

# SAURASHTRA UNIVERSITY RAJKOT



Accredited Grade 'A' by NAAC

Syllabus for M.Sc. (Applied Physics) Integrated  
Semester - I  
(Based on UGC-CBCS-2015)

Under

Department of Nano science  
&  
Advanced Materials

Effective from June -2016

Saurashtra University,  
University Road, University Campus  
Rajkot- 360005  
Gujarat, India

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# Semester - I

## Paper I: Foundation Course (Communication Skills)

### Unit 1 COMMUNICATION: IT'S SIGNIFICANCE & GRAMMAR:

Basic Concepts of Communication; Process of Communication; Types of Formal communication; The Media of Communication; Channels of Communication; Barriers in Communication; How to Overcome Barriers to Communication. Grammar: Synonyms; Antonyms; Words used as different parts of speech; Spotting errors; Concord; Principle of proximity between subject and verb.

### Unit 2 SYNTAX, READING SKILLS & WRITING SKILLS:

Sentence Structure; Combination and Transformation of sentences; Verb Patterns in English. **Reading Skills:** Purpose and Process of Reading; Reading Tactics; Reading Strategies; Reading Comprehension; Paraphrase; Preparing outlines of paragraph/text. **Writing Skills:** Elements of Effective Writing; Job Application, Bio-data, Personal Resume and Curriculum Vitae; Preparing Agenda and Minutes of a Meeting; Back office job for organizing a conference/seminar; Writing Styles; Scientific and Technical Writing; Summary Writing; Writing paragraphs; Writing Essays.

### UNIT 3 LISTENING SKILLS, TECHNICAL REPORT & SELF DEVELOPMENT:

Process of listening; Hard and Soft Skills; Feedback Skills; Essentials of Good Communications; Types of Listening; Barriers to Listening; Note taking and Note making. **Speaking Skills:** Skills of Effective Speaking; Component of an Effective Talk; Tone of Voice; Accent, Body Language; Timing and Duration of Speech; Audio-Visual Aids in Speech. Technical Report: Main considerations in writing a good report; Types and Structure of Reports; Collecting Data; Technical Proposals; Visual Aids; General Tips for Writing Reports. **Self-Development:** Know yourself; Tips for giving an Interview; Body language for Interviews; Group Discussion; Skills of participating in meeting; Attending Calls; Soft Skills & Leadership.

### Recommended-Book

The Functional Aspects of Communication Skills, Prajapati Prasad and Rajendra K. Sharma, S. K. Kataria & Sons, New Delhi, Reprint 2007.

### Reference Books

1. Business Communication, Sinha K. K, S. Chand, New Delhi.
2. Business Communication, Asha Kaul, Prentice Hall of India.
3. Business Correspondence and Report Writing: A Practical Approach to Business and Technical Communication, Sharma, R.C. and Krishna Mohan, Tata McGraw-Hill.
4. A New Approach to English Grammar for High Schools, Madan Sabina, Spectrum Books, New Delhi.

# Semester - I

## Paper II: Fundamental of Mathematics

### **Unit-I: Determinants & Matrices**

Definition of a determinant, Minors & Co-factors, Expansion of determinants, properties of determinants, Multiplication of determinants, Solution of Simultaneous linear equations- Cramer's Rule.

Definition of a matrix, Types of matrices, Matrix operations, Related Matrices, Solution of simultaneous equations, Rank of a matrix, Elementary row and column operations on a matrix, row and column vectors, linear independence of row and column vectors, row and column rank of a matrix, equivalence of row and column ranks, Condition for consistency of simultaneous equations, Eigen values and Eigen vectors, Characteristic equation, Cayley-Hamilton Theorem.

### **Unit-II: Complex Numbers**

Rectangular, polar and exponential forms of complex numbers, DeMoivre's Theorem, Powers, roots and logarithm of complex numbers, Hyperbolic and circular functions and their relations, Properties of hyperbolic functions, Inverse circular functions.

### **Unit-III: Differential Equations & their applications**

Differential equations of first order and first degree, Variable separable form, Homogeneous differential equations, Bernaulli's and exact differential equations, examples of non-homogeneous equations, Condition for exactness, Integrating factor, rules of finding integrating factors, Linear differential equations with constant coefficients, Differential equations of first order and first degree solvable for x, solvable for y, solvable for p. Clairaut's and Lagrange's forms.

Newton's law of Cooling, Kirchoff's law of electrical circuits, motion under gravity, simple harmonic motion.

### **Unit-IV: Vector Analysis**

Vectors, Scalar(dot) product of vectors, Vector( cross ) product of vectors, Right handed and Left handed systems, Vector areas, Physical applications, Scalar and Vector products of three vectors, Applications to Solid Geometry, Differentiation of vectors, Velocity and Acceleration, Scalar and Vector point functions, Gradient, Divergence and Curl.

## Semester - I

### Paper III: Applied Physics – I

#### **Unit I:**

**1. Units & Dimensions:**

Introduction, Rules for writing units, systems of units Definitions, practical units, fundamental of derived units, Dimensions of Physical Quantity, Conversion of Units, Limitations.

**2. Force & Motion:**

Introduction, Unit of Force, Graphical representation, Various Laws of forces, Newton's Laws of Motion, Force of friction.

**3. Motion in two dimensions:**

Circular motion & Projectile motion, Uniform circular motion, non-uniform circular motion, centrifugal forces, inertial and non-inertial frames, projectile motion, various cases of projectile motion.

#### **Unit II:**

**1. Elasticity:**

Elastic behavior, some definitions, Young modulus, bulk modulus & modulus of rigidity, relation between elastic constants.

**2. Fluids:**

Characteristics of fluids, thrust & Pressure, Pascal's principle, surface tension, capillarity, experimental determination of surface Tension, Viscosity, Stokes Law, Streamline and turbulent flow, Bernoulli's theorem.

#### **Unit III:**

**1. Temperature & its measurements**

Temperature & Thermometry, scale of temperature, types of thermometer, other thermometers.

**2. Transfer of transmission of heat**

Thermal conductivity, its application, convection, Radiation, Prevost's theorem, perfect black body, Kirchhoff's law, Stefan's law, Wien's displacement law, Newton's law of cooling.

#### **Unit IV:**

**1. Waves and Vibrations:**

Types of Waves, characteristics of waves, Simple Harmonic Motion (SHM), Equations of Simple Harmonic Motion, Free-Forced and resonant vibrations, Sound of Light waves.

**Book: Applied Physics (Theory & Practical's) - S.L. Kakani & Shubhra Kakani**

Pub: - Viva Books, 2015, edu.

**Semester - I**  
**Paper IV Applied Physics –II**

**Unit I:**

**1. Sound Waves**

Longitudinal Waves in fluid, Velocity of Sound Wave in medium (Solid, Liquid, & Gases), factors affecting velocity of sound waves, superposition of waves, stationary wave, interference, beats, vibration of string, laws of transverse vibrations of string, vibrations of air columns, Meld's Experiments.

**2. Acoustics**

Architectural acoustics, Reverberation Derivation and Reverberation time, Absorption Coefficient, Acoustic designs & Acoustic materials.

**3. Ultrasonic's**

Definitions, Production & Detection of Ultrasonic's, Application of Ultrasonic's.

**Unit II:**

**1. Electrostatic**

Electrical Charge, Coulomb's law, Electric field, electric field due to point charge, electric lines of force, Electric Flux, Gauss's Law, Electric Potential, Electric Potential Energy.

**Unit III:**

**1. Direct Current Electricity**

Electric Current, Electro Motive Force (e.m.f), ohms Law, resistance & resistivity, conductance and conductivity

Types of resistance, color codes, classification of substances according to resistivity, Kirchhoff's Law, combination of resistances, potentiometer, Galvanometers, Ammeters & Voltmeters.

**Unit IV:**

**1. Electromagnetic Induction**

Magnetic Flux, Faradays laws of Electromagnetic Induction, motional EMF, Eddy Currents, types of electromagnetic inductions (Self & Mutual Induction).

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