



**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**Bachelor of Engineering**  
**Subject Code: 3110005**  
**BASIC ELECTRICAL ENGINEERING**  
**1<sup>st</sup> Year**

**Type of course:** Engineering Science

**Prerequisite:** NA

**Rationale:** Electricity has been the main source of energy for the developing and developed countries. Per capita consumption of electricity of a country can be considered as an indicator of the development of the country. In view of this, it is essential for all engineering graduates to know the basic aspects of electrical engineering. This subject deals with basic circuit solution methods, introduction to electrical machines and basics of domestic electrical installations.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE(E)	PA (M)	ESE (V)	PA(I)	
3	0	2	4	70	30	30	20	150

**Content:**

Sr. No.	Content	Total Hrs	% Weightage
1	<b>DC Circuits:</b> Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff's current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.	8	20
2	<b>AC Circuits</b> Representation of sinusoidal waveforms, peak and RMS values, Phasor representation of AC quantities, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), Series and parallel resonance. Three phase balanced circuits, voltage and current relations in star and delta connections, Power measurement in three phase circuits.	10	25
3	<b>Transformers</b> Magnetic materials, BH characteristics. Construction and working principle of single phase and three phase transformers. Ideal and practical transformer. Auto-transformer and its applications.	8	15
4	<b>Electrical Machines</b> Generation of rotating magnetic fields.	8	20



# GUJARAT TECHNOLOGICAL UNIVERSITY

## Bachelor of Engineering

Subject Code: 3110005

	Construction and working of following machines: <ul style="list-style-type: none"> <li>• Three-phase induction motor</li> <li>• Single-phase induction motor.</li> <li>• Separately excited DC motor.</li> <li>• Synchronous generators.</li> </ul>		
5	<b>Electrical Installations</b> Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB. Types of Wires and Cables. Earthing – Types of earthing and its importance. Safety precautions for electrical appliances. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption. Basics of power factor improvement.	8	20

### Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
40	20	20	20	0	0

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### Reference Books:

- D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
- Basic Electrical Engineering - Nagsarkar and Sukhija, Oxford University Press
- B. L. Theraja, "Electrical Technology – Part I and II", S. Chand and Co. 2012
- D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
- L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
- E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
- V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

### Course Outcomes

Sr. No.	CO statement	Marks % weightage
CO-1	Apply fundamental electrical laws and circuit theorems to electrical circuits.	20
CO-2	Analyze single phase and three phase AC circuits.	25
CO-3	Describe operating principle and applications of static and rotating electrical machines.	35
CO-4	Comprehend electrical installations, their protection and personnel safety.	20



## GUJARAT TECHNOLOGICAL UNIVERSITY

### Bachelor of Engineering

Subject Code: 3110005

#### List of Experiments:

- (1) Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Resistors, Capacitors and Inductors.
- (2) To verify the DC circuit currents and voltages by calculations and actual measurements.
- (3) To verify the Kirchoff's current and voltage laws.
- (4) To verify the Network theorems.
- (5) To obtain sinusoidal steady state response of R-L and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage.
- (6) Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a Digital Storage Oscilloscope).
- (7) To verify the resonance in R-L-C circuits.
- (8) To measure the power in three phase circuits using two wattmeter method.
- (9) To verify the current and voltage relationships in three phase star and delta connections.
- (10) Demonstration of cut-section models and charts of various machines.
- (11) Demonstration of domestic installations like MCB, ELCB, MCCB etc.
- (12) Understanding of various safety precautions for electrical installations.
- (13) Demonstration of various types of wires and cables.
- (14) Understanding of various electricity bills and calculations for energy consumption.
- (15) To verify the power factor improvement in single phase AC circuit.

#### Major Equipment:

Ammeters, Voltmeters, Wattmeters, Resistors, Capacitors and Inductors of appropriate rating. Multimeters, Digital storage oscilloscope, Cut section models/charts of various machines, Demo units for MCB, ELCB, MCCB etc, Samples of wires and cables. Charts for earthing and safety precautions.

#### List of Open Source Software/learning website:

[www.vlabs.co.in](http://www.vlabs.co.in)



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject Code: 3110006**

**Semester – I/II**

**Subject Name: Basic Mechanical Engineering**

**Type of course:** Engineering Science

**Prerequisite:** Zeal to learn the subject

**Rationale:** Understanding of basic principles of Mechanical Engineering is required in various field of engineering.

## Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	5	70	30	30	20	150

## Content:

Sr #	Topic	Total Hrs.
1	<b>Introduction:</b> Prime movers and its types, Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity, Change of state, Path, Process, Cycle, Internal energy, Enthalpy, Statements of Zeroth law and First law	4
2	<b>Energy:</b> Introduction and applications of Energy sources like Fossil fuels, Nuclear fuels, Hydro, Solar, Wind, and Bio-fuels, Environmental issues like Global warming and Ozone depletion	3
3	<b>Properties of gases:</b> Boyle's law, Charles's law, Gay-Lussac's law, Avogadro's law, Combined gas law, Gas constant, Relation between $c_p$ and $c_v$ , Various non-flow processes like constant volume process, constant pressure process, Isothermal process, Adiabatic process, Polytropic process	5
4	<b>Properties of Steam:</b> Steam formation, Types of steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of steam tables, steam calorimeters	6
5	<b>Heat Engines:</b> Heat engine cycle and Heat engine, working substances, Classification of heat engines, Description and thermal efficiency of Carnot; Rankine; Otto cycle and Diesel cycles	5
6	<b>Steam Boilers:</b> Introduction, Classification, Cochran, Lancashire and Babcock and Wilcox boiler, Functioning of different mountings and accessories	-
7	<b>Internal Combustion Engines:</b> Introduction, Classification, Engine details, four-stroke/ two-stroke cycle Petrol/Diesel engines, Indicated power, Brake Power, Efficiencies	4
8	<b>Pumps:</b> Types and operation of Reciprocating, Rotary and Centrifugal pumps, Priming	3
9	<b>Air Compressors:</b> Types and operation of Reciprocating and Rotary air compressors, significance of Multistage	3
10	<b>Refrigeration &amp; Air Conditioning:</b> Refrigerant, Vapor compression refrigeration system, Vapor absorption refrigeration system, Domestic Refrigerator, Window and split air conditioners	4



# GUJARAT TECHNOLOGICAL UNIVERSITY

## Bachelor of Engineering

Subject Code: 3110006

11	<b>Couplings, Clutches and Brakes:</b> Construction and applications of Couplings (Box; Flange; Pin type flexible; Universal and Oldham), Clutches (Disc and Centrifugal), and Brakes (Block; Shoe; Band and Disc)	-
12	<b>Transmission of Motion and Power:</b> Shaft and axle, Different arrangement and applications of Belt drive; Chain drive; Friction drive and Gear drive	-
13	<b>Engineering Materials:</b> Types, properties and applications of Ferrous & Nonferrous metals, Timber, Abrasive material, silica, ceramics, glass, graphite, diamond, plastic and polymer	4

Note: Topic No. 6, 11 and 12 of the above syllabus are to be covered in Practical Hours.

### Distribution of marks weightage for cognitive level:

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	40	40	-	-	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### Reference Books:

1. Elements of Mechanical Engineering by N M Bhatt and J R Mehta, Mahajan Publishing House
2. Basic Mechanical Engineering by Pravin Kumar, Pearson Education
3. Fundamental of Mechanical Engineering by G.S. Sawhney, PHI Publication New Delhi
4. Elements of Mechanical Engineering by Sadhu Singh, S. Chand Publication
5. Introduction to Engineering Materials by B.K. Agrawal, McGraw Hill Publication, New Delhi

### Course Outcome:

Sr. No.	CO statement	Marks % weightage
CO-1	Discuss the various sources of energy and basic terminology of Mechanical engineering	14
CO-2	Make calculations for commonly used working fluids i.e. ideal gases and steam	22
CO-3	Analyze various heat engine cycles and understand construction and working of IC engines	20
CO-4	Discuss working and applications of steam boilers and various energy conversion systems	28
CO-5	Discuss various power transmission elements	08
CO-6	Discuss properties of various engineering materials and their applications	08



# GUJARAT TECHNOLOGICAL UNIVERSITY

## **Bachelor of Engineering** **Subject Code: 3110006**

### **List of Experiments:**

1. To understand construction and working of various types of boilers.
2. To understand construction and working of different boiler mountings and accessories.
3. To understand construction features of two/four stroke petrol/diesel engines
4. To determine brake thermal efficiency of an I. C. Engine.
5. To understand construction and working of different types of air compressors.
6. To demonstrate vapor compression refrigeration cycle of domestic refrigerator OR window air conditioner OR split air conditioner.
7. To understand construction, working and application of clutches, coupling and brakes
8. To understand different arrangement and application of various power transmission drives

**Major Equipment:** Models of Cochran, Lancashire and Babcock and Wilcox boilers, models of various mountings and accessories, Models of various types of IC engines, Single cylinder two stroke /four stroke petrol/ diesel engine, models of pumps, compressors, Domestic refrigerator/window air conditioner/split air conditioner, models of various types of brakes, coupling, clutches, drives

**List of Open Source Software/learning website:** <https://nptel.ac.in>, [www.vlab.co.in](http://www.vlab.co.in)



**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**Bachelor of Engineering**  
**Subject Code: 3110002**

**ENGLISH**  
**B.E. 1ST YEAR**

**Type of course:** Language and Communication

**Prerequisite:** Zeal to learn the subject

**Rationale:** The rationale of the curriculum is to help students refresh their knowledge of English language. It also targets the understanding of grammar, focusing on comprehension, and reading, speaking and writing skills. This would be developed through balanced and integrated tasks.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

**Content:**

Sr. No.	Topics	Teaching Hours	Module Weightage
1	Vocabulary building: Introduction to Word Formation Types of word formation processes: compounding, clipping, blending, derivation, creative respelling, coining and borrowing Acquaintance with prefixes and suffixes Synonyms, antonyms, and standard abbreviations.	06	20%
2	Phonetics: IPA Transcription Introduction to different accents	04	10%
3	Identifying Common Errors in Writing: Tenses Subject-verb agreement Noun-pronoun agreement Misplaced modifiers Articles Prepositions Modal Auxiliaries Redundancies	06	20%
4	Basic Writing Skills: Sentence Structures Use of phrases and clauses in sentences Importance of proper punctuation Creating coherence Organizing principles of paragraphs in documents	04	10%



**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**Bachelor of Engineering**  
**Subject Code: 3110002**

5	Nature and Style of Writing: Describing Defining Classifying Writing introduction and conclusion	06	20%
6	Writing Practices: Comprehension Précis Writing Letter Writing Email etiquettes Abstract Memo writing	06	20%

**Suggested Specification table with Marks (Theory):**

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	10	20	20	20	20

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Reference Books:**

- (i) Technical English, Dr. M. Hemamalini, Wiley. 2014
- (ii) Practical English Usage, Michael Swan, OUP. 1995
- (iii) Remedial English Grammar, F.T. Wood, Macmillan. 2007
- (iv) Oxford Language Reference, (Indian Edition) OUP
- (v) On Writing Well, William Zinsser, Harper Resource Book. 2001
- (vi) Study Writing, Liz Hamp-Lyons and Ben Heasley, Cambridge University Press. 2006
- (vii) Communication Skills, Sanjay Kumar and Pushp Lata, Oxford University Press. 2011
- (viii) Exercises in Spoken English, Parts. I-III. CIEFL, Hyderabad. Oxford University Press
- (ix) The Study of Language, George Yule, CUP, 4<sup>th</sup> Edition. 2010
- (x) A Course in English Phonetics, T R Kansakar, Orient Longman. 1998
- (xi) Spoken English, R K Bansal and J B Harrison, Orient Longman. 2013

**Course Outcome:** At the end of the course students will be able to –

Sr. No	Course Outcomes	Weightage
CO1	Use various forms of vocabulary in varied situations in oral and written communication.	10%
CO2	Understand the phonetics and the transcription pattern to learn correct pronunciation.	10%
CO3	Comprehend the dynamics of various rules of grammar and check its validation while they speak and write language correctly.	20%



**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**Bachelor of Engineering**  
**Subject Code: 3110002**

CO4	Use grammar effectively to make themselves competent Listener, Speaker, Reader and Writer by exposing to various set of situations.	20%
CO5	Write various formal and informal documents of day to day life and professional set up.	20%
CO6	Demonstrate the qualities of writing in diverse situation by using the nuances such as conciseness, clarity, accuracy, organization, and coherence.	20%

**List of Experiments:**

Sr. No.	Practical/ Exercise	Apprx. Hours required
1	Word Formation-1	02
2	Word Formation-2	02
3	Listening Comprehension	02
4	Transcription and dictionary usage	02
5	Common Everyday Situations: Conversations and Dialogues	04
6	Communication at Workplace	04
7	Common errors in writing	04
8	Reading Comprehension	02
9	Letter Writing, Precis Writing	04
10	Email Writing: Formal and Informal	02
11	Practical assessment	04

# Induction Program

## **Preamble:**

The goal of engineering education is to train engineering graduates well in branch of admission, have a holistic personality and must have desire to serve society and nation. It is expected that an engineering graduate work for solving the problems of society using the modern technologies and practices. That needs the broad understanding of the society and relationships. It is needed to cultivate the human values in engineering graduates to fulfil his responsibilities as an engineer, a citizen and a human being.

Considering the various social backgrounds and whether a student comes from the urban or rural areas they differ in many of the life skills and their abilities and thinking. There branch of admission may be due to rush; their interest in subject is question. They are facing the issues like hostel and settlements, pressures from peers and many related issues. To overcome such issues, it is necessary to create an environment for students so that they feel comfortable, find their interest and explore their inner beings, create bonding with other students, establish relation with teachers, work for excellence, get a broader view of life and practice human values to build characters. The Induction Program covers the various activities which enables them to overcome all such issues and motivates them to perform well in their chosen branch of admission.

## **Scheme:**

<b>Sr No</b>	<b>Phase and Activities Heads</b>	<b>Weightage</b>
1.	<b>Initial Phase</b>	<b>1 day (6 Hrs)</b>
2	<b>Regular Phase</b>	<b>13 Days</b>
a)	Physical activity	24 Hours
b)	Creative Arts	12 Hours
c)	Universal Human Values	12 Hours
d)	Literary	12 Hours
e)	Proficiency Modules	6 Hours
f)	Lectures by Eminent People	3 Hours: 3 Expert Lectures, One per Week
g)	Visits to local Areas or Industry	1 Day
h)	Innovations	3 Hours
3	<b>Closing Phase</b>	<b>1 Day (6 Hrs)</b>
	<b>Total</b>	<b>90 Hours</b>

## Phases, Modules, Activities and Guidelines:

The activity during Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The initial and closing phases would be one day each. The following is the guidelines indicating the possible activities under each phase of the Induction Program.

<b>Initial Phase (First Day)</b>		
<p>Following are the activities to be carried on the first day:</p> <ul style="list-style-type: none"> <li>● Orientation Programme</li> <li>● Know your Department/Institute</li> <li>● Know your university</li> <li>● Know hostel and other amenities</li> <li>● Information about Student Diary and Induction Program</li> </ul>		
<b>Regular phase ( 13 Days )</b>		
<p>The Regular Phase consists of 13 days, each day is of 6 hours. It covers all the 8 different activity modules. For each module, the objectives, suggested activities and guidelines are provided herewith. Institute can use additional relevant activities in addition in suggested activities for each of the phases.</p>		
<b>Module Name</b>	<b>Objectives</b>	<b>Suggested Activities</b>
<p>1. Physical Activity (24 hours )</p>	<p>1. Improve bone health</p> <p>2. Improve cardio respiratory and muscular fitness</p> <p>3. Understand the anatomy, basic biomechanical principles and terminology.</p> <p>4. Examine the effect of nutrition, rest and other lifestyle factors that contribute to the better health.</p>	<p>1. Running/Jogging</p> <p>2. Brisk Walk</p> <p>3. Cycling</p> <p>4. Heavy yard work</p> <p>5. Swimming</p> <p>6. Yoga/Pranayam</p> <p>7. Aerobics</p> <p>8. Outdoor Sports/Indoor Games (In addition to cricket, Volleyball, Badminton, Chess, Carom, Table Tennis, Other games like Critical Thinking, Math skill developing Games, Memory Games can be included.)</p> <p>9. Calculate Body mass index of each students and explain their fitness level from it.</p> <p>10. Tree Plantation</p> <p>11. Gardening</p>
<p><b>Guidelines:</b></p> <ul style="list-style-type: none"> <li>● Half an hour Yoga/Pranayam followed by physical activities including various games.</li> <li>● Refer this link for Yoga/Pranayam <a href="https://s3-ap-southeast-1.amazonaws.com/ministry-">https://s3-ap-southeast-1.amazonaws.com/ministry-</a></li> </ul>		

<b>Module Name</b>	<b>Objectives</b>	<b>Suggested Activities</b>
2. Creative Arts (12 hours)	<ol style="list-style-type: none"> <li>1. Develop creativity and imagination through a range of complex activities.</li> <li>2. Improve the student's ability to control materials, tools and techniques.</li> <li>3. Develop increasing confidence in the use of visual and tactile elements and materials.</li> </ol>	<ol style="list-style-type: none"> <li>1. Make a model of any physical object related to Engineering Design</li> <li>2. Crafting</li> <li>3. Painting</li> <li>4. Sculpture</li> <li>5. Pottery</li> <li>6. Music</li> <li>7. Dance</li> </ol>

**Guidelines:**

- Use any activities leading to creative thing and practice.
- Show the video demonstrating the creative ideas and thinking.
- Show the video demonstrating phenomenon performance using innovation in different areas of humanity and social science.
- Demonstrate the story of leaders with the context of how with their creative vision, with all odds they achieved success.

<b>Module Name</b>	<b>Objectives</b>	<b>Suggested Activities</b>
3. Universal Human Values (12 hours)	<ol style="list-style-type: none"> <li>1. Impart universal human values in students.</li> <li>2. Enable students to live in harmony within themselves, with family, with society and the nature</li> <li>3. Initiate the process of self exploration and self investigation within themselves about their understanding of happiness.</li> </ol>	<ol style="list-style-type: none"> <li>1. Showing Motivational Movies.</li> <li>2. Social Activities like visit of orphanage, old age home, blind peoples' school etc.</li> <li>3. Swachchhata Mission Activities.</li> <li>4. Awareness regarding environmental issues and remedies.</li> <li>5. Spread awareness about blood donation, organ donation, precaution to avoid malaria in monsoon etc.</li> <li>6. Discuss autobiography of legendary persons who practiced universal human values in their life and work.</li> <li>7. Conduct universal human values group discussions.</li> </ol>

**Guidelines:**

- Use the materials and activities covered in the FDP on Induction Program held at GTU organized by AICTE.
- The faculties trained from institute will take leadership role to rollout it at institute level.

<b>Module Name</b>	<b>Objectives</b>	<b>Suggested Activities</b>
4. Literary (12 hours)	1. Inculcate the habit of active (or interactive) consumption of the best content available in literature. 2. Develop thinking skills. 3. Improve reading abilities and attitude.	1. Digital literacy and use of Internet 2. Basic Mathematics for Solving Real World Problems 3. Use of Scientific Calculator in Engineering 4. General Knowledge Quiz Competition 5. Vedic Mathematics 6. Reading/writing/speaking/listening 7. Debating/Elocution 8. Enacting a play 9. Book review

**Guidelines:**

- Use the video lectures to literate students in different skills needed for day-to-day life and need.
- Motivate students to create the nature of inquiry and reading habits.
- Arrange the various competitions like Elocution, Essay writing, Storytelling, Book reviews etc.
- Writing the review of the well known books, movies etc and sharing.

<b>Module Name</b>	<b>Objectives</b>	<b>Suggested Activities</b>
5. Proficiency modules (6 hours)	1. Determining English proficiency level of students and mentoring accordingly. 2. Learn the mining vocabulary, idioms, and expressions and understand their meanings in context. 3. Develop ability to write a paragraph about general topics by using the English language correctly.	1. English general diagnostic test to determine student's English proficiency level. 2. Mentoring students to improve in English proficiency according to his/her proficiency level based on test.

	4. Realize the importance of English language as a global business language.	
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**Guidelines:**

- An MCQ test of **45 minutes** should be conducted covering basic grammar and vocabulary.
- Group the students in three groups based on test result in three proficiency levels:
  - Unsatisfactory
  - Satisfactory
  - Good
- Following activities are to be used to uplift proficiency levels of students.
  - Motivational movies, documentary
  - Language games
  - Essay/story writing
  - Ice breaking games.
- Separate set of activities from suggested list should be used for different groups.

<b>Module Name</b>	<b>Objectives</b>	<b>Suggested Activities</b>
6. Lectures by Eminent people  (3 hours)	1. Motivation through knowing experience of successful person. 2. Meet and interact with eminent personalities of different fields.	1. To conduct lecture by eminent people. 2. Interaction with leaders, experts, entrepreneurs, contributors and successful personalities

**Guidelines:**

- 3 expert lectures each of 1 hour per week.
- Multiple divisions can be combined in an expert lecture.
- External expert should be invited.
- Expert can be from academic, industry, research organization, social organization etc.
- An individual successful person in any of the field can be invited.
- The aspect to be addressed may be social / economical / engineering / entrepreneurship/ spiritual/ humanity science.

<b>Module Name</b>	<b>Objectives</b>	<b>Suggested Activities</b>
7. Visit to Local Area and Industry (1 Full day)	1. To familiarize students with the local area. 2. Sensitise with the different aspects of the life including social services and heritage	1. A full day visit covering at least 2 or 3 places. 2. List of possible places A. Centre of excellence B. Elite Academic Institutes C. Research institute

		D. Hospitals E. Industry visit F. Heritage places
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**Guideline and References:**

- Institute can arrange visit to public, social or specifies places to give insight of the activities and overall socio-economic contribution of such places.
- The uniqueness or impact of such visits should be highlighted.

Module Name	Objectives	Suggested Activities
8. Innovation (3 hours)	1. Introduce the student about innovation in different fields 2. Make students aware about innovative and modern practices and products in their own branch 3. Create awareness about support available for start-up and innovation	1. Lectures by senior faculties. 2. Showing videos demonstrating innovation. 3. Introducing innovative technology/products. 4. Awareness regarding SSIP Scheme of Government of Gujarat 5. Awareness about Government initiatives in areas of innovations and supports for start-up, Incubation, Entrepreneurship etc.

**Guideline:**

- Video lectures from leaders and innovators.
- TeDx Talks.
- Government Policy documents for different schemes.

**Closing Phase ( Last Day )**

The closing phase is the last day of the Induction Program and covering conclusion and summary of the Induction Program.

**Conclusion and summary:**

- Guiding students for preparation of student report about Induction Program.
- Instruct students regarding submission and examination of the Induction Program.
- Address by HODs/Senior faculties regarding branch/discipline and career option in respective branch.
- Introduce about the engineering and its importance in life and their responsibilities towards the society.

**General Regulations:**

- Every student has to maintain a daily diary. Format of the diary is already given.
- After completion of the Induction program student has to prepare a report based on activities performed during the Induction program. Diary will be attached as Appendix in Report.
- 75% Attendance is require during Induction Program.

- d) This program will be noncredit subject but it will reflect in 1<sup>st</sup> Semester Marksheet as PASS or FAIL.
- e) Institute should appoint a mentor for a group of 20 to 30 students. Mentor can take help of senior students.
- f) If student gets admission transfer in other college during Induction Program the diary will be continued from previous college to new college.
- g) If student gets admission in middle of the Induction Program or student gets admission after Induction Program, it is responsibility of the institute to fulfill the criteria of the Induction Program.
- h) If student fails in the Induction program the student has to clear the same during subsequent Semester

### **Evaluation Pattern:**

1. Induction Program is Mandatory course for each branch of Engineering.
2. It is mandatory for each student to clear Induction Program with PASS grade.
3. Grades for Induction Program are either PASS or FAIL and have no credits. Evaluation for Induction Program is based on the Induction Program Report prepared by a student from Student diary and student will be declared PASS or FAIL.
4. Student has to submit the Induction Program Report at the end of first semester dully approved by Mentor and HOD.
5. Evaluation of Induction Program will be done along with first Semester Term-Work Submission.
6. The evaluation is carried out by Internal Examiner from institute itself. The entry on the GTU portal will be PASS or FAIL, not marks.
7. The students who will FAIL have to reappear again after every 6 months as remedial exam.

### **Guidelines for Program Report:**

- 1) Report should have minimum 20 pages.
- 2) Report must have One Photograph per Activity.
- 3) Report consists of Certificate, Index and Diary as Appendix.
- 4) Report should be dully signed by Mentor and HOD.
- 5) Index will have following sequence:

1.	<b>Initial Phase</b>
2	<b>Regular Phase</b>
a)	Physical activity
b)	Creative Arts
c)	Universal Human Values
d)	Literary
e)	Proficiency Modules
f)	Lectures by Eminent People
g)	Visits to local Areas or Industry
h)	Innovations
3	<b>Closing Phase</b>

# Format of Diary

Enrolment/Roll No:

Name of Student:

<b>Day .....</b>		<b>Date:</b>
<b>Hour</b>	<b>Activities Done</b>	<b>Learning Outcomes</b>
<b>1</b>		
<b>2</b>		
<b>3</b>		
<b>4</b>		
<b>5</b>		
<b>6</b>		
<b>Signature of the Student</b>		<b>Signature of Mentor</b>



# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3110014

**SUBJECT NAME: Mathematics-1**

**1<sup>st</sup> Year**

**Type of course:** Basic Science Course

**Prerequisite:** Algebra, Trigonometry, Geometry

**Rationale:** The study of rate of changes, understanding to compute area, volume and express the function in terms of series, to apply matrix algebra.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	2	0	5	70	30	0	0	100

**Content:**

Sr. No.	Content	Total Hrs	% Weightage
01	Indeterminate Forms and L'Hôpital's Rule.	01	15 %
	Improper Integrals, Convergence and divergence of the integrals, Beta and Gamma functions and their properties.	03	
	Applications of definite integral, Volume using cross-sections, Length of plane curves, Areas of Surfaces of Revolution	03	
02	Convergence and divergence of sequences, The Sandwich Theorem for Sequences, The Continuous Function Theorem for Sequences, Bounded Monotonic Sequences, Convergence and divergence of an infinite series, geometric series, telescoping series, $\square^{\square}$ term test for divergent series, Combining series, Harmonic Series, Integral test, The p - series, The Comparison test, The Limit Comparison test, Ratio test, Raabe's Test, Root test, Alternating series test, Absolute and Conditional convergence, Power series, Radius of convergence of a power series, Taylor and Maclaurin series.	08	20 %
03	Fourier Series of $2\square$ periodic functions, Dirichlet's conditions for representation by a Fourier series, Orthogonality of the trigonometric system, Fourier Series of a function of period $2\square$ , Fourier Series of even and odd functions, Half range expansions.	04	10 %
04	Functions of several variables, Limits and continuity, Test for non existence of a limit, Partial differentiation, Mixed derivative theorem, differentiability, Chain rule, Implicit differentiation, Gradient, Directional derivative, tangent plane and normal line, total differentiation, Local extreme values, Method of Lagrange Multipliers.	08	20 %
05	Multiple integral, Double integral over Rectangles and general regions, double integrals as volumes, Change of order of integration, double integration in polar coordinates, Area by double integration, Triple integrals in rectangular, cylindrical and spherical coordinates, Jacobian, multiple integral by substitution.	08	20 %
06	Elementary row operations in Matrix, Row echelon and Reduced row echelon forms, Rank by echelon forms, Inverse by Gauss-Jordan method,	07	15%



# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3110014

Solution of system of linear equations by Gauss elimination and Gauss-Jordan methods. Eigen values and eigen vectors, Cayley-Hamilton theorem, Diagonalization of a matrix.		
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### Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	25	35	0	0	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy).

### Reference Books:

- (1) Maurice D. Weir, Joel Hass, Thomas' Calculus, Early Transcendentals, 13e, Pearson, 2014.
- (2) Howard Anton, Irl Bivens, Stephens Davis, Calculus, 10e, Wiley, 2016.
- (3) James Stewart, Calculus: Early Transcendentals with Course Mate, 7e, Cengage, 2012.
- (4) Anton and Rorres, Elementary Linear Algebra, Applications version,, Wiley India Edition.
- (5) T. M. Apostol, Calculus, Volumes 1 & 2,, Wiley Eastern.
- (6) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Edition.
- (7) Peter O'Neill, Advanced Engineering Mathematics, 7th Edition, Cengage.

### Course Outcomes

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and matrices. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Sr. No.	Course Outcomes	Weightage in %
1	To apply differential and integral calculus to improper integrals and to determine applications of definite integral. Apart from some other applications they will have a basic understanding of indeterminate forms, Beta and Gamma functions.	15
2	To apply the various tests of convergence to sequence, series and the tool of power series and fourier series for learning advanced Engineering Mathematics.	30
3	To compute directional derivative, maximum or minimum rate of change and optimum value of functions of several variables.	20
4	To compute the areas and volumes using multiple integral techniques.	20
5	To perform matrix computation in a comprehensive manner.	15

### List of Open Source Software/learning website:

Scilab, MIT Opencourseware.



**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**Bachelor of Engineering**  
**Subject Code: 3110003**  
**PROGRAMMING FOR PROBLEM SOLVING**  
**1<sup>ST</sup> YEAR**

**Type of course:** Engineering Science

**Prerequisite:** Zeal to learn the subject

**Rationale:** Understanding of basic principles of Mechanical Engineering is required in various field of engineering.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	0	2	4	70	30	30	20	150

**Content:**

Sr. No.	Topics	Teaching Hours	Module Weightage
1	<b>Introduction to computer and programming:</b> Introduction, Basic block diagram and functions of various components of computer, Concepts of Hardware and software, Types of software, Compiler and interpreter, Concepts of Machine level, Assembly level and high level programming, Flowcharts and Algorithms	5	11
2	<b>Fundamentals of C:</b> Features of C language, structure of C Program, comments, header files, data types, constants and variables, operators, expressions, evaluation of expressions, type conversion, precedence and associativity, I/O functions	4	9
3	<b>Control structure in C:</b> Simple statements, Decision making statements, Looping statements, Nesting of control structures, break and continue, goto statement	5	11
4	<b>Array &amp; String:</b> Concepts of array, one and two dimensional arrays, declaration and initialization of arrays, string, string storage, Built-in-string functions	6	13
5	<b>Functions:</b> Concepts of user defined functions, prototypes, definition of function, parameters, parameter passing, calling a function, recursive function, Macros, Pre-processing	5	11
6	<b>Recursion:</b> Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.	4	9
7	<b>Pointers:</b> Basics of pointers, pointer to pointer, pointer and array, pointer to array, array to pointer, function returning pointer	4	9
8	<b>Structure:</b> Basics of structure, structure members, accessing structure members, nested structures, array of structures, structure and functions, structures and pointers	4	9
9	<b>Dynamic memory allocation:</b> Introduction to Dynamic memory allocation, malloc, calloc	4	9
10	<b>File management:</b> Introduction to file management and its functions	4	9



# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3110003

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	30	30	20	0	0

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

### Reference Books:

1. Programming in ANCI C, Seventh edition, by Balagurusamy E, Tata McGraw-Hill Publishing Company Limited
2. Programming with C, Second edition, by Gottfried, Tata McGraw-Hill Publishing Company Limited
3. Star C Programming, Pub: STAR Certification
4. C Programming language, Second edition, by Kernighan B W and Ritchie D M Prentice Hall,
5. Let us C, Fifth edition, by Kanetkar Y. P., BPB Publication
6. Fundamentals of Computing and Programming in C, First Edition, Oxford University Press, 2009 by Pradip Dey, Manas Ghosh,
7. "Computer programming", Pearson Education, 2007 by Ashok N. Kamthane.
8. "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007 by R.G. Dromey.
9. Programming in C, Reema Theraja, Oxford.

### Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Formulate algorithm/flowchart for given arithmetic and logical problem	10
CO-2	Translate algorithm/flowchart into C program using correct syntax and execute it	10
CO-3	Write programs using conditional, branching, iteration, and recursion	40
CO-4	Decompose a problem into function	20
CO-5	Develop an application using the concepts of array, pointer, structure, and file management to solve engineering and/or scientific problems	20

### List of Experiments:

1. Write a program to that performs as calculator ( addition, multiplication, division, subtraction).
2. Write a program to find area of triangle( $a=h*b*.5$ )  
a = area  
h = height  
b = base
3. Write a program to calculate simple interest ( $i = (p*r*n)/100$  )  
i = Simple interest  
p = Principal amount  
r = Rate of interest  
n = Number of years
4. Write a C program to interchange two numbers.
5. Write a C program to enter a distance in to kilometre and convert it in to meter, feet, inches and centimetre



**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**Bachelor of Engineering**  
**Subject Code: 3110003**

6. Write a program to compute Fahrenheit from centigrade ( $f=1.8*c +32$ )
7. Write a C program to find out distance travelled by the equation  $d = ut + at^2$
8. Write a C program to find that the accepted number is Negative, or Positive or Zero.
9. Write a program to read marks of a student from keyboard whether the student is pass or fail( using if else)
10. Write a program to read three numbers from keyboard and find out maximum out of these three. (nested if else)
11. Write a C program to check whether the entered character is capital, small letter, digit or any special character.
12. Write a program to read marks from keyboard and your program should display equivalent grade according to following table(if else ladder)

Marks	Grade
100 - 80	Distinction
79 - 60	First Class
59 - 40	Second Class
< 40	Fail

13. Write a c program to prepare pay slip using following data.  
 $Da = 10\%$  of basic,  $Hra = 7.50\%$  of basic,  $Ma = 300$ ,  
 $Pf = 12.50\%$  of basic,  $Gross = basic + Da + Hra + Ma$ ,  $Nt = Gross - Pf$ .
14. Write a C program to read no 1 to 7 and print relatively day Sunday to Saturday.
15. Write a C program to find out the Maximum and Minimum number from given 10 numbers
16. Write a C program to input an integer number and check the last digit of number is even or odd.
17. Write a C program to find factorial of a given number.
18. Write a program to reverse a number.
19. Write a program to generate first  $n$  number of Fibonacci series
20. Write a program to find out sum of first and last digit of a given number.
21. Write a C program to find the sum and average of different numbers which are accepted by user as many as user wants
22. Write a program to calculate average and total of 5 students for 3 subjects (use nested *for* loops)
23. Read five persons height and weight and count the number of person having height greater than 170 and weight less than 50,
24. Write a program to check whether the given number is prime or not.
25. Write a program to evaluate the series  $1^2+2^2+3^2+\dots+n^2$
26. Write a C program to find  $1+1/2+1/3+1/4+\dots+1/n$ .
27. Write a C program to find  $1+1/2!+1/3!+1/4!+\dots+1/n!$ .
28. Write a program to evaluate the series  $sum=1-x+x^2/2!-x^3/3!+x^4/4!-\dots-x^9/9!$
29. Write a program to print following patterns :

i	ii	iii
*	*	*****
**	* *	****
***	* * *	***
****	* * * *	**
*****	* * * * *	*

30. Write a program to print following patterns :

i	ii	iii	iv
1	12345	55555	1
12	1234	4444	22
123	123	333	333
1234	12	22	4444
12345	1	1	55555



**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**Bachelor of Engineering**  
**Subject Code: 3110003**

31. Write a program to print following patterns:
- |   |       |    |       |
|---|-------|----|-------|
| i | AAAAA | ii | ABCDE |
|   | BBBB  |    | ABCD  |
|   | CCC   |    | ABC   |
|   | DD    |    | AB    |
|   | E     |    | A     |
32. Write a C program to read and store the roll no and marks of 20 students using array.
33. Write a program to find out which number is even or odd from list of 10 numbers using array
34. Write a program to find maximum element from 1-Dimensional array.
35. Write a C program to calculate the average, geometric and harmonic mean of  $n$  elements in an array.
36. Write a program to sort given array in ascending order (Use Insertion sort, Bubble sort, Selection sort, Mergesort, Quicksort, Heapsort).
37. Write a program to find a character from given string.
38. Write a program to replace a character in given string.
39. Write a program to delete a character in given string.
40. Write a program to reverse string.
41. Write a program to convert string into upper case
42. Write a program that defines a function to add first  $n$  numbers.
43. Write a function in the program to return 1 if number is prime otherwise return 0
44. Write a function Exchange to interchange the values of two variables, say  $x$  and  $y$ . illustrate the use of this function in a calling function.
45. Write a C program to use recursive calls to evaluate  $F(x) = x - x^3 / 3! + x^5 / 5! - x^7 / 7! + \dots x^n / n!$ .
46. Write a program to find factorial of a number using recursion.
47. Write a C program using global variable, static variable.
48. Write a function that will scan a character string passed as an argument and convert all lowercase character into their uppercase equivalents
49. Write a program to read structure elements from keyboard.
50. Define a structure type *struct* personal that would contain person name, date of joining and salary using this structure to read this information of 5 people and print the same on screen.
51. Define structure data type called *time\_struct* containing three member's integer hour, integer minute and integer second. Develop a program that would assign values to the individual number and display the time in the following format: 16: 40:51
52. Define a structure called cricket that will describe the following information:  
Player name  
Team name  
Batting average  
Using cricket, declare an array player with 50 elements and write a C program to read the information about all the 50 players and print team wise list containing names of players with their batting average.
53. Design a structure *student\_record* to contain name, branch and total marks obtained. Develop a program to read data for 10 students in a class and print them.
54. Write a program to print address of variable using pointer.
55. Write a C program to swap the two values using pointers.



**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**Bachelor of Engineering**  
**Subject Code: 3110003**

56. Write a C program to print the address of character and the character of string using pointer.
57. Write a program to access elements using pointer.
58. Write a program for sorting using pointer.
59. Write a program to write a string in file
60. A file named data contains series of integer numbers. Write a c program to read all numbers from file and then write all odd numbers into file named “odd” and write all even numbers into file named “even”. Display all the contents of these file on screen

**List of Open Source Software/learning website** : Students must refer to following sites to enhance their learning ability.

- 1) Vlabs.iitb.ac.in
- 2) NPTEL tutorials
- 3) [www.coursera.org](http://www.coursera.org)
- 4) [www.udacity.com](http://www.udacity.com)