

## 1.1 ENGLISH AND COMMUNICATION SKILLS - I

**L T P**  
**3 - 2**

### RATIONALE

The curriculum aims to develop the use of English for three major purposes social interaction, academic achievement and professional use. Listening, speaking, reading, and writing skills can not be thought of as independent skills. They are generally perceived as interdependent where one skill often activates the other skills as well as the paralinguistic skills required for the achievement of effective communication. It is believed that the most effective way to achieve these purposes is through the adoption of a thematic, integrated, content-based approach to teaching and learning.

### DETAILED CONTENTS

#### 1. INTRODUCTION

##### Theory:

(10 Hrs.)

- Definition, Introduction and Process of Communication
- Objectives of Communication
- Essentials of Communication
- Media and Modes of Communication
- Channels of Communication
- Barriers to Communication
- Body language
- Humour in Communication
- Silence in Communication

**Note:** Teachers are expected to give practical examples, while teaching above topics

#### 2. LISTENING

**Theory:** Significance, essentials, barriers and effectiveness of Listening. (04 Hrs.)

**Practicals:** The following exercises to be conducted in practical sessions:

- Using pre-recorded CDs/DVDs with pre-listening exercise to prepare students about what they are going to hear and comprehension based on the audio
- Note-taking
- Listening for the main ideas
- Assessing listening proficiency

### 3. SPEAKING

**Theory:** (06 Hrs.)

- Significance, essentials, barriers and effectiveness of Speaking
- Introduction to phonetics (Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics)

**Practicals:** The following exercises to be conducted in practical sessions:

- Exercises on pronunciation of common words as given in the standard dictionary using symbols of phonetics
- Greetings for different occasions
- Introducing oneself, others and leave taking (talking about yourself)
- Just a minute (JAM) sessions: Speaking extempore for one minute on given topics
- Paper reading before an audience (reading unseen passages)
- Situational Conversation/role-playing with feedback, preferably through video recording
- Reading aloud of Newspaper headlines and important articles
- Improving pronunciation through tongue twisters

### 4. READING

**Theory:** (10 Hrs.)

- Techniques of reading: Skimming, Scanning, Intensive and Extensive Reading
- Comprehension, Vocabulary enrichment and grammar exercises based on the following selective readings:

#### Section-I

- Homecoming – R.N. Tagore
- The Selfish Giant - Oscar Wilde
- The Stick – Justice Surinder Singh

#### Section-II

- I Have A Dream – Martin Luther King
- My struggle for An Education- Booker T Washington
- Life Sketch of Sir Mokshagundam Visvesvarayya

#### Section-III

- Ozymandias – P.B. Shelley
- Daffodils – William Wordsworth
- Stopping by Woods on a Snowy Evening – Robert Frost
- Comprehension exercises on unseen passages
- Exercises on interpretation of tables, charts, graphs, signs and pictures etc.

**Practicals:**

- Paper reading
- Poetry recitation
- Reading newspaper headlines

## 5. WRITING

**Theory:** (06 Hrs.)

- Significance, essentials and effectiveness of writing
- Paragraph of 100-120 words

**Practicals:**

- Exercises on spellings
- Group exercises on writing paragraphs on given topics

## 6. VOCABULARY

**Theory:** (06 Hrs.)

- Vocabulary of commonly used words
- Pair of words (Words commonly confused and misused)

**Practicals:**

- To look up words in a Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics
- To seek information from an Encyclopedia

## 7. GRAMMAR

**Theory:** (06 Hrs.)

- Identification of parts of speech
- Using a word as different parts of speech
- Correction of in-correct sentences
- Tenses
- Voice

**Note:** Teachers are expected to give practical examples, while teaching above topics

## RECOMMENDED BOOKS

1. Spoken English (2<sup>nd</sup> Edition) by V Sasikumar & PV Dhamija; Published by Tata MC Graw Hills, New Delhi.
2. Spoken English by MC Sreevalsan; Published by M/S Vikas Publishing House Pvt. Ltd; New Delhi.
3. Spoken English –A foundation course (Part-I & Part-II) By Kamlesh Sdanand & Susheela Punitha; Published by Orient BlackSwan, Hyderabad
4. Practical Course in English Pronunciation by J Sethi, Kamlesh Sadanand & DV Jindal; Published by PHI Learning Pvt. Ltd; New Delhi.
5. A Practical Course in Spoken English by JK Gangal; Published by PHI Learning Pvt. Ltd; New Delhi.
6. English Grammar, Composition and Usage by NK Aggarwal and FT Wood; Published by Macmillan Publishers India Ltd; New Delhi.

7. Business Correspondence & Report writing (4<sup>th</sup> Edition) by RC Sharma and Krishna Mohan; Published by Tata MC Graw Hills, New Delhi.
8. Business Communication by Urmila Rani & SM Rai; Published by Himalaya Publishing House, Mumbai.
9. Business Communication Skills by Varinder Kumar, Bodh Raj & NP Manocha; Published by Kalyani Publisher, New Delhi.
10. Professional Communication by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
11. Business Communication and Personality Development by Bsiwajit Das and Ipseeta Satpathy; Published by Excel Books, Delhi
12. Succeeding Through Communication by Subhash Jagota; Published by Excel Books, Delhi
13. Communication Skills for professionals by Nira Konar; Published by PHI Learning Pvt. Ltd; New Delhi.
14. Developing Communication Skills (2<sup>nd</sup> Edition) by Krishna Mohan & Meera Banerji; Published by Macmillan Publishers India Ltd; New Delhi.
15. Effective Technical Communication By M .Ashraf Rizwi; Published by Tata MC Graw Hills, New Delhi.
16. Basic Communication Skills for Technology by Andrea J Rutherford; Published by Pearson Education, New Delhi
17. English & Communication Skills for students of Science & Engineering by SP Dhanavel; Published by Orient BlackSwan, Hyderabad.
18. Technical Communication- Principles & Practices by Meenakshi Raman & Sangeetha Sharma; Published by Oxford University Press, New Delhi.
19. Technical English by S. Devaki Reddy & Shreesh Chaudhary; Published by Macmillan Publishers India Ltd; New Delhi.
20. Advanced Technical Communication, by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
21. Communication Skills for Engineer & Scientist by Sangeeta Sharma & Binod Mishra; Published by PHI Learning Pvt. Ltd; New Delhi.

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	20
2	04	08
3	06	14
4	10	22
5	06	12
6	06	12
7	06	12
<b>Total</b>	<b>48</b>	<b>100</b>

## LIST OF COMMONLY USED ADMINISTRATIVE TERMS

1. Senior	वरिष्ठ	ਸੀਨੀਅਰ, ਉੱਚਾ, ਵੱਡਾ
2. Cashier	खजान्ची, रोकड़िया	ਰੋਕੜੀਆ
3. Consent	सहमति	ਸਹਮਤੀ
4. Earned Leave	अर्जित अवकाश	ਕਮਾਈ ਛੁੱਟੀ
5. Under Consideration	विचाराधीन	ਵਿਚਾਰ ਅਧੀਨ
6. Criterion	कसौटी	ਕਸੌਟੀ
7. Staff	कर्मचारी	ਅਮਲਾ, ਸਟਾਫ
8. Tenure	कार्यकाल	ਕਾਰਜ ਕਾਲ
9. Working Committee	कार्य समिति	ਕਾਰਜ ਸਮਿਤੀ
10. Estate	सम्पदा	ਸੰਪਦਾ
11. Self-Sufficient	आत्मनिर्भर	ਆਤਮਨਿਰਭਰ
12. Emergency	आपातकाल	ਆਪਤਿ ਕਾਲ
13. General Body	आम सभा	ਆਮ ਸਭਾ
14. Exemption	छूट	ਛੁੱਟ
15. Daily Wages	दिहाड़ी, दैनिक वेतन	ਦਿਹਾੜੀ, ਰੋਜ਼ਾਨਾ ਉਜਰਤ
16. Death-Cum Retirement	मृत्यु व निवृत्ति	ਮ੍ਰਿਤੂ ਅਤੇ ਨਿਵਰਤੀ
17. Dispatch Register	रवानगी रजिस्टर, प्रेषण रजिस्टर	ਰਵਾਨਗੀ ਰਜਿਸਟਰ
18. Dispatch	रवानगी, प्रेषण	ਰਵਾਨਗੀ
19. Stenography	आशुलिपि	ਆਸ਼ੁਲਿਪੀ, ਸਟੈਨੋਗ੍ਰਾਫੀ
20. Assurance	दिलासा, आश्वासन	ਦਿਲਾਸਾ
21. Justify	सही साबित करना	ਠੀਕ ਸਾਬਿਤ ਕਰਨਾ
22. Superior	बढ़िया, उच्चकोटि	ਉੱਚ/ ਵਧੀਆ
23. High Commission	उच्चायुक्त	ਉੱਚ ਆਯੁਕਤ
24. Simultaneous	साथ-साथ	ਨਾਲ-ਨਾਲ
25. Precaution	एहतियात, सतर्कता, सावधानी	ਇਤਿਆਤੀ
26. Commanding Officer	कमांडिंग ऑफसर	ਕਮਾਨ ਅਫਸਰ
27. Negligence	लापरवाही	ਲਾਪਰਵਾਹੀ
28. Performance	निष्पादन	ਨਿਭਾਉਣ, ਪ੍ਰਦਸ਼ਨ
29. Proof Reader	प्रूफ रीडर	ਪਰੂਫ ਰੀਡਰ
30. Take Over	काम संभालना	ਕੰਮ ਸੰਭਾਲਨਾ
31. Timely Compliance	समय दौरान पूरा करना	ਸਮੇਂ ਵਿਚ ਪੂਰਾ ਕਰਨਾ
32. Responsibility	जिम्मेदारी	ਜ਼ਿੰਮੇਦਾਰੀ
33. Chief Justice	मुख्य न्यायधीश	ਮੁੱਖ ਨਿਆਇਧੀਸ਼
34. Disciplinary Action	अनुशासनिक कार्यवाही	ਅਨੁਸ਼ਾਸਨਿਕ ਕਾਰਵਾਈ
35. Efficiency Bar	दक्षता रोक	ਦਖਿਅਤਾ ਰੋਕ
36. Flying Squad	उड़न दस्ता	ਉਡਣ ਦਸਤਾ
37. Regret	खेद	ਖੇਦ
38. Inconvenience	असुविधा	ਅਸੁਵਿਧਾ
39. Ambiguous	अस्पष्ट	ਅਸਪਸ਼ਟ
40. Part Time	अशंकालीन	ਅੰਸਕਾਲਿਕ
41. Academy	अकादमी	ਅਕਾਦਮੀ
42. Disparity	असमानता	ਅਸਮਾਨਤਾ
43. Extraordinary	असाधारण	ਅਸਧਾਰਨ
44. Provisional	अस्थायी	ਕੱਚਾ
45. Income Tax	आयकर	ਆਯਕਰ, ਆਮਦਨ ਕਰ
46. Bonafide	असली	ਅਸਲੀ / ਅਸਲ
47. Acting in Official Capacity	बतौर अधिकारिक हैसियत	ਬਤੌਰ ਅਧਿਕਾਰੀ ਹੈਸਿਅਤ
48. Contractor	ठेकेदार	ਠੇਕੇਦਾਰ
49. On probation	परिवीक्षाधीन	ਅਜਮਾਇਸ਼ ਤੇ
50. State	राज्य	ਰਾਜ

## 1.2 APPLIED MATHEMATICS - I

L T P  
5 - -

### RATIONALE

Applied Mathematics forms the backbone of engineering students. Basic elements of algebra, trigonometry, coordinate geometry have been included in the curriculum as foundation course. This course will develop analytical abilities to make exact calculations and will provide continuing educational base to the students.

**Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.**

### DETAILED CONTENTS

- |      |   |          |
|------|---|----------|
| 1.   | Algebra   | (30 hrs) |
| 1.1  | Complex Numbers: Complex number, representation, modulus and amplitude. De-movier's theorem, its application in solving algebraic equation.   |          |
| 1.2  | Basics and properties of logarithms and its applications in solving problems related to basic logarithmic formulas.   |          |
| 1.3  | Geometrical progression, its nth term and sum of n terms and to infinity. Application of Arithmetic progression and Geometrical progression to Engineering problem such as maximum possible output of the machine, vibration of the spring, finding out capacity of tank etc. |          |
| 1.4. | Partial fractions (linear factors, repeated linear factors, non-reducible quadratic factors excluding repeated factors)   |          |
| 1.5  | Permutations and Combinations: Value of ${}^n P_r$ ${}^n C_r$ . Simple problems of formulation of words from given alphabets (with and without repetition), circular permutations etc.  |          |
| 1.6  | Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof) first and second binomial approximation with applications to engineering problems   |          |

2. Trigonometry (25 hrs)
- 2.1 Concept of angles, measurement of angles in degrees, grades and radians and their conversions. Applications of angles such as angle subtended by an arc, diameter of moon etc.
  - 2.2 T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T-Ratios of multiple angles, sub-multiple angles ( $2A$ ,  $3A$ ,  $A/2$ ).
  - 2.3 Graphs of  $\sin x$ ,  $\cos x$ ,  $\tan x$  and  $e^x$
  - 2.4 Applications of Trigonometric terms in engineering problems such as to find an angle of elevation, height, distance etc.
3. Co-ordinate Geometry (25 hrs)
- 3.1 Cartesian and Polar coordinates (two dimensional), conversion from cartesian to polar coordinates and vice-versa, distance between two points (cartesian co-ordinates), section formulae
  - 3.2 Area of triangle when its vertices are given, co-ordinates of centroid, in center of a triangle when the vertices are given, simple problems on locus.
  - 3.3 Equation of straight line in various standard forms (without proof), intersection of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula
  - 3.4 General equation of a circle and its characteristics. To find the equation of a circle, given:
    - \* Centre and radius
    - \* Three points lying on it
    - \* Coordinates of end points of a diameter
  - 3.5 Equation(s) of a straight line, circle, and conics (ellipse, parabola and hyperbola) and their applications in engineering problems..

### INSTRUCTIONAL STATREGY

Basic elements of algebra, trigonometry and coordinate geometry can be taught in the light of their applications in the field of engineering and technology. By laying more emphasis on applied part, teacher can also help in providing a good continuing education base to the students.

### RECOMMENDED BOOKS

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
3. Applied Mathematics by RD Sharma
4. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar
5. Comprehensive Mathematics, Vol. I & II by Luxmi Publications
6. Engineering Mathematics by Dass Gupta
7. Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi
8. Engineering Mathematics, Vol I, II & III by V Sundaram et al, Vikas Publishing House (P) Ltd., New Delhi
9. Engineering Mathematics by S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi
10. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
11. Engineering Mathematics, Vol I & II by AK Gupta, MacMillan India Ltd., New Delhi
12. Applied Mathematics I, Archana Sharma, Lords Publications, Jalandhar
13. Advanced Engineering Mathematics by Peter V. Oneil, University of Alabama, 2007 edition, Cengage Learning India Pvt. Ltd. Patparganj, New Delhi

### SUGGESTED DISTRIBUTION OF MARKS

Sr. No.	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Algebra	30	35
2	Trigonometry	25	35
3	Co ordinate Geometry	25	30
<b>Total</b>		<b>80</b>	<b>100</b>



### 1.3 APPLIED PHYSICS – I

**L T P**  
**4 - 2**

#### RATIONALE

Applied physics includes the study of a large number of diverse topics all related to things that go on in the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects will behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

**Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.**

#### DETAILED CONTENTS

1. Units and Dimensions ( 8 hrs)
  - 1.1 Physical quantities
  - 1.2 Units - fundamental and derived units, systems of units (FPS, CGS, MKS and SI units)
  - 1.3 Dimensions and dimensional formulae of physical quantities
  - 1.4 Dimensional equations and principle of homogeneity, applications to conversion from one system of units to another, checking the correctness of physical relations and derivation of simple physical relations, limitations of dimensional analysis
  - 1.5 Error in measurement, random and systematic errors
  - 1.6 Application of units and dimensions in measuring length, diameter, Circumference, volume, surface area etc. of metallic and non metallic blocks, wires, pipes etc (at least two each).
2. Force and Motion (10 hrs)
  - 2.1 Scalar and vector quantities – examples, addition and multiplication (scalar product and vector product) of vectors
  - 2.2 Force, resolution and composition of forces: resultant, parallelogram law of forces, equilibrium of forces
  - 2.3 Newton's Laws of motion: concept of momentum, Newton's laws of motion and their engineering applications, derivation of force equation from Newton's second law of motion; conservation of momentum, impulse. Simple numerical problems

- 2.4 Circular motion: angular displacement, angular velocity and angular acceleration
- 2.5 Relation between linear and angular variables (velocity and acceleration)
- 2.6 Centripetal force (derivation) and centrifugal force with its application such as banking of roads, bending of cyclist, motion in vertical circle etc
- 2.7 Application of various forces in lifts, cranes, large steam engines and turbines,
- 3. Waves and Vibrations (10 hrs)
  - 3.1. Wave motion: transverse and longitudinal wave motion with examples, sound and light waves, velocity, frequency and wave length of a wave (relationship  $v = n\lambda$ ) and their applications
  - 3.2 Wave equation,  $y = r \sin \omega t$ , phase, phase difference, superposition of waves and their applications.
  - 3.3 Simple Harmonic Motion(SHM): definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M.
  - 3.4 Free, forced and resonant vibrations with examples
  - 3.5 Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications
  - 3.6 Ultrasonics – production (magnetostriction and piezoelectric methods) and their engineering and medical applications
- 4 Rotational Motion ( 6 hrs)
  - 4.1 Concept of translatory and rotating motion with examples
  - 4.2 Definitions of torque, angular momentum and their relationship
  - 4.3 Conservation of angular momentum (qualitative) and its examples
  - 4.4 Moment of inertia and its physical significance, radius of gyration, Theorems of parallel and perpendicular axes (statements), Moment of inertia of rod, disc, ring and sphere (Formulae only).
  - 4.5 Application of rotational motions in transport vehicles, trains and aero plane turbine/engine.

- 5      Work, Power and Energy      (10 hrs)
- 5.1      Work: definition and its SI units
  - 5.2      Work done in moving an object on horizontal and inclined plane (incorporating frictional forces) with its application
  - 5.3      Power: definition and its SI units, calculation of power with numerical problems
  - 5.4      Energy: Definition and its SI units: Kinetic energy and Potential energy with examples and their derivation
  - 5.5      Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another with its application
  - 5.6      Friction: concept, types and its engineering applications.
  - 5.7      Application of Friction in brake system of moving vehicles, trains, aero planes and other objects.
- 6      Properties of Matter      (10 hrs)
- 6.1      Elasticity: definition of stress and strain, different types of modulus of elasticity, stress – strain diagram, Hooke's law with its applications
  - 6.2      Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, U-tube, manometers and barometer gauges and their applications
  - 6.3      Surface tension: concept, its units, angle of contact, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension
  - 6.4      Fluid motion, stream line and turbulent flow, Equation of Continuity, Bernauli's Theorem and their applications.
  - 6.5      Viscosity and coefficient of viscosity: Buoyant force, buoyancy, Stoke's Law and derivation of terminal velocity, effect of temperature on viscosity and its application in hydraulic systems.
- 7      Thermometry      (10 hrs)
- 7.1      Difference between heat and temperature on the basis of K.E. of molecules
  - 7.2      Principles of measurement of temperature and different scales of temperature and their relationship

- 7.3 Resistance thermometers and Pyrometers with their field applications such as Thermocouple, Bi-metallic thermometer.
- 7.4 Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them
- 7.5 Modes of transfer of heat (Conduction, convection and radiation with examples)
- 7.6 Co-efficient of thermal conductivity, determination of thermal conductivity of good conductor (Searle's method) and bad conductor (Lee's disc method)
- 7.7 Application of various systems of thermometry in refrigeration and air-conditioning etc.

**LIST OF PRACTICALS (to perform minimum ten experiments)**

- 1. To find the diameter of wire using a screw gauge
- 2. To find volume of solid cylinder and hollow cylinder using a vernier calipers
- 3. To determine the thickness of glass strip and radius of curvature using a spherometer
- 4. To verify parallelogram law of forces
- 5. To find the time period of a simple pendulum and determine the length of second's pendulum.
- 6. To find the frequency of a tuning fork by a sonometer
- 7. To find the velocity of sound by using resonance apparatus at room temperature.
- 8. To find the Moment of Inertia of a flywheel about its axis of rotation
- 9. To find the surface tension of a liquid by capillary rise method
- 10. To determine the atmospheric pressure at a place using Fortin's Barometer
- 11. To determine the viscosity of glycerin by Stoke's method
- 12. To determine the coefficient of linear expansion of a metal rod
- 13. To find the coefficient of thermal conductivity of Bakelite sheet (bad conductor) by Lee's Disc Method
- 14. To determine the coefficient of thermal conductivity of a copper strip using Searle's Thermal Conductivity apparatus.

## INSTRUCTIONAL STATREGY

Teacher may use various teaching aids like models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics of mechanics, work power and energy, rotational motion, properties of matter etc. to develop proper understanding of the physical phenomenon. **Use of demonstration can make the subject interesting and develop scientific temper in the students.**

## RECOMMENDED BOOKS

1. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
2. Text Book of Physics for Class XII (Part-I, Part-II) N.C.E.R.T
3. Applied Physics Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, New Delhi
4. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
5. Fundamentals of Physics by Resnick and Halliday & Walker, Asian Book Pvt. Ltd., New Delhi
6. Berkeley Physics Course, Vol. I, II & III, Tata McGraw Hill, Delhi
7. The Feynman Lectures on Physics by Feynman, Leighton and Sands, Vol. I & II, Narosa Publishing House, Delhi
8. Comprehensive Practical Physics, Vol. I & II, JN Jaiswal, Laxmi Publishers
9. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
10. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar
11. Applied Physics by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar City
12. Physics by Nelcon and Parker Publishers UK
13. Engineering Physics by Vanchna Singh and Sheetal Kumar, Cengage Learning India Pvt. Ltd. Patparganj, Delhi (year 2008)

## SUGGESTED DISTRIBUTION OF MARKS

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Units and Dimensions	08	10
2	Force and Motion	10	15
3	Waves and Vibrations	10	15
4	Rotational Motion	06	10
5	Work, Power and Energy	10	20
6	Properties of Matter	10	15
7	Thermometry	10	15
	<b>Total</b>	<b>64</b>	<b>100</b>

## 1.4 APPLIED CHEMISTRY-I

L T P  
4 - 2

### RATIONALE

Every branch of engineering is expanding greatly. The contributions of chemicals and chemical products are playing important role in the field of engineering, biotechnology, agriculture and pharmacology etc. The numbers of such chemical products are exponentially increasing each successive year. This results in enhancing the responsibility of engineers while choosing engineering materials for converting them into finished products. Now a days, choosing engineering material is not only based conventional qualitative and quantitative testing of their chemical composition and behavior under service conditions, but also based on environmental and eco-friendly factors. To achieve such objectives it is essential to apply applied aspects of chemistry. In order to educate and train Engineers and skilled work force applied chemistry syllabus for diploma students in various engineering and technology courses is designed to develop scientific temper and appreciate physical and chemical properties of engineering materials, which are used in their professional career. Best efforts should be made to teach and train the skilled engineers and work force by imparting essential knowledge required from this subject through demonstrations, and minor projects.

**Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.**

### DETAILED CONTENTS

1. Basic Concepts of Chemistry (10 hrs)
  - 1.1 Units and Dimensions, dimensional formulas- dimensional analysis principle of homogeneity of dimensions and their limitations, derived units (with special reference to pressure, volume, temperature, density, specific gravity, surface tension, viscosity and conductivity, thermodynamic parameters-significance and applications)
  - 1.2 Matter, element, compound and mixtures, atoms, molecules, ions, symbols and formulae, Atomic mass (A), atomic number (Z) isotopes, isobars, isotone (recapitulation only)
  - 1.3 Mole concept, solution, standard solution, methods to express concentration of solution
    - 1.3.1 molar mass, molar volume of gases, strength of solutions in grams per liter, molarity (M), molality (m), mass and volume percentages and mole fraction
  - 1.4. Chemical equations, thermo-chemical equations, balancing of chemical equations and simple stoichiometric calculations.
  - 1.5 Numerical problems based on mole concept and molarity.

2. Atomic Structure, Periodic Table and Chemical Bonding (12 hrs)
  - 2.1 Fundamental particles- electrons, protons and neutrons
  - 2.2 Bohr's model of atom and its limitations (qualitative treatment only).
  - 2.3 Wave particle duality and Heisenberg's uncertainty principle (elementary idea only)
  - 2.4 Modern concept of atom, definition of orbit and orbitals, shapes of s and p orbitals only, quantum numbers (significance only), electronic configuration of elements up to atomic number 30 on the basis of Aufbau Principle, Pauli's Principle and Hund's Rule
  - 2.5 Modern periodic law and periodic table, groups and periods.
  - 2.6 Classification of elements into s, p, d, and f blocks (periodicity in properties are excluded)
  - 2.7 Chemical bond and cause of bonding.
  - 2.8 Ionic bond, valence bond approach of covalent bond, hybridization ( $sp^3$ ,  $sp^2$  and  $sp$ ) sigma ( $\sigma$ ) and pi ( $\pi$ ) bonds.
  - 2.9 Metallic bonding – electric, magnetic and dielectric properties based on Band model
  
3. Water (10 hrs)
  - 3.1 Sources of water, impurities in water (dissolved –gases, salts and suspended),
  - 3.2 Hardness of water, types of hardness, degree of hardness, units of hardness- ppm,  $^{\circ}\text{Cl}$ ,  $^{\circ}\text{Fr}$  – numerical problems
  - 3.3 Disadvantages of using hard water in domestic and in industries: Laundry work (action of soap on water), paper, textile and beverage industries.
  - 3.4 Boiler feed water and its quality - causes and prevention of
    - 3.4.1 Scale and sludge formation,
    - 3.4.2 Priming and foaming
    - 3.4.3 Boiler corrosion,
    - 3.4.4 Caustic embitterment
  - 3.5 Softening of hard water by
    - 3.5.1 Ion exchange process- dematerialized water advantages and limitations of this method
    - 3.5.2 Desalting of sea water by reverse osmosis (RO) method
    - 3.5.3 Calgon process
  - 3.6 Characteristics of drinking water and ICMR, ISI –quality criteria
  - 3.7 Water analysis: Quantitative analysis of hardness by EDTA method, alkalinity, and estimation of total dissolved solids (TDS)-numerical problems
  - 3.8 Enlist applications of various kinds of water in engineering and chemical industry.
  
4. Gas laws, Terminology of Thermodynamics and Equilibrium (14 hrs)
  - 4.1 Definition of gas and perfect gas, gas laws- Boyle's Law, Charles law & Avagadro's law, Gas constant (R).

- 4.2 Terminology of Thermodynamics- thermodynamic system, surroundings, types of systems, extensive and intensive properties, state of a system, state functions, isothermal, adiabatic reversible, irreversible spontaneous and non spontaneous processes, meaning of  $\Delta E$ ,  $\Delta H$ ,  $\Delta S$  and  $\Delta G$ , free energy of spontaneous and non spontaneous processes (mathematical derivations are excluded)
- 4.3 Elementary idea of zeroth, 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> laws of thermodynamics (without mathematical derivation)
- 4.4 Applications of free energy change ( $\Delta G$ ) criteria (in metallurgy and electric work without any mathematical derivation)
- 4.5 Equilibrium state and its significance statement of Le-Chatelier's principle, equilibrium constant (K) and its applications..
- 4.6 Electrolytes, non electrolytes, ionization in aqueous solutions, degree of ionization, ionic product of water ( $K_w$ )
- 4.7 Concept of pH, pH- scale and industrial applications of pH
- 4.8 Definitions - acids, bases, neutralization and acid base titrations, indicators and choice of indicators for acid base titration.
- 4.9 Buffer (acidic, basic and neutral) solutions, enlist applications of buffer solution
- 4.10 Simple numerical problems (only on 4.1, 4.5. 4.6 and 4.7 sections)
  
5. Electrochemistry (10 hrs)
  - 5.1 Electronic concept of oxidation and reduction, redox reactions
  - 5.2 Electrolytes, non-electrolytes and electrolysis,
  - 5.3 Faraday's Laws of electrolysis and applications in electrometallurgy and electroplating in automobile
  - 5.4 Standard reduction potential (SRP), activity series, electrochemical cell and their e.m.f
  - 5.5 Chemistry of commercial electrochemical cells
    - 5.5.1 primary cells - Daniel cell and dry cell
    - 5.5.2 secondary cell - lead acid storage cell, Wetson-cadmium cell, nicad battery, Lil battery, Hg – button cell and Ag- button cell
    - 5.5.3 Fuel cells
  - 5.6 Simple numerical problems related (to only 5.1, 5.3 and 5.4 sections).
  
6. Organic Chemistry (06 hrs)
  - 6.1 Tetra covalency of carbon in carbon compounds, catenation (definition only)
  - 6.2 Classification of organic compounds on the bases of functional group
  - 6.3 IUPAC nomenclature of simple organic compounds (containing one functional group only) and their common names (if any)



## LIST OF PRACTICALS

1. Introduction to volumetric analysis, apparatus used in volumetric analysis and molarity based calculations.
2. Preparation of standard solution of oxalic acid  $\{(COOH)_2 \cdot 2H_2O\}$  or potassium permanganate ( $KMnO_4$ ) or potassium dichromate ( $K_2Cr_2O_7$ )
3. To verify the physical (state, colour, odour solubility, boiling and melting points) properties and few chemical properties of ionic (e.g. NaCl) and covalent (kerosene oil or any other such compound may be given) compounds.
4. To determine strength of given solution of sodium hydroxide by titrating against standard solution of oxalic acid using phenolphthalein indicator.
5. To determine total acid number of given oil volumetrically
6. To prepare cuprammonium  $\{Cu(NH_3)_4SO_4\}$  and estimate cupric ion in the given solution of copper sulphate solution by spectrophotometric method..
7. To distinguish between aldehyde and ketone by Tollen's reagent (benzaldehyde and acetone may be used)
8. To verify the first law of electrolysis. (Electrolysis of copper sulphate solution using copper electrode).
9. To prepare iodoform from ethanol or acetone
10. To prepare bakelite
11. To prepare the Mohr's salt from ferrous sulphate and ammonium sulphate.
12. Estimation of hardness of water by EDTA method.
13. Estimation of total alkalinity in the given sample of water by titrating against standard solution of sulfuric acid
14. Determination of pH of given solution using pH meter.

## INSTRUCTIONAL STATREGY

Teacher may take help of various models and charts while imparting instructions to make the concepts clear. More emphasis may be laid on discussing and explaining practical applications of various chemical processes and reactions. In addition, students should be encouraged/motivated to study those processes in more details, which may find practical applications in their future professional life.

## RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuricose and J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C.Jain and Monika Jain, Dhanapat Rai Publishing Company, New Delhi.
3. Engineering Chemistry by Shashi Chawla.
4. Progressive Applied Chemistry – I by Dr. G.H. Hugar Eagle Prakashan, Jalandhar
5. Engineering Chemistry – A text Book by H. K. Chopra and A Parmer- Narosa Publishing House New Delhi.
6. Applied Chemistry-I by Dr.P.K. Vij & Shiksha Vij, Lords Publications, Jalandhar

7. Engineering Chemistry by Dr. Himanshu Pandey, Goel Publishing House, a unit of Krishna Prakashan Pvt. Ltd. Meerut, India, (year 2008)
8. Rapid Chemistry for peak performance by Anil Ahlawat, MTE books, 503, Taj Apartments, Ring Road, New Delhi (year 2008)
9. Applied Chemistry (Theory and Practice) by Vermani OP and Narula A.K., Cengage International Pvt. Ltd. New Delhi (year 2008)
10. Engineering Chemistry by Shelli Oberoi and Monica Malik, Cengage International Pvt. Ltd. New Delhi (year 2008)

### SUGGESTED DISTRIBUTION OF MARKS

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Basic Concepts of Chemistry	10	15
2	Atomic Structure Periodic Table and Chemical Bonding	12	20
3	Water	10	15
4	Gas laws, Language of Thermodynamics and Equilibrium	14	20
5	Electrochemistry	12	20
6	Organic Chemistry	06	10
<b>Total</b>		<b>64</b>	<b>100</b>

## 1.5 ENGINEERING DRAWING - I

L T P  
- - 7

### RATIONALE

Drawing is the language of engineers and technicians. Reading and interpreting engineering drawing is their day to day responsibility. The subject is aimed at developing basic graphic skills in the students so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis, while imparting instructions, should be to develop conceptual skills in the students following BIS SP 46 – 1988.

#### Note:

- i) First angle projection is to be followed
- ii) Minimum of 16 sheets to be prepared
- iii) Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students

### DETAILED CONTENTS

1. Introduction to Engineering Drawing
  - 1.1 Introduction to drawing instruments, materials and layout of drawing sheets.
2. Free Hand Sketching and Lettering (03 sheets)
  - 2.1 Different types of lines in Engineering drawing as per BIS specifications
  - 2.2 Practice of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagonal, pentagon with the help of drawing instruments.
  - 2.3. Free hand lettering (Alphabet and numerals) – lower case and upper case, single stroke, vertical and inclined at 75 degree in different standards, series of 3,5,8 and 12 mm heights in the ratio of 7:4
3. Dimensioning Technique (01 sheet)
  - 3.1 Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)
  - 3.2 Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sink holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches

#### 4. Scales (02 sheets)

4.1 Scales - their need and importance (Theoretical instructions).

4.2 Drawing of plain and diagonal scales

#### 5. Projection (05 sheets)

5.1 Theory of projections ( Elaborate theoretical instructions)

5.2 Projection of Points

5.2.1. Production of a point in the first quadrant.

5.2.2. Projection of a point in the third quadrant.

5.3 Projection of Straight Line

5.3.1. Line parallel to both the planes

5.3.2. Line perpendicular to any one of the reference plane

5.3.3. Line inclined to any one of the reference plane.

5.4 Drawing 3 views of given objects( Non-symmetrical objects may be selected for this exercise)

5.5. Drawing 6 views of given objects( Non-symmetrical objects may be selected for this exercise)

5.6. Identification of surfaces on drawn views and objects drawn

5.7. Exercises on missing lines and views

Note: At least one sheet in third angle projection

#### 6. Sections (02 sheets)

6.1 Importance and salient features, Methods of representing sections, conventional sections of various materials, classification of sections, conventions in sectioning

6.2 Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.

6.3 Drawing of different conventions for materials in section, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections

6.4 Exercises on sectional views of different objects.

7. Isometric Views (03 sheets)
- 7.1 Fundamentals of isometric projections (Theoretical instructions)
- 7.2 Isometric views of combination of regular solids like cylinder, cone, cube and prism..

### **RECOMMENDED BOOKS**

1. A Text Book of Engineering Drawing by Surjit Singh, Dhanpat Rai & Co., Delhi
2. Engineering Drawing by PS Gill, SK Kataria & Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt, Charotar Publishing House
4. Engineering Drawing I & II by JS Layall, Eagle Parkashan, Jalandhar

## 1.6 GENERAL WORKSHOP PRACTICE - I

L T P

- - 7

### RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hand on experience about use of different tools and basic manufacturing practices.

This course aims at developing general manual and machining skills in the students. Besides above, the development of dignity of labour, precision, safety at work place, team working and development of right attitude are the other objectives.

### DETAILED CONTENTS (PRACTICALS)

The following shops are included in the syllabus:

1. Carpentry and Painting Shop-I
2. Fitting Shop –I
3. Welding Shop-I
4. Electric Shop –I
5. Smithy Shop –I or Electronic Shop-I
6. Sheet Metal Shop-I

#### Note:

1. The branches e.g. Civil Engineering, Electrical Engineering, Mechanical Engineering, Mechanical (RAC), Production Engineering, Industrial Engineering, Tool and Die Making and Aeronautical Engineering will do **Smithy Shop - I** instead of Electronic shop- I
2. The branches e.g. Electronics and Communication Engineering, ECE (Spl. in Microprocessor), Electronics and Telecommunication Engineering, Instrumentation and Control, Computer Engineering and Information Technology will do **Electronic shop-I** instead of Smithy Shop-I.
3. The branches e.g Computer Engineering and Information Technology will do ONLY Workshop Practice –I. The details are given in their respective curricula.
4. The instructor is to first explain the introductory part given at the beginning under each shop followed by demonstration and practice by students.

## 1. Carpentry and Painting Shop – I

- 1.1 Introduction to various types of wood such as Deodar, Kail, Partal, Teak, Hollack, Sheesham, Champ, etc. (Demonstration and their identification).
- 1.2 Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed.  
Job I Marking, sawing, planning and chiseling & their practice
- 1.3 Introduction to various types of wooden joints, their relative advantages and uses.  
Job II Preparation of half lap joint  
Job III Preparation of Mortise and Tenon Joint
- 1.4 Demonstration of various methods of painting wooden items.  
Job IV Preparation of surface before painting including primar coat  
Job V Painting Practice by brush/roller/spray

## 2. Fitting Shop – I

- 2.1 Introduction to fitting shop tools, common materials used in fitting shop, Identification of materials. (e.g. Steel, Brass, Copper, Aluminium etc.). Identification of various sections of steel such as Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section, etc.
- 2.2 Description and demonstration of various types of work benches. holding devices and files. Precautions while filling.  
Job I Marking of job, use of marking tools and measuring instruments.  
Job II Filing a dimensioned rectangular or Square piece of an accuracy of  $\pm 0.25\text{mm}$   
Job III Filing practice (Production of flat surfaces) Checking by straight edge.
- 2.3 Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade.  
Job IV Making a cutout from a square piece of MS Flat using Hand hacksaw.

## 3. Welding Shop – I

- 3.1 Introduction to welding and its importance in engineering practice; types of welding; common materials that can be welded, introduction to welding equipment e.g. a.c. welding set, d.c. rectifier, Electrode holder, electrodes and their specifications, welding screens and other welding related equipment and accessories.
- 3.2 Electric arc welding, (ac. and dc.) precautions while using electric arc welding, Practice in setting current and voltage for striking proper arc.  
Job I Practice of striking arc while using electric arc welding set.

- Job II Welding practice on electric arc welding for making uniform and Straight weld beads
- 3.3 Various types of joints and end preparation.
  - Job III Preparation of butt joint by electric arc welding.
  - Job IV Preparation of lap joint by electric arc welding.
  - Job V Preparation of corner joint by using electric arc welding.
  - Job VI Preparation of Tee joint by electric arc welding.

#### 4. **Electric Shop – I**

- 4.1 Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, ceiling roses, battens, cleats and allied items, tools and accessories.
- 4.2 Study of electrical safety measures and demonstration about use of protective devices.
  - Job I Identification of phase, neutral and earth of domestic appliances and their connection to two pin/three pin, plugs.
  - Job II Preparation of a house wiring circuit using fuse, switches, socket, holder, ceiling rose etc. by batten wiring and PVC casing and capping
- 4.3 Study of common electrical appliances such as electric iron, electric kettle, ceiling fan, table fan, electric mixer, electric Geyser, desert cooler etc.
- 4.4 Introduction to the construction of a Lead-acid battery and its working.
  - Job III Installation of a battery and to connect two or more batteries in series and in parallel
  - Job IV Charging of a battery and testing it with the help of hydrometer and Cell Tester

#### 5. **Smithy Shop – I**

- 5.1 Demonstration and detailed explanation of tools and equipment used. Forging operations in Smithy shop. Safety measures to be observed in the smithy shop.
- 5.2 Demonstration and description of bending operation, upsetting operation, description and specification of anvils, swage blocks, hammers etc.
- 5.3 Demonstration and description of tongs, fullers, swages etc.
  - Job I To forge a L-Hook.
  - Job II To prepare a job involving upsetting process
  - Job III To forge a chisel
  - Job IV To prepare a cube from a M.S. round by forging method.

**OR**

#### 5. **Electronic Shop - I**

- 5.1 Identification and familiarization with the following tools used in electronic shop:



Tweezers, Screw drivers (different sizes), Insulated Pliers, Cutter, Sniper, Philips Screw Driver (Star Screw Driver), L- Keys, Soldering Iron and their demonstration and uses.

- 5.2 Identification and familiarization with the following electronic instruments:
  - a) Multimeter analog and digital (Three and half digit)
  - b) Single beam simple CRO, Signal Generator and Function Generator; function of every knob on the front panel
  - c) Audio-oscillator having sine and square wave output
  - d) Regulated Power supply -- fixed voltage and variable voltage, single output as well as dual output.

Job I Practice in the use of above-mentioned equipment. For this small experimental as set up may be done
- 5.3 Various types of protective devices such as : Wire fuse, cartridge fuse etc. ,
- 5.4 Identification and familiarization with ear phone speaker connector, telephone jacks and similar male and female connectors
- 5.5 Safety precautions to be observed in the electronic shop

**NOTE:**

**Demonstration Boards for the above components should be made.**

- Job II Cut, strip, join and insulate two lengths of wires/ cables (repeat with different types of cables/wires)
- Job III Cut, strip, connect/solder/crimp different kinds of wires/ cables (including co-axial and shielded cable) to different types of power/general purpose/Audio Video/Telephone plugs, sockets, jacks, terminals, binding posts, terminal strips, connectors. The tasks should include making complete recording/ playback/ antenna/ speaker leads for common electronic products such as Radio, TV, CD Players, VCD/DVD Players, Cassette Recorder and Players, Hi-Fi equipment, Hand- set, microphone
- Job IV Cut, bend, tin component, Leads, inserts and solder components (resistor, capacitor, diodes, transistors, FETs, IFT coils, ICs etc) on a PCB

**6. Sheet Metal Shop –I**

Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material.

- 6.1 Introduction and demonstration of hand tools used in sheet metal shop.
- 6.2 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine, Turning Machine, Wiring Machine, Setting Down Machine, Forming Machine , Brake etc.
- 6.3 Introduction and demonstration of various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheets etc.

6.4 Study of various types of Nuts, Bolts, Rivets, Steel Screws etc.

Job I Shearing practice on a sheet using hand shears.

- a) Practice on making Single riveted lap joint/Double riveted lap Joint.
- b) Practice on making Single cover plate chain type, zig-zag type and single rivetted Butt Joint

**RECOMMENDED BOOKS**

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay
2. Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.
3. Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi
4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
5. Workshop Technoogy by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi
6. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi