DIPLOMA ENGINEERING
SEMESTER-II
SYLLABUS

GUJARAT TECHNOLOGICAL UNIVERSITY

COURSE NAME : MATHEMATICS-II

1. RATIONALE : The entrance qualifications for a Diploma technician is 10th pass. They have gained sufficient knowledge of the course Mathematics in the standard 10th to qualify for further studies in diploma programmes. A technician engineer needs to study relevant theories and principles of Mathematics to enable them to understand & grasp the concepts of the advance courses of diploma programme and their various engg. applications. With this view, the necessary content for the course Mathematics is designed and developed in consultations with the senior technical teachers to make students capable to understand the technology related courses at higher levels. It is presumed that this course-content will provide a suitable foundation for all the engineering applications which technician is supposed to come across in his field and will be able to use it in understanding them during his diploma study.

3. TOPICS AND SUB-TOPICS
Part-I CO-ORDINATE GEOMETRY:

TOPIC-1 : Point 3 hrs
1.1 Distance formula for R2.
1.2 Circum-centre of a triangle.
1.3 Area of a triangle.
1.4 Division of a line segment.
1.5 Locus of point.

SN. Topics Theory Hours
Part-I CO-ORDINATE GEOMETRY
1. Point 3
2. Straight line 3
3. Circle 3
TOTAL 9

Part-II CALCULUS
1. Functions & Limit 5
2. Differentiation 13
3. Integration 15
TOTAL 33
Grand Total 42 hrs.

2. SCHEME OF TEACHING :

COURSE NAME : MATHEMATICS-II

TOPIC-2 : Straight line 3 hrs
2.1 Cartesian equation of a straight line.
2.2 Equation of a straight line in R2: ax+by+c=0.
2.3 Slope of a straight line.
2.4 Intercepts on axis.
2.5 Equation of a straight line passes through two points \((x_1, y_1)\) and \((x_2, y_2)\)
2.6 Equation of straight line having slope m and passing through the point \((x_1, y_1)\).
2.7 Equation of st. line having intercepts on y-axis and slope m
2.8 Parallel and perpendicular straight line relation between their slope.
2.9 Angle between two straight lines.

**TOPIC-3: CIRCLE 3 hrs**
3.1 Definition of a circle
3.2 General equation
3.3 Standard equation
3.4 Formation of equation of a circle
3.5 Tangent & Normal.

**PART-II CALCULUS**

**TOPIC-1: Functions & Limit 5 hrs**
1.1 Definition of function
1.2 Examples
1.3 Concept & rules of limit
1.4 Evaluation of Standard limit of algebraic & trigonometric function.

**TOPIC-2 : Differentiation: 13 hrs.**
2.1 Definition.
2.2 Derivation of constant function.
2.3 Formula: \( x^n, a^x, \sin x, e^x, \) etc.
2.4 Formula for sum, product and quotient of functions.
2.5 Chain rule.
2.6 Derivation of parametric and Implicit functions.
2.7 Second order differentiation.
2.8 Application of derivatives.
3
(i) Velocity
(ii) Acceleration
(iii) Maxima and minima, radius of curvature

**TOPIC-3. Integration 15 hrs.**
3.1 Introduction of Integration
3.2 Formula for standard function as mentioned in 2-3.
3.3 Simple basic rules of Indefinite Integration.
3.4 Evaluation of simple Indefinite Integrals.
3.5 Integration by Substitution.
3.6 Definite Integral
3.6.1 Lower limit
3.6.2 Upper limit
3.6.3 Properties of definite integral
3.7 Solution of simple problems of definite Integral.
3.8 Application of Integration.
(1) Area & volume of circle, parabola & ellipse only.

**Grand Total 42 hrs.**

**4. REFERENCES :**
(1) Engg. Mathematics P.N. Wartikar
(2) Engg. Mathematics B.S. Greval.
(3) Engg. Mathematics I. B. Prasad
(4) Polytechnic Mathematics (Vol. I & II) TTTI Bhopal
(5) College Algebra Shah and Desai
(6) Mathematics for Polytechnic S.P. Deshpande
(7) Co-Ordinate Geometry Bansilal
(8) Technical Ganitshashtra(Part I,II in Gujarati) R.D.Desai
(9) ---do--- Anant Shashtri

[www.gtucampus.com](http://www.gtucampus.com)
GUJARAT TECHNOLOGICAL UNIVERSITY

COURSE NAME : APPLIED SCIENCE-II (CHEMISTRY)

1. RATIONALE :
Science is the foundation for all technician courses. The basic aim of teaching science is to develop in the student the habit of scientific enquiry, ability to establish the cause and effect relationship and logical development of different disciplines. Chemistry forms the part of applied science. The study of basic concepts Chemistry like atom, corrosion, lubrication etc. will help the students in understanding engineering subjects where the emphasis is laid on the application of these concepts. Chemistry is concerned with the changes in structure and properties of matter. Many of the processes, which are involved to bring out these changes; form the basis for engineering activities. Teaching of chemistry should be aimed at developing right type of attitudes in the students and the ability to predict the results under given conditions of chemical activities. Thus a good foundation in basic sciences will help the students in their self-development, to cope up with the continuous flow of innovation and discoveries in technology.

2. SCHEME OF TEACHING :
Sr. No. Name of Topics Theory Hours
1. Atomic & Molecular Structure 4
2. Ionisation & Electro Chemistry 5
3. Corrosion of metals & its prevention 5
4. Water Treatment 4
5. Lubrication & Lubricants 3
6. Chemistry of Engineering Materials 7
Total 28

3. OBJECTIVES :
1. Understand the atomic model.
2. Understand the ionisation energy, ionisation affinity and chemical bonds.
3. Understand the molecular structure of solid, liquid and gases.
4. Understand the ionisation process and factors affecting the degree of ionisation.
5. Understand the importance of pH.
6. Appreciate the importance and use of buffer solutions.
7. Understand the types of electrolytes and their industrial uses.
8. Understand the electrolytic conductance of metals & slats.
9. Understand the process of oxidation - reduction and working of electrochemical cell.
10. Understand the terms : Standard conditions, hydrogen, electrode, halfcellpotential, electro chemical series.
11. Describe the different types of corrosion.
12. Comprehend the different factors affecting the rate of corrosion.
13. Appreciate the different protective measures to prevent corrosion.
14. Understand the types and degree of hardness of water.
15. Know the effects of hard water when used in boiler and methods of it's prevention.
17. Know the water quality and methods of treatment of water for town supply.
18. Understand the terms lubrications and lubricant.
19. Comprehend different tests of lubricants.
20. Understand the functions of additives to improve properties of lubrications.
21. Appreciate the process of selection of lubricant for gears cutting control and steam turbines.
22. Understand the process of polymerisation.
23. Know the properties and uses of natural and synthetic rubber.
24. Know the different types of adhesives, their characteristics and uses.
25. Know the ingredients of paints and varnish.
26. Know the characteristics and types of refractories.
27. Know the properties and uses of insulating materials.
28. Understand the preparation, properties and use of natural and synthetic rubbers.

4. TOPICS AND SUBTOPICS :

**TOPIC – 1 ATOMIC AND MOLECULAR STRUCTURE 04 HRS.**
1. Arrangement of , p and n in atom.
2. Distribution of electrons in shell and subshell.
3. Concept of atomic orbitals.
5. Ionisation energy.
7. Different types of chemical bonds.
8. Motion of molecules.
10. Molecular arrangement in solid, liquid and gases.
11. Structure of solids.

**TOPIC – 2 IONISATION AND ELECTROCHEMISTRY 05 HRS.**
1. Introduction
2. Ionisation and degree of ionisation.
3. Factors affecting the degree of ionisation.
4. Ionic equilibrium constant (kw) for water.
5. Definition of pH.
6. Ionisation of acid, base and salts.
7. pH calculations of acid, base and salt solution at different concentration.
8. pH of acid, base and neutral solution.
9. Importance of pH in various fields.
10. Definition of buffer solution.
11. Types of buffer solution.
13. Metallic conductors and electrolytes.
14. Types of electrolytes.
15. Industrial applications of electrolytes.
17. Effect of dilution on electrical conductance.
18. Electrical conductivity of elements, e.g., Li, Be, B, c etc.
19. ‘N’ and ‘P’ type semiconductors.

**TOPICS - 3 CORROSION OF METALS AND IT’S PREVENTION 05 HRS.**
1. Oxidation - reduction process
2. Construction and working of electrochemical cell.
3. Interpretation of corrosion.
4. Definition of corrosion.
5. Standard conditions.
7. Half cell potential.
9. Atmospheric corrosion
12. Crevice corrosion.
14. pH of solution.
15. Area of cathode and anode.
16. Temperature.
17. Moisture
18. Purity of the metal.
20. Modification of the properties of metal.
21. Use of protective coatings.
22. Anodic and cathodic protection.
23. Modification in design and choice of material.

**TOPIC – 4 WATER TREATMENT 04 HRS.**
1. Hard water and soft water.
2. Types of hardness of water and it’s units.
3. Salts producing hardness of water.
4. Method to express the hardness of water.
5. Scale and sludge formation and it’s prevention.
6. Priming and foaming and it’s prevention.
7. Caustic embrittlement and it’s prevention.
8. Corrosion and it’s prevention.
9. Chemical reactions involved in permutit and regeneration of permutit.
10 Chemical reactions involved in ion-exchange process and regeneration of acidic and basic-resins.
11. Purification of water by screening, sedimentation, co-agulation and filtration.
12. Sterilisation / Disinfection of water by boiling and chlorination by using chlorine and Bleaching - powder.

**TOPIC – 5 LUBRICATION AND LUBRICANTS 03 HRS**
1. Introduction and definition of lubricants and lubrication.
2. Functions of lubricants
3. Types of Lubrication
   (a) Fluid film lubrication
   (b) Boundary lubrication
4. Classification of lubricant
   (a) Solid lubricants
   (b) Semi-solid lubricants
   (c) Liquid lubricants
   (d) Synthetic oils
5. Test of lubricants and their significance like
   (a) Viscosity and viscosity index
   (b) Volatility
   (c) Flash point and fire point
   (d) Pour point and cloud point
   (e) Neutralisation No. and acid value
   (f) Saponification number
   (g) Emulification number
   (h) Corrosion test and copper strip test.
6. Additives to improve the quality of lubricants.
7. Purpose for the use of additives like
   (a) Anti oxidants
   (b) Corrosion inhibitors
   (c) Antiwear agents
   (d) Detergents and foam inhibitors
8. Selection of lubricants for
(a) Gears
(b) Cutting tools
(c) Steam turbine.

TOPIC - 6 CHEMISTRY OF ENGINEERING MATERIALS 07 HRS.
1. Outline of polymer and polymerisation
2. Classification of polymers with suitable examples
3. Thermoplastic and thermosetting
4. Properties and uses of thermosetting like Bakelite, melamine, epoxy and silicones
5. Properties and uses of thermoplastics like PVC, polyethylene.
6. Preparation and uses of elastomers.
(Chemical, Structural aspects, should be avoided)
7. Comparison of properties of natural and synthetic elastomers.
8. Vulcanisation of rubber
10. Definition, characteristics, and examples of adhesives.
11. Classification of adhesives and their uses.
12. Purpose of using oil paint.
14. Ingredients of oil paint
15. Function and examples of each ingredient like,
(i) Drying oil
(ii) Pigments
(iii) Thinner
(iv) Driers
(v) Extenders and plasticizers
17. Difference between paint and varnishes.
18. Definition & application of refractories.
19. Characteristics of refractories like:-
(i) Refractoriness
(ii) Strength
(iii) Thermal expansion
(iv) Thermal conductivity
(v) Porosity
(iv) Thermal shock resistance
20. Classification of refractories like:-
(i) Acid refractories
(ii) Basic refractories
(iii) Neutral refractories
23. Types of insulating materials:
(i) Natural insulating materials,
(ii) Insulating foils.
(iii) Insulating wool.
(iv) Manufactured insulating materials.
24. Properties and use of insulating materials like:-
(i) Glass wool.
(ii) Thermocol (foamable polystyrene)

5. REFERENCES:
1. Engineering Chemistry Jain
GUJARAT TECHNOLOGICAL UNIVERSITY

COURSE NAME : ELECTRICAL CIRCUITS

1. RATIONALE :
This is a basic technology course which will be a bridge course between science subjects and applied technology courses. Diploma electrical engineering student has to develop certain important technology related skills. To develop these skills he has to study applied technology courses. To learn applied technology courses Electrical Circuit is an important course in which fundamentals of D.C. and A.C. circuit, magnetism, electro-magnetism and dielectric circuits are included.

2. SCHEME OF TEACHING :

<table>
<thead>
<tr>
<th>TOPIC NAME OF TOPIC</th>
<th>NO. OF HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fundamental Concepts of D.C. Circuit</td>
<td>06</td>
</tr>
<tr>
<td>2. Magnetic Circuit</td>
<td>07</td>
</tr>
<tr>
<td>3. Electro-magnetic Induction</td>
<td>08</td>
</tr>
<tr>
<td>4. Dielectric Circuit</td>
<td>06</td>
</tr>
<tr>
<td>5. A.C. Fundamentals</td>
<td>10</td>
</tr>
<tr>
<td>6. A.C. Series and Parallel Circuit</td>
<td>13</td>
</tr>
<tr>
<td>7. Three Phase Circuit</td>
<td>06</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>56</strong></td>
</tr>
</tbody>
</table>

3. OBJECTIVES :-
(1) Understand the concept of electric current, voltage, resistance, power and energy.
(2) Solve electrical circuit using Ohm’s law and Kirchhoff’s laws.
(3) Compute current and voltage in different sections when resistances are connected in series and parallel.
(4) Understand magnetic and dielectric circuit parameters.
(5) Apply Cork - screw rule, right hand gripping rule, Fleming’s left hand rule.
(6) Solve series magnetic circuit.
(7) Compare electric circuit with magnetic circuit.
(8) Explain Faraday’s law of electro-magnetic induction.
(9) Explain Fleming’s right hand rule and Lenz’s law.
(10) Differentiate statically induced e.m.f and dynamically induced e.m.f.
(11) Apply the concept of magnetic hysteresis for selecting materials.
(12) Apply the concept of energy stored in magnetic field in relation to lifting magnet.

4. COMMUNICATION SKILLS :
1. Ask pertinent questions as well as to answer them.
2. Speak fluently using proper intonation, expression before individuals and groups.
3. Take-down lecture notes.
4. Develop detailed write-ups from lecture notes.
5. Write assignments (classroom, library, home).

5. TOPICS AND SUB-TOPICS :
1. FUNDAMENTAL CONCEPTS OF D.C CIRCUIT 6 Hrs.
1.1 Voltage, current, resistance, power and energy.
1.2 Ohm’s law and Kirchhoff’s laws.
1.3 Resistances in series and parallel.
1.4 Effect of temperature on resistance.
1.5 Star - Delta transformation and Superposition theorem.

2. MAGNETIC CIRCUIT 7 Hrs.
2.1 Magnetic circuit parameters, m.m.f, magnetising force,
reluctance, Flux, Flux density, permeability, inductance etc.
2.2 Force on a current carrying conductor placed in a magnetic field.
2.3 Series magnetic circuit.
2.4 Comparison between magnetic circuit and electric circuit.

3. ELECTRO-MAGNETIC INDUCTION 8 Hrs.
3.1 Faraday’s laws, and Lenz’s law.
3.2 Statically and dynamically induced e.m.f.
3.3 Self and mutual inductance.
3.4 Hysteresis and hysteresis loop.
3.5 Energy stored in magnetic field.
3.6 Rise and decay of current in magnetic circuit.

4. DIELECTRIC CIRCUIT 6 Hrs.
4.1 Dielectric circuit parameters, capacitance, permitivitiy, potential
gradient etc.
4.2 Capacitor and its types.
4.3 Capacitors in series and parallel.
4.4 Charging and discharging of capacitor.
4.5 Capacitance for parallel plate, multiple and composite plate.

5 A.C. FUNDAMENTALS 10 Hrs.
5.1 Terms related with alternating current.
5.2 Phase and phase difference.
5.3 Vector representation of A.C. and voltages.
5.4 Addition and subtraction of Alternating current and Voltages.
5.5 Form factor and peak factor.

6. A.C. SERIES AND PARALLEL CIRCUIT 13 Hrs.
6.1 A.C. through pure resistance, pure inductance and pure capacitor.
6.4 A.C. parallel circuits using vector and admittance method.
6.5 Resonance in parallel circuit.

7. THREE PHASE CIRCUIT 6 Hrs.
7.1 Generation of 3-phase voltage.
7.2 3 phase Star and Delta connection and relation of current, voltage and power.

6. LABORATORY EXPERIENCES:
1. Verify Ohm’s law. 4 Hrs
2. Verify series-parallel law’s of resistance. 4 Hrs
3. Test the effect of temperature on the resistance of a conductor. 4 Hrs
4. Verify Superposition theorem. 4 Hrs
5. Test the hysteresis characteristic of given magnetic core using C.R.O. 6 Hrs
6. Verify series-parallel laws of capacitors. 4 Hrs
7. Measure power and power factor in R.L.circuit. 4 Hrs
8. Measure power and power factor in R.L.C. circuit. 4 Hrs
9. Measure inductance and resistance of a tube light choke. 6 Hrs
10. Identification of electrical components using black box (R.L.& C.) 6 Hrs
11. Measurement of R.C.time constant. 4 Hrs
12. Varification of voltage and current relation in 3 phase star 6 Hrs and delta connections.

7. REFERENCES:
1. Fundamentals of Electrical Engineering and Electronics by B.L.Theraja
GUJRAT TECHNOLOGICAL UNIVERSITY

NAME OF COURSE: PROGRAMMING IN 'C'.

1. RATIONALE:
This course gives fundamentals of programming language which is useful in developing applications in various fields & gives knowledge of latest concept of 'C' language. The fundamental concepts of learning a computer programming language have been covered in this course which will enhance their ability to suitably use it in their respective field of applications.

2. SCHEME OF TEACHING & ASSESSMENT:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Topic</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Program Language Concepts</td>
<td>2 4 6</td>
</tr>
<tr>
<td>2</td>
<td>Constants, Variable &amp; Data types</td>
<td>4 4 8</td>
</tr>
<tr>
<td>3</td>
<td>Operators &amp; Expression</td>
<td>4 8 12</td>
</tr>
<tr>
<td>4</td>
<td>Branching &amp; Looping</td>
<td>4 8 12</td>
</tr>
<tr>
<td>5</td>
<td>Arrays</td>
<td>4 6 10</td>
</tr>
<tr>
<td>6</td>
<td>User-Defined functions</td>
<td>2 6 8</td>
</tr>
<tr>
<td>7</td>
<td>Pointers</td>
<td>4 8 12</td>
</tr>
<tr>
<td>8</td>
<td>Structure, Unions</td>
<td>2 4 6</td>
</tr>
<tr>
<td>9</td>
<td>File Management</td>
<td>2 8 10</td>
</tr>
</tbody>
</table>

--- --- ---
28 56 84

3. OBJECTIVES:
The students should be able to
a) Write high level & low level programs.
b) Understands concepts of structure.
c) Apply basic programming concepts in relevant field

4. TOPIC & SUBTOPIC:

1. PROGRAMMING LANGUAGE CONCEPTS:
   1.1 Concepts of programming methodology.
   1.2 Flowchart
   1.3 Algorithm

2. CONSTANTS, VARIABLES & DATA TYPES:
   2.1 Character set
   2.2 'C' token
   2.3 Keywords & Identifiers
   2.4 Constant, Variables
   2.5 Data types
   2.6 Storage Classes

GUJRAT TECHNOLOGICAL UNIVERSITY

2

3. OPERATORS & EXPRESSIONS:
   3.1 Arithmetic, logical, Assignment operators
   3.2 Increment & Decrement, Conditional operator
3.3 Bit-wise special operators
3.4 Formatted & Unformatted input & output
3.5 Arithmetic, Evaluation of the types of expressions

**4. BRANCHING & LOOPING**
4.1 Decision making with IF statement
4.2 Switch Statement
4.3 The ? : Operator
4.4 Goto Statement
4.5 While, For Statement
4.6 Macro substitutions

**5. ARRAYS :**
5.1 Introductions
5.2 One dimensional arrays
5.3 Initiating two dimensional arrays

**6. USER DEFINED FUNCTIONS :**
6.1 Introduction
6.2 Call by value & Call by reference
6.3 Nesting of functions
6.4 Recursions
6.5 Functions with arrays

**7. POINTERS :**
7.1 Introduction
7.2 Understanding Pointers
7.3 Pointers expressions
7.4 Pointers & Arrays
7.5 Pointers & Strings
7.6 Pointers & Structures
7.7 Pointer to Pointer

**8. STRUCTURES, UNIONS :**
8.1 Introduction
8.2 Structure definition & initialization
8.3 Arrays of Structures
8.4 Structures with Structures
8.5 Structures & functions
8.6 Unions

**9. FILE MANAGEMENT :**
9.1 Introduction
9.2 Defining, Opening and Closing file.
9.3 Input/Output operations on file
9.4 Command line arguments

**5. LABORATORY EXPERIENCE :**
Students should write programmes on the basis of prescribed curriculum of this course. (minimum 20 programmes are required)

**6. REFERENCES :**
1. Programming in ANSI 'C' Lagurusamy TMH
2. Let us 'C' Etkar Tech Media
3. Programming in 'C' U Gopal TMH
4. Programming in 'C' Nigham & TMH
5. Program with 'C' Gottfried MHT
GUJARAT TECHNOLOGICAL UNIVERSITY

NAME OF COURSE : ELECTRONIC PRACTICES

1. RATIONALE :-
This course is aimed at providing knowledge of working of simple circuits & Fabrication of PCBS soldering practice, study of electronic work bench etc. The course covers preparation of simple PCB, drilling of holes, soldering technique and surfing through internet for datasheets of different components. This course is useful in the project and setting up of many experiments in other basic technology and applied technology courses.

2. LABORATORY EXPERIENCES :
1. Electronics Accessories
   1.1 Wires & Cables
      1.1.1 SWG
      1.1.2 Single core
      1.1.3 Multi core
      1.1.4 Single strand
      1.1.5 Multi strand and their types
      1.1.6 Armed cable
      1.1.7 Shielded wires
      1.1.8 Coaxial cables
      1.1.9 Twisted pair
      1.1.10 Flat ribbon cable
      1.1.11 Teflon coated wires
      1.1.12 Different types of Fiber cables
   1.2 Connectors
      1.2.1 BNC
      1.2.2 TNC
      1.2.3 Banana pin connector
      1.2.4 D connector
      1.2.5 FRC connector
      1.2.6 Relimate
      1.2.7 Burg strip
      1.2.8 Edge connector
      1.2.9 Euro connector
      1.2.10 Power connector
      1.2.11 SMA connector
      1.2.12 RJ-45 connector
      1.2.13 RJ-11 connector
      1.2.14 JACK pin connector-Mono stereo
   1.3 Fuses
      1.3.1 Glass
      1.3.2 Ceramic fuse
      1.3.3 Resetable fuse
      1.3.4 Shunt fuse- MOV
      1.3.5 HRC fuse
   1.4 Switches
      1.4.1 Toggle switch- SPDT, DPDT,TPDT
      1.4.2 Centre off, Without centre off
      1.4.3 Rotary switch types depending on their poles and positions
      1.4.4 Rocker switch
      1.4.5 Push button latch and non latch
      1.4.6 Tactile switch
1.4.7 Micro switch
1.4.8 Limit switch
1.4.9 DIP switch
1.4.10 Thumb wheel switch- BCD, Decimal
1.4.11 Membrane switch
1.5 Relays
1.5.1 Electro magnetic relay and their types according to their coil voltage and contacts
1.5.2 Reed & Reed relay
1.5.3 Semi conductor relay
1.5.4 Solid state relay
1.5.5 Contactors
1.6 Transformer
1.6.1 Step up
1.6.2 Step down
1.6.3 Center trapped
1.6.4 Current transformer
1.6.5 Pulse transformer
1.6.6 Audio transformer
1.6.7 Auto Transformer
1.6.8 R.F. Transformer, I.F. Transformer
2. Electronics Components
2.1.1 Resister
2.1.2 Carbon composition Resister
2.1.3 Carbon film resister
2.1.4 Metal film resister
2.1.5 Wire wound, Fusible resister
2.1.6 1/8w, 1/4w, 1/2w, 1w,2w,5w
2.1.7 Fixed & Variable Potentiometer-preset-multi turn-trim post wire wound, sliders
2.1.8 Colour codes
2.2 Inductor
2.2.1 Wire indicator- Air core
2.2.2 Ferrite core
2.2.3 Axial lead inductor
2.3 Capacitor
2.3.1 Electrolytic
2.3.2 Ceramic
2.3.3 Polyester
2.3.4 Metalized polyester
2.3.5 Tetantalum, mica
2.3.6 Ceramic
2.3.7 Paper capacitor
2.3.8 Gang capacitor- trimmer capacitors
2.4 Semi conductor component
2.4.1 Diode
2.4.2 Transistor
2.4.3 LED
2.5 SMD components
2.5.1 Resister
2.5.2 Capacitor
2.5.3 Diode
2.5.4 Transistor
2.5.5 Heat Sink
2.5.6 I.C. Packages
2.6 Component packages
2.6.1 DIP
2.6.2 SIP
2.6.3 TO-92
2.6.4 TO-3
2.6.5 TO-5
2.6.6 TO-220
2.7 Memory equipment
2.7.1 CRO
2.7.2 Multimedia
2.7.3 DMM
2.8 PCB-Introduction
2.8.1 Types
2.8.2 Single sided
2.8.3 Double sided
2.8.4 Multi layer
2.8.5 Strock-PTH

3 Wiring & Testing of simple electronics circuit
3.1 Bread board
3.1.1 Series & parallel connection of Resister on bread board
3.2 Soldering
3.2.1.1 Solider iron- Use and its characteristics
3.2.1.2 Soldering station
3.2.1.3 Good soldering & bad soldering
3.2.1.4 Difficulties of dry soldering
3.2.1.5 Zero defect soldering
3.2.1.6 Soldering material
3.2.1.7 Series and parallel connection of resister, capacitors
3.2.1.8 SMD soldering and tools
3.2.1.9 Liquid Flux
3.2.1.10 Use of Thinner to clean Soldering contacts
3.3 De-soldering
3.3.1 De-soldering pump
3.3.2 Hot air gun
3.3.3 De-soldering station
3.3.4 SMD rework station

4. Literature survey & Industrial visit
4.1 Use of data Book for component data sheets.
4.2 Use of Internet surfing for component data sheets

5. TERM WORK :-
This shall consist of the prescribed jobs as under, duly certified.
1. Writing circuit on bread board 4 Jobs
2. Writing circuits on General purpose PCB 2 Jobs
3. Soldering on PCB 2 Jobs
4. De Soldering from PCB 1 Jobs
5. PCB Drilling, Connector crimping 1 Jobs
6 SMD Soldering and Desoldering 2 Jobs
----------
Total 12 Jobs
COURSE NAME : ENGINEERING MEASUREMENTS – II

1. RATIONALE :
Work in an industry is characterized by certain specific features which in turn makes certain demands on the technician. First of all, he must be able to accurately measure physical quantities using appropriate measuring equipment. He must perform all experiments and related operations accurately in strict accordance with the relevant manual, standards or textbooks. Particular care must be taken to use these apparatus/instruments carefully. This course on Engineering Measurement intends to develop elementary measurement skills in the students. It is an interdisciplinary course emphasizing the development of personal attributes like spirit of enquiry, problem solving etc. Some elementary skills in error analysis, safety precautions and interpretation of results are to be developed through this course.

3. OBJECTIVES :

2. SCHEME OF TEACHING :
Sr. No. Particulars Hours
1. Planning & Introduction 04
2. Preforming Experiments 20
3. Assessment/Submission 04
Total 28

The students should be able to :
* Use appropriate units for each physical quantities.
* Read the physical quantities for basic measuring instruments.
* Record Observed data in the designed observation table accurately.
* Compute/Report the results based on the measurements taken accurately wherever necessary.

4. LABORATORY EXPERIENCES :
1. Determination of static friction.
3. Measurement of pressure by using various instruments.
10. Determination of percentage of iron in an alloy.
11. Measurement of rate of corrosion for given metals (like copper and alluminium) in acid or alkaline medium.
12. Measurement of power for different speed of a ceiling or a table fan.

Note: 1. Minimum 10 experiences to be performed during the term in this course from the above given list looking to the available resources at the Polytechnic.
2. The experiences should be changed every year as far as possible.
3. Assessment should be continuous and progressive.
4. Student should be provided an opportunity to take measurement independently.
5. Lectures should be arranged before starting actual laboratory work.
6. Practical examination : 50 % marks of term work.

GUJARAT TECHNOLOGICAL UNIVERSITY

COURSE NAME : NON-CONVENTIONAL ENERGY SOURCES
1. RATIONALE:

Energy is an important input in all sectors of country’s economy. Standards of living of a country can be directly judged by per capita consumption of energy. Energy sources in general can be broadly categorized as -

(i) Conventional sources of energy — like fossil fuels such as coal, oil, gas, atomic and hydroelectric energy and

(ii) Non-conventional sources of energy — such as solar, wind, ocean, geothermal, and bio-mass etc

In general conventional sources of energy are widely used in our daily life and nearly 92% of our energy requirements are met from such sources only. Unfortunately their availability is not universal i.e. in some countries, they are available in plenty whereas in some other countries they are to a very little extent. On the contrary, the non-conventional sources of energy are available everywhere in abundance and may not be exhausted soon.

It is a known fact that resources of conventional fossil fuel in the world in general and our country in particular is limited. The rate at which we are using them, it is likely to be exhausted in near future. As we cannot think of human life without energy, it is, therefore, very essential that non conventional sources of energy be tapped invariably. Students will develop awareness about the technologies involved in tapping such energy resources and then putting them in use effectively for the service of mankind. They may also be apprised of the problem of the limited availability of energy and so to take effective measures to save energy.

2. SCHEME OF TEACHING:

<table>
<thead>
<tr>
<th>TOPIC NAME</th>
<th>TOPIC LECT.</th>
<th>NO. HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Renewable Sources of Energy</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>2. Solar Energy</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>3. Wind Energy</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>4. Bio-mass Energy</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>5. Other Alternative Sources of Energy</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>6. Energy Conservation and auditing</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>42</strong></td>
<td></td>
</tr>
</tbody>
</table>

3. OBJECTIVES:

1. Understand conventional sources of energy.
2. Identify non-conventional (renewable) sources of energy.
3. Understand the concept of solar radiation.
4. Use and operate different appliances based on solar radiation.
5. Understand the concept of wind energy and its applications like wind mill wind farm etc.
6. Understand feasibility of as a source of energy
7. Identify different types of biomass energy plants.
8. Apply principles of conservation of energy
9. Understand the concept of energy auditing, energy saving etc.
10. Identify newer and newer renewable sources of energy.

4. TOPICS AND SUB-TOPICS:

**TOPIC 1 : RENEWABLE SOURCES OF ENERGY.**

1.1 Renewable Sources of Energy such as Hydro, Solar, Wind, Bio-mass, Tidal and Geothermal - their availability and limitations.
1.2 Energy crisis and energy demand projection.

**TOPIC 2 : SOLAR ENERGY :**

2.1 Solar radiation.
2.2 Photovoltaic Cell.
2.3 Pyranometer.
2.4 Solar Thermal Collectors
2.5 Solar air heaters.
2.6 Solar constant
2.7 Solar Cell.
2.8 Materials of Solar Cell.
2.9 Applications of solar energy

**TOPIC 3 : WIND ENERGY :**
3.1 Wind map of India, mean wind speed, and wind density during different months in specific areas.
3.2 Types of wind mills, their assembly and applications as electric converters, pumping motors
3.3 Concept of wind farms, its applications.

**TOPIC 4 : BIO–MASS ENERGY :**
4.1 Bio-mass as a source of energy.
4.2 Energy plantation.
4.3 Pyrolysis, Classification and Anaerobic fermentation.
4.4 Types of Biogas plants.
   - Their comparative status
   - Design and
   - Applications.

**TOPIC 5 : OTHER ALTERNATE SOURCES OF ENERGY :**
5.1 Tidal power, sites for tidal power plants in India.
5.2 Micro hydel power station
5.3 Geothermal energy.
5.4 Limitations and applications of such power plants.

**TOPIC 6 : ENERGY CONSERVATION AND AUDITING :**
6.1 Conservation of energy in
   - Domestic appliances and industries
6.2 Use of fuel efficiently in vehicles.
6.3 Waste recycling.
6.4 Fuel gases and heat recovery.
6.5 Energy demand management.
6.6 Energy accounting and auditing.

**5. REFERENCES :**
(1) Solar Energy :
   - Principles of thermal collection and storage
   - by S.P. Sukhatame, Tata McGrow Hills.
   - Solar Energy Utilization
   - Wind Energy Data for India
   - Anna Mani & D.A. Mooley, Allied Publishers.
(2) Biogas Technology
   - K.C. Khandelwal, S.S.Mahdi, Tata MGH
(3) Power Plant Engg.
(4) Energy resources and supply
   - J.T. MacMillan, R. Morgan, R.B. Murray,
   - John Willy & sons, New York.
(5) Principles of energy conservation
   - A.W. Culp, Tata MGH

---

**GUJARAT TECHNOLOGICAL UNIVERSITY**

**COURSE NAME : ELECTRONIC DEVICES AND CIRCUITS - I**

**1. RATIONALE:**
The aim of introducing this course is to impart knowledge of basic Electronics devices to the students of Electronics Engineering. Through the study of this course the students will get, knowledge of construction, working & characteristics of various types of diodes and transistors. The study of the devices will be helpful to understand the various basic and applied technology courses.
2. SCHEME OF TEACHING

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Topics</th>
<th>Th.</th>
<th>Pra.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Semiconductor physics and diodes</td>
<td>04</td>
<td>02</td>
<td>06</td>
</tr>
<tr>
<td>2.</td>
<td>Diode applications and other terminal devices</td>
<td>08</td>
<td>14</td>
<td>22</td>
</tr>
<tr>
<td>3.</td>
<td>Transistor</td>
<td>06</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>4.</td>
<td>Transistor amplifier</td>
<td>06</td>
<td>06</td>
<td>12</td>
</tr>
<tr>
<td>5.</td>
<td>Transistor biasing circuits and thermal stability</td>
<td>04</td>
<td>06</td>
<td>10</td>
</tr>
<tr>
<td>6.</td>
<td>Frequency response of small signal transistor amplifier</td>
<td>06</td>
<td>04</td>
<td>10</td>
</tr>
<tr>
<td>7.</td>
<td>Hybrid parameter</td>
<td>04</td>
<td>04</td>
<td>08</td>
</tr>
<tr>
<td>8.</td>
<td>Regulated Power Supply</td>
<td>04</td>
<td>10</td>
<td>14</td>
</tr>
</tbody>
</table>

TOTAL 42 56 98

3. TOPICS AND SUBTOPICS:

1. SEMICONDUCTOR PHYSICS AND DIODES:
   1.1 Energy levels of conductors, semiconductors and insulators.
   1.2 Extrinsic material N & P type.
   1.3 Ideal diode basic construction & characteristics.
   1.4 D.C. & A.C. resistance of diode.
   1.5 Diode equivalent circuits.
   1.6 Drift and diffusion currents.
   1.7 Transition and diffusion capacitance.

2. DIODE APPLICATION AND OTHER TERMINAL DEVICES:
   2.1 Series and parallel diode configuration with d.c. inputs.
   2.2 The half-wave, full-wave and bridge rectifier and determination of PIV.
   2.3 Determination of average d.c. current, voltage, ratio of rectification and ripple factor.
   2.4 Disadvantage of half wave rectifier.
   2.5 Requirement of filters.
   2.6 Simple capacitor filter & induction filter.
   2.7 Diode clamper and clipper.
   2.8 Voltage doubler and multipliers.
   2.9 Zener diode characteristics & operation.
   2.10 Schottky barrier diode.
   2.11 Varactor/diode tunnel diode.
   2.12 Photo diode, LDR, photo voltaic cell, photo transistor.
   2.13 Light emitting diode & Optocoupler, opto-isolator.
   2.14 Seven Segment display.

3. TRANSISTOR:
   3.1 Transistor construction (NPN silicon planner transistor)
   3.2 Transistor operation and amplifying action.
   3.3 Common base configuration.
   3.4 Common emitter configuration.
   3.5 Relation between current gain, alpha and beta.

4. TRANSISTOR AMPLIFIERS:
   4.1 Principle of an amplifier.
   4.2 Tr. common base amplifier working.
   4.3 D.C. load line & operating point in CB amplifier.
4.5 Tr. common emitter amplifier.
4.6 Load line consideration & operating point in CE Amplifier, Determination of Av, Ai, Ap, Ro, Ri in CE amplifier.
4.7 Tr. common collector amplifier.
4.8 Comparison of CB, CE and CC amplifier.
4.9 Darlington pair

5. TRANSITOR BIASING CIRCUITS AND THERMAL STABILITY:
5.1 Transistor biasing circuits.
5.2 Reasons for thermal instability.
5.3 Stability factor.
5.4 Stability factor of a CE amplifier.
5.5 Collector to base biasing methods for stabilisation.
5.6 Emitter biasing methods for stabilisation and emitter bypass capacitor.
5.7 Potential divider method of biasing, Thermal resistance & requirements of heat sink.

6. FREQUENCY RESPONSE OF SMALL SIGNAL TRANSISTOR AMPLIFIER
6.1 Different methods of coupling in amplifier.
6.2 Circuits of R.C. coupled amplifier. using single stage (CE)
6.3 Two stage RC coupled amplifier.
6.4 Low frequency response of R-C coupled CE Amplifier.
6.5 Low frequency response and effect of coupling and emitter bypass capacitor
6.6 Low frequency response to a pulse.
6.7 High frequency response to a pulse.
6.8 High frequency Model for CE Amplifier.

7. HYBRID PARAMETERS
7.1 Transistor Amplifier as a four terminal network (Black Box Concept)
7.2 Hybrid parameter & derivation
7.3 Hybrid parameters for transistor Amplifier
7.4 Transistor amp analysis using H-parameters

8. REGULATED POWER SUPPLY
8.1 Simple series voltage regulators with over current and over voltage protection
8.2 Shunt regulator using transistor
8.3 SMPS (Switch mode power supply)
8.4 Three terminal voltage regulators like 7805, 7812, 7905 & 7912
8.5 Basic working principle and advantage of stabilizer & uninterrupted power supply (UPS)

4. LABORATORY EXPERIENCES:
1. To study the C.R.O.
2. To study function generator & T.P.S.U.
3. To study Multimeter.
4. Identification of components.
5. To study forward & reverse V-I characteristics of diode.
6. To study zener diode characteristic.
7. To study the characteristics of LED.
8. To study the characteristics of photodiode.
9. To test Half-wave rectifier.
10. To test full-wave rectifier with capacitor filter.
11. To test Bridge rectifier with choke filter.
12. To study the positive & negative clipping.
13. To study the positive & negative clamping.
14. To study the LDR characteristic.
15. To verify I/P & O/P characteristic of CB configuration.
16. To verify I/P & O/P characteristic of CE configuration.
17. To test CE amplifier & obtain the frequency response.
18. To test darlington pair.
19. To study colour coding of resistors, capacitors.
20. To Measure the load regulation and line regulation of Regulated Power Supply / SMPS
21. To study different types of capacitors.

5. REFERENCES:
1. Electronics Principles A.P. Malvino TMH
2. Electronic device & Circuits Allen Mottershead MGH
3. Electronic devices & Ckts. theory Robert Boylestand PHI
5. Electronic devices & Ckts. V. K. Mehta S.Chand
6. Integrated Electronics Millman & Halkias

Gujarat Technological University

NAME OF COURSE : CHEMICAL ENGINEERING MATERIALS

1 RATIONALE :
Chemical engineering materials is an important course for understanding properties of materials used for construction of equipments and piping. Chemical properties of materials affect the life and performance of equipments to the large extent. Knowledge of properties of materials helps in understanding the importance of materials with respect to cost & safety.

2 SCHEME OF TEACHING :

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>NAME OF TOPICS</th>
<th>NO.OF HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>PROPERTIES OF MATERIALS</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>CORROSION &amp; ITS PREVENTION</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>METALS</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>CERAMIC MATERIALS</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>ORGANIC MATERIALS</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>ORGANIC PROTECTIVE COATING</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>LUBRICANTS</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>MATERIALS FOR SPECIAL APPLICATIONS</td>
<td>3</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>28</td>
</tr>
</tbody>
</table>

3. OBJECTIVES :
1. Identify required raw materials catalyst, intermediates for the product appropriately.

4. COMMUNICATION SKILLS
* Ask pertinent questions as well as to answer them.
* Describe an object, process or procedure.
* Write reports on experiments conducted in laboratories.

5. TOPICS / SUB- TOPICS :

www.gttucampus.com
Topic-1: INTRODUCTION 1 hr.
1.1 Definition & scope of materials science.
1.2 General principles of selection of materials.

Topic-2: PROPERTIES OF MATERIALS 1 hr.
2.1 Definition & brief explanation of:
Melting point, Boiling point, Specific heat,
Thermal conductivity, Thermal expansion,
Thermal insulation, Stresses, Strain.

Topic-3: CORROSION & ITS PREVENTIONS 4 hrs.
3.1 Definition of corrosion.
3.2 Types of corrosion:
Direct corrosion, Electro-chemical corrosion,
Galvanic corrosion, High temp.corrosion.
3.3 Factors affecting corrosion rate, brief description.
3.4 Common methods used for the control & prevention of corrosion.

Topic-4: METALS 4 hrs.
4.1 General comparison with ferrous metals & alloys.
4.2 General properties of metals:
Cast iron, rough iron, steel, Aluminium, Zinc,
Chromium, Nickel, Tin, Copper, Titanium, Tungsten, Platinum & Silver.
4.3 General properties of alloys:
Duralumin, Y alloy, Brass, Bronze, Inconel, Invar, Hastalloy, B & C bearing metals.
4.4 Important types of furnaces for purification of metal.
Blast furnace, Arc.

Topic-5: CERAMIC MATERIALS 4 hrs.
5.1 Definition of ceramic materials
5.2 Clay
5.2.1 General chemical composition china clay, fire clay, bentonite.
5.3 Refractories:
5.3.1 Definition
5.3.2 General properties of refractories.
5.3.3 Classification of refractories.
5.3.4 Manufacture, properties & uses of bricks.
5.4 Glasses:
5.4.1 Definition of glass
5.4.2 Brief description of raw materials used in glass making & their effect on product glass. Manufacture of glass, Stepwise description in brief.
5.4.4 Types of glasses their general properties & uses, Soda lime glass, boroselicate glass, high silica glass, fibre glass, glass wool, form glass.
5.5 Porcelain: general properties, composition & uses.
5.6 Cement concrete & reinforced cement concrete applications only.

Topic-6: ORGANIC MATERIALS: 5 hrs.
6.1 Polymer and their structure
6.2 Addition and condensation Polymerisation
6.3. Plastics
6.3.1 Definition of plastics
6.3.2 General properties of plastics
6.3.3 Classification of plastics.
6.4 Rubbers [Elastomers]:
6.4.1 Definition
6.4.2 Classification of rubber
6.4.3 Sources, properties & uses of natural rubber and synthetic rubber.
6.4.4 General idea about Vulcanizing
6.5 Wood:
6.5.1 General properties of wood
6.5.2 General idea about wood seasoning & its advantages & limitation.
Topic-7 ORGANIC PROTECTIVE COATING 3 hrs.
7.1 Paints :
7.1.1 Classification of paints
7.1.2 Ingredients of paints :their properties & importance
7.1.3 Special types of paints and their applications.
7.2 Varnishes :
7.2.1 Definition
7.2.2 Ingredients of Varnishes & their brief description
7.2.3 Classification of Varnishes Topic-8 LUBRICANTS 3 hrs.
8.1 Importance of lubricants
8.2 Classification of lubricants.
8.2.1 Synthetic lubricants, their properties & applications
8.2.2 Semisolid lubricants, types & their applications
8.3 Methods of applying lubricants
Topic-9 MATERIALS FOR SPECIAL APPLICATIONS 3 hrs.
9.1 Insulation materials
9.1.1 General properties & applications of various :
1 Electric insulation
2 Thermal insulation
3 Sound insulation
9.2 Industrial adhesives
9.2.1 Definition and mechanism of their effect on surface.
9.2.2 Classification of adhesives
9.2.3 Advantages & limitation of adhesives.
6. REFERENCES :
1 Material science and processes S.K.Hazarachaudhary
2 Engg. materials handbook Mc graw hill publi.
3. Engg. materials Patel & Khakkhar
4 Engg. materials S.C.Rangwala

GUJARAT TECHNOLOGICAL UNIVERSITY

NAME OF COURSE : CIVIL ENGINEERING DRAWING

1. RATIONALE :
Drawing is the language of Engineers. The diploma technicians working on site are required to refer drawings and specifications for executing civil engineering works/structures. Hence, Civil Engg. Drawing is a course which every civil engg. technician should learn and develop skills to become successful in their profession. This course is a basic essential course and is the backbone of all Civil Engineers. No technician can supervise or guide civil engg. construction without thorough knowledge and practice of preparing civil engg. drawings. When he is able to prepare drawings, he can interpret drawings, which ultimately will help him to execute or carry out construction work precisely and also estimate the quantities correctly.

2. SCHEME OF TEACHING :
Topic No. Name of Topic L P
hours hours
1. Introduction 3 4
2. Building bye-laws 3 2
3. Principles of planning 3 4
4. Details of building drawing 4 14
5. Drawing of a building by actual — 6 measurements
6. Planning residential buildings 5 14
7. Planning other types of buildings 4 14
8. Perspective Drawing 4 6
9. Auto-Cad 1 18
10. Building components 1 2

Total hours 28 84

3. TECHNOLOGY RELATED SKILLS (TRS ) TO BE DEVELOPED IN THIS COURSE :

TRS - 1 : Plan small residential buildings given the situations and requirements and prepare set of drawings.

EOs :
1.1 Understand principles of planning, building bye-laws, I.S. recommendations related to buildings etc., appropriately considering the given situations and requirements. 1.2 Appreciate the need of
* Signs
* Symbols
* Conventions
* Abbreviations
* Scales used in Civil Engineering Drawing
1.3 Prepare set of drawings showing plan, elevation, section, site plan, layout plan, services plan- using appropriate symbols, scales etc.- of the planned small residential building.

TRS - 2 : Use Auto CAD for preparing set of drawings.

EOs :
2.1 Use proper Auto CAD commands.
2.2 Use Auto CAD My house or 3D Home architecture (Lab Exp. on to get set of working drawings. Computer)

TRS - 3 : Prepare foundation plan and give layout at construction site.

EOs :
3.1 Interpret the given drawing of building.
3.2 Prepare ‘ foundation plan ‘ of the building
3.3 Appreciate the need of establishing permanent reference points.
3.4 Identify the instruments, accessories required for giving layout.
3.5 Trace down the foundation plan on ground using identified instruments/accessories etc. accurately.
3.6 Compare traced ground dimensions with those given in foundation plan.
3.7 Correct the layout by applying diagonal checks.

TRS - 4 : Interpret working drawing for guiding & supervising construction.

EOs :
4.1 Understand various signs, symbols, abbreviations, scales used in drawings.
4.2 Identify each element/component of building shown in drawing.
4.3 Workout each dimension & location of each component of building.

4. COMMUNICATION SKILLS :
1. Express ideas effectively in English in oral form.
2. Express views in English in written form effectively.
3. Write brief and precise proposals and reports.
4. Lead group discussions and meetings independently in English.
5. TOPICS/ SUB-TOPICS
1. Introduction
1.1 Introduction
1.1.1 Various types of drawings
1.1.2 Importance of above drawings
1.1.3 Situations where above drawings are prepared/required
1.2 Types of projections adopted
1.2.1 First angle projection
1.2.2 Third angle projection
1.2.3 Combinations of first and third angle projection
1.2.4 Characteristics of above projections
1.2.5 Advantages and dis-advantages of each type of projection
1.2.6 Situations where each of the above projection is used
1.3 Symbols, Conventions and Abbreviations
1.3.1 Commonly used symbols and conventions for
* Electric fittings * Water supply * Sanitary
* Furniture * Material of construction etc.
1.3.2 Abbreviations used for the above
1.3.3 Actual use of symbols, conventions and abbreviations
1.4 Scales
1.4.1 Definition
1.4.2 Scales used for various types of drawings
1.4.3 Title, Margins and size of letters as per IS:
1.4.4 Sizes of various standard papers
1.4.5 Layout of various views on drawing paper
2. Building bye-laws:
2.1 Building bye-law for residential buildings
2.2 Building bye-law for industrial buildings
2.3 Building bye-law for commercial buildings (as per I.S. recommendations)
2.4 Following important bye-laws for above three types:
* Plot area & Built-up area * Size of rooms * Margins
* Heights * Passages * Ventilation
* Circulation * Open space * Water supply & sanitary
* Electrification * Fire safety * Other safety
* Lifts * Environment
2.5 Approval procedure with respect to bye-laws
3. Principles of planning:
3.1 For residential buildings
3.1.1 Principles of planning such as
* room dimension * area * heights * privacy * ventilation
* access * circulation * economy * drainage * aspect
* prospect * orientation * grouping etc.
3.2 For other types of buildings
3.2.1 Principles of planning for
* school * hospital * bank * post office
* shopping centre * office building * industrial unit etc.
3.3 Principles of planning for single storey buildings on
* regular & irregular grounds * sloping grounds
as per the given requirements.
4. Details of building drawing:
4.1 Site plan 4.7 Drawing of details
4.2 Line plan 4.8 Layout plan
4.3 Detailed plan 4.9 Services plan
4.4 Elevation (Plan showing drainage,
4.5 Section water supply and electricity
4.6 Foundation plan lines)
Importance and purpose of preparing above drawings.
4.10 Details to be shown and location of the details
4.11 Scales used in above drawings
5. **Drawing of a building by actual measurements**
5.1 Preparation of site plan, Line plan & detailed plan of an
   existing residential building.
5.1.1 Dimensions to be taken, method of taking dimensions for
   preparing above plan
5.1.2 Prepare line plan
5.1.3 Rough detailed plan with dimensions written on plan
5.1.4 Noting the dimensions for location of
   * doors * windows * ventilators * lofts
   * cupboards * steps and other details
5.1.5 Prepare detailed plan, elevation & section and compare
   it with the existing drawing of the building
5.2 Comment the drawing with respect to principles of planning and
   building byelaws
6. **Planning residential buildings**:
6.1 Given situations & plot area; prepare detailed drawing of a
   single storeyed residential building i.e line plan, detailed plan,
   elevation and section of the building
6.2 Given situations & plot area; prepare detailed drawing of a two
   storeyed building i.e line plan, detailed ground floor plan,
   first floor plan, second floor plan, design of stair case,
   elevation and section
6.3 Other plans and tables required to be submitted for approval
7. **Planning other type of buildings**:
7.1 Given situations & plot area; prepare detailed drawings for
   *school *hospital *bank *post office
   *shopping centre *office building *industrial unit etc.
8. **Perspective Drawing**:
8.1 Related Terms
8.2 Procedure of preparing perspective view
   *one point method *two point method
8.3 Draw the perspective view of
   *single room residential building with verandah and steps
   *column with sloping slab
9. **Auto Cad**
9.1 Recall the commands
9.2 Recall the use of Auto Cad
   * My house or 3D Home Architecture to get set of working drawings
9.3 One exercise on Auto Cad
10. **Building components**
10.1 Draw sketches of
   * floors and floorings * roofs and roof coverings
   * false ceiling * doors * windows * ventilators
   * cupboards etc.
6. **LAB EXPERIMENT / TERM WORK / PROJECT**:
   (A) **SKETCH BOOK**:
   Draw sketches of
* Signs, symbols, abbreviations & conventions (Max. 10 in each)
* Types of stairs
* Building Components (sub-structure and super-structure)
* Buildings on sloping ground.

(B) DRAWING SHEETS:
Prepare following sheets
Sheet No 1. Measured Drawing
Sheet No 2. Planning of a Single storeyed residential building (Minimum 2 exercises)
Sheet No 3. Planning of a Two-storeyed residential building (Minimum 2 exercises)
Sheet No 4. Planning of commercial complex with parking
Sheet No 5. Planning of small industrial unit
Sheet No 6. Perspective drawing of
  * Steps
  * One room structure
  * Column
  * Garden bench.

(C) Prepare set of drawing of a single storeyed R.B. using computer (Auto CAD)

(D) EXERCISES ON:
  * Multi-storeyed building. (framed structure)
  * Row-houses.
  * Low-cost housing.

7. REFERENCES:
* IS : 962-1967 IS : 1256-1967
* Copy of building bye-laws of the town where the Polytechnic is situated
* Standard text book of civil engineering drawing.

GUJARAT TECHNOLOGICAL UNIVERSITY

COURSE NAME : COMPUTER APPLICATIONS

1. RATIONALE :-
Computers are now-a-days necessary in human routine life. At each and every stage, we find its importance. In technical side, engineers are using computers extensively to solve their design problems, to create and to generate optimum designs, to prepare the design drawings, and preparations of project reports and routine correspondence, including site reports, critical decision support tables and summerising the facts in feedback. Engineering drawing is an effective language for artisan to chief engineer. Here, an attempt is made to generate different skills like drawing an object through AutoCAD, report writting through MS-Word and to generate work sheets, data manipulation, graphs, for decision support system through MS-Excel.

2. TEACHING SCHEME
Sr. Topics Theory Practical Total
No. Hrs. Hrs. Hrs.
1. Introduction to Computer system and software, operating environments and Windows — 04 04
2. Introduction to CAD, Drawing & Editing drawing — 30 30
3. Report Writing using MS-WORD — 06 06
4. Worksheet & Graph preparation using MS-EXCEL — 12 12
5. Introduction to Internet — 04 04
Total Hours — 56 56

3. OBJECTIVES :-
- Understand computer applications and its software requirements.

www.gttucampus.com
- Know operating system and its use.
- Use operating system commands.
- Appreciate the use of computerized drafting.
- Identify the main menu and other menu options of AUTOCAD, Window, Word and Excel
- Draw any given Engineering drawing
- Measure length and area of displayed object
- Edit stored drawing
- Edit stored report
- Distinguish different softwares
- Print/Plot the drawing, report, letter.
- Appreciate the concept of Graphics user Interface
- Operate computer system.
- Apply parameter passing techniques using dialogue boxes.
- Understand the economy factor.
- Handle multiple reports.
- Relate different data
- Select the software according to use requirement.
- Print the table/report/drawing
- Transfer the document to other computers using floppy
- Identify the menu/toolbar/dialog box/settings
- Identify different hardware of the computers
- Modify drawings/reports as per requirements.

4. LIST OF LABORATORY EXPERIENCES TO BE PERFORMED IN SEQUENCE

<table>
<thead>
<tr>
<th>Sr. Laboratory Experience Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
</tr>
<tr>
<td>1. Introduction to the computer system Demonstration and use and computer software</td>
</tr>
<tr>
<td>2. Introduction to the operating system, file “identification, extension, bytes, directory.</td>
</tr>
<tr>
<td>3. Introduction to CAD software, Co-ordinate system, ACAD Demonstration and use drawing files, save, quit, end</td>
</tr>
<tr>
<td>4. Use commands POINT, LINE, P.LINE, OFFSET, ORTHO “</td>
</tr>
<tr>
<td>5. Draw CIRCLE, ELLIPSE “</td>
</tr>
<tr>
<td>6. Draw ARC with its various options “</td>
</tr>
<tr>
<td>7. PDMODE, DIVIDE, MEASURE Command “</td>
</tr>
<tr>
<td>8. Use of commands like BREAK, TRIM, ERASE, OSNAP, &quot;REDRAW</td>
</tr>
<tr>
<td>9. Use of commands like UNITS, UCS, LIMITS, SNAP, GRID, “ZOOM, PAN</td>
</tr>
<tr>
<td>10. Use of commands like PEDIT, DONUT, POLYGON, “COPY, MIRROR, MOVE</td>
</tr>
<tr>
<td>11. Use of commands like ARRAY, CHAMFER, FILLET, “SOLID, OOPS</td>
</tr>
<tr>
<td>12. DIMENSION BY DEFAULT &amp; BY REQUIREMENT “</td>
</tr>
<tr>
<td>13. TEXT BY DEFAULT &amp; STYLE REQUIRED “</td>
</tr>
<tr>
<td>14. BLOCK, INSERT, MINsert, HATCH “</td>
</tr>
<tr>
<td>15. LAYER ,COLOR ,LINETYPE “</td>
</tr>
<tr>
<td>16. LAYER SETTINGS “</td>
</tr>
<tr>
<td>17. PRINT DRAWING “</td>
</tr>
<tr>
<td>18. One drawing Preparation Assignment</td>
</tr>
<tr>
<td>19. Introduction to WORD processor, data entry, save, quit, Demonstration and use retrieve.</td>
</tr>
<tr>
<td>20. Basic settings, page layout, sizing, left and right margins, justification, tabulation “</td>
</tr>
<tr>
<td>21. Editing text using deleting character, word, line, etc. search and replace, cut, copy, paste, move, sort file read and write file. ”</td>
</tr>
<tr>
<td>22. Introduction to worksheet, workbook, cell, row, column, dataentry, open, save, quit, help ”</td>
</tr>
<tr>
<td>23. Editing data, clean, insert, delete/copy/move cell/row/ column, formula and function for data entry,</td>
</tr>
<tr>
<td>24. Worksheet settings, width of column, colour, heading, hide &amp; display, align data, bold, italics, orientation Freeze cell/row/column, split, sort, filter ”</td>
</tr>
</tbody>
</table>
5. REFERENCES
1. Mastering AUTOCAD George Omura
2. Inside AUTOCAD Raker & Rice 3.
3. MS Office Instant Reference
4. Windows Inside Peter Norton
5. Teach Yourself WINDOWS Al Stevens
6. DOS Instant Reference

Gujarat Technological University

COURSE NAME : ELEMENTS OF ELECTRICAL & MECHANICAL ENGINEERING FOR TEXTILE TECHNOLOGY

1. RATIONALE :
In the era of technology integration, it has become unavoidable to passes the basic knowledge of various engineering disciplines. The advancement in technology is the best on multi technology integration and hence in performance too. The Aim of this subject is to enhance the knowledge and skill level in the inter disciplinary area to strengthen the present engineering practices.

2. [A] ELEMENTS OF MECHANICAL ENGINEERING:
SCHEME OF TEACHING

<table>
<thead>
<tr>
<th>Topic Name of Topic</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. -----------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Lect. Pract. Total</td>
<td>--------------</td>
</tr>
</tbody>
</table>

| 1. Properties of steam | 04 -- 04 |
| 2. Air Compressors & Blowers | 05 06 11 |
| 3. Air Psychometry | 04 06 10 |
| 4. Pumps and valves | 05 06 11 |
| 5. Power Transmissions | 05 06 11 |
| 6. Vibrations | 02 -- 02 |
| 7. Material Handling | 03 04 07 |
| Total 28 28 56 |

3. OBJECTIVES:
1. Describe the property of steam and its applicationS in Textile industries.
2. Describe different air compressors, its composition and applications.
3. Know primary parameters involved in air psychometry.
4. Different types of pumps.
5. Different types of flow control valves.
6. Describe the mode of power transmission.
7. Know the effects of vibration on machines.

4. TOPICS AND SUBTOPICS:
Topic-1 Properties of Steam:
1.1 Sensible, latent and total heat of steam.
1.2 Types of steam.
1.3 Dryness fraction of wet steam.
1.4 Calculations on different types of steam.
1.5 Application of steam in Textile industries and processes.

**Topic-2 Air Compressors & Blowers:**
2.1 Use of compressed air.
2.2 Types of air compressor.
2.3 Comparison of different air compressors.
2.4 Use of filters & moisture-oil separators.
2.5 Use of Blowers - Types of Blowers.

**Topic-3 Air Psychometry:**
3.1 Definition of dry bulb, wet bulb and dew point temperature.
3.2 Humidity, specific humidity, relative humidity.
3.3 Methods of humidifications - Unit type humidifier, central station type.
3.4 Importance of humidity in textile industries i.e. in spinning & weaving department.
3.5 Calculation of Relative humidity from Dry Bulb & Wet Bulb temperature.

**Topic-4 Pumps and Valves:**
4.1 Different types of pumps, their construction and functions.
4.2 Use of pumps.
4.3 Calculations related to pump power, discharge and head.
4.4 Merits and demerits of pumps.
4.5 Different types of valves, construction and working.
4.6 Applications of valves in textile industries.

**Topic-5 Power Transmission:**
5.1 Importance of power transmission.
5.2 Modes of power transmission (P.T.).
5.3 Applications.
5.4 Belt and rope drive system.
5.5 P.T. by gears & chains.
5.6 P.T. by couplings.
5.7 Calculations for speeds in different modes of P.T.

**Topic-6 Vibrations:**
6.1 Definition of vibrations.
6.2 Vibration in mechanical systems and its consequences.
6.3 Types of vibrations.
6.4 Causes of vibrations.
6.5 Remedies for vibration causes.

**Topic-7 Material Handling:**
7.1 Needs of material handling.
7.2 Types of material handling equipment.
   i) Hoisting equipment
   ii) Conveying equipment
   iii) Surface and overhead equipment
7.3 Criteria for selection.
7.4 Selection of suitable material handling equipment for the given situation.

**5. LABORATORY EXPERIENCES:**
Mechanical Engineering:
1. Demonstrate a reciprocating air compressor.
2. Demonstrate the air washer.
3. Study of steam humidifier.
4. Demonstrate the centrifugal pump.
5. Demonstrate the reciprocating pump.
6. Demonstrate manually controlled and automatic controlled flow valves.
7. Study of belt & chain drive system.
8. Study of gear train.
9. Study of dust collection systems of textile industry.
10. Study of different conveying systems of textile industry.
11. Study of air blowers.

[B] ELEMENTS OF ELECTRICAL ENGINEERING:

1. SCHEME OF TEACHING

<table>
<thead>
<tr>
<th>Topic Name of Topic</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.C.Circuits</td>
<td>03 04 07</td>
</tr>
<tr>
<td>A.C.Circuits</td>
<td>03 06 09</td>
</tr>
<tr>
<td>D.C.Machines</td>
<td>05 06 11</td>
</tr>
<tr>
<td>A.C.Machines</td>
<td>05 04 09</td>
</tr>
<tr>
<td>Illumination</td>
<td>03 02 05</td>
</tr>
<tr>
<td>Photo Electric DeviceS &amp; Digital controls</td>
<td>04 02 06</td>
</tr>
<tr>
<td>Transducers &amp; Electrical wiring</td>
<td>05 04 09</td>
</tr>
</tbody>
</table>

Total 28 28 56

2. OBJECTIVES:
1. Know the importance of D.C. fundamentals.
2. Know the importance of A.C. fundamentals.
3. Understand the working principle, construction and application of rotating electrical machines.
4. Understand the working principle, construction and applications of transformer.
5. Appreciate the importance of various protective devices applied for the machines.
6. Understand the importance of electronic circuit used in control system.

3. TOPICS AND SUBTOPICS:

Topic-1 D.C.circuits:
1.1 Definition of DC circuits and the sources available in textile mills with standard voltage.
1.2 Define EMF, current, resistance, specific resistance and ohm's law.
1.3 Simple calculations of energy bills in textile mills.

Topic-2 A.C.circuits:
2.1 A.C. fundamentals.
2.2 Generation of 3-Phase voltage.
2.3 3-Phase star and Delta connections.
2.4 Power in 3-Phase circuit and simple problems on it.

Topic-3 D.C.Machines:
3.1 Working principle construction and applications of D.C. motor and generators in textile.
3.2 Speed control of D.C.motor.
3.3 D.C. shunt motor starter and connection with motor.

Topic-4 A.C.Machines:
4.1 Working principle, construction & types of transformers.
4.2 Accessories of power transformer.
4.3 Auto transformer.
4.4 Working of induction motors.
4.5 Types and application of different types of induction motors in textile industry.
4.6 Different types of induction motor starters like D.O.L., Auto transformer and star delta.
Topic-5 Illumination:
5.1 Laws of illumination.
5.2 Define flux, intensity, solid angle and plane angle.
5.3 Direct and Indirect Illumination system.
5.4 Simple problem on Illumination.
5.5 Tube light wiring used in textile industry.
5.6 Different light sources and reflection.

Topic-6 Photoelectric Devices and Digital Controls
6.1 Construction and working of photo cell and photo diode.
6.2 Simple operating control circuit using photo/solar cell.
6.3 Automatic light operated relay using photo devices.
6.4 Use of digital control in textile processes.

Topic-7 Transducers and Electrical Wiring:
7.1 Definition, and classification of different types of transducer and their application for measurement like PH measurement in textile industry.
7.2 Different types of wires, cables, switches and fuses.
7.3 Specifications of electrical accessories.
7.4 Necessity of earthing and types of earthing.
7.5 Shock and shock treatment.
7.6 Connection of meters like A-meter, Volt meter, Watt meter, pf meter, frequency meter, energy meter and Maximum demand.

4. LABORATORY EXPERIENCES:
1. Verification of OHM's law
2. Measurement of power in D.C. Circuits
3. Measurement of power and pf in single phase A.C. circuit (RL, RC or RLC)
4. Verification of series and parallel laws of resistance
5. Speed control of D.C. shunt motor
6. Direction of rotation of D.C. shunt motor
7. Determination of turns ration single phase transformer
8. Study different types of starter used for three phase induction motor
9. Verification of relationship between line value and phase value in star connection
10. Exercise on staircase wiring
11. Calibration of single phase energy meter
12. Exercise on tube light wiring and testing
13. Study of different types of light sources
14. Characteristics of photo diode

5. REFERENCES:
Sr.No. Name of books Authors
------------------------------------------------------------------------------------------------------------------
1. Thermodynamics P.K.Nag
2. Heat engine Shah & Pandya
3 Thermal engineering P.L.Belany
4. Refrigeration & Air conditioning P.L.Belany
5. Air conditioning systems A.R.Arora
6. Applied Thermodynamics Estope
7. Pumps operation and maintenance Tyler & Hicks
8. Hydraulics R.C.Patel
10 Theory of machines R.C.Patel
11. Theory of machines R.S.Khurani
12. Material handling equipment M.Rudenko
13. Material handling John Immer
14. Air conditioning in Textile ATIRA
1. **RATIONALE**:  
In the era of technology integration, it has become unavoidable to possess the basic knowledge of various engineering disciplines. The advancement in technology is the best on multi technology integration and hence in performance too. The motive of this subject is to enhance the knowledge & skill level in the inter disciplinary area to strengthen the present practices. This course is specially designed with a view to impart basic knowledge of other conventional disciplines (other than his own discipline). In this course, the Civil Engg. students will study the curriculum of other two disciplines i.e. Mechanical and Electrical Engg. portions of this course. Similarly, Mechanical Engg. students will study the curriculum of other two disciplines i.e. Electrical Engg. and Civil Engg. portions of this course. Similarly, Electrical Engg. students will study the curriculum of other two disciplines.

2. **SCHEME OF TEACHING**

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>THEORY</th>
<th>PRACT.</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Chain and Tape Survey</td>
<td>04</td>
<td>04</td>
<td>08</td>
</tr>
<tr>
<td>2. Compass Survey</td>
<td>03</td>
<td>08</td>
<td>11</td>
</tr>
<tr>
<td>3. Levelling</td>
<td>03</td>
<td>04</td>
<td>07</td>
</tr>
<tr>
<td>4. Interpretation of Civil Engg. Drgr.</td>
<td>04</td>
<td>02</td>
<td>06</td>
</tr>
<tr>
<td>5. Site selection for factory buildings</td>
<td>02</td>
<td>02</td>
<td>04</td>
</tr>
<tr>
<td>6. Building Bye-Laws for Industrial building/Sheds</td>
<td>02</td>
<td>—</td>
<td>02</td>
</tr>
<tr>
<td>7. Layout for industrial sheds</td>
<td>02</td>
<td>06</td>
<td>08</td>
</tr>
<tr>
<td>8. Machine foundations</td>
<td>02</td>
<td>—</td>
<td>02</td>
</tr>
<tr>
<td>9. Construction Materials</td>
<td>04</td>
<td>02</td>
<td>06</td>
</tr>
<tr>
<td>10. Strength of cement concrete</td>
<td>02</td>
<td>—</td>
<td>02</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>28</strong></td>
<td><strong>28</strong></td>
<td><strong>56</strong></td>
</tr>
</tbody>
</table>

3. **OBJECTIVES**:-
1. Know the principles of survey  
2. Know the components of survey instruments  
3. Know the conventional signs and its use in survey drawing.  
4. Know the procedure to conduct chain and tape survey (by Chain triangulation method).  
5. Understand use of prismatic compass  
6. Define : levelling and different terms used in levelling  
7. Know the parts and functions of Dumpy level.  
8. Interprete simple building drawings  
10. Understand the sketch for machine foundation with reference to requirement of equipment.  
11. Know the ideal site for an industrial shed for typical industry.  
12. Know various construction materials commonly used, their properties, uses and selection  
13. Know the approx. market cost of each material and their suitability for the job on the basis of strength, durability, economy etc.  
14. Know the various parameters influencing the strength of cement concrete  
15. Know the factors to be kept in mind while planning & designing a layout for any industrial building.  
4. TOPICS AND SUB-TOPICS

1. **CHAIN AND TAPE SURVEY 4 Hrs**
   - Principles of survey
   - Define: Plane surveying
   - Purpose of reconnaissance survey
   - List of instruments required
   - Explain various components of Instruments.
   - Use of survey instruments on the field
   - Ranging of survey lines
     * Base line
     * Tie line
     * Check line
   - Signs used in ranging - types of ranging
   - Explain ranging a line on field
   - Conventional signs- its importance, types etc.
   - Location sketches, key plan, offset, running measurements,
   - selection of stations. Feild book, recording, plotting of details to the scale
   - Preparation of sheet-using survey details

2. **COMPASS SURVEY 3Hrs**
   - Use of Prismatic compass in surveying .
   - Procedure of using compass
   - Component parts of compass & functions
   - Explain : whole circle bearing (WCB), Fore bearing (F.B.),
     Back bearing (B.B.)
   - Computation of included angles from WCB.
   - Computation of correct included angles
   - Effect of local attraction
   - Establish station from given bearing & length
   - Explain the procedure for conducting “Chain and Compass Survey”

3. **LEVELLING 3Hrs**
   - Purpose of levelling
   - Define : Temp.bench mark, Back, Intermediate & fore sight,
     collimation plane, Line of collimation, Hight of instrument, Reduced level.
   - Procedure of taking out & placing in of levelling instrument in the box.
   - Types of levels e.g.Dumpy, Tilting, Wye.
   - Temp.adjustments of levels.
   - Taking staff readings & recording them in level book correctly
   - Computation of reduced levels (RLs)
   - Apply arithmatic checks.

4. **INTERPRETATION OF CIVIL ENGG. DRG. 4Hrs**
   - Define : Building plan, map & distinguish them.
   - Methods of projections-first & third angle projections.
   - 1st & 3rd angle method of projections used in building drawings.
   - Abbreviations, conventions, symbols etc. used for different building
     components in the drawings.
   - Sketch the symbols used in structural drawings.
   - Show drawings to develop interpretation ability.

5. **SITE SELECTION FOR FACTORY BUILDINGS: 2Hrs**
   - Various considerations in selecting site for factory building/industrial sheds.
   - Sources from where the maps & plans are available
   - Various factors influencing location of sites for industrial sheds.
   - Probable/Possible areas where site can be located
   - Compare the alternative available sites
- Selection of most suitable & economical site for industrial shed/building. 
considering the following salient features:
- Locally available materials of construction & their approx. cost
- Labour rates prevailing in that area & its quantity & skills
- Availability of essential services like water, electricity, fuel, gas, 
television, fax, internet, transport, road network, nearby railway station, 
airstrip, port, godowns, transit sheds, job work sheds, marketing 
agencies, hotels & guest house etc.
- Soil data for sound foundation of structures.
- Application of Government bye-laws & regulations.

6. BUILDING BYE-LAWS FOR INDUSTRIAL SHEDS/BUILDINGS
2Hrs
- Define : Bye-law
- Provisions of bye-laws related to industrial buildings in I.S.
- Application of bye-laws as per IS-1256 explaining the purpose of each 
bye-law
- Layout of industrial shed using relevant bye-laws.
- Comment on application of bye-laws for industrial sheds & its design.

7. LAYOUT OF INDUSTRIAL – SHEDS 2Hrs
Planning a layout
- Factors affecting planning
- Various considerations like north light, orientation, margins, storages incoming & outgoing materials despatch 
etc.
- Specific requirement for each
- Comment on a given layout
- Provisions to be made for preparing lay-out
* Grouping of working spaces
* Rules for parking spaces
- Factors in designing industrial sheds like internal roads, light & ventilation, margins, set back, water and 
sanitary rooms, recreation & retiring rooms, tool room, tiffin room store room etc.
- Rules for showing details in layout like margins, road width, compound walls and gates, north line, machine 
foundations, trees, electric and telephone poles etc.

8. MACHINE FOUNDATIONS 2Hrs
- Procedure of designing machine foundations.
- its purpose
- Factors to be considered while designing machine foundations like
  - Shear settlement
  - Vibrations, resonance
  - Operating frequency
  - Dead load etc.
- Various types of failures of machine foundations
- Design foundations for simple machine like lathe, compression press, universal testing machine (20 T 
capacity), electric power hammer etc.
- Provision made by I.S. specifications for machine foundations
* Provisions made in I.S.- 2974 - Part - II
* Prepare proper foundation plan for IS specifications for the given sample machine.
* Precautions to be taken while selecting a design when vibrational 
forces are predominant.
- Selection of appropriate types of machine foundation identifying 
governing factor causing failure
- Types of dynamic loads & their effects on foundations
- Selections of appropriate foundation design for withstanding dynamic loads referring IS-2974-Part I and II etc.

9. CONSTRUCTION MATERIALS 4 Hrs
Various types of construction materials commonly used like:
- Bricks
- Stones (natural)
- Wood
- Steel (bars and sections)
- Lime
- Cements
- Aggregates
- Glass
- Aluminium
- Paints
- Water
- Plastics (PVC)
- Bitumen (tar) etc.

- Properties of each material & their acceptable standards
- Where they are most suitably used
- Estimated market cost of above referred construction materials
- Select most suitable construction materials for industrial structures with respect to durability, appearance, economy etc.
- Compare the following materials and construction works:
  * Brick work & stone work, on the basis of strength and economy
  * Lime & cement, on the basis of strength and economy
  * Wood & steel (as structural members) on the grounds of strength-weight ratio, life & maintenance
  * Steel & Aluminium, as construction materials
  * Stone work & concrete work, on the basis of strength, economy & weathering effects
  * Wood and PVC, on the basis of durability, weight, maintenance & safety
  * Stone flooring, IPS flooring and granolithic C.C. flooring, in factory areas where heavy loads are expected on floors.

10. STRENGTH OF CEMENT CONCRETE 2 Hrs.
- Ingredients of cement concrete
- Water cement ratio & its effect on the strength of cement concrete
- Relationship of compressive strength of concrete with w/c ratio.
- Draw graph : strength v/s water-cement ratio.
- Effect of degree of compaction on strength of concrete
- Role of % air voids on strength of concrete
- Influence of other parameters on the strength of concrete Parameters like :
  - Aggregate cement ratio
  - Grading of aggregates
  - Size & shape of aggregates
  - Strength & type of aggregates
  - Quantity of materials
  - Compaction
  - Curing method & curing period
  - Workmanship & handling of concerte (mixing, Transporting)
- Property of cement used

5. List of Laboratory Experiences:
1. Conduct “Chain and compass survey” (max. 5 stations) (On any Saturday)
   * Practice for ranging, chaining, offsetting, recording field book etc.
   * Practice for working on prismatic compass, Bearing of lines, recording/computing included angles using bearings etc. Preparing drawing plate using A2 size sheet of ‘chain & compass survey’
2. Spot levelling using a Dumpy Level
* Practice with the instrument-selecting suitable position for the instrument, temp. adjustments, taking change points (C.P.), reading level staff, recording level book, calculations, arithmetic checks, T.B.M., Reduced levels etc.
* Interpretation of contour map.

3. Interpretation of Civil Engg. Drawing.
* The small groups of students be supplied with prints and they will interpret the given drawing for details like wall thickness, room size, orientation, lighting and ventilation, roominess, locations of doors, windows, ventilators, stair-case etc, economy, aspects, effect of elevation, grouping, circulation, built up & plot-area relationship, F.S.I, open spaces, location of W.C & bath, rise & tread, foundation details, abbreviations & conventional signs used, services details, bye-laws applicable etc.(for residential buildings) After showing this one print for commercial complex and a print for any industrial shed may also be given in the group for further clarity.
4. Visit to an industrial factory building and all details may be taken on paper (On Saturday)
5. Prepare a layout plan of the visited industrial building (not to scale)
6. Given a drawing dimensioned sketch of any small RCC unit/component like lintel, steps, beam, pillar or column etc., the student will calculate the quantity of materials used in making concrete and will find out the rate of concrete per

6. REFERENCES :-
1. Pumps operation and maintenance Tyler and Hicks
2. Elements of Workshop Technology (Vol. 1,2) Hazara chaudhary
3. Theory of Machines R.C.Patel
4. Heat engine Shah & Pandya
5. Material Handling equipments M.Rundenko
6. Material Handling John Immer
7. Hydraulic Machines Jagdish Lal
8. Hydraulics R.C.Patel
10. Text book on Surveying & levelling B.C.Punmia
11. Civil Engg. Drawing Shah,Kale & Patki
12. IS.1256-1967, IS.-962 Indian standard
14. IS-2974 part-1 and part-2
15. Engg.material Rajaraman
16. Properties of concrete A.M.Neville
17. Estimating and costing B.N.Dutta
18. Estimating and costing G.S.Birdie
20. Planning and designing buildings Y.S.Sane
21. Planning and designing buildings Gurucharan Singh

GUJARAT TECHNOLOGICAL UNIVERSITY

COURSE NAME : ELEMENTS OF MECHANICAL ENGINEERING

1. RATIONALE :

www.gtucampus.com
In the era of technology integration, it has become unavoidable to possess the basic knowledge of various engineering disciplines. The advancement in technology is the best on multi technology integration and hence in performance too. The motive of this subject is to enhance the knowledge & skill level in the inter disciplinary area to strengthen the present practices. This course is specially designed with a view to impart basic knowledge of other conventional disciplines (other then his own discipline). In this course, the Civil Engg. students will study the curriculum of other two disciplines i.e. Mechanical and Electrical Engg. portions of this course. Similarly, Mechanical Engg. students will study the curriculum of other two disciplines i.e. Electrical Engg. and Civil Engg. portions of this course. Similarly, Electrical Engg. students will study the curriculum of other two disciplines i.e. Civil Engg. and Mechancial Engg.

2. SCHEME OF TEACHING

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>TOPICS</th>
<th>THEORY</th>
<th>PRACT.</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power Transmission and Safety</td>
<td>5</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>Gas &amp; Arc welding</td>
<td>3 2</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Boilers &amp; Accessories</td>
<td>1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>I.C. Engines</td>
<td>3 6 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Steam Prime movers</td>
<td>4 2 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Hydraulic Principles &amp; Water Turbines</td>
<td>4 2 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Pumps</td>
<td>4 6 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Material Handling</td>
<td>4 4 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>28 28 56</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. TOPICS AND SUB TOPICS

**Topic -1 Power Transmission & Safety**
- Importance of power Transmission
- Modes of Power transmission
- Application
- Belt & rope drive systems
- Power transmission by gears & chains
- Role of coupling & journal in power Transmission
- Causes of accidents & their remedies
- Personal safety in shops
- Tool safety in shops

**Topic-2 Gas & Arc welding**
- Welding
- Types of welding
- Basic Gas welding
- Basic Arc welding, Soldering & Brazing
- Suitable Application

**Topic- 3 Boiler & Accessories**
- Functions & classification
- Working Principles of Boilers & Accessories
- Uses

**Topic- 4 I.C. Engines**
- Function & classification
- Working Principle
- Uses

**Topic-5 Steam Prime movers**
- Meaning of the term “Prime movers “
- Function and classification of Prime movers
- Working principle of Turbines
- Function & working of steam turbines

**Topic-6 Hydraulic Principles & Water Turbines**
- Concept of Theory of fluid flow
- General properties of fluids
- Water Turbines
- Working principles & classification

**Topic-7 Pumps**
- Function of pumps
- Types of pumps:
  * Centrifugal
  * Reciprocating
- Faults in Pumps (C & R pumps)

**Topic - 8 Material Handling**
- Need of material handling
- Types of material handling equipment
  (i) Hoisting equipment
  (ii) Conveying equipment
  (iii) Surface & overhead equipment
- Criteria for selection
- Factors affecting selection
- Selection of suitable material handling equipment for the given situation.

4. **LIST OF LABORATORY EXPERIENCES:**
1. Demonstrate an I.C. Engine (Identification of Parts, its function, Classification, working etc.)
2. Locate the faults in a given I.C. Engine and suggest remedial measures
3. Study the effect of variation of load on fuel-consumption of an I.C. Engine.
4. Demonstrate a water-turbine.
5. Demonstrate a pump
6. Perform test on Centrifugal pump
7. Find fault and remedies for C.F. Pump.
8. Study various types of materials handling equipment.
9. Study power transmission systems.
10. Demonstrate an Air-compressor.

5. **REFERENCES :-**
1. Pumps operation and maintenance Tyler and Hicks
2. Elements of Workshop Technology (Vol. 1,2) Hazara chaudhary
3. Theory of Machines R.C.Patel
4. Heat engine Shah & Pandya
5. Material Handling equipments M.Rundenko
6. Material Handling John Immer
7. Hydraulic Machines Jagdish Lal
8. Hydraulics R.C.Patel
10. Text book on Surveying & levelling B.C.Punmia
11. Civil Engg. Drawing Shah,Kale & Patki
12. IS.1256-1967, IS.-962 Indian standard
14. IS-2974 part-1 and part-2
15. Engg.material Rajaraman
16. Properties of concrete A.M.Neville
17. Estimating and costing B.N.Dutta
18. Estimating and costing G.S.Birdie
20. Planning and designing buildings Y.S.Sane
21. Planning and designing buildings Gurucharan Singh
GUJARAT TECHNOLOGICAL UNIVERSITY

COURSE NAME: MECHANICAL DRAFTING

1. RATIONALE:
The student of Mechanical Engineering Programme is basically responsible for manufacturing of various material components in shops. This course enable him shop floor professional skill by way of communicating through drawing amongst personnel working on shop floor. To meet the requirements of job functions as technician to the full extent, the student should be acquainted with relevant Indian Standard Specifications and computer as well.

2. SCHEME OF TEACHING:

<table>
<thead>
<tr>
<th>TOPIC NAME OF TOPIC</th>
<th>NO. LECT</th>
<th>PRACT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Projections and Sections of Solids</td>
<td>04</td>
<td>24</td>
<td>29</td>
</tr>
<tr>
<td>2. Development of Surfaces</td>
<td>04</td>
<td>06</td>
<td>10</td>
</tr>
<tr>
<td>3. Intersection of Solids</td>
<td>04</td>
<td>08</td>
<td>11</td>
</tr>
<tr>
<td>4. Details and Assembly Drawing of</td>
<td>04</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Machine Parts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. System of Limits and Fits as per BIS</td>
<td>04</td>
<td>02</td>
<td>05</td>
</tr>
<tr>
<td>6. Welding and Machining Symbols and Piping Drawing</td>
<td>02</td>
<td>04</td>
<td>05</td>
</tr>
<tr>
<td>7. Computer Graphics</td>
<td>06</td>
<td>20</td>
<td>27</td>
</tr>
</tbody>
</table>

3. TECHNOLOGY RELATED SKILLS AND ENABLING OBJECTIVES:

TRS 1. Use Indian/ISO codes/standards/databooks.
EO's 1.1 Practice the codes, standards (Indian), databooks and handbook.
1.2 Interpret Indian standards, databooks and ISO.
1.3 Use Indian/ISO codes/standards/databooks.

TRS 2. Draw/reproduce assembly and detailed drawings of machine parts as per standards.
EO's 2.1 Draw detailed drawings of machine parts as per Indian standards manually.
2.2 Draw detailed drawings of machine parts as per Indian standards using AUTOCAD.
2.3 Develop assembly drawings manually as well as using computer.

TRS 3. Use production drawings/material codes.
EO's 3.1 Discuss the application of production drawing and material codes.
3.2 Interpret Production drawing and material codes.

TRS 4. Use software and hardware for CAD.
EO's 4.1 Develop awareness of the software packages of CAD and hardware.
4.2 Draft drawing using CAD software.

4. COMMUNICATION SKILLS:
1. Deliver a talk on a topic fluently and confidently for five minutes (or more).
2. Follow written or oral instructions and interpret them to others.
3. Counsel people in work situations.
4. Describe an object, process or procedure.
5. Write assignments (classroom, library, home).

5. TOPICS AND SUB TOPICS:

1.0: PROJECTIONS AND SECTIONS OF SOLIDS
1.1 Drawing of Projections of solids - in various position with respect to the reference planes.
1.2 Concepts of sectioning, Horizontal and vertical traces representing sectional planes
- Sectional views of different solids in given various positions - auxiliary section and true shape of section.
1.3 Multiview Representation of simple object.

2.0 : DEVELOPMENT OF SURFACES
2.1 Importance of development of surfaces - Drawing of development of surfaces of various solid - surface development of combination of different solids and of sectioned solids.

3.0 : INTERSECTION OF SOLIDS
3.1 Importance - Various method for intersection of different solids.

4.0 : DETAILS AND ASSEMBLY DRAWING OF MACHINE PARTS
4.1 Importance - Terminology - Lay-out for production drawings as per B.I.S. code.
4.2 Detailed component drawings from given assembly.
4.3 Assembly drawing from given details of machine parts.

5.0 : SYSTEM OF LIMITS AND FITS AS PER B.I.S.
5.1 Importance, Terminology.
5.2 Selection of appropriate limits and fits as per B.I.S.
5.3 Symbols of tolerance of form and position.

6.0 : WELDING AND MACHINING SYMBOLS AND PIPING DRAWING
6.1 Symbols and conventions for welding and machining as per B.I.S.
6.2 Symbols and layout for piping.

7.0 : COMPUTER GRAPHICS
7.1 Introduction to Design and Drafting (AutoCAD)
7.2 General features
7.3 Basic drawing and Editing commands.
7.4 Use of dimensioning utilities.
7.5 Prepare copy from Auto CAD

NOTE: Demonstrate the use of BIS/ISO, codes, standards, data book while teaching topics.

6. LABORATORY EXPERIENCES/TERM WORK :
(A) PREPARE DRAWING SHEETS ON
(1) Projections of solids (Minimum 4 problems)
(2) Sections of solids (—— Do ——)
(3) Development of Surfaces (——Do——)
(4) Intersection of Solids (——Do——)
(5) Sectional orthographic Projectons (Three problems).
(6) Missing views and Sections (Three problems).
(7) Details production drawings of machine components including zone and fold mark, limit, fits and tolerances.
(8) Assembly production drawing of machine components (Manually).
(9) Pattern drawing showing draft and allowances of pattern.
(10) Forging Drawing

(B) PREPARE SKETCH BOOK
(1) Data of Drawing sheets Sr.No. 1 to 9 with solution of problems where needed.
(2) Exercises giving ideas of limits, fits and tolerances.
(3) Symbols * Welding symbols.
* Machining symbols.
(4) Piping symbols and piping drawing.

(C) USE AUTOCAD
(1) AutoCAD commands for preparation of production drawings.
(2) Production drawing of one component including zone and fold mark, limits, fits and tolerances (with the help of computer).
(3) Assembly production drawing of machine components. (with the help of computer).

8. REFERENCES :
Sr No. Name of Book Author Publishers
1. BIS - 696 - 1972
2. BIS - 919 - 1963  
3. BIS - 2709 - 1964  
13. Mastering AUTO CAD George Omura  
14. Inside in AUTO CAD Ralcer & Rice

---

Gujarat Technological University

COURSE NAME : MECHANICAL OPERATION (C.E.O.- I)

1. RATIONALE :  
Mechanical Operation is a basic course for Diploma in Chemical Engineering to develop skills required in them as operators of plant. Efforts are made to design the course content in such a way that it is having enough theoretical as well as practical exposure. Design of practicals to be done, study of models are done in accordance with the requirement of an operator, who will handle all these equipment in the plant continuously during operation as well as during shut down. It also includes elementary knowledge of maintenance like cleaning, flushing of equipment etc.

2. SCHEME OF TEACHING

<table>
<thead>
<tr>
<th>Topic No.</th>
<th>Name of Topic</th>
<th>Lect.</th>
<th>Pract.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Introduction 1</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Properties of particulate solids 3</td>
<td>4</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>3.</td>
<td>Screen analysis</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>4.</td>
<td>Size reduction</td>
<td>9</td>
<td>12</td>
<td>21</td>
</tr>
<tr>
<td>5.</td>
<td>Sedimentation</td>
<td>4</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>6.</td>
<td>Filtration</td>
<td>7</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td>7.</td>
<td>Separation of solid particles</td>
<td>6</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>8.</td>
<td>Agitation</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>9.</td>
<td>Mixing</td>
<td>5</td>
<td>4</td>
<td>9</td>
</tr>
</tbody>
</table>

---

42 56 98

3. TECHNOLOGY RELATED SKILLS : (TRS)

TRS 1 : Operate various unit operations and process equipment efficiently. EOs  
1.1 Select the appropriate raw materials for the finished (Lab.Exp.) product.  
1.2 Select the appropriate process for the finished product."
1. Locate the faults / fluctuations of working parameters (""") in the manufacturing process.
2. Correlate the effect of different operating parameters. (Topic 4,6,7,8 & Lab.Exp.)
3. Regulate / rectify the faults by correcting the working parameters in process equipment. (Topic 2,3,5,6 & Lab.Exp.)
4. Optimise the rate of production by maintaining quality. ("")

TRS 2: Perform the assigned job during scheduled and unscheduled shutdown efficiently. EOs
1. Identify the faults during scheduled and unscheduled shutdown. (Topic 2,3,5,6 & L.E)
2. Plan & schedule the assigned job during shutdowns effectively. (Topic 4,6,7,8,9 & L.E)

4. COMMUNICATION SKILLS:
1. Ask pertinent questions as well as to answer them.
2. Face oral examinations confidently.
3. Write reports on experiments conducted in laboratories/ workshops/ and reports on field and industrial visits.
4. Build rapport with individuals and the group, e.g to start with statements that most of them will accept.

5. TOPICS/ SUB-TOPICS

1 INTRODUCTION OF MECHANICAL OPERATION : 1 hrs.
1.1 Definition of Unit operation & Unit process.
1.2 Difference of Unit operation & unit process.
1.3 Examples of unit operation & unit process.

2 PROPERTIES OF PARTICULATE SOLIDS 3 hrs.
2.1 Specific properties of solids.
2.2 Density and Bulk density.
2.3 Definitions and calculation of particle diameter. Sphericity equivalent diameter, specific surface area, volume surface mean diameter, mass mean diameter, volume and surface mean diameter, shape factor.
2.4 Calculation of no. of particles particulate solids.

3 SCREEN ANALYSIS 3 hrs.
3.1 Need of screen analysis.
3.1.1 Types of screen analysis.
3.2 Applications of screen analysis.
3.3 Types of screen, trommel, Grizzlies, vibrating screen etc.
3.4 Explain : Ideal & actual screen.
3.5 Capacity & effectiveness of screen.
3.5.1 Derivation of formula for overall effectiveness of screen
3.6 Calculation of capacity and effectiveness of screen.
3.7 Faults in screening.

4 SIZE REDUCTION 9 hrs.
4.1 Definition and need of size reduction.
4.2 Principles of size reduction.
4.3 Characteristics of comminuted products.
4.4 Energy and power requirement in comminution.
4.5 Explain (i) Rittingers law,
(ii) Bond's law
(iii) Kick's law.
4.6 Calculation of power for size reduction on the basis of above laws.
4.7 Work index and its calculations.
4.8 Types of Equipment for size reduction.
4.9 Principles of size reduction in various equipment.
4.10 Construction and working of Jaw crusher, Gyratory crusher, roll crusher, Ball mill, Fluid Energy mill.
4.11 Derivation of equation of angle of nip in roll crusher of critical speed.
4.12 Derivation of equation of critical speed in ball mill and its calculations.
4.13 Calculation of angle of Nip, capacity and Ribbon factor.
4.14 Differentiate : open and close circuit grinding.

5 SEDIMENTATION 4 hrs.
5.1 Definition of sedimentation.
5.2 Theory of batch sedimentation.
5.3 Interphase height and time curve.
5.4 Flocculation principle.
5.5 Gravity thicker: Principle, construction and working
5.6 Explain: free and hindered settling.
5.7 Explain: Bowl, nozzle discharge, disk, tubular, centrifuge (construction and working).
5.8 Explain: Cyclone separator, principle, construction and working, cut diameter, efficiency of cyclone.
5.9 Definition of stocks law and Newton's law for terminal settling velocity.

6 FILTRATION 7 hrs.
6.1 Definition and applications of filtration.
6.2 Classify: Equipment for liquid-solid separation.
6.3 Principle, construction and working of filter press.
6.4 Principle, construction and working of leaf filters.
6.5 Principle, construction and working of Rotary vacuum filter.
6.6 Principle, construction and working of cartridge filter.
6.7 Filter media and its required characteristics.
6.8 Filter aids and method of application. Pre coating.
6.9 Calculation of special cake resis, filter media resis, porosity for constant rate, constant pressure system and vacuum drum.
6.10 Explain: Constant rate filtration and constant pressure filtration.
6.11 Centrifuges: * Classification of centrifugal equipment.
* Principle, construction and working of batch centrifuge.
* Advantages and disadvantages of centrifuge over filter press.

7 SEPARATION OF SOLID PARTICLES 6 hrs.
7.1 Definition and application of solid separation.
7.2 Factors affecting selection of equipment.
7.3 Working principle of
a) Jigging b) Elutriation
b) Double cone classifier d) Electrostatic precipitator
c) Magnetic separator f) Froth flotation cell
e) Magnetic separator
7.4 Explain: Differential settling methods.
7.5 Explain: Sink and float method.

8 AGITATION 4 hrs.
8.1 Define: Agitation and mixing, and give their definitions, applications.
8.2 Classify Impellers
8.3 Explain: Vortex formation and swirling, methods of Vortex prevention.
8.4 Principle, working and construction of Agitation vessel.
8.5 Derivation of equation for power consumption.
8.6 Calculations of power consumption in Baffled and unbaffled tank.
8.7 Derivation of equation for flow number.
8.8 Factors affecting agitation.

9 MIXING 5 hrs.
9.1 Purpose of mixing solids and pastes.
9.2 Factors considered in selection of equipment.
9.3 Rate of mixing and mixing index for pastes and powder.
9.4 Principle, construction and working of
a) Ribbon blender b) Kneaders
c) Pug mill d) Banbury mixer
e) Muller mixer
9.5 Calculation of mixing index.

Note: The General preventive maintenance of the equipment involved in the respective course must be taught while teaching the students in theory classes and should be strengthened during industrial visits or during laboratory experiments or during projects, wherever the scope found to be.
6. LABORATORY EXPERIENCES
1. Measure separation of particles by measuring volume, 4 hrs. surface mean diameter, mass mean dia. etc in sieve shaker.
2. Test Rittinger's law for grinding in ball mill and 4 hrs. measure critical speed.
3. Test Kicks law for crushing in jaw crusher. 4 hrs.
4. Test Bond's law for crushing in roll crusher.
5. Test effect of liquid height on power consumption in 4 hrs. agitation vessel.
6. Measure efficiency of separation in cyclone separator. 4 hrs.
7. Measure efficiency of separation in froth flotation cell. 4 hrs.
8. Find out rate of settling by sedimentation. 4 hrs.
9. Measure rate of filtration by gravity filtration method. 4 hrs.
10. Measure rate of filtration by vacuum filtration method. 4 hrs.
12. Measure rate of filtration in centrifuge. 4 hrs.
13. Evaluate mixing index in double cone mixer. 4 hrs.
14. Compute separation efficiency in magnetic separator. 4 hrs.

7. REFERENCES
1. Unit Operations in Mc Cabe and Smith  
Chemical Engineering
2. Introduction to Walter L. Badger and  
Chemical Engineering Julius T Banchero

Gujarat Technological University

COURSE NAME: MECHATRONICS WORKSHOP

1. RATIONALE: -
Workshop practice is the backbones of the real industrial work situation, which helps in development and enhancement of relevant skill required by the technician working in engineering industries and workshops. The workshop experiences would also help them to understand the complexity of industrial working in relative shorter duration of time. Moreover the contents of these curricula from a basis and link for study of manufacturing processes and basic electronics engineering courses in successive semesters. The Electronic Workshop is aimed at providing knowledge of working of simple circuits & fabrication of PCBs, drilling of holes, soldering technique and Simulation of simple experiments using electronic workbench. The students are advised to undergo each skill experience with an understanding of know-why for the various instructions/practices imparted to them in each shop.

2. (A) MECHANICAL WORKSHOP
SCHEME OF TEACHING:

Sr. No. 
Name of Topics Theory Hours 
Practical Hours 
1. Introduction to workshop - 02 
2. Fitting - 06 
3. Tin Smithy - 04 
4. Carpentry - 06 
5. Metal Joining - 04 
6. Turning - 04 
Total - 28
3. OBJECTIVES:
1. Comprehend the need of various sections in a workshop.
2. Demonstrate observance of the safety consciousness and good housekeeping in workshop.
3. Follow the standard procedure for workshop practice.
4. Select and use appropriate material for various sections of workshop.
5. Use various tools, instruments and machines for different operations in fitting, tin smithy, carpentry and material joining shop.
6. Prepare the required jobs correctly according to given specification in various of workshop as mentioned in 5.
7. Demonstrate turning operations on lathe machine such as facing centering and taper turning.

4. TOPICS AND SUB-TOPICS:
1. INTRODUCTION TO WORKSHOP
   1.1 Workshop layout
   1.2 Importance of various sections of workshop
   1.3 Types of jobs done in each shop
   1.4 General safety rules and work-procedure of workshop

2. FITTING
   2.1 Fitting tools like-files, vice chisels, punch, scriber, hammers surface plate, Calipers etc.
   2.2 Fitting operations such as chipping, filing, scraping, grinding, sawing, marking, drilling, reaming, tapping
   2.3 Safety precautions.
   2.4 Demonstration of various operations.
   2.5 Preparation of male-female joints.

3. TIN SMITHY
   3.1 Tin smithy tools like-hammers. Stakes, scissors etc.
   3.2 Sheet metal operations such as shearing, bending, joining
   3.3 Safety precautions
   3.4 Demonstration of various operations.

4. CARPENTRY
   4.1 Carpentry tools like-saws, planner, chisels, hammers, pallet, marking gauge, vice, try square, rule etc.
   4.2 Carpentry operations such as marking, sawing, planning, chiseling, grooving, boring, joining.
   4.3 Types of woods and carpentry hardware
   4.4 Safety precautions
   4.5 Demonstration of various operations using hardware.

5. METAL JOINING
   5.1 Metal joining hand tools and equipment
   5.2 Metal joining temporary and permanent method such as screw, nuts bolts and washers, rivets, keys, pins and welding, soldering, brazing
   5.3 Demonstrations of metal joining operations.
   5.4 Safety precautions.

6. TURNING
   6.1 Turning operations such as facing, centering and turning
   6.2 Demonstration of different laths parts and demonstration of above operations.

5. LIST OF EXPERIENCES:
(1) FITTING
   • Prepare one job on marking, drilling and taping generating different profiles such as pentagon, haxagon etc.
   • Prepare one job on male female fitting

(2) TIN SMITHY
   • Prepare one job on sheet metal marking, shearing, flattening bending and joining (with solder)

(3) CARPENTRY

www.gtucampus.com
• Prepare one job on marking, planning, sawing, chiseling and joining
• Prepare one job on marking, sawing, planning, nailing and screwing using plywood/ packing wood.

(4) WELDING
• Prepare one job using arc welding

(5) TURNING
• Demonstration of different parts of lathe demonstration of centering and turning operation in a group of 10 students.

6. REFERENCES:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Books Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Workshop Familiarization E. Wilkinson</td>
</tr>
<tr>
<td>2.</td>
<td>Workshop Technology-I Hazra and Chaudhary</td>
</tr>
<tr>
<td>4.</td>
<td>Engineering industry training Board Instruction Manual</td>
</tr>
<tr>
<td></td>
<td>(1) Inspection and measurements</td>
</tr>
<tr>
<td></td>
<td>(2) Mechanical Fitting</td>
</tr>
<tr>
<td></td>
<td>Engineering industry Training Board</td>
</tr>
<tr>
<td>5.</td>
<td>I.T.B. Hand Booj Engineering Industry Training Board</td>
</tr>
<tr>
<td>6.</td>
<td>Sheet metal shop practice Bruce &amp; Meyer</td>
</tr>
<tr>
<td>7.</td>
<td>Workshop Technology Vol. I &amp; II Gupta &amp; Kaushik</td>
</tr>
</tbody>
</table>

(B) ELECTRONIC WORKSHOP

1. SCHEME OF TEACHING:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>TOPICS Theory</th>
<th>Theory Hours</th>
<th>Practical Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Introduction to Electronic Workshop</td>
<td>-- 02</td>
<td>-- 02</td>
</tr>
<tr>
<td>2.</td>
<td>Study of Electronic Test Equipment</td>
<td>-- 02</td>
<td>-- 02</td>
</tr>
<tr>
<td>3.</td>
<td>Study of Electronic Components</td>
<td>-- 02</td>
<td>-- 02</td>
</tr>
<tr>
<td>4.</td>
<td>Wiring of Electronic circuits</td>
<td>-- 06</td>
<td>-- 06</td>
</tr>
<tr>
<td>5.</td>
<td>Designing of a PCB</td>
<td>-- 06</td>
<td>-- 06</td>
</tr>
<tr>
<td>6.</td>
<td>Mounting &amp; Soldering</td>
<td>-- 04</td>
<td>-- 04</td>
</tr>
<tr>
<td>7.</td>
<td>Introduction to electronic workbench</td>
<td>-- 04</td>
<td>-- 04</td>
</tr>
<tr>
<td>8.</td>
<td>Use of Data Book</td>
<td>-- 02</td>
<td>-- 02</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>-- 28 Hrs.</td>
<td></td>
</tr>
</tbody>
</table>

2. OBJECTIVES

1. Comprehend the need of various sections in a workshop
2. Select appropriate test equipment & power supply
3. Identification of various electronic components
4. Designing of PCB and Soldering practice on the PCB
5. Study of Simulation Software like Electronic Workbench

3. TOPICS AND SUB-TOPICS

1. INTRODUCTION TO ELECTRONIC WORKSHOP
1.1 Importance of various electronics circuits & Types of jobs done in the workshop
1.2 General rules for electronic wiring and assembling practice
1.3 Selection of Electronic Project

2. ELECTRONIC TEST EQUIPMENT
2.1 Study the types of Test Equipment
2.2 Study the front panel operation of Power Supply, CRO, Function Generator, Multi meter, etc.

3. ELECTRONIC COMPONENT
3.1 Demonstration and testing of various electronic component
3.2 Identification & Testing of Resistor, Capacitor, Diode, Transistors, LED, Relays, Switches, along with their circuit symbols.

4. WIRING OF ELECTRONIC CIRCUITS
4.1 Wiring of simple electronic circuits like a amplifiers, Oscillator Power supply on a bread board
4.2 Testing of various outputs of the circuit

5. DESIGNING OF A PCB
5.1 Study of Printed Circuit Boards (PCB)
5.2 Designing the layouts for a PCB
5.3 Preparing the artwork
5.4 Fabrication PCB making negative of the artwork
5.5 Fabrication using photo resist method

6. MOUNTING & SOLDERING
6.1 Soldering practice on the general purpose PCB’s
6.2 Use of SMD rework station (surface Mounting device)
6.3 Mounting of the component on the prepared Printed Circuit Board
6.4 Testing of the complete job

7. INTRODUCTION TO ELECTRONIC WORKBENCH
7.1 Introduction to software like circuit maker, electronic workbench, orcad etc.
7.2 Study the basic circuit simulation on the software

8. USE OF DATABOOK
8.1 Use of Data book for component specifications.

4. LIST OF EXPERIENCES

1. ELECTRONIC TEST EQUIPMENT
   • Prepare the report on Front panel controls of the CRO, Function Generator and Millimeter

2. ELECTRONIC COMPONENT
   • Identification of terminal & types of various electronic components
   • Find value of Resistors, Capacitors using Colour code method
   • Use of Data book for component specifications.

3. WIRING OF ELECTRONIC CIRCUITS
   • wiring of simple electronic circuits like amplifiers, Oscillator, Power supply on a bread board

4. DESIGNING OF PCB
   • Prepare design, artwork, etching on printed circuit board

5. MOUNTING WORKBENCH
   • Prepare Mounting & soldering on the selected PCB

6. ELECTRONIC WORKBENCH
   • design simple circuit using software on computer
   • Test circuit simulation using electronic work bench

5. REFERENCES:

   Sr. No.
   Name of Books Authors
   1. Principles of Electronics V.K.Mehta
   2. Electronics Devices & Circuits Robert Boylsted
   3. Electronics Devices & Circuits V.N.Bhargav
GUJARAT TECHNOLOGICAL UNIVERSITY

COURSE NAME : WORK-SHOP

1. RATIONALE :
Workshop practice is the backbone of the real industrial work situation, which helps in development and enhancement of relevant skills required by the technician working in engineering industries and workshops. The workshop experiences would also help them to understand the complexity of industrial working in relative shorter duration of time. Moreover, the contents of these curricula form a basis and link for study of manufacturing processes and production technology courses in successive semesters. The students are advised to undergo each skill experience with an understanding of know-how with special emphasis on know-why for the various instructions/practices imparted to them in each shop.

2. SCHEME OF TEACHING :
Sr. TOPICS Theory Practical
No. Hours Hours
1. Introduction to workshop — 02
2. Fitting — 16
3. Smithy — 08
4. Tin Smithy — 04
5. Carpentary — 12
6. Pipe fitting — 04
7. Metal Joining — 06
8. Turning — 04
Total Hrs — 56

3. OBJECTIVES :
1. Comprehend the need of various sections in a workshop
2. Demonstrate observance of the safety consciousness and good housekeeping in a workshop
3. Follow the standard procedure for workshop practice.
4. Select and use appropriate materials for various sections of a workshop.
5. Use various tools, instruments and machines for different operations in fitting, smithy, carpentry, pipe fitting and metal joining shop.
6. Prepare the required jobs correctly according to given specification in various sections of a workshop as mentioned in 5.
7. Demonstrate turning operations on lathe machine such as facing, centering, and taper turning.

4. TOPICS AND SUB-TOPICS

TOPIC 1 : INTRODUCTION TO WORKSHOP
1.1 Workshop layout
1.2 Importance of various sections/shops of workshop
1.3 Type of jobs done in each shop
1.4 General safety rules and work-procedure of workshop

TOPIC 2 : FITTING
2.1 Fitting tools like - files vice, chisels, punch, scriber, hammers, surface plate, try squar, Callipers etc.
2.2 Fitting operations such as chipping, filing, scraping, grinding, sawing, marking, drilling, reaming, tapping.
2.3 Safety precautions.
2.4 Demonstration of various operations.
2.5 Preparation of male-female joints.

TOPIC 3 : SMITHY
3.1 Smithy tool like - hammer, tongs, anvil, flatner etc.
3.2 Smithy operations such as upsetting, drawing down, bending, setting down, welding, cutting, punching and fullering etc.
3.3 Safety precautions.
3.4 Demonstration of various smithy operations.

**TOPIC 4: TIN SMITHY**
4.1 Tin smithy tools like - hammers, stakes, scissors etc.
4.2 Sheet metal operations such as shearing, bending, joining.
4.3 Safety precautions.
4.4 Demonstration of various operations.

**TOPIC 5: CARPENTARY**
5.1 Carpentry tools like - saws, planner, chisels, hammers, pallet, marking gauge, vice, try square, rule etc.
5.2 Carpentry operations such as marking, sawing, planning, chiselling, grooving, boring, joining.
5.3 Types of woods and carpentry hardware.
5.4 Safety precautions.
5.5 Demonstration of various operations using hardware.

**TOPIC 6: PIPE FITTING**
6.1 Pipe fitting tools
6.2 Pipe fitting operations such as marking, cutting, bending, threading, assembling, dismentaling etc.
6.3 Types of various spanners such as flat, fix, ring, box, adjustable etc.
6.4 Safety precautions.
6.5 Demonstrations of various operations.

**TOPIC 7: METAL JOINING**
7.1 Metal joining hand tools and equipment.
7.2 Metal joining temporary and permanent methods such as, screw, nuts bolts and washers, rivets, keys, pins and welding soldering brazing.
7.3 Demonstrations of metal joining operations.
7.4 Safety precautions.

**TOPIC 8: TURNING**
8.1 Turning operations such as facing, centering and turning.
8.2 Demonstration of different Lathe parts and demonstration of above operations.

**5. LIST OF EXERCISES**

(1) **FITTING**
* Prepare one job on marking, drilling filing and tapping generating different profiles such as pentagon, hexagon etc.
* Prepare one job on male female fitting.

(2) **SMITHY**
* Prepare one job on upsetting, drawing down, bending, joining, etc.

(3) **TIN SMITHY**
* Prepare one job on sheet metal marking, shearing, flattening, bending and joining (with solder)

(4) **CARPENTARY**
* Prepare one job on marking, planning, sawing, chiselling and joining.
* Prepare one job on marking, sawing, planning, nailing and screwing using plywood/packing wood.

(5) **PIPE FITTING**
* Prepare one job on pipe marking, cutting, threading and assembling. pipe fitting in a group of five students.

(6) **WELDING**
* Prepare one job using arc welding.

(7) **TURNING**
* Demonstration of different parts of lathe demonstration of centering and turning operations in a group of 10 students.

**NOTE :-**
1. Work progress book should be maintained continuously.
2. Apron, Shoes etc. should be stressed for safety.

**Sr. Objective Instructional Strategies**
No. No.
1. 1 • Input on layout of workshop
   • Use suitable charts and sketches depicting layout of workshop
   • Workshop visit and discussion
2. 2 • Input-cum-discussion/demonstration
   • Use suitable charts cutouts and sketches to show safe and unsafe practices
   • Video programme will be used to demonstrate safe practices, good and poor house keeping etc.
3. 3 • Discussion on workshop practices, followed by demonstration.
4. 4 • Input-cum-discussion
   • Use relevant I.S. Code.
   • Demonstration of commonly used materials in different sections of a workshop with their samples of different cross sections.
5. 5 • Demonstration by the instructor
   • Hands-on experience with practice and feedback exercise will be provide to develop the skills in handling tools and equipment in various shops.
6. 6 • Demonstrate a few jobs produced in different sections of a workshop.
   • Hands-on experience with practice and feedback exercises will be provided to produce a given job correctly.
7. 7 • Demonstration

6. REFERENCES :

   Sr. No. Name of Books Authors
   No.
1. Workshop Familiarization E. Wilkinson
2. Workshop Technology - I Hazra and Choudhary
3. Workshop Technology - I W.A.J. Chapman
4. Engineering industry Training Board Engineering Industry Training Board Instruction Manual
   (i) Inspection & Measurements
   (ii) Mechanical Fitting
5. I.T.B. Hand Book Engineering Industry Training Board
6. Sheet metal shop practice Bruce & Meyer
7. Workshop Technology Vol. I & II Gupta & Kaushik