Gujarat Technological University  
BE- Sem - I  
Mathematics-I

• Review of limits, continuity, differentiability.
• Mean value theorem, Taylors Theorem, Maxima and Minima.
• Riemann integrals, Fundamental theorem of Calculus, Improper integrals, applications to area, volume.
• Convergence of sequences and series, power series.
• Partial Derivatives, gradient and directional derivatives, chain rule, maxima and minima, Lagrange multipliers.
• Double and Triple integration, Jacobians and change of variables formula.
• Parametrization of curves and surfaces, vector Fields, line and surface integrals.
• Divergence and curl, Theorems of Green, Gauss, and Stokes.

Texts/References

Chemistry

1. **Water Technology**:
   - Introduction, sources of water, Impurities in water, hard and soft water, Degree of hardness, Types of hardness, Scale and sludge formation in boiler, Boiler corrosion. Caustic embrittlements, Priming and Foaming, Softening of water. Potable water, Break point of chlorination, Desalination of Brackish water etc.

2. **Metals and alloys**:

3. **Corrosion and its inhibition**:
   - Introduction, Theories of corrosion, Types of corrosion, Protection of metals from corrosion – organic and inorganic materials, Inhibitors, Cathodic protection.

4. **Fuels and Combustion**:

5. **Lubricants**:
   - Definition: Types of lubrication, classification of lubricants and their properties. Functions of lubricants.

6. **Cements**:

7. **Polymers and Plastics**:

8. **Multidisciplinary nature of Environment Study**:
9. **Natural and Synthetic Fibers:**

10. **Chemical aspect of Biotechnology:**

11. **Protective Coatings:**
    Introduction, Types of protective coatings – metallic, chemical, organic, electroplating. Paints and varnishes – Ingredients, properties and uses, Enamels, Lacquers etc.

12. **Renewable and Non-renewable energy of sources:**
    Resources of energy, Appraisal resources problems, classification of Natural and renewable resources. Destruction and Conservation.

13. **Refractories, Abrasives and Insulators:**
    Classification, properties and uses of abrasives. Classification, properties and uses of Insulators.

14. **Analytical Techniques:**
    Introduction Types of analysis – Physical, Chemical and instrumentation.
    Physical analysis – Specific gravity, Melting point, Boiling point, Crystallization. Purification of compounds etc. Chemical analysis – Quantitative and Qualitative analysis of organic and inorganic compounds.
    Instrumental analysis – Spectroscopic, Chromatographic PH measurement, Conductinity, Turbidity etc.

- The topics No. 12, 13 and 14 are to be taught during practical hours as a part of tutorial.

**References:**
1. Engineering Chemistry by Jain and Jain Publisher Dhanpat Rai Publishing Co.
2. Engineering Chemistry by Dr. O.P. Agrawal Khanna Publishers Delhi
3. Engineering Chemistry by N. Krishnamurthy, P. Vallinaygam and D. Madhavan Publisher – Prentice – Hall of India Pvt. Ltd. New Delhi
4. Engineering Chemistry by R. Gopalan, D. Venkappaya and Sulochana Nagarjan
7. Environmental Studies and Disaster Management by S.G. Shah, S.G. Shah and Gopal N. Shah
8. Engineering Chemistry by B. Sivsankar The M.C. Grawhill Companies, New Delhi
Physics

1) Architectural Acoustics

2) Ultrasonic
Introduction, production, properties and detection of ultrasonics. Determination of velocity and application of ultrasonic in Engineering.

3) Crystal Physics
Introduction and classification of solids-crystal structure – The crystal systems and Bravias Lattice – Space Lattices of cubic systems – Miller Indices – Relation between Interplanner Distance and cubic Edge and Laws Formula.

4) Band theory of Solids
Based theory of Solids – Classification of solids – Energy band structure of conductors, insulator and semi conduction types of diodes (simple diode, Zener diode, varactor diode, LED Solar cells, photovoltaic cell, Photo Conductivity, Hall effects.

5) LASERS:

6) Optical – Fibre Communication
Introduction – Fibre – Optic System – advantages of Fibre optics – Basic principle – Acceptance angle and Numerical Aperture – Types of optics preparation through optical fibre

7) Conducting Materials:

8) Super Conducting Materials
Introduction to super conductor – properties of super conductor Type I and Type II super conductor – Comparision between I and II – High T conductors – Application

9) New Engineering Materials
10) Non-Destructive Testing

Reference Books :
1) Engineering Physics  K. Rajagopal Prentice-Hall of India Pvt. Ltd., New Delhi
MECHANICS OF SOLIDS

Description

1. **Introduction:** Scalar and Vector Quantities, composition and resolution of vectors, system of units, definition of space, time, particle, rigid body, force.

2. **Fundamentals of Statics:** Principles of statics, coplanar, concurrent and non-concurrent, parallel and non-parallel forces, composition and resolution of forces, moments & couples - their properties, combination of coplanar couples and forces, equilibrant, equilibrium, free body diagrams, analytical conditions of equilibrium for coplanar force systems.

3. **Truss:** Simple determinate plane trusses and analysis for member forces using methods of joints and methods of sections.

4. **Distributed forces, center of gravity and moment of inertia:** Center of gravity of lines, plane areas, volumes and bodies, Pappus – Guldinus theorems, moment of inertia, polar moment of inertia & radius of gyration of areas, parallel & perpendicular axes theorems.

5. **Friction:** Theory of friction, static and sliding friction, laws of friction, angle and coefficient of friction, inclined plane friction, ladder friction, wedges, belt and rope friction.

6. **Simple Machines:** Velocity ratio, mechanical advantage, efficiency, reversibility of machines, simple machines such as levers, pulley and pulley blocks, wheel and differential axle, Single purchase/double purchase crab, compound screw jacks.

7. **Physical & Mechanical properties of structural materials:** Properties related to axial, bending, and torsional & shear loading, Toughness, hardness, proof stress, factor of safety, working stress, load factor.

8. **Simple stresses & strains:** Elastic, homogeneous, isotropic materials; limits of elasticity and proportionality, yield limit, ultimate strength, strain hardening, section of composite materials, prismatic and non-prismatic sections. Strains: Linear, shear, lateral, thermal and volumetric, Poisson’s ratio. Stresses: Normal stresses, axial – tensile & compressive, shear and complementary shear, thermal and hoop,. Applications to composite material stepped & tapered bars.

9. **Beam:**
   (a) Types of loads, Types of supports, Types of beams, Support reactions for statically determinate beams
   (b) Bending moment and Shear force, Bending moment and shear force diagrams for statically determinate beams subjected to couples,
concentrated forces, uniformly distributed loadings, relation between bending moment, shear force and rate of loading, point of contra-
flexure.

10. **Stresses in beams**: Theory of simple bending, bending stresses and their distribution, moment of resistance, modulus of sections, distribution of shear stresses in different sections.

11. **Principal stresses and strains**: Compound stresses, analysis of principal planes and principal stresses, principal strains, angle of obliquity of resultant stress, principal stresses in beams.

**BOOKS :**
1. Engineering Mechanics (Statics) Beer and Johnston
Engineering Graphics

1. Introduction to Engineering Graphics, Drawing instruments and accessories, BIS - SP 46. Use of plane scales and Representative Fraction.


3. Loci of Points: Path of the points moving on simple arrangements and simple mechanisms, slider crank mechanism, four bar chain mechanism etc.

4. Projections of Points & Lines: Introduction to principal planes of projections, Projections of the points located in same quadrant and different quadrants, Projections of line with its inclination to one reference plane and with two reference planes. True length of the line and its inclination with the reference planes.

5. Projections of Planes: Concept of different planes, Projections of planes with its inclination to one reference plane and with two reference planes. Concept of auxiliary plane method for projections of the plane.

6. Projections of Solids & Section of Solids: Classification of solids. Projections of solids like Cylinder, Cone, Pyramid and Prism with its inclination to one reference plane and with two reference planes. Section of such solids and the true shape of the section.


8. Orthographic Projections: Principle of projection, Principal planes of projection, Projections from the pictorial view of the object on the principal planes for View from Front, View from Top and View from Side using first angle projection method and third angle projection method, Full Sectional View.

9. Isometric Projections and Isometric View or Drawing: Isometric Scale, Conversion of orthographic views into isometric projection, isometric view or drawing.

NOTE: Topic No. 1, 8 and 9 of the above syllabus to be covered in Practical Hours.

Text Books:
Reference Books:

1. Engineering Graphics – I and II By Arunoday Kumar
   Tech – Max Publication, Pune
2. Engineering Drawing & Graphics using Auto CAD 2000 By T. Jeyapoovan
   Vikas Publishing House Pvt. Ltd., New Delhi
   S.Chand & Company Ltd., New Delhi
   S.K.Katara & sons, Delhi
5. Engineering Drawing with an Introduction to AutoCAD By D.A.Jolhe
6. Computer Aided Engineering Drawing, S. Trymbaka Murthy
Computer Programming and Utilization

1 **Introduction to Computer & Programming:** Introduction, Basic block Diagram and functions of various components of computer. Concept of Hardware and Software. Concept of basic types of software. Introduction to programming and programming languages. Flow charts and algorithms.

2 **Introduction to C Language:**


   II **Functions and recursion:** Concepts of functions with various types of parameters. Various types of parameter passing mechanisms. Recursive functions and implementation of these concepts in ‘C’.

   III **Pointers and structures:** Concepts of pointers and simple programs using pointers. Introduction to simple structure and its implementations.

3 **Introduction to C++ language**

   I Principles of object oriented programming, Comparison with procedural languages, Tokens, expressions and control structures

   Introduction to functions, classes, objects, constructors, destructors in C++. Classes and Objects: Declaring classes, defining member functions, Making an outside function inline, nesting of member functions, private member functions, Arrays with in a class, Memory allocation of objects, static data members, static member functions, arrays of objects, objects as function arguments, friend function, returning of objects, const member function.

Text books:

1. Title : Programming in ANSI C, 4th edition
   Author: Balagurusamy E
   Publisher: Tata McGraw-Hill Publishing Company limited

2. Object oriented programming with C++, 3rd edition
   Author: Balagurusamy E
   Publisher: Tata McGraw-Hill Publishing Company limited
### Communication Skills

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<tr>
<th>Unit</th>
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| Unit – 1 | Communication skills  
Process, types and levels of communication.  
Technical Communication and General Communication. Factors to be considered in technical communication. |
| Unit – 2 | Verbal and non-verbal communication (kinesics)  
Components of Non-verbal Communication (Kinesics)  
Barriers to effective communication. (Noise in oral and written communication) Communication across cultures. |
| Unit – 3 | Listening skills - Types of Listening  
Active Listening V/s Passive Listening  
Empathetic Listening. Traits of a good listener, barriers in effective listening,  
Tips for effective listening. |
| Unit – 5 | Interviews  
Introduction, General preparations for an interview, Types of questions generally asked at the interviews. Types of interviews, Importance of non-verbal aspects. |
| Unit – 6 | Group Discussions  
Introduction, Group discussions as a part of the selection process, guidelines for group discussion. Role functions in group discussion. |
| Unit – 8 | Letter - Writing  
| Unit – 9 | Technical reports  
Introduction, types of reports, structure of reports, objectives and characteristics of reports. |
| Unit – 10 | Technical Proposals  
Definition, Purpose, Types, Characteristics, Structure, Style and appearance. |
| Unit – 11 | Technical Descriptions |
Introduction, Definition of an object or a process. Guidelines for writing good description - organization, content, structure.

Unit – 12 Effective Reading Skills
Purpose of reading, skimming and scanning. Tips for improving comprehension skills.

Unit – 13 Job application

Unit – 14 Grammar and Vocabulary

Reference books:

1. Technical Communication Principles and Practice
   - Meenakshi Raman, Sangeeta Sharma (OUP)


3. Basic Communication Skills for Technology
   Andrea J. Rutherford (Pearson Education)

4. Communication Skills for Technical Students
   T.M. Farhathullah (Orient Longman)

5. A Textbook of English for Engineers and Technologists.
   Prepared by Humanities & Social Sciences Division. Anna University, Chennai. (Orient Longman)

6. Communication Skills for Engineers
   - Sunita Mishra, C, Murali Krishna (Pearson Education)

7. English for Technical Communication
   - K.R. Lakshminarayanan
   (Scitech Publications, Chennai.)

8. Basics of Management and Communication Skills
   - Dr. P.C. Shejwalkar (Everest Publishing House)
   - Matthukutty M. Monippally
     (Tata – McGraw – Hill)

10. Body Language
    - Allan Pease
     (Sheldon Press, London)

11. A Communicative Grammar of English
    - Geoffrey Leech, Jan Swartvik (ELBS – with Longman)