2 | | | | |
| 3 | Assignment-3 | | | | |
| 4 | Assignment-4 | | | | |
| 5 | Assignment-5 | | | | |
| Total | | | | | |

Assignment : 1

Objectives: To understand

- a. Basics of laws.
 - b. Star – delta transformation formula.
 - c. Concept of theorems.
 - d. Response of RL and RC circuits.
-
1. Define electrical circuit elements Resistor (R), Inductor (L), and Capacitor (C).
 2. Write the V–I relationship for R, L, and C.
 3. What is meant by an independent voltage source and an independent current source?
 4. State Kirchhoff’s Current Law (KCL).
 5. State Kirchhoff’s Voltage Law (KVL).
 6. Define time constant of: (a) RL circuit (b) RC circuit
 7. Explain the behavior of inductor and capacitor under DC excitation.
 8. Explain the procedure to analyze a DC circuit using Kirchhoff’s laws.
 9. State and explain the Superposition Theorem with necessary conditions.
 10. State and explain Thevenin’s Theorem.
 11. State and explain Norton’s Theorem.
 12. Derive the formula for Star–Delta and Delta–Star transformations.
 13. Derive the expression for current growth in an RL circuit when a DC voltage is applied.
 14. Derive the expression for voltage across capacitor in an RC circuit during charging.
 15. Compare Thevenin’s and Norton’s Theorems.

Rubric wise marks obtained:

| Criteria | Level of Knowledge and Understanding | Analytical Ability | Quality & Correctness of Write-up, Ethical Practices and Submission | Total |
|-----------------|---|---------------------------|--|--------------|
| Marks | | | | |

Assignment : 2

Objectives: To understand

- a. AC terms.
- b. Power, power factor and phasor diagram for different load.
- c. Series and parallel resonance.

1. Define following terms
(i) Cycle, (ii) Time period, (iii) Frequency, (iv) RMS Value, (v) Average value, (vi) Peak factor, (vii) Form factor, (viii) Line Voltage/Current, (ix) Active power. (x) Power factor.
2. Derive the current and voltage relation in a purely resistive AC circuit.
3. Explain AC circuit containing pure inductance with phasor diagram.
4. Explain AC circuit containing pure capacitance with phasor diagram.
5. Analyze series RL circuit with phasor diagram and equation.
6. Analyze series RC circuit with phasor diagram.
7. Explain series RLC circuit and obtain expression for impedance.
8. Explain parallel RLC circuit with phasor diagram.
9. What is resonance in AC circuits? Explain its significance.
10. Explain series resonance and derive resonant frequency.
11. Explain parallel resonance and its characteristics.
12. Explain advantages of three-phase system over single-phase system.
13. Derive voltage and current relation in star and delta connection.
14. Explain power measurement in three-phase balanced circuits.
15. Explain two-wattmeter method of power measurement.
16. Derive expression for total power in a three-phase balanced system.

Rubric wise marks obtained:

| Criteria | Level of Knowledge and Understanding | Analytical Ability | Quality & Correctness of Write-up, Ethical Practices and Submission | Total |
|-----------------|---|---------------------------|--|--------------|
| Marks | | | | |

Assignment : 3

Objectives: To understand

- a. Magnetic circuit.
 - b. Working and construction of transformer.
 - c. Working of single phase induction motor.
 - d. Construction and working of brushless DC motors.
-
1. Explain construction and working principle of a single-phase transformer with neat diagram.
 2. Describe B–H curve and hysteresis loop with applications.
 3. Explain hysteresis and eddy current losses in transformer and methods to minimize them.
 4. Explain ideal transformer and practical transformer with comparison.
 5. Define transformer losses and explain them in detail.
 6. Explain efficiency of transformer and derive its expression.
 7. Define voltage regulation of transformer and explain its significance.
 8. Compare ideal and practical transformer in detail.
 9. Explain generation of rotating magnetic field and its importance in induction motors.
 10. Explain construction, working and applications of single-phase induction motors.
 11. Compare split-phase, capacitor-start, permanent split capacitor and capacitor start–capacitor run motors.
 12. Explain torque–speed characteristics of various single-phase induction motors.
 13. Explain construction and working of BLDC motor with neat diagram.
 14. Compare BLDC motor and conventional DC motor.
 15. Explain advantages of BLDC motors over induction motors.
 16. Explain applications of BLDC motor in Electric Vehicles.

Rubric wise marks obtained:

| Criteria | Level of Knowledge and Understanding | Analytical Ability | Quality & Correctness of Write-up, Ethical Practices and Submission | Total |
|-----------------|---|---------------------------|--|--------------|
| Marks | | | | |