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
				Theory Marks		Practical Marks		
L	T	P	C	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%

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 Heasly, 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, 4th 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%

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%

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List of Experiments:

Sr.No.	Activity type	Duration in hrs	Preferably to be conducted in:
1	Word Formation-1	2	Lab/classroom
2	Word Formation-2	2	Lab/classroom
3	Listening Comprehension	2	Lab/classroom
4	Transcription and dictionary usage	2	Lab/classroom
5	Common Everyday Situations: Conversations and Dialogues	4	Classroom/Hall
6	Communication at Workplace	4	Classroom/Hall
7	Common errors in writing	4	Classroom/Hall
8	Reading Comprehension	2	Classroom/Hall
9	Letter Writing, Precis Writing	4	Classroom/Hall
10	Email Writing: Formal and Informal	2	Lab/classroom
11	Practical assessment	4	Lab/classroom

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3110003
PROGRAMMING FOR PROBLEM SOLVING
1ST 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
				Theory Marks		Practical Marks		
L	T	P	C	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	**Introduction to computer and programming:** 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	**Fundamentals of C:** 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	**Control structure in C:** Simple statements, Decision making statements, Looping statements, Nesting of control structures, break and continue, goto statement	5	11
4	**Array & String:** Concepts of array, one and two dimensional arrays, declaration and initialization of arrays, string, string storage, Built-in-string functions	6	13
5	**Functions:** Concepts of user defined functions, prototypes, definition of function, parameters, parameter passing, calling a function, recursive function, Macros, Pre-processing	5	11
6	**Recursion:** 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	**Pointers:** Basics of pointers, pointer to pointer, pointer and array, pointer to array, array to pointer, function returning pointer	4	9
8	**Structure:** Basics of structure, structure members, accessing structure members, nested structures, array of structures, structure and functions, structures and pointers	4	9
9	**Dynamic memory allocation:** Introduction to Dynamic memory allocation, malloc, calloc	4	9
10	**File management:** Introduction to file management and its functions	4	9

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 Balagarusamy 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

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+……+n^2
26. Write a C program to find 1+1/2+1/3+1/4+....+1/n.
27. Write a C program to find 1+1/2!+1/3!+1/4!+.....+1/n!.
28. Write a program to evaluate the series sum=1-x+x^2/2!-x^3/3!+x^4/4!......-x^9/9!
29. Write a program to print following patterns :

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

30. Write a program to print following patterns :

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

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 $F(x) = x - x^3 / 3! + x^5 / 5 ! - x^7 / 7! + \ldots x^n / n!$.
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.

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
4) www.udacity.com

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engienering
Subject Code: 3110005
BASIC ELECTRICAL ENGINEERING
1st 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	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	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	***DC Circuits:*** 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	***AC Circuits*** 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	***Transformers*** 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	***Electrical Machines*** Generation of rotating magnetic fields.	**8**	**20**

	Construction and working of following machines: • Three-phase induction motor • Single-phase induction motor. • Separately excited DC motor. • Synchronous generators.		
5	***Electrical Installations*** 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:

(i) D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
(ii) Basic Electrical Engineering - Nagsarkar and Sukhija, Oxford University Press
(iii) B. L. Theraja, "Electrical Technology – Part I and II", S. Chand and Co. 2012
(iv) D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
(v) L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
(vi) E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
(vii) 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

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

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
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	5	70	30	30	20	150

Content:

Sr #	Topic	Total Hrs.
1	**Introduction:** 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	**Energy:** 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	**Properties of gases:** 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	**Properties of Steam:** Steam formation, Types of steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of steam tables, steam calorimeters	6
5	**Heat Engines:** 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	**Steam Boilers:** Introduction, Classification, Cochran, Lancashire and Babcock and Wilcox boiler, Functioning of different mountings and accessories	-
7	**Internal Combustion Engines:** Introduction, Classification, Engine details, four-stroke/ two-stroke cycle Petrol/Diesel engines, Indicated power, Brake Power, Efficiencies	4
8	**Pumps:** Types and operation of Reciprocating, Rotary and Centrifugal pumps, Priming	3
9	**Air Compressors:** Types and operation of Reciprocating and Rotary air compressors, significance of Multistage	3
10	**Refrigeration & Air Conditioning:** Refrigerant, Vapor compression refrigeration system, Vapor absorption refrigeration system, Domestic Refrigerator, Window and split air conditioners	4

11	**Couplings, Clutches and Brakes:** 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	**Transmission of Motion and Power:** Shaft and axle, Different arrangement and applications of Belt drive; Chain drive; Friction drive and Gear drive	-
13	**Engineering Materials:** 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 and properties of various engineering materials with their applications	16

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 stoke 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

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3110007

ENVIRONMENTAL SCIENCE
1st Year

Type of course: Mandatory Course

Prerequisite: Interest in natural systems sustaining the life on the earth.

Rationale: To inculcate the environmental values translating into pro-conservation actions. Honorable Supreme Court of India has made it 'mandatory' to introduce a basic course on environment at the undergraduate level.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**INTRODUCTION TO ENVIRONMENT** Definition, principles and scope of Environmental Science. Impacts of technology on Environment, Environmental Degradation, Importance for different engineering disciplines	02	8
2	**ENVIRONMENTAL POLLUTION** a) Water Pollution: Introduction – Water Quality Standards, Sources of Water Pollution, Classification of water pollutants, Effects of water pollutants b) Air Pollution: Composition of air, Structure of atmosphere, Ambient Air Quality Standards, Classification of air pollutants, Sources of common air pollutants like PM, SO_2, NO_X, Auto exhaust, Effects of common air pollutants c) Noise Pollution: Introduction, Sound and Noise, Noise measurements, Causes and Effects d) Solid Waste: Generation and management e) Bio-medical Waste: Generation and management f) E-waste: Generation and management	14	44
3	**GLOBAL ENVIRONMENTAL ISSUES** Sustainable Development, Climate Change, Global Warming and Green House Effect, Acid Rain, Depletion of Ozone layer, Carbon Footprint, Cleaner Development Mechanism (CDM), International Steps for Mitigating Global Change	06	24

4	**BASIC CONCEPT OF GREEN BUILDING AND SMART CITIES** Green Building: Introduction, Objectives, Fundamental Principles, Benefits of Green Building, Examples of Green Building Smart Cities: Concept	04	16
5	**CONCEPT OF 4R's** Principles, Application of 4R's	02	8

Suggested Specification table with Marks (Theory):

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

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha Second edition,2013 Publisher: Universities Press (India) Private Ltd, Hyderabad.
2. Basics of Environmental Studies by Prof Dr N S Varandani ,2013 Publisher: LAP -Lambert Academic Publishing , Germany
3. Environmental Studies by Anindita Basak ,2009 Publisher: Drling Kindersley(India)Pvt. Ltd Pearson
4. Textbook of Environmental Studies by Deeksha Dave & S S Kateva , Cengage Publishers.
5. Environmental Sciences by Daniel B Botkin & Edward A Keller Publisher: John Wiley & Sons.
6. Environmental Studies by R. Rajagopalan, Oxford University Press
7. Environmental Studies by Benny Joseph, TMH publishers
8. Environmental Studies by Dr. Suresh K Dhameja, 2007 Published by : S K Kataria & Sons New Delhi
9. Basics of Environmental Studies by U K Khare, 2011 Published by Tata McGraw Hill

Course Outcome:

Sr. No.	CO statement	Marks % weightage
CO-1	Identify the types of pollution in society along with their sources	45
CO-2	Realize the global environmental issues	25
CO-3	Conceptualize the principles of Green Buildings and Smart cities	15
CO-4	Implement the concept of recycle and reuse in all fields of engineering	15

List of Tutorials: Based on

1. Introduction to Environment
2. Water Pollution
3. Air Pollution
4. Noise Pollution
5. Solid Waste
6. Bio-medical Waste
7. E-waste
8. Global Environmental Issues
9. Concept of Green Building
10. Concept of Smart Cities
11. Concept of 4R's

List of Open Source Software/learning website: MOEF, NPTEL

GUJARAT TECHNOLOGICAL UNIVERSITY

WORKSHOP/ MANUFACTURING PRACTICES

B.E. 1st YEAR

Type of course: Engineering Science

Prerequisite: Zeal to learn the subject

Rationale: Workshop practice is the backbone of the real industrial environment which helps to develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops. Irrespective of branch, the use of workshop practices in day to day industrial as well domestic life helps to dissolve the problems.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
0	0	4	2	0	0	80	20	100

Contents:
Introduction to various shops / sections and workshop layouts. Safety norms safety equipment's to be followed in a workshop.

Demonstration of hand tools, power tools, basic measuring instruments, marking and measurement. Overview of Carpentry, Fitting, Smithy shop, Welding, Tin smithy, Electrical and Electronic, Plumbing, Machine shop and machine tools.

Practice:
Students are required to prepare one job each in the following shops: Fitting, Carpentry, Smithy /Tin smithy, Electric Arc welding/ Resistance welding.
Demonstrations of Jobs in following machine shops: Lathe Machine, Drilling Machine, Hacksaw Machine

Laboratory Outcomes

1. Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
2. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
3. By assembling different components, they will be able to produce small devices of their interest.

Workshop Practice:

1) Machine shop
2) Fitting shop
3) Carpentry

4) Welding shop
5) Electrical
6) Electronics
7) Casting
8) Smithy
9) Plastic moulding & Glass Cutting
10) Plumbing and its fitting
11) Masonry Work
12) IOT
13) Software Tools & OS Commands

List of Experiments

Machine shop

1. Demonstration of job on Lathe machine
2. Demonstration of job on Drilling machine
3. Study of different types of power tools

Fitting Shop

Hands on Practice and job making in Fitting shop

Carpentry

Hands on Practice and job making in Carpentry shop.

Welding shop

1. Hands on Practice and job making using Electric arc Welding / Resistance welding process
2. Hands on Practice and job making using Soldering process

Casting:

Demonstration of Pattern Making by sand moulding

Smithy

Hands on Practice and job making in Smithy/ Tin smithy shop.

Plumbing and its fitting

1) Types of Pipes and Fittings
2) Joints (PVC and Metal)
3) Plumbers tools and equipment's
4) Cutting and bending of different mental pipes
5) Pipe fitting
6) Plumbing symbols
7) Plumbing services
8) Sanitary Pipes and Fittings
9) Joints

Plastic moulding & Glass Cutting

Masonry Work

1) Different types of Bricks
2) Different size and part of Bricks
3) Different types of Bonds
4) Types of tools used for various masonry works

Electrical

1. Measure voltage, current, frequency, phase difference, power, power factor for single and three-phase supply
2. Wire fan, tube light, two-way control (staircase wiring).
3. Wire MCB, ELCB for a given load circuit
4. Preparing the drawing for wiring a newly built room, without any electrical wiring along with a bill of materials with specifications; the room may be a class-room, an office, a shop, a clinic, a small workshop etc.
5. Identify and rectify open circuit, and short circuit faults in PCB/System
6. Solder and de-solder electronic components on different types of PCB
7. Identify various types of ports and connectors

Electronics:

1) Introduction to basic electronics components and its testing: Resistors, Inductors, Capacitor, Diode, BJT
2) Introduction to testing and Measurement Instruments: Power Supply, Function Generator, Oscilloscope

IOT

Arduino starter kits or raspberry pi

i.e. Arduino Starter kit mostly includes following:, Similarly for Raspberry pi use whatever required

- An Arduino or Raspberry
- Jumper wires
- Resistors
- Breadboard
- LEDs
- Buttons

Case Studies/Demonstration

1. Arduino LED On/Off

2. Or Raspberry LED/On

It requires

- LED
- Resistor
- Connecting wires

3. Arduino alarm system which detects movement of an intruder with a high pitched alarm sounds and flashing lights.

It requires

- An ultrasonic "ping" sensor –HC-SR04 or PIR
- A piezo buzzer
- LED strip light

4. Arduino Trafiic Light Controller

5. raspberry pi on screen keyboard app.

It requires

- Red, yellow and green LEDs.
- A breadboard.
- 6 x 220 resistors.
- Connecting wires.
- 1 x pushbutton switch.
- 1 x 10k resistor

Software Tools & OS Commands

- **Dream weaver Web development Too**l

Student Has to build his own Web Site consisting of basic profile about his department,his own personnel profile and basic Institute Details

Student Has to learn any of Two OS (Windows,Linux,Unix,MacOS,Apple,Android)

Student has to learn basic Windows and Linux/Ubuntu shell commands and have to develop simple shell script.

Journal is to be prepared covering the topics of demonstration and report about process / methodology / inspection for making jobs.

Major Equipment: Lathe machine, drilling machine, grinding machine, Resistance and Arc Welding machine, Hacksaw machine, Fitting, Carpentry and Plumbing vice, various types of files for fitting shop, hand hacksaw, monkey spanner, die, chisels, jack plane, furnace, anvil, different types of hammers for various shops, tongs, scissors, hand shear machine, sheet cutter, welding goggles, welding gloves, Soldering iron, Moulding box, different wooden/ metal patterns.

List of Open Source Software/learning website: http://nptel.iitm.ac.in/courses.php

Reference Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.
3. Workshop Technology Vol. 1 and 2 by Raghuvanshi B.S. Dhanpat Rai & Sons1998
4. Workshop Technology by Chapman W.A. J and Arnold E. Viva low priced student edition, 1998
5. Workshop Practices, H S Bawa, Tata McGraw-Hill,2009

P.S: Out of 13 activities, college has to opt for any 8 activities for a specific branch.

Each activity will be of 4 hours per semester.

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3110013
ENGINEERING GRAPHICS & DESIGN
1st YEAR

Type of course: Engineering Science

Prerequisite: Zeal to learn the subject

Rationale: Engineering Drawing is an effective language of engineers. It is the foundation block which strengthens the engineering & technological structure. Moreover, it is the transmitting link between ideas and realization.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	**Introduction to Engineering Graphics:** Drawing instruments and accessories, BIS – SP 46. Use of plane scales, Diagonal Scales and Representative Fraction	2 (Lab teaching)	20%
2	**Loci of Points:** Path of the points moving on Simple mechanisms, Slider crank mechanism, Four bar mechanism	2	
3	**Engineering Curves:** Classification and application of Engineering Curves, Construction of Conics, Cycloidal Curves, Involutes and Spirals along with normal and tangent to each curve	6 (Lab teaching)	
4	**Projections of Points and Lines:** Introduction to principal planes of projections, Projections of the points located in same quadrant and different quadrants, Projections of line with its inclination to one reference plane and with two reference planes. True length and inclination with the reference planes	8	30%
5	**Projections of Planes:** Projections of planes (polygons, circle and ellipse) with its inclination to one reference plane and with two reference planes, Concept of auxiliary plane method for projections of the plane	6	
6	**Projections of Solids, Section of Solids and Development of Surfaces:** Classification of solids. Projections of solids (Cylinder, Cone, Pyramid and Prism) along with frustum with its inclination to one reference plane and with two reference planes, Section of such solids and the true shape of the section, Development of surfaces	10	15%
7	**Orthographic Projections:** Fundamental of projection along with classification, Projections from the pictorial view of the object on the	2	25%

	principal planes for view from front, top and sides using first angle projection method and third angle projection method, full sectional view		
8	**Isometric Projections and Isometric View or Drawing:** Isometric Scale, Conversion of orthographic views into isometric projection, isometric view or drawing of simple objects	2 (Lab teaching)	
9	**Computer Aided Drawing:** Introduction to AutoCAD, Basic commands for 2D drawing like : Line, Circle, Polyline, Rectangle, Hatch, Fillet, Chamfer, Trim, Extend, Offset, Dim style, etc..	4 (Lab teaching)	10%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	**30**	**30**	**5**	**5**	**5**

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

Reference Books:

1. A Text Book of Engineering Graphics by P.J.Shah S.Chand & Company Ltd., New Delhi
2. Elementary Engineering Drawing by N.D.Bhatt Charotar Publishing House, Anand
3. A text book of Engineering Drawing by R.K.Dhawan, S.Chand & Company Ltd., New Delhi
4. A text book of Engineering Drawing by P.S.Gill, S.K.Kataria & sons, Delhi
5. Engineering Drawing by B. Agrawal and C M Agrawal, Tata McGraw Hill, New Delhi

Course Outcome:

Sr. No.	CO statement	Marks % weightage
CO-1	Know and understand the conventions and the methods of engineering drawing.	15
CO-2	Interpret engineering drawings using fundamental technical mathematics.	25
CO-3	Construct basic and intermediate geometry and comprehend the theory of projection.	25
CO-4	Improve their visualization skills so that they can apply these skills in developing new products.	25
CO-5	Improve their technical communication skill in the form of communicative drawings.	05
CO-6	Use computer software for engineering drawing.	05

List of Practical:

Students must prepare sketch book and drawing sheets on the following topics. **Minimum three problems must be given for sheet number 3 to 9.**

1. Practice sheet (which includes dimensioning methods, different types of line, construction of different polygon, divide the line and angle in parts, use of stencil)
2. Plane scale and diagonal scale
3. Loci of points (only sketch book)
4. Engineering curves
5. Projection of line
6. Projection of plane
7. Projection of solid, section of solid and development of surfaces
8. Orthographic projection
9. Isometric projection
10. At least one orthographic drawing (three views) using above mentioned AutoCAD commands.

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3110014
SUBJECT NAME: Mathematics-1
1st 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
				Theory Marks		Practical Marks		
L	T	P	C	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'Hôspital'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, □□□ 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*□ periodic functions, Dirichlet's conditions for representation by a Fourier series, Orthogonality of the trigonometric system, Fourier Series of a function of period *2*□, 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%

	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.		

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: 3110015
SUBJECT NAME: Mathematics-2
1st Year

Type of course: Basic Science Course

Prerequisite: Calculus, fourier series

Rationale: To compute line integrals, solution techniques of higher order ordinary differential equations, fourier integral representation**.**

Teaching and Examination Scheme:

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

Sr. No.	Content	Total Hrs	% Weightage
01	Vector Calculus: Parametrization of curves, Arc length of curve in space, Line Integrals, Vector fields and applications as Work, Circulation and Flux, Path independence, potential function, piecewise smooth, connected domain, simply connected domain, fundamental theorem of line integrals, Conservative fields, component test for conservative fields, exact differential forms, Div, Curl, Green's theorem in the plane (without proof).	9	20
02	Laplace Transform and inverse Laplace transform, Linearity, First Shifting Theorem (s-Shifting), Transforms of Derivatives and Integrals, ODEs, Unit Step Function (Heaviside Function), Second Shifting Theorem (t-Shifting), Laplace transform of periodic functions, Short Impulses, Dirac's Delta Function, Convolution, Integral Equations, Differentiation and Integration of Transforms, ODEs with Variable Coefficients, Systems of ODEs.	7	20
03	Fourier Integral, Fourier Cosine Integral and Fourier Sine Integral.	02	
04	First order ordinary differential equations, Exact, linear and Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.	6	14
05	Ordinary differential equations of higher orders, Homogeneous Linear ODEs of Higher Order, Homogeneous Linear ODEs with Constant Coefficients, Euler–Cauchy Equations, Existence and Uniqueness of Solutions, Linear Dependence and Independence of Solutions, Wronskian, Nonhomogeneous ODEs, Method of Undetermined Coefficients, Solution by Variation of Parameters.	10	26
06	Series Solutions of ODEs, Special Functions, Power Series Method, Legendre's Equation, Legendre Polynomials, Frobenius Method, Bessel's Equation, Bessel functions of the first kind and their properties.	8	20

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3110015

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) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley and Sons.
(2) Peter O'Neill, Advanced Engineering Mathematics, 7th Edition, Cengage.
(3) Dennis G. Zill, 4th edition, Advanced Engineering Mathematics, 4th Edition, Jones and Bartlett Publishers.
(4) Maurice D. Weir, Joel Hass, Thomas' Calculus, Early Transcendentals, 13e, Pearson, 2014.
(5) Howard Anton, Irl Bivens, Stephens Davis, Calculus, 10e, Wiley, 2016.

Course Outcomes:

The objective of this course is to familiarize the prospective engineers with techniques in vector calculus, ordinary differential equations, fourier integrals and laplace transform. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Sr. No.	Course Outcomes	Weightage in %
1	To apply mathematical tools needed in evaluating vector calculus and their usage like Work, Circulation and Flux.	20
2	To apply the laplace transform as tools which are used to solve differential equations and fourier integral representation.	20
3	To apply effective mathematical tools for the solutions of first order ordinary differential equations.	14
4	To apply effective mathematical methods for the solutions of higher order ordinary differential equations.	26
5	To use series solution methods and special functions like Bessels' functions.	20

List of Open Source Software/learning website:

Scilab, MIT Opencourseware.

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3110016
BASIC ELECTRONICS
1st Year

Type of course: Engineering Science

Prerequisite: High School Education & Physics

Rationale: Electronics is playing a key role in all engineering applications. All engineers should have basic knowledge of electronics. Purpose of this subject is make students familiar with basic electronics concepts. Students will be able to operate electronic test and measurement equipment like multi-meter, CRO, DC power supply and function generator.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	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	**Diode theory and applications** Basic idea about forward bias, reverse bias and VI characteristics, ideal diode, second and third approximation, surface mount diodes, Zener diode, Testing of diode with multi-meter, half wave rectifier, full wave rectifier, bridge rectifier, RC and LC filters, Design of un-regulated DC power supply, Clipping circuit, Clamping circuit, voltage multiplier circuit, Reading datasheet of semiconductor diode.	**10**	20%
2	**Bipolar junction transistors and its biasing** BJT operation, BJT voltages and currents, CE, CB and CC characteristics, DC load line and bias point, base bias, emitter feedback bias, collector feedback bias, voltage divider bias, Thermal stability, biasing BJT switching circuits, transistor power dissipation and switching time, Testing of bipolar junction transistor with multi-meter, Reading datasheet of BJT.	**10**	20%
3	**Special purpose diodes and transistors** Light emitting diode (LED). Zener diode, Zener diode circuit for voltage regulation, Photo diode, Solar cell, PIN diode, Varactor, Schottky diode, Varistors, Tunnel diode, Seven Segment display, Sixteen segment display, Identify segments on pin using multi-meter, Dot-matrix LED display, Photo transistor, Opto-coupler, Reading datasheet of opto-electronics devices	**4**	10%

4	**AC Analysis of BJT circuits and small signal amplifier** Coupling and bypass capacitors, AC load lines, Transistor models and parameters, Common emitter circuit analysis, common base circuit analysis, common collector circuit analysis, Comparison of CE, CB and CC circuits, Transistor as a switch	**10**	20%
5	**Field effect transistors (FET) and its biasing** Junction field effect transistors(JFET), Comparison of BJT and FET, JFET characteristics, FET, Biasing in ohmic region and active region, Trans-conductance, amplification and switching, MOSFETs (D-type and E-type MOSFET), CMOS introduction, E-MOSFET amplifier. MOSFET testing, Reading datasheet for FET and MOSFET.	**10**	20%
6	**Digital Circuits** Basic gates AND, OR,NOT, NAND, NOR, EX-OR, EX-NOR, Building AND, OR Gate with diodes, Digital logic families RTL, DTL, TTL, CMOS, Comparison of logic families	**4**	10%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30 %	**30%**	**40%**	**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] David A. Bell, "Electronic Devices and Circuits", Oxford University Press, Fifth edition
[2] Albert Malvino & David, "Electronic Principles", Tata McGraw-Hill, Seventh edition
[3] R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education
[4] Jaccob Millman, Chritos Halkias, Chetan D Parikh, "Integrated Electronics", Tata McGraw-Hill, Second edition
[5] Albert Malvino & David, "Problems and Solutions in Basic Electronics, McGraw Hill Education

Course Outcomes:

Sr. No.	**CO statement**	**% weightage**
CO-1	Analyze the general – and special-Purpose diode circuits	30
CO-2	Design biasing circuits for BJT	20
CO-3	Analyze BJT Circuits in small-signal domain	20
CO-4	Analyze basic FET Circuits	20
CO-5	Verify the functionalities of basic digital gates and logic families	10
CO-6	Construct and test circuit using basic electronic devices in a group	From Lab work

List of Experiments:

(General guidelines. Institute may change list of experiments)

- To measure DC voltage and current, AC voltage and current with multi-meter
- To observe waveforms on oscilloscope, measure basic parameters amplitude and frequency of sine wave and square wave.
- Obtain VI characteristics of semiconductor rectifier diode, LED, Photo-diode
- To observe waveform at the output of half wave rectifier with and without filter capacitor. To measure DC voltage, DC current, ripple factor with and without filter capacitor
- To observe waveform at the output of full wave rectifier with and without filter capacitor. To measure DC voltage, DC current, ripple factor with and without filter capacitor
- To observe waveform at the output of bridge rectifier with and without filter capacitor. To measure DC voltage, DC current, ripple factor with and without filter capacitor
- To construct clamper circuits on breadboard and To observe waveforms at the output of clamper circuits
- To construct clipper circuits on breadboard and To observe waveforms at the output of clipper circuits
- Construct AND gate & OR gate with help of diode and verify truth table
- To obtain common emitter characteristics of NPN transistor
- To obtain common base characteristics of NPN transistor
- To obtain common collector characteristics of NPN transistor
- To design common emitter amplifier and construct circuit on breadboard. Measure gain at different frequencies and plot frequency response
- To understand working of transistor as a switch. To draw DC load line for given circuit.
- To observe input-output waveforms of common collector (CC) amplifier. To measure gain of amplifier at different frequencies and plot frequency response
- To obtain characteristics of field effect transistor (FET)
- To measure gain of FET common source (CS) amplifier
- Verify truth table of basic digital logic gates OR, AND, NOT, NAND, NOR, EX-OR, EX-NOR
- To test individual circuit prepared by the student (Get circuit from the faculty, build it, draw circuit diagram and test it in the laboratory. Write test results in this practical)

Major Equipment:

1. CRO
2. Function generator
3. DC Power Suppy
4. Bread board and discrete electronics components

List of Open Source Software/learning website:

- http://nptel.ac.in/syllabus/117103063/
- https://swayam.gov.in/course/3595-basic-electronics
- eSIM available on FOSSEE website: https://fossee.in/

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:

Sr No	Phase and Activities Heads	Weightage
1.	**Initial Phase**	**1 day (6 Hrs)**
2	**Regular Phase**	**13 Days**
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	**Closing Phase**	**1 Day (6 Hrs)**
	Total	**90 Hours**

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 phaseswould be one day each. The following is the guidelines indicating the possible activities under eachphaseof the Induction Program.

Initial Phase (First Day)

Following are the activities to be carried on the first day:

- Orientation Programme
- Know your Department/Institute
- Know your university
- Know hostel and other amenities
- Information about Student Diary and Induction Program

Regular phase (13 Days)

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 additional in suggested activities for each of the phases.

Module Name	Objectives	Suggested Activities
1. Physical Activity **(24 hours)**	1. Improve bone health 2. Improve cardio respiratory and muscular fitness 3. Understand theanatomy, basic biomechanical principles and terminology. 4. Examine the effect of nutrition, rest and other lifestyle factors that contribute tothebetter health.	1. Running/Jogging 2. Brisk Walk 3. Cycling 4. Heavy yard work 5. Swimming 6. Yoga/Pranayam 7. Aerobics 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.) 9. Calculate Body mass index of each students and explain their fitness level from it. 10. Tree Plantation 11. Gardening

Guidelines:

- Half an hour Yoga/Pranayam followed by physical activities including various games.
- Refer this link for Yoga/Pranayam https://s3-ap-southeast-1.amazonaws.com/ministry-

of-yoga/images/1528106718.pdf

Module Name	Objectives	Suggested Activities
2. Creative Arts **(12 hours)**	1. Develop creativity and imagination through a range of complex activities. 2. Improve the student's ability to control materials, tools and techniques. 3. Develop increasing confidence in the use of visual and tactile elements and materials.	1. Make a model of any physical object related to Engineering Design 2. Crafting 3. Painting 4. Sculpture 5. Pottery 6. Music 7. Dance

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.

Module Name	Objectives	Suggested Activities
3. Universal Human Values **(12 hours)**	1. Impart universal human values in students. 2. Enable students to live in harmony within themselves, with family, with society and the nature 3. Initiate the process of self exploration and self investigation within themselves about their understanding of happiness.	1. Showing Motivational Movies. 2. Social Activities like visit of orphanage, old age home, blind peoples'school etc. 3. Swachchhata Mission Activities. 4. Awareness regarding environmental issues and remedies. 5. Spread awareness about blood donation, organ donation, precaution to avoid malaria in monsoon etc. 6. Discuss autobiography of legendary persons who practiced universal human values in their life and work. 7. Conduct universal human values group discussions.

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.

Module Name	Objectives	Suggested Activities
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.
- Writingthe review ofthe well known books, movies etc and sharing.

Module Name	Objectives	Suggested Activities
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.	

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.

Module Name	Objectives	Suggested Activities
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, contributorsandsuccessful 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.

Module Name	Objectives	Suggested Activities
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

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:

a) Every student has to maintain a daily diary. Format of the diary is already given.

b) 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.

c) 75% Attendance is require during Induction Program.

d) This program will be noncredit subject but it will reflect in 1st 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.	**Initial Phase**
2	**Regular Phase**
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	**Closing Phase**

Format of Diary

Enrolment/Roll No:

Name of Student:

Day ……		**Date:**
Hour	**Activities Done**	**Learning Outcomes**
1		
2		
3		
4		
5		
6		
Signature of the Student		**Signature of Mentor**

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3110018
PHYSICS
1st YEAR
(For Group II Branches)

Type of course: Type of course: Basic Science (Physics)

Prerequisite: Basic understanding of Math's, Physics and chemistry

Rationale: The basic science physics program is to prepare students for careers in engineering where physics principles can be applied to the advancement of technology. This education at the intersection of engineering and physics will enable students to seek employment in engineering upon graduation while, at the same time, provide a firm foundation for the pursuit of graduate studies in engineering.

Teaching and Examination Scheme:

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

Content:

SrNo	Topic	Teaching Hrs.	Module Weightage
1	**MODULE 1: ELECTRONIC MATERIALS** • Free electron theory • Density of states and energy band diagrams, • Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, • E-k diagram, Direct and indirect bandgaps, • Types of electronic materials: metals, semiconductors, and insulators, • Density of states, Occupation probability, • Fermi level, Effective mass, Phonons.	8	22%
2	**MODULE 2: SEMICONDUCTORS (10)** • Intrinsic and extrinsic semiconductors • Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics) • Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, • Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices	10	27%

3	**MODULE 3: LIGHT-SEMICONDUCTOR INTERACTION** • Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; • Joint density of states • Density of states for photons, • Transition rates (Fermi's golden rule) • Optical loss and gain; Photovoltaic effect, Exciton • Drude model.	6	17%
4	**Module 4: Measurements** • Four-point probe and Van Der Pauw measurements for carrier density, • Resistivity and hall mobility • Hot-point probe measurement, capacitance-voltage measurements, • Parameter extraction from diode I-V characteristics, DLTS, • band gap by UV-Vis spectroscopy, absorption/transmission.	6	17%

5	**Module 5: Superconductivity**
	• Introduction of Superconductivity
	• Properties of superconductor
	  • Effect of magnetic field
	  • Meissner effect
	  • Pressure effect
	  • Impurity effect
	  • Isotopic mass effect
	• Mechanism of Superconductivity : BCS Theory
	• Penetration depth : Magnetic field
	• Josephson's junction and its application
	Application of superconductors
		6	17%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	**40**	**30**	**0**	**0**	**0**

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

References:

1. 1. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
2. 2. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
3. 3. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
4. 4. A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications,

Oxford
5. University Press, New York (2007).
6. 5. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).
7. Engineering Physics by Dattu R Joshi, McGraw hill Publications.

Extra Study Material

1. Online course: "Semiconductor Optoelectronics" by M R Shenoy on NPTEL
2. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL

Course Outcome:

Sr. No.	CO statement	% weightage
CO-1	The student will gain knowledge of basic theoretical and mathematical concept of electronic materials.	22%
CO-2	The student will demonstrate understanding of basic principles, properties and applications associated with semiconducting materials.	27%
CO-3	The student will demonstrate understanding of basic theory and properties associated with optoelectronic materials.	17%
CO-4	The student will gain knowledge of the different measurements techniques to characterize various semiconducting, electrical and optoelectrical materials and devices.	17%
CO-5	The student will demonstrate understanding of basic theory, properties and applications of Superconductivity.	17%

List of Experiments:

1. To measure the dielectric constantofa material
2. To study the Hall-Effect.
3. To study the I-VCharacteristic of Silicon diode.
4. To study the I-VCharacteristic ofZenerdiode.
5. To study the I-VCharacteristic ofLED.
6. To determine the efficiency ofgiven solarcell.
7. To measure the Resistivity & Band gap ofGermanium Crystal (N-type)by Four Probe Method.
8. To measure thenumerical aperture ofopticalfiber.
9. To Study ofpropagation & bending loss in optical fiber.
10. P-N Junction diode as Bridge Rectifier.
11. Energy gap of Semiconductor
12. Study of cathode ray oscilloscope
13. Time constant of an R-C circuit.
14. L-C-R Circuit.
15. Logic Gates
16. Virtual Laser Optics Lab
17. Virtual Solid-State Physics Lab
18. Virtual Harmonic Motion & Waves Lab
19. Virtual Optics Lab
20. Virtual Modern Physics Lab
21. Virtual Physical Sciences Lab