SEMESTER-IST

1.4 APPLIED CHEMISTRY-I

L	T	P
3	-	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 on 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 know applied aspects of chemistry. Applied chemistry for diploma students in various engineering and technology courses is designed to develop scientific temper and appreciation of physical and chemical properties of engineering materials, which are used in their professional career. Best efforts should be made to teach and train the engineers 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 (06 hrs)

   1.1 S.I. Units of pressure, volume, density, specific gravity, surface tension, viscosity and conductivity.
   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 Chemical equations, thermo-chemical equations, balancing of chemical equations

2. Atomic Structure, Periodic Table and Chemical Bonding (10 hrs)

   2.1 Fundamental particles- electrons, protons and neutrons
   2.2 Orbit & orbital, electronic configuration of elements (upto Z=30)
   2.3 Modern periodic law and periodic table, groups and periods.
   2.4 Chemical bond and cause of bonding- Ionic bond, covalent bond, and its types

3. Water (10 hrs)

   3.1 Sources of water
   3.2 Types of water based on dissolved salts.
      3.2.1 Hard water, soft water

3.2.2 Units to measure water hardness in ppm (mg/l) & simple numericals, degree Clark & degree French

3.3 Disadvantages of use of hard water in domestic and industrial applications (mainly boiler feed water)

3.4 Methods to remove water hardness by
- 3.4.1 Ion exchange process
- 3.4.2 Lime-soda process
- 3.4.3 Reverse Osmosis method

3.5 Quality criteria of drinking water as per BIS. (with special emphasis on hardness, total dissolved solids (TDS), Chloride, alkalinity present in water)

4. Solutions (08 hrs)

4.1 Concept of homogenous solution, brief introduction of the terms (i) Ionization (ii) Acidity (iii) Basicity (iv) equivalent weight and gram equivalent weight with suitable examples

4.2 Strength of a solution (i) Normality (ii) Molarity (iii) Molality as applied in relation to a solution.

4.3 Definition of pH, simple numericals and different industrial applications of pH.

4.4 Buffer solution and applications of buffer.

5. Electrolysis (08 hrs)

5.1 Definition of the terms: Electrolytes, Non-electrolytes with suitable examples

5.2 Faraday's Laws of Electrolysis and simple numericals

5.3 Different industrial applications of 'Electrolysis'

5.4 Applications of redox-reactions in battery technology such as (i) Dry cell (ii) lead acid battery and (iii) Ni-Cd battery

6. Environmental Chemistry (06 hrs)

6.1 Brief introduction to Environmental Chemistry & Pollution

6.2 Causes and effects of air, water & soil pollutions

6.3 Role of chemistry in controlling air, water & soil pollutions

LIST OF PRACTICALS

1. Volumetric analysis and study of apparatus used therein. Simple problems on volumetric analysis equation

2. Preparation of standard solution of oxalic acid or potassium dichromate

3. Determine the strength of solution of HCl with the help of a solution of NaOH and an intermediate solution of standard oxalic acid

4. Find the amount of chlorides in mg per liter in a sample of H_2O with the help of a solution of $AgNO_3$

5. Determine the degree of temporary hardness of water by EDTA titration

6. Estimation of total dissolved solids (TDS) in water sample gravimetrically

7. Estimation of total alkalinity of water volumetrically

8. Determine conductance, pH of water sample using conductance bridge and pH meter

9. Determine the percentage purity of commercial sample like blue vitriol, 12.5 g. of which have been dissolved per litre. Given M/20 $Na_2S_2O_3$.

10. Determination of solubility of a solid at room temperature

11. To verify the first law of electrolysis (electrolysis of copper sulphate solution using copper electrode)

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. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi

2. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra ; Kumar and Kumar Publishers (P) Ltd. Bangalore-40

3. A Text Book of Applied Chemistry-I by SS Kumar; Tata McGraw Hill, Delhi

4. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar

5. Engineering Chemistry by Jain PC and Jain M, Dhanpat Rai Publishers, Delhi

6. Chemistry of Engineering by Aggarwal CV

7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi

8. A Text Book of Applied Chemistry-I by Sharma and Others; Technical Bureau of India, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	14
2	10	20
3	10	20
4	08	16
5	08	16
6	06	14
Total	**48**	**100**

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.

DETAILED CONTENTS

1. Algebra (35 hrs)

1.1 Complex numbers: Complex numbers, representation, modulus and amplitude, Demovier's theorem and its applications in solving algebraic equation.

1.2 Geometrical progression, its nth term and sum of n terms and to infinity with application to engineering problems.

1.3. Partial fractions (linear factors, repeated linear factors, non-reducible quadratic factors excluding repeated factors)

1.4 Concept of permutations and Combinations: Value of ${}^{n}p_{r}$ ${}^{n}c_{r}$.

1.5. Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof)

2. Trigonometry (20 hrs)

Review of ratios of some standard angles (0,30,45,60,90 degrees), 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).

3. Co-Ordinate Geometry (25 hrs)

3.1 Equation of straight line in various standard forms (without proof), inter section of two straight lines, angle between two lines, perpendicular distance formula (without proof)

3.2 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

3.3. Equations of conics (ellipse, parabola and hyperbola), simple problems related to

engineering (standards forms only)

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 Dr. RD Sharma
4. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar
5. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
6. Engineering Mathematics by Dass Gupta
7. Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi
8. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
9. Engineering Mathematics, Vol I, II & III by V Sundaram et.al, Vikas Publishing House (P) Ltd., New Delhi
10. Engineering Mathematics by N.Ch.S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi
11. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
12. Engineering Mathematics, Vol I & II by AK Gupta, MacMillan India Ltd., New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	35	45
2	20	25
3	25	30
Total	**80**	**100**

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, types of errors, propagation of errors, significant figures

2. Force and Motion (12 hrs)

   2.1 Concept of Scalar and Vector quantities – examples, types of vectors.
   2.2 Resolution and Composition of vectors, Vector multiplication (scalar product and vector product of vectors), addition of vectors (Parallelogram law)
   2.3 Force: Newton's laws of motion, linear momentum and conservation of linear momentum, impulse and its application, simple numerical problem in brake system of vehicles and trains etc.
   2.4 Friction: Types of friction and its application.
   2.5 Circular motion: Angular displacement, angular velocity and angular acceleration
   2.6 Relation between linear and angular variables (velocity and acceleration)
   2.7 Centripetal force (derivation) and centrifugal force with application such as banking of roads and bending of cyclists
   2.8 Application of various forces in lifts

3 Rotational Motion (6 hrs)

3.1 Concept of translatory and rotating motion with examples

3.2 Definitions of torque, angular momentum and their relationship

3.3 Conservation of angular momentum (qualitative) and its examples

3.4 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).

3.5 Application of rotational motions in transport vehicles, trains and aero plane turbine/engine.

4 Work, Power and Energy (8 hrs)

4.1 Work: definition and its SI units

4.2 Work done in moving an object on horizontal and inclined plane (incorporating frictional forces) with its application

4.3 Power: definition and its SI units, calculation of power with numerical problems

4.4 Energy: Definition and its SI units: Kinetic energy and Potential energy with examples and their derivation

4.5 Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another with its application

5 Properties of Matter (10 hrs)

5.1 Elasticity: definition of stress and strain, different types of modulus of elasticity, stress – strain diagram, Hooke's law with its applications

5.2 Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications

5.3 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

5.4 Viscosity and coefficient of viscosity: Stoke's Law and derivation of terminal velocity, effect of temperature on viscosity.

6 Thermometry (10 hrs)

6.1 Difference between heat and temperature

6.2 Principles of measurement of temperature and different scales of temperature and their relationship

6.3 Types of thermometers (Concept only)

6.4 Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them

6.5 Modes of transfer of heat (Conduction, convection and radiation with examples)

6.6 Co-efficient of thermal conductivity

6.7 Engineering Application of conduction, convection and radiations

7. Waves and Vibrations (10 hrs)

7.1 Simple Harmonic Motion(SHM): definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M. Equation of simple harmonic progressive wave

7.2 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

7.3 Free, forced and resonant vibrations with examples

7.4 Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications

7.5 Ultrasonics – production (magnetostriction and piezoelectric methods) and their engineering and medical applications

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

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. Berkeley Physics Course, Vol. I, II &III, Tata McGraw Hill, Delhi
6. Comprehensive Practical Physics, Vol. I & II, JN Jaiswal, Laxmi Publishers
7. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
8. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar
9. Applied Physics by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar City
10. Engineering Physics by Vanchna Singh and Sheeetal Kumar, Cengage Learning India Pvt. Ltd. Patparganj, Delhi (year 2008)

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Units and Dimensions	08	15
2	Force and Motion	12	20
3	Rotational Motion	06	10
4	Work, Power and Energy	08	10
5	Properties of Matter	10	15
6	Thermometry	10	15
7	Waves and Vibrations	10	15
	Total	**64**	**100**

1.5 ENGINEERING DRAWING – I

L	T	P
-	-	8

RATIONALE

Drawing is said to be the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The course is aimed at developing basic graphic skills 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.

Note: 1. First angle projection is to be followed
2. Instruction relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

DETAILED CONTENTS

1. Drawing Office Practice, Lines & Lettering (2 Sheets)

1.1 Drawing instruments
1.2 Sizes and layout of standard drawing sheets and drawing boards

1.3 Different types of lines in engineering drawing as per BIS specifications

1.4 Free hand lettering (alphabet and numerals) lower case and upper case, single stroke vertical and inclined at 75 degree in different standard series of 2.5, 3, 5, 7, 10, and 15 mm heights in the ratio of 7:4

2. Dimensioning (2 Sheets)

2.1 Necessity of dimensioning, Types of dimensioning (chain, parallel and progressive dimensioning, size and location dimensioning)

Methods of placing dimensioning (Aligned and unidirectional system), use of leader lines. General principles of dimensioning.

2.2 Dimensioning of overall sizes, circles, thread holes, chamfered surfaces, angles, tapered surface holes equally spaced on PCD, counter sunk hole counter bored holes, cylindrical parts, narrow space and gaps, radii, curves and arches.

3. Simple Geometrical Constructions used in Engineering Practice (2 Sheets)

3.1 Construction of regular polygons (triangle, square, pentagon, hexagon) and circles
3.2 Ellipses (concentric circle method and Intersecting Arcs method)

3.3 Parabola (rectangle and tangent method), cycloid

4. Scale (2 sheets)

4.1 Scale – their need and importance, Definition of representative fraction (R.F), find RF of given scale

4.2 Construction of plain and diagonal scales

5. Principle of Projections (7 sheets)

5.1 Principle of orthographic projection and introduction to first angle projection and third angle projection

5.2 Projection of points situated in different quadrants (1 Sheet)
5.3 Projection of lines, Lines inclined to one plane and parallel to the other and vice versa (1st &3rd quadrants) (1 Sheet)
5.4 Projection of Planes: Planes perpendicular and parallel to either of the planes; planes perpendicular to one plane and parallel to the other or vice versa (1st & 3rd quadrants) (1 Sheet)

5.5 Drawing 3 orthographic views of given objects (3 sheets, at least one sheet in 3rd Angle Projection)

5.6 Identification of surfaces on drawn orthographic views from isometric object drawn (1Sheet)

6. Sectional Views (1 sheet)

6.1 Need for sectional views –Drawing of different conventions for materials in sections, conventional breaks for shafts, pipes, rectangular, square, angle, channel and rolled sections

7. Isometric Views (2 sheets)

   7.1 Fundamentals of isometric projections (theoretical instructions) and isometric scales
   7.2 Isometric views of combination of regular solids like cylinder, cone, cube, prism and pyramid

8. Development of Surfaces (2 sheets)

   8.1 Parallel line method (Prism and cylinder)
   8.2 Radial line method (Pyramid and Cone)

RECOMMENDED BOOKS

1. Elementary Engineering Drawing (in first angle projection) by ND Bhatt, Charotar Publishing House

2. A Text Book of Engineering Drawing by Surjit Singh published by Dhanpat Rai and Co., Delhi

3. Engineering Drawing by PS Gill published by SK Kataria and sons, Delhi

4. Engineering Drawing by RB Gupta published by Satya Prakashan, New Delhi

1.1 ENGLISH AND COMMUNICATION SKILLS - I

L	T	P
3	-	2

RATIONALE

Language is the most commonly used medium of self-expression in all spheres of human life – personal, social and professional. A student must have a fair knowledge of English language and skills to communicate effectively to handle the future jobs in industry. The objective of this subject is to enable the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the subject, the student will be able to develop comprehension skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English. It is expected that each polytechnic will establish a **communication skill laboratory** for conducting practicals mentioned in the curriculum.

DETAILED CONTENTS

1. Facets of Literature (14 hrs)

1.1 Short Stories

1.1.1 Homecoming – R.N. Tagore
1.1.2 The Selfish Giant - Oscar Wilde
1.1.3 The Diamond Necklace- Guy- De Maupassantt

1.2 Prose

1.2.1 I Have A Dream – Martin Luther King
1.2.2 On Habits – A. G. Gardiner
1.2.3 My struggle for An Education- Booker T Washington

1.3 Poems

1.3.1 Ozymandias – P.B. Shelley
1.3.2 Daffodils – William Wordsworth
1.3.3 Stopping by Woods on a Snowy Evening – Robert Frost

2. Grammar and Usage (10 hrs)

2.1 Parts of speech

2.1.1 Nouns
2.1.2 Pronouns
2.1.3 Adjectives

2.1.4 Articles
2.1.5 Verbs
2.1.6 Adverbs
2.1.7 Prepositions
2.1.8 Conjunction
2.1.9 Interjection
2.1.10 Identifying parts of speech
2.1.11 Using a word as different parts of speech

2.2 Pair of words (Words commonly confused and misused)

2.3 Tenses
2.4 Correction of incorrect sentences
2.5 One word substitution
2.6. Forms of verbs (100 words)

3. Translation (04 hrs)

3.1 Glossary of Administrative Terms (English/ Hindi/Urdu)
3.2 Translation from Urdu into English

4. Paragraph of 100-150 words from outlines (08 hrs)

5. Comprehension (04 hrs)

Unseen passages of literature, scientific data/graph based for comprehension exercises

6. Communication (08 hrs)

6.1 Definition, Introduction and Process of Communication
6.2 Objectives of Communication
6.3 Essentials of Communication

LIST OF PRACTICALS

1. Locating a Book in Library
2. To look up words in a Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics
3. To seek information from an Encyclopedia
4. Listening pre-recorded English language learning programme
5. Paper reading before an audience (reading unseen passages)
6. Study of spelling Rules
7. Study of essentials of a good speech to respond and comprehend visual, oral themes, situations or stimulus and practice before select gathering (Making an oral presentation with stress on body language and voice modulation)
8. Exercises on use of different abbreviations
9. Greetings for different occasions
10. Introducing oneself, others and leave taking
11. Exercises on writing sentences on a topic

Note:

1. The Text Book on "English and Communication Skills, Book-I By Kuldip Jaidka et. al. developed by NITTTR, Chandigarh is recommended to be used for teaching and setting-up the question papers.
2. A communication laboratory may be set up consisting of appropriate audio-video system with facility of playing CDs/DVDs and a video camera for recording the performance of each student with play back facility. A set of CDs from any language training organization e.g. British Council etc. may be procured for use of students.
3. Elements of body language will be incorporated in all the practicals
4. The practical exercises involving writing may also be included in Theory Examination.

INSTRUCTIONAL STATREGY

Looking into the present day needs of effective communication in every field, it is imperative to develop necessary competencies in students by giving practical tips and emphasis on grammar, vocabulary and its usage in addition to practical exercises. The teacher should give report writing assignments, projects etc. while teaching this subject.

RECOMMENDED BOOKS

1. English and Communication Skills, Book-I By Kuldip Jaidka, Alwainder Dhillon and Parmod Kumar Singla, Prescribed by NITTTR, Chandigarh Published By Abhishek Publication, 57-59, Sector-17, Chandigarh
2. Rich Vocabulary Made Easy by Kuldip Jaidka , Mohindra Capital Publishers, Chandigarh
3. Spoken English (2nd Edition) by V Sasikumar & PV Dhamija; Published by Tata MC Graw Hills, New Delhi.
4. Spoken English by MC Sreevalsan; Published by M/S Vikas Publishing House Pvt. Ltd; New Delhi.
5. Spoken English –A foundation course (Part-I & Part-II) By Kamlesh Sdanand & Susheela Punitha; Published by Orient BlackSwan, Hyderabad
6. Practical Course in English Pronunciation by J Sethi, Kamlesh Sadanand & DV Jindal; Published by PHI Learning Pvt. Ltd; New Delhi.
7. A Practical Course in Spoken English by JK Gangal; Published by PHI Learning Pvt. Ltd; New Delhi.
8. English Grammar, Composition and Usage by NK Aggarwal and FT Wood; Published by Macmillan Publishers India Ltd; New Delhi.
9. Business Correspondence & Report writing (4th Edition) by RC Sharma and Krishna Mohan; Published by Tata MC Graw Hills, New Delhi.
10. Business Communication by Urmila Rani & SM Rai; Published by Himalaya Publishing House, Mumbai.
11. Business Communication Skills by Varinder Kumar, Bodh Raj & NP Manocha; Published by Kalyani Publisher, New Delhi.
12. Professional Communication by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
13. Business Communication and Personality Development by Bsiwajit Das and Ipseeta Satpathy; Published by Excel Books, Delhi

14. Succeeding Through Communication by Subhash Jagota; Published by Excel Books, Delhi
15. Communication Skills for professionals by Nira Konar; Published by PHI Learning Pvt. Ltd; New Delhi.
16. Developing Communication Skills (2nd Edition) by Krishna Mohan & Meera Banerji; Published by Macmillan Publishers India Ltd; New Delhi.
17. Effective Technical Communication By M .Ashraf Rizwi; Published by Tata MC Graw Hills, New Delhi.
18. Basic Communication Skills for Technology by Andrea J Rutherfoord; Published by Pearson Education, New Delhi
19. English & Communication Skills for students of Science & Engineering by SP Dhanavel; Published by Orient BlackSwan, Hyderabad.
20. Technical Communication- Principles & Practices by Meenakshi Raman & Sangeetha Sharma; Published by Oxford University Press, New Delhi.
21. Technical English by S. Devaki Reddy & Shreesh Chaudhary; Published by Macmillan Publishers India Ltd; New Delhi.
22. Advanced Technical Communication, by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
23. 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	14	30
2	10	20
3	4	10
4	8	15
5	4	10
6	8	15
Total	**48**	**100**

GLOSSARY OF ADMINISTRATIVE TERMS

1.	Senior	वरिष्ठ	۱۔ بڑا ۔ اکبر
2.	Cashier	खजांची	۲۔ خزانچی
3.	Consent	सहमती	۳۔ آمادگی ۔ رضامندی
4.	Earned Leave	जमा छुट्टी	۴۔ جمع تعطیل ۔ جمع چھٹی
5.	Under Consideration	विचार अधीन	۵۔ زیر غور
6.	Criterion	कसौटी	۶۔ کسوٹی ۔ معیار
7.	Staff	कर्मचारी	۷۔ ملازم
8.	Tenure	कार्यकाल	۸۔ ملازمت کی مدّت
9.	Working Committee	कार्य समिति	۹۔ کام کرنے والی جماعت
10.	Estate	संम्पदा	۱۰۔ جائیداد
11.	Self-Sufficient	आत्मनिर्भर	۱۱۔ خود کفیل
12.	Emergency	आपात्तकाल	۱۲۔ ہنگامی صورت حال
13.	General Body	आमसभा	۱۳۔ جنرل اجلاس
14.	Exemption	छूट	۱۴۔ رعایت
15.	Daily wager	दिहाड़ीदार	۱۵۔ یومیہ اجرت پر کام کرنے والا مزدور۔
16.	Death-Cum Retirement	मृत्यु और सेवानिवृत्ति	۱۶۔ موت ۔اور نوکری سے فارغ
17.	Despatch Register	रवानगी रजिस्टर	۱۷۔ ڈاک بھیجنے کا رجسٹر۔
18.	Despatch	रवानगी	۱۸۔ روانگی
19.	Stenography	आशुलिपिक	۱۹۔ سٹینو گرافی
20.	Assurance	दिलासा	۲۰۔ بھروسہ
21.	Justify	सही साबित करना	۲۱۔ ثابت کرنا
22.	Superior	बढ़िया	۲۲۔ بہتر
23.	High Commision	उच्चायुक्त	۲۳۔ ہائی کمیشن
24.	Simultaneous	साथ-साथ	۲۴۔ ایک ساتھ
25.	Precautionary	सावधानी हेतु, एहतिहाति	۲۵۔ احتیاطاً ۔ حفاظتی طور پر
26.	Commanding Officer	कमांडिंग अफसर	۲۶۔ کمانڈنگ آفیسر۔ حکم دینے والا افسر
27.	Negligence	लापरवाही	۲۷۔ لاپرواہی
28.	Performance	पूरा करना	۲۸۔ کارکردگی
29.	Proof Reader	प्रूफ रीडर	۲۹۔ موازنہ کرنے والا۔ پروف ریڈر
30.	Take Over	काम सभालना	۳۰۔ کام سنبھالنا
31.	Timely Compliance	समय दौरान पूरा करना	۳۱۔ بروقت مکمل کرنا ۔

32.	Responsibility	जिम्मेदारी	۳۲۔ ذمّے داری
33.	Chief Justice	मुख्य न्यायधीश	۳۳۔ مُنصف اعلےٰ
34.	Disciplinary Action	अनुशासनिक कारवाई	۳۴۔ ضابطہ عمل
35.	Efficiency Bar	दक्षता रोक	۳۵۔ ذکیہ روک
36.	Flying Squad	उड़न दस्ता	۳۶۔ چھاپہ مار دستہ
37.	Regret	खेद	۳۷۔ افسوس۔ رنج۔ دُکھ
38.	Inconvenience	असुविधा	۳۸۔ احتیاط
39.	Ambiguous	अस्पष्ट	۳۹۔ مُہمل
40.	Part Time	अंशकालीन	۴۰۔ مختصر عرصہ کے لئے
41.	Academy	अकादमी	۴۱۔ مدرسہ
42.	Disparity	असमानता	۴۲۔ نابرابری
43.	Extraordinary	असाधारण	۴۳۔ عدیم۔ نایاب مخصوص۔ علیحدہ۔
44.	Provisional	अस्थाई	۴۴۔ عارضی
45.	Income Tax	आयकर	۴۵۔ جزیہ
46.	Bonafide	असली	۴۶۔ حقیقی
47.	Acting in Official Capacity	बतौर अधिकारिक हैसियत	۴۷۔ سرکاری حیثیت سے
48.	Contractor	ठेकेदार	۴۸۔ یکمشت اجرت سے کام کرنا ٹھیکیدار
49.	On probation	परिवीक्षाधीन	۴۹۔ امتحان پر۔ پروبیشن پر۔ زیر نگرانی ٹیسٹ کے طور پر
50.	State	राज्य	۵۰۔ صوبہ۔ راجیہ۔ پرانت
51.	Administrator	प्रशासक	۵۱۔ منصب دار
52.	Admission	प्रवेश	۵۲۔ داخلہ
53.	Aforesaid	पूर्वोक्त	۵۳۔ مذکورہ بالا
54.	Affidavit	शपथपत्र	۵۴۔ حلف نامہ
55.	Agenda	कार्यसूची	۵۵۔ کاروباری فہرست
56.	Alma Mater	विद्यालय जहां किसी व्यक्ति ने शिक्षा प्राप्त की हो	۵۶۔ درس گاہ
57.	Appointing Authority	नियुक्ति अधिकारी, मनोनीत अधिकारी	۵۷۔ نوکری دینے والا آفیسر
58.	Apprentice	शिल्पकारू, अप्रेंटिस	۵۸۔ زیر تربیت
59.	Additional	अतिरिक्त	۵۹۔ زائد
60.	Advertisement	विज्ञापन	۶۰۔ اشتہار
61.	Assistant	सहायक	۶۱۔ مددگار
62.	Assumption of Charge	अधिकार ग्रहण करना	۶۲۔ بازیافتگی یا
63.	Attested copy	सत्यापित प्रति	۶۳۔ تصدیق شدہ نقل۔
64.	Chief Minister	मुख्यमन्त्री	۶۴۔ وزیر اعلےٰ
65.	Clerical Error	लेखन सम्बन्धी त्रुटि	۶۵۔ سہواً غلطی
66.	Code	कानून की किताब, गुप्त भाषा	۶۶۔ قانونی کتاب۔ پوشیدہ اشارہ

67	Corruption	भ्रष्टाचार, खोटापन	۶۷ - بے ایمانی۔
68.	Craftsman	कारीगर	۶۸ - کاریگر
69.	Compensation	हरजाना, क्षतिपूर्ति	۶۹ - مُعاوضہ
70.	Compensatory Allowance	क्षतिपूरक भत्ता	۷۰ - نقصان کو پورا کرنے والا بھتہ
71.	Compile	संकलन करना, संग्रह करना	۷۱ - سنگرہ کرنا۔ اکٹھا کرنا۔
72.	Confidential Letter	गुप्त पत्र	۷۲ - خُفیہ خط (دستاویز)
73.	Chief Engineer	मुख्य अभियन्ता	۷۳ - چیف انجینیر۔ اعلےٰ انجینر
74.	Data	स्वीकृत तत्व (आंकड़े)	۷۴ - اِعداد و شمار
75.	Dearness Allownace	मंहगाई भत्ता	۷۵ - مہنگائی بھتہ
76.	Department	विभाग	۷۶ - محکمہ
77.	Dictionary	शब्द कोष	۷۷ - لُغات
78.	Director	निर्देशक, संचालक	۷۸ - ڈائریکٹر
79.	Director of Tech. Edu.	तकनीकी शिक्षा निर्देशक	۷۹ - ڈائریکٹر تکنیکی تعلیم
80.	Executive Engineer	अधिशासी अभियन्ता	۸۰ - انتظامیہ انجینر
81.	Employment Exchange	रोज़गार केंद्र, व्यवसाय	۸۱ - روزگار دفتر
82.	Head Office	मुख्य कार्यालय	۸۲ - صدر دفتر
83.	Head Clerk	प्रधान लिपिक	۸۳ - ہیڈ کلرک۔ بڑے بابو۔ پردھان کلرک
84.	Indian Admn. Service	भारतीय प्रशासनिक सेवा	۸۴ - ہندوستان اِنتظامیہ سروس
85.	Legislative Assembly	विधान सभा	۸۵ - صُوبائی کونسل
86.	Officiating	स्थानापन्न	۸۶ - عارضی۔ قائمقام
87.	Office Record	कार्यालय रिकार्ड	۸۷ - دفتری ریکارڈ۔
88.	Office Discipline	कार्यालय अनुशासन	۸۸ - دفتری ضابطہ
89.	Polytechnic	बहुतकनीकी	۸۹ - تکنیکی۔ دستکاری
90.	Temporary	अस्थाई	۹۰ - عارضی
91.	Qualified	योग्यता प्राप्त	۹۱ - تربیت یافتہ
92.	Under-Investigation	जांच अधीन	۹۲ - زیر تفتیش۔ زیر تفتیش۔
93.	Sub-treasury	उप-खजाना	۹۳ - سب ٹریژری۔
94.	Target Date	लक्ष्य तिथि	۹۴ - مقررہ تاریخ۔
95.	Technical Approval	तकनीकी मान्यता	۹۵ - تکنیکی منظوری
96.	Verification	जांच पड़ताल	۹۶ - تصدیق۔
97.	Viva-Voce	मौखिक परीक्षा	۹۷ - زبانی امتحان
98.	Write off	बटटेखाते डालना	۹۸ - وہ رقم/سامان جو وصول نہ ہوسکے۔ ناقابلِ وصول کھاتہ
99.	Warning	चेतावनी	۹۹ - وارننگ۔ اطلاع - چیتاونی
100.	Yours faithfully	भवदीय	۱۰۰ - تیرا اندیش۔

1.6 GENERAL WORKSHOP PRACTICE - I

L T P - - 8

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)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus:

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

Note:

1. The branches e.g. Civil Engineering, Electrical Engineering, Mechanical Engineering, Automobile Engineering, Wood Technology, Leather Technology, Food Technology, Quantity Surveying and Public Health Engineering will do **Smithy Shop** instead of Electronic Shop- I

2. The branches e.g. Electronics and Communication Engineering, Instrumentation and Control, Computer Engineering, Information Technology, and Medical Electronics will do **Electronic Shop-I** instead of Smithy Shop.

1. Carpentry and Painting Shop

1.1 Introduction to various types of wood such as Deodar, Kail, Partal, Teak, Mango, Sheesham, 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

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.

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 I Marking of job, use of marking tools and measuring instruments.

Job II Filing a dimensioned rectangular or Square piece of an accuracy of ± 0.5mm

Job III Filing practice (Production of flat surfaces) Checking by straight edge.

Job IV Making a cutout from a square piece of MS Flat using Hand hacksaw.

2.4 Care and maintenance of measuring tools like calipers, steel rule, try square, vernier calipers, micrometer, height gauge, combination set. Handling of measuring instruments, checking of zero error, finding of least count.

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, PVC Conduits, PVC Channels and allied items, tools and accessories.

4.2 Study of electrical safety measures and demonstration about use of protective devices. Such as fuses, MCBs and relays

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 on wooden board using fuse,

Switches, socket, holder, ceiling rose etc. by PVC Conduit 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, gas geyser, desert cooler, refrigerator, water purifier

4.4 Introduction to the construction of a Lead-acid battery and its working.

Job III Installation of inverter with 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

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, soldering wire, flux and their demonstration and uses.

5.2 Identification and familiarization with Multimeter analog and digital (Three and half digit)

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 (Audio, Video)

5.5 Safety precautions to be observed in the electronic shop

5.6 Identification and familiarization with soldering and desoldering practice.

NOTE: Demonstration boards for the electronics components such as resistor, capacitor, diodes, transistors, FETs, IFT Coils, ICs should be made.

Job II Cut, strip, join an insulated wire with the help of soldering iron (repeat with different types of 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

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, power press, sheet bending machine.

6.3 Introduction and demonstration of various raw materials used in sheet metal shop e.g. M.S. sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheets etc.

6.4 Study of various types of Rivets, Steel Screw 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, 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

SEMESTER 2nd

2.4 APPLIED CHEMISTRY-II

L T P
3 - 2

RATIONALE

The role of chemistry in every branch of engineering and technology is expanding greatly. Now a days, various chemical products are playing important role in the field of engineering with increasing number of such products each successive years. The strength of materials, the chemical composition of substances, their behaviour when subjected to different treatment and environment, and the laws of heat and dynamic energy have entered in almost every activity of modern life. Chemistry is considered as one of the core subjects for diploma students in engineering and technology for developing in them scientific temper and appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstrations/ minor projects and with the active involvement of 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. Metallurgy (08 hrs)

   1.1 A brief introduction of the terms: Metallurgy (types), mineral, ore, gangue or matrix, flux, slag, concentration (methods of concentrating the ores), ore, roasting, calcinations, smelting and refining of metal.

   1.2 Metallurgy of (i) Aluminium (ii) Iron

   1.3 Definition of an alloy, purposes of alloying, composition, properties and uses of alloys-brass, bronze, monel metal, magnalium, duralumin, alnico, stainless steel and invar.

2. Fuels (10 hrs)

   2.1 Definition of a 'Fuel', characteristics of a good fuel and classification of fuels with suitable examples

   2.2 Definition of Calorific value of a fuel and determination of calorific value of a solid fuel with the help of Bomb calorimeter. Simple numerical problems based upon Bomb-calorimeter method of finding the Calorific values

2.3 Brief description of 'Proximate' and 'Ultimate' analysis of a coal. Importance of conducting the proximate and ultimate analysis of a fuel

2.4 Merits of gaseous fuels over those of other varieties of fuels

2.5 Manufacture, composition, properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas

2.6 Composition, calorific values and applications of (i) LPG (ii) CNG (iii) Power alcohol

2.7 Fuel rating

2.7.1 Octane number for petrol
2.7.2 Cetane number for diesel

3 Corrosion (06 hrs)

3.1 Definition of corrosion

3.2 Theories of corrosion i.e. (i) direct chemical action theory and (ii) electro chemical theory

3.3 Passivity

3.4 Prevention of corrosion by
1. (a) Alloying
(b) Providing metallic coatings
2. Cathodic protections:
(a) Sacrificial
(b) Impressed voltage method
3. Heat treatment (quenching, annealing, tempering & normalizing)

4 Lubricants (06 hrs)

4.1 Definition of (i) lubricant (ii) lubrication

4.2 Classification of lubricants

4.3 Principles of lubrication
(i) fluid film lubrication
(ii) boundary lubrication
(iii) extreme pressure lubrication

4.4 Properties of lubricants

4.4.1 Physical properties: viscosity, viscosity index, flash-point, fire-point, cloud-pour point, oiliness, volatility, emulsification

4.4.2 Chemical properties-Total acidity number (TAN) saponification and iodine value, coke number and aniline point.

5 Glass (04 hrs)

5.1 Glass: Chemical composition, types of glasses and their applications

5.2 Manufacture of ordinary glass and lead glass

6. Classification and Nomenclature of Organic Compounds (06 hrs)

Classification of Organic Compounds, functional group, Homogolus Series, IUPAC-Nomenclature of various homogolous series i.e. alcohols, aldehydes, ketones, carboxylic acids, and phenols.

7. Polymers & Plastics (08 hrs)

7.1 Definition of polymer, monomer & degree of polymerization
7.2 Brief introduction of addition & condensation polymers with suitable examples (PVC, Polyester, Teflon, Nylon 66, Bakelite)
7.3 Definition of plastic & type of plastics (thermo & thermo setting plastics) with suitable examples
7.4 Applications of polymers & plastics in daily life.

LIST OF PRACTICALS

12. Gravimetric analysis and study of apparatus used
13. To determine the percentage composition of a mixture consisting of a volatile and a non-volatile substances
14. Determine the viscosity of a given oil with the help of "Redwood viscometer"
15. Determine the flash point of the given oil with the help of Abel's Flash Point Apparatus
16. Estimate the amount of moisture in the given sample of coal
17. Estimate the amount of ash in the given sample of coal
18. Electroplate the given strip of Cu with Ni
19. Confirmation test of alcohol, aldehydes, carboxylic acid, amine
20. To determination the total acidity number of a lubricant
21. Detection of metal iorn in the rust (solution of rust in concentrated HCl may be given
22. To prepare Bakelite
23. To study the effect of metal coupling on corrosion of metals

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. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi
2. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra ; Kumar and Kumar Publishers (P) Ltd. Bangalore-40
3. A Text Book of Applied Chemistry-I by SS Kumar; Tata McGraw Hill, Delhi
4. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar
5. Engineering Chemistry by Jain PC and Jain M Dhanpatrai publishers. New Delhi
6. Chemistry of Engineering by Aggarwal CV
7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
8. A Text Book of Applied Chemistry-I by Sharma and Others; Technical Bureau of India, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	16
2	10	20
3	06	14
4	06	14
5	04	08
6	06	12
7	08	16
Total	**48**	**100**

2.2. APPLIED MATHEMATICS - II

L T P
5 - -

RATIONALE

Applied mathematics forms the backbone of engineering students. Basic elements of Differential calculus and integral calculus and statistics have been included in this course. This will develop analytical abilities to apply in engineering field and will provide continuing educational base to the students.

DETAILED CONTENTS

1. Differential Calculus (30 hrs)

1.1 Definition of function; Concept of limits.

Four standard limits $\lim_{x \to a} \frac{x^n - a^n}{x - a}$,

$\lim_{x \to 0} \frac{\sin x}{x}$, $\lim_{x \to 0} \frac{a^x - 1}{x}$, $\lim_{x \to 0} (1+x)^{1/x}$

1.2 Differentiation by definition of x^n, sin x, cos x, tan x, e^x, $\log_a x$ only

1.3 Differentiation of sum, product and quotient of functions. Differentiation of function of a function.

1.4 Differentiation of trigonometric inverse functions . Logarithmic differentiation. Exponential differentiation Successive differentiation (excluding nth order).

1.5 Applications:

(a) Maxima and minima

(b) Equation of tangent and normal to a curve (for explicit functions only) – Simple problems only

2. Integral Calculus (30 hrs)

2.1 Integration as inverse operation of differentiation

2.2 Simple integration by substitution, by parts and by partial fractions (for linear factors only)

2.3 Evaluation of definite integrals (simple problems)-

Evaluation of $\int_0^{\pi/2} \sin^n x \, dx$, $\int_0^{\pi/2} \cos^n x \, dx$, $\int_0^{\pi/2} \sin^m x \cos^n x \, dx$

using formulae without proof (m and n being positive integers only)

3 Ordinary Differential Equations (10 hrs)

3.1. Definition and formation of Differential Equations

3.2. Solution of first order Differential Equations of the type:

(i) Variable separable form

(ii) Homogeneous Differential Equations

(iii) Linear Differential Equations

4. Statistics (10 hrs)

4.1 Measures of Central Tendency: Mean, Median, Mode
4.2 Measures of Dispersion: Mean deviation, Standard deviation

RECOMMENDED BOOKS

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi.
2. Applied Mathematics –II by Dr. Sunita Rani Jain, Abhishek Publishers, Chandigarh
3. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
4. Applied Mathematics by Dr. RD Sharma
5. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar
6. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
7. Engineering Mathematics by Dass Gupta
8. Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi
9. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
10. Engineering Mathematics, Vol I, II & III by V Sundaram et.al, Vikas Publishing House (P) Ltd., New Delhi

10. Engineering Mathematics by N.Ch.S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi

11. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
12. Engineering Mathematics, Vol I & II by AK Gupta, Macmillan India Ltd., New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	30	35
2	30	40
3	10	10
4	10	15
Total	**80**	**100**

2.3 APPLIED PHYSICS – II

L T P
4 - 2

RATIONALE

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

DETAILED CONTENTS

1. Optics (10 hrs)

   1.1 Review of basic optics laws: reflection and refraction

   1.2 Refraction and refractive index, image formation in lenses, image magnification, lens formulae (thin lens only), power of lens, total internal reflection and their applications

   1.3 Simple and compound microscope, astronomical telescope, magnifying power and its calculation (in each case), Terrestrial and Galileo's telescope (Concept only) and their applications

2. Electrostatics (12 hrs)

   2.1 Coulombs law, unit of charge, electric potential and electric potential difference

   2.2 Electric field, electric field intensity, electric lines of force, electric flux Gauss's Law

   2.3 Applications of Gauss law in finding electric field of point charge, straight charged conductor, plane charged sheet and between two plane parallel charged sheets

   2.4 Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors, Dielectric and its effect on capacitance, and dielectric break down

   2.5 Application of electrostatics in electrostatic precipitator

3. DC Circuits (12 hrs)

   3.1 Concept of electricity, current and its units, direct and alternating current, voltage, resistance, potential difference and e.m.f,

   3.2 Ohm's law and its applications, concept of resistance, conductance, specific resistance, effect of temperature on resistance, co-efficient of resistance, series and parallel combination of resistors, introduction to super conductivity.

   3.3 Kirchhoff's laws, Wheatstone bridge principle and its applications (Slide Wire Bridge)

3.4 Heating effect of current and concept of electric power, energy and their units, related numerical problems

3.5 Application of electricity in various equipments, advantages of electrical energy over other forms of energy

4. Electromagnetism (13 hrs)

4.1 Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and their units, Right hand thumb rule, magnetic lines of force due to straight conductor, circular coil and solenoid

4.2 Force on a charge, moving in a uniform magnetic field (Lorentz force). Force on a current carrying straight conductor. Torque on a current carrying rectangular coil.

4.3 Moving coil galvanometer conductor, its principle, construction and working, conversion of a galvanometer into ammeter and voltmeter.

4.4 Electromagnetic induction, Faradays Laws, Lenz's Law.

4.5 Applications of Electromagnetism

5. Semiconductor physics (07 hrs)

5.1 Energy bands, intrinsic and extrinsic semiconductors, p-n junction diode and its characteristics

5.2 Diode as rectifier – half wave and full wave rectifier, semiconductor transistor pnp and npn (concept only)

6. Modern Physics (10 hrs)

6.1 Electro magnetic spectrum, photo electric effect and work function, X rays - properties, production and their applications in medicine and industries.

6.2 Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, Helium- Neon and ruby lasers, their engineering and medical applications

6.3 Fibre optics: introduction to optical fiber materials, types, light propagation and applications in communication.

LIST OF PRACTICALS (To perform minimum eight experiments)

1. To find the focal length of convex lens by displacement method.
2. To determine the magnifying power of an astronomical telescope
3. Conversion of Galvanometer into an Ammeter of given range.
4. Conversion of Galvanometer into Voltmeter of given range.
5. To verify ohm's laws by drawing a graph between voltage and current.
6. To verify laws of resistances in series and in parallel connection.
7. To find resistance of galvanometer by half deflection method

8. To measure very low resistance and very high resistance using Wheat Stone bridge
9. To find the time constant of a capacitor
10. To draw characteristics of a pn junction diode and determine knee and break down voltages
11. To find wave length of He Ne semiconductor laser.

INSTRUCTIONAL STATREGY

Teacher may use various instructional media like models, charts and graphs while imparting instructions. The field application should be made clear before teaching the basics of waves, sound, light, electrostatics, dc circuits, electromagnetism, and semiconductor physics 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. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
4. Fundamentals of Physics by Resnick, Halliday and Walker, Asian Book Pvt. Ltd., New Delhi
5. Fundamentals of Optics by Francis A. Jenkins & Harvey E White, McGraw Hill International Editions, Physics Series
6. A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi
7. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publishers
8. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
9. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar
10. Applied Physics Vol II by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar
11. Basic Electronics and Linear Circuits by NN Bhargava et al Tata Mc Graw Hill Publishers, New De
12. Principles of Electronics by SK Sahdev, Dhanpat Rai and Co, New Delhi
13. Engineering Physics by Vanchna Singh and Sheeetal Kumar, Cengage Learning India Pvt. Ltd. Patparganj, Delhi (year 2008)

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Optics	10	15
2	Electrostatics	12	20
3	DC Circuits	12	20
4	Electromagnetism	13	20
5	Semiconductor Physics	07	10
6	Modern Physics	10	15
	Total	**64**	**100**

2.5 BASICS OF INFORMATION TECHNOLOGY

L	T	P
-	-	4

RATIONALE

Information technology has great influence on all aspects of our life. Primary purpose of using computer is to make the life easier. Almost all work places and living environment are being computerized. The subject introduces the fundamentals of computer system for using various hardware and software components. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools of MS Office/Open Office using internet etc. form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

Note:

Explanation of Introductory part should be dovetailed with practical work. Following topics may be explained in the laboratory along with the practical exercises. There will not be any theory examination.

TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION

1. Information Technology – its concept and scope, applications of IT, ethics and future with information technology
2. Impact of computer and IT in society.-- Computer application in office, book publishing, data analysis, accounting, investment, inventory control, graphics, air and railway ticket reservation, robotics, military, banks, Insurance financial transactions and many more
3. Generations of computer, block diagram of a computer, CPU, memory, data – numeric data, alpha numeric data; program, processing of data.
4. Computers for information storage, information seeking, information processing and information transmission, computer organization, computer hardware and software; primary and secondary memory: RAM, ROM, PROM etc. Input devices; keyboard, mouse, scanner, etc ; output devices ; VDU and Printer(Impact and non-Impact printers), Plotter etc. Primary and Secondary Storage (Auxiliary Storage), Secondary storage; magnetic disks – tracks and sectors, optical disk (CD, CD-RW and DVD Memory)
5. Introduction to Operating Systems such as MS-DOS and Windows, difference between DOS and Windows
6. Basics of Networking – LAN, MAN,WAN, Topologies

LIST OF PRACTICALS

1. *Identify and list functions of various components and peripherals of given computer.*
2. Installation of operating system viz. * Windows XP, *Windows 2007 etc.
3. Installing a computer system by giving connection and loading the system-software and application software and various sources to install software
4. Exercises on entering text and data (Typing Practice)

   Features of Windows as an operating system

   - Start , shutdown and restore
   - Creating and operating on the icons

- Opening, closing and sizing the windows
- Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file , creating and operating on a folder
- Introduction to all properties such as changing settings like, date, time, colour (back ground and fore ground)
- Using short cuts

5. Word Processing (MS Office/Open Office)

File Management:

- Opening, creating and saving a document, locating files, copying contents in some different file(s),

Editing a document:

- Entering text, Cut, copy, paste using tool- bars

Formatting a document:

- Using different fonts, changing font size and colour, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
- Aligning of text in a document, justification of document ,Inserting bullets and numbering
- Formatting paragraph, inserting page breaks and column breaks, line spacing
- Use of headers, footers: Inserting footnote, end note, use of comments
- Inserting date, time, special symbols, importing graphic images, drawing tools

Tables and Borders:

- Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table
- Print preview, zoom, page set up, printing options
- Using Find, Replace options

6. Spread Sheet Processing (MS Office/Open Office)

Starting Excel

- open worksheet, enter, edit, data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets

Menu commands:

- ***Create, format charts, organize, manage data, solving problem by analyzing data, creating graphs***

Work books:

- Managing workbooks (create, open, close, save), working in work books, Editing a worksheet:

- copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet

Creating a chart:

- Working with chart types, changing data in chart, formatting a chart, use chart to analyze data
- Using a list to organize data, sorting and filtering data in list

Formulas:

Addition, subtraction, division, multiplication, percentage and auto sum

7. PowerPoint Presentation (MS Office/Open Office)

a) Introduction to PowerPoint
   - How to start PowerPoint
   - Working environment: concept of toolbars, slide layout, templates etc.
   - Opening a new/existing presentation
   - Different views for viewing slides in a presentation: normal, slide sorter etc.

b) Addition, deletion and saving of slides

c) Insertion of multimedia elements
   - Adding text boxes, importing pictures, movies and sound, tables and charts etc.

d) Formatting slides
   - Text formatting, changing slide layout, changing slide colour scheme
   - Changing background, Applying design template

e) How to view the slide show?
   - Viewing the presentation using slide navigator, Slide transition
   - Animation effects etc.

8. Working with Data Processing (MS Office/Open Office)

a) Understanding different data types

b) Creation of table, entering data in a table and modify it.

c) Retrieve data with query:
   - Create a pivot table, customizing a pivot table, statistical analysis of data
   - Exchange data with other application: embedding objects, linking to other applications, import, export document.

9. Internet and its Applications

a) Log-in to internet, introduction to search engine

   Browsing and down loading of information from internet

b) Creating E-Mail Account
   - Log in to e-mail account and Log out from e-mail account

c) Managing E mail
   - Creating a message

- sending, receiving and forwarding a message
- attaching a file
- Deleting a message

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts, peripherals, connectors etc. and proficient in making use of MS Office/Open Office in addition to working on internet. The student should be made capable of working on computers independently. This subject should by taught with the help of LCD projector, while teaching a group.

RECOMMENDED BOOKS

1. Fundamentals of Computer by E Balagurusamy,Tata McGraw Hill Education Pvt Ltd , New Delhi
2. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
3. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
4. Fundamentals of Computer by Sumita Arora by Dhanpat Rai and Co , New Delhi
5. Computers Today by SK Basandara, Galgotia Publication Pvt ltd. Daryaganj, New Delhi.
6. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
7. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
8. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
9. Fundamentals of Information Technology by Leon and Leon;Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
10. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar
11. Basics of Information Technology, by Ishan Publications, Ambala
12. Information Technology for Management by Henery Lucas, 7th edition, Tata McGraw Hill Education Pvt Ltd , New Delhi

2.6 ENGINEERING DRAWING – II

L	T	P
-	-	6

RATIONALE

Drawing is said to be the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation SP 46 – 1988 should be followed

Note: 1. First angle projection is to be followed
2. Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

DETAILED CONTENTS

1. Detail and Assembly Drawing (2 sheets)

1.1 Principle and utility of detail and assembly drawings

1.2 Wooden joints i.e. corner mortice and tenon joint, Tee halving joint, Mitre faced corner joint, Tee bridle joint, Crossed wooden joint, Cogged joint, Dovetail joint, Through Mortice and Tenon joint

2. Screw threads and threaded fasteners (8 sheets)

2.1 Thread Terms and Nomenclature

2.1.1 Types of threads-External and Internal threads, Right and Left hand threads (Actual and Conventional representation), single and multiple start threads.

2.1.2 Different Forms of screw threads-V threads (B.S.W threads, B.A thread, American National and Metric thread), Square threads (square, Acme, Buttress and Knuckle thread)

2.2 Nuts and Bolts

2.2.1 Different views of hexagonal and square nuts and hexagonal headed bolt
2.2.2 Assembly of Hexagonal headed bolt and Hexagonal nut with washer.
2.2.3 Assembly of square headed bolt with hexagonal and with washer.

2.3 Locking Devices

2.3.1 Different types of locking devices-Lock nut, castle nut, split pin nut, locking plate, slotted nut and spring washer.
2.3.2 Foundations bolts-Rag bolt, Lewis bolt, curved bolt and eye bolt.

2.4 Drawing of various types of machine screw, set screw, studs and washers

3. Keys and Cotters (3 sheets)

3.1 Various types of keys and cotters and their practical application and preparation of drawing of various keys and cotters showing keys and cotters in position

3.2 Various types of joints (3 sheets)
- Spigot and socket joint
- Gib and cotter joint
- Knuckle joint

4. Rivets and Riveted Joints (4 sheets)

4.1 Types of general purpose-rivets heads (4 Sheets)
4.2 Caulking and fullering of riveted joints
4.3 Types of riveted joints
(i) Lap joint-Single riveted, double riveted (chain and zig-zag type)
(ii) Butt Joint-
(a) Single cover plate
(i) Single riveted joint
(ii) Double riveted joint (Chain and zig-zag type)
(b) Double cover plate
(i) Single riveted joint
(ii) Double riveted joint (Chain and zig-zag type)

5. Couplings (2 sheets)

5.1 Flange coupling (Protected and non-protected)

6. Symbols and Conventions (2 sheets)

6.1 Civil engineering sanitary fitting symbols
6.2 Electrical fitting symbols for domestic interior installations
6.3 Building plan drawing with electrical and civil engineering symbols

7. AUTO CAD (for practical and viva-voce only)

7.1 Concept of AutoCAD, Tool bars in AutoCAD, coordinate system, snap, grid, and ortho mode

7.2 Drawing commands – point, line, arc, circle, ellipse

7.3 Editing commands – scale, erase, copy, stretch, lengthen and explode

RECOMMENDED BOOKS

1. Elementary Engineering Drawing (in first angle projection) by ND Bhatt, Charotar Publishing House

2. A Text Book of Engineering Drawing by Surjit Singh Published by Dhanpat Rai and Co. Delhi

3. Engineering Drawing by PS Gill; published by SK kataria and Sons, New Delhi

4. Machine Drawing by RB Gupta published by Satya Prakashan, New Delhi.

2.1 ENGLISH AND COMMUNICATION SKILLS – II

L	T	P
3	-	2

RATIONALE

Language is the most commonly used medium of self-expression in all spheres of human life – personal, social and professional. A student must have a fair knowledge of English language and skills to communicate effectively to handle the future jobs in industry. The objective of this course is to enable the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the course, the student will be able to develop comprehension skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English. It is expected that each polytechnic will establish a **communication skill laboratory** for conducting practicals mentioned in the curriculum.

DETAILED CONTENTS

1. Facets of Literature (14 hrs)

   1.1 Short stories

      1.1.1 The Portrait of a Lady - Khushwant Singh
      1.1.2 The Doll's House – Katherine Mansfield
      1.1.3 The Refugees – Pearl S. Buck

   1.2 Prose

      1.2.1 Walking Tours – R.L. Stevenson
      1.2.2 A Dialogue on Civilization – C.E.M. Joad
      1.2.3 The Sign of Red Cross – Horace Shipp

   1.3 Poems

      1.3.1 All The World's A Stage – W. Shakespeare
      1.3.2 Say Not, The Struggle Nought Availeth – A.H. Clough
      1.3.3 Pipa's Song – Robert Browning

2. The Art of Précis Writing (04 hrs)

3. Grammar and Usage (08 hrs)

   3.1 Narration
   3.2 Voice
   3.3 Idioms and Phrases

4. Correspondence (04 hrs)

   4.1 Business Letters

4.2 Personal letters

5. Drafting (06 hrs)

5.1 Report Writing
5.2 Inspection Notes
5.3 Memos, Circulars and Notes
5.4 Notices
5.5 Press Release
5.6 Agenda and Minutes of Meetings
5.7 Applying for a Job: Forwarding letter, Resume/C.V., follow up.

6. Glossary of Technical & Scientific Terms (04 hrs)

7. Communication (08 hrs)

7.1 Media and Modes of Communication
7.2 Channels of Communication
7.3 Barriers to Communication
7.4 Listening Skills
7.5 Body language
7.6 Humour in Communication

LIST OF PRACTICALS

1. Practice on browsing information from Internet and e-mail
2. Group Discussions
3. Mock Interviews
4. Telephone Etiquette – demonstration and practice
5. Situational Conversation with feedback through video recording
6. Presentation on a given theme (using PowerPoint)
7. Exercises leading to personality development like mannerism, etiquettes, body language etc.
8. Reading unseen passages
9. Writing (developing) a paragraph
10. Exercises on writing notices and telephonic messages

Note:

1. The Text Book on "English and Communication Skills, Book-II By Kuldip Jaidka et. al. developed by NITTTR, Chandigarh is recommended to be used for teaching & setting-up the question papers.
2. A communication laboratory may be set up consisting of appropriate audio-video system with facility of playing CDs/DVDS and a video camera for recording the performance of each student with play back facility. A set of CDs from any language training organization e.g. British Council etc. may be procured for use of students.
3. Elements of body language will be incorporated in all practicals
4. The practical exercises involving writing may also be included in Theory Examination.

RECOMMENDED BOOKS

24. English and Communication Skills, Book-I By Kuldip Jaidka, Alwainder Dhillon and Parmod Kumar Singla, Prescribed by NITTTR, Chandigarh Published By Abhishek Publication, 57-59, Sector-17, Chandigarh
25. Rich Vocabulary Made Easy by Kuldip Jaidka , Mohindra Capital Publishers, Chandigarh
26. Spoken English (2nd Edition) by V Sasikumar & PV Dhamija; Published by Tata MC Graw Hills, New Delhi.
27. Spoken English by MC Sreevalsan; Published by M/S Vikas Publishing House Pvt. Ltd; New Delhi.
28. Spoken English –A foundation course (Part-I & Part-II) By Kamlesh Sdanand & Susheela Punitha; Published by Orient BlackSwan, Hyderabad
29. Practical Course in English Pronunciation by J Sethi, Kamlesh Sadanand & DV Jindal; Published by PHI Learning Pvt. Ltd; New Delhi.
30. A Practical Course in Spoken English by JK Gangal; Published by PHI Learning Pvt. Ltd; New Delhi.
31. English Grammar, Composition and Usage by NK Aggarwal and FT Wood; Published by Macmillan Publishers India Ltd; New Delhi.
32. Business Correspondence & Report writing (4th Edition) by RC Sharma and Krishna Mohan; Published by Tata MC Graw Hills, New Delhi.
33. Business Communication by Urmila Rani & SM Rai; Published by Himalaya Publishing House, Mumbai.
34. Business Communication Skills by Varinder Kumar, Bodh Raj & NP Manocha; Published by Kalyani Publisher, New Delhi.
35. Professional Communication by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
36. Business Communication and Personality Development by Bsiwajit Das and Ipseeta Satpathy; Published by Excel Books, Delhi
37. Succeeding Through Communication by Subhash Jagota; Published by Excel Books, Delhi

38. Communication Skills for professionals by Nira Konar; Published by PHI Learning Pvt. Ltd; New Delhi.
39. Developing Communication Skills (2nd Edition) by Krishna Mohan & Meera Banerji; Published by Macmillan Publishers India Ltd; New Delhi.
40. Effective Technical Communication By M .Ashraf Rizwi; Published by Tata MC Graw Hills, New Delhi.
41. Basic Communication Skills for Technology by Andrea J Rutherfoord; Published by Pearson Education, New Delhi
42. English & Communication Skills for students of Science & Engineering by SP Dhanavel; Published by Orient BlackSwan, Hyderabad.
43. Technical Communication- Principles & Practices by Meenakshi Raman & Sangeetha Sharma; Published by Oxford University Press, New Delhi.
44. Technical English by S. Devaki Reddy & Shreesh Chaudhary; Published by Macmillan Publishers India Ltd; New Delhi.
45. Advanced Technical Communication, by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
46. 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	14	30
2	4	10
3	8	10
4	4	10
5	6	10
6	4	10
7	8	20
Total	**48**	**100**

GLOSSARY OF TECHNICAL AND SCIENTIFIC TERMS

1.	Absolute	परम, अचर, पूर्ण, स्थिर	مکمل - ساکن
2.	Acceleration	त्वरण, प्रवेग	حرکت
3.	Acid	अम्ल	عمل - تیزاب
4.	Alkaline	क्षारीय, खारा	کھارا
5.	Air Compressor	वायु-संपीडक	ہوا کے دباؤ - ایئر کمپریشر
6.	Air Conditioning	वातानुकूलन	ایئر کنڈیشن -
7.	Alignment	सरेखन	ایک لائن میں - ایک سیدھ میں
8.	Alternating Current	प्रत्यावर्ती धारा	تبدیل کرنٹ - اے سی کرنٹ
9.	Altimeter	ऊंचाई मापने का यंत्र	اونچائی ماپنے کا آلہ
10.	Alum	फिटकरी	پھٹکڑی
11.	Ammeter	अम्मीटर	بجلی کا کرنٹ ماپنے کا آلہ - ایمی میٹر
12.	Ampere	ऐम्पियर	بجلی کی طاقت کو ماپنے کی اکائی - ایمپیئر
13.	Amplication	प्रवर्धन	پرو دھن - ایمپلی کیشن
14.	Amplitude	आयाम	ایام - ایمپلی چیوڈ
15.	Angle	कोण	زاویہ - کون
16.	Angular velocity	कोणीय वेग	کونیئے ویگ -
17.	Angular Momentum	कोणीय संवेग	کونیئے سنویگ
18.	Annealing	तापानुशीतन	تاپ انوشیتن - انی لنگ -
19.	Anode	अनोड	انوڈ
20.	Apex	शीर्ष, शिखर, शिखाग्र	اونچائی - سب سے اونچا
21.	Apparent	स्पष्ट	صاف
22.	Applied machanics	अनुप्रयुक्त यंत्रिकी	انوپریکت آلہ - اپلائیڈ مکینک
23.	Applied Science	अनुप्रयुक्त विज्ञान	انوپریکت سائینس - اپلائیڈ سائینس
24.	Archimedes's Principle	आर्किमिडीज़ का सिद्धांत	آرک میڈیز کا اصول -
25.	Architecture	वास्तुकला, स्थापत्यकला	تعمیراتی سائینس - تعمیراتی کلا -
26.	Armature	आर्मेचर	آرمیچر -
27.	Atom	परमाणु	ایٹم
28.	Automatic	स्वचलित	اپنے آپ چلنے والا
29.	Axis	अक्ष	اکش
30.	Axle	धुरी	دھرا - ایکسل -

31.	Balance (Scale)	तुला, तराजू	ترازو
32.	Ball Bearing	बाल-बेयरिंग	بال بیرنگ
33.	Bar magnet	छड़-चुम्बक	مقناطیس کا ٹکڑا
34.	Barometer	वायुदाबमापी	ہوا کا دباؤ ماپنے کا آلہ۔ بیرومیٹر
35.	Base	आधार	بنیادی
36.	Base Plate	आधार पट्टिका	بنیادی پلیٹ۔ آدھار پٹکا۔ بیس پلیٹ
37.	Battery	बैटरी	بیٹری
38.	Beaker	बीकर	بی کر
39.	Bending Moment	वंकन आघूर्ण	بینڈنگ مومنٹ جھکنے کی شکتی (طاقت) لچک
40.	Blast Furnace	झोंका भट्टी	بلاسٹ فرنس۔ بلاسٹ بھٹی۔
41.	Bleach	विरंजक	بلیچ۔ وِرنجک
42.	Boiler	उबालक	بوائیلر۔ اُبالنے والا۔ آبالک۔
43.	Bridge	पुल	پل
44.	Burette	ब्यूरेट	بیوریٹ۔ لیبارٹری میں استعمال ہونیوالی شیشے کی نالی۔
45.	Callipers	कैलिपर्स	کیلی پرس۔
46.	Calorie	कैलोरी	کیلوریہ۔ خوراک کی طاقت ماپنے کی یونٹ
47.	Canal	नहर	نہر
48.	Capacitance	धारिता	کے پے سی ٹنس۔ دھارتا۔
49.	Carburettor	कार्बुरेटर	کاربوریٹر
50.	Cast Iron	ढलवा लोहा	کچا لوہا۔ کاسٹ آئرن
51.	Catalyst	उत्प्रेरक	اُت پریرک۔
52.	Cathode	कैथोड	کے تھوڈ
53.	Centre of Gravity	गुरूत्वाकर्षण-केन्द्र	دھرتی کی طاقت کا مرکز۔
54.	Centrifugal	उपकेन्द्रीय	مرکز سے دور کرنے والا۔ آپ کیندریہ
55.	Centripetal	अभिकेन्द्रीय	مرکز کی طرف لانے والا۔ ابھی کیندریہ
56.	Centroid	केन्द्रीय	مرکزی
57.	C.G.S. System	सी.जी.एस. पद्धति	سی۔ جی۔ ایس سسٹم
58.	Chemical Action	रासायनिक क्रिया	تیزابی نتیجہ۔
59.	Chain	श्रृंखला, माला	سلسلہ۔ مالا۔
60.	Change of State	अवस्था परिवर्तन	تبدیلیٔ حالات
61.	Characteristics	लक्षण	آثار۔ خوبیاں
62.	Charge (n)	आवेश	آویش۔ چارج۔ بھرنا
63.	Choke	चोक	چوک۔ بجلی کی ٹیوب کو چلانے کیلئے لگایا جانیوالا پرزہ
64.	Chord, Major	गुरू स्वर-संघात	کارڈ میجر۔ لورد سنگھات۔
65.	Chord, Minor	लघु स्वर-संघात	کورڈ مائینر۔ چھوٹا سور سنگھات
66.	Circular	वृत्ताकार, वर्तुल	سرکولر۔ وِرتاکار۔ وِرتل۔ باہر سے جانیوالا

67.	Clock-wise	दक्षिणा वर्त	داہنے ہاتھ چلنے والا۔ دکشن ورت کلاک وائز
68.	Coagulation	स्कंदन	کواگولیشن۔ سکندن
69.	Coefficient of Expansion	प्रसार गुणांक	کوایفی شنٹ آف ایکسپنشن۔ پرسارگنک۔ نمبر جسے پہلے ضرب کیلئے لگایا گیا نمبر
70.	Coil	कुंडली	کوائیل۔ کنڈلی۔
71.	Combustion	दहन	دہن۔
72.	Compass	दिशासूचक	کمپاس۔ اطراف بتانے والا آلہ۔ دِشا سُوچک۔
73.	Compound	यौगिक	کمپاؤنڈ۔ یوگک۔
74.	Concave	अवतल	کن ویو۔ اوتل
75.	Convex	उत्तल	کن ویکس۔ اُتل۔
76.	Concentrated (Solution)	(गाढ़ा, सांद्रित (घोल)	گاڑھا مشرب۔ گھول۔ سولیوشن
77.	Concrete	कंकरीट	کنکریٹ۔ پتھر کا۔
78.	Conduction	चालन	کنڈکشن۔ چالن۔
79.	Conductor	चालक	کنڈکٹر۔ چلانے والا۔
80.	Cone	शंकु	کون۔ شنکو۔
81.	Connection	सम्बंध, जोड़	جوڑ۔ تعلق۔
82.	Constant (Adj.)	स्थिर, अचल, एकसमान	کھڑا۔ ساکن۔ اچل
83.	Convection	संवहन	کنوکشن۔ سنزا ہونا۔ زور نہ ہونا۔ وزن نہ ہونا بات میں
84.	Coulomb	कूलोम (विद्युत शक्ति की इकाई)	طاقت کی اکائی۔
85.	Couple	बल युग्म	کپل۔ بل یگم۔ طاقت یگم
86.	Crane	क्रेन	کرین۔ وزن اُٹھانے والی مشین
87.	Crystalline	रवेदार	رَوے دار۔ کرسٹلائن۔
88.	Dehydrate	निर्जल करना	بغیر پانی کے ہونا۔
89.	Distil	आसहन करना	عرق نکالنا
90.	Effervescence	बुदबुदाहट	بُدبداہٹ
91.	Element	तत्व, मूलतत्व	ایلی منٹ۔ بلب میں جلنے والی تار۔ تتو
92.	Empirical Formula	मूलअनुपाती सूत्र	بنیادی انوپاتی سُوتر۔
93.	Equivalent Weight	तुल्यांकी-भार	ہم وزن۔ برابر وزن کا۔
94.	Flame Test	ज्वाला-परीक्षण	فلیم ٹیسٹ۔ آگ کے شعلہ کا ٹیسٹ۔
95.	Flash Point	प्रज्वलन-ताप	فلیش پوائینٹ۔ آگ کی گرمی
96.	Flask	फ्लास्क	فلاسک۔ پانی کو گرم یا ٹھنڈا رکھنے والی بوتل۔
97.	Spring Balance	कमानी तुला	سپرنگ دار ترازو۔
98.	Soluble	विलयशील	وے شیل۔ سلوایبل
99.	Viscosity	गाढ़ापन	گاڑھا پن
100.	Volumetric Analysis	आयतनी विश्लेषण	آئیتنی موازنہ۔ ولیومیٹرک موازنہ/مقابلہ

2.7 GENERAL WORKSHOP PRACTICE - II

L T P - -
6

RATIONALE

As we know that, the psychomotor skills are mastered through practice, an opportunity therefore, has been extended to students through this course to refine their skills in different trades. The basic skills developed during first semester will be refined during this course by doing higher order skills jobs. In addition to developing general manual and machining skills in the students, the objective of development of sense of dignity of labour, precision, safety at work places, team working and right attitude among the students will also be met.

DETAILED CONTENTS (PRACTICALS)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus.

1. Carpentry and Painting shop-II
2. Plumbing Shop
3. Welding shop -II
4. Electric shop -II
5. Machine shop or Electronic shop-II
6. Sheet Metal Shop –II

Note:

1. The branches e.g. Civil Engineering, Electrical Engineering, Mechanical Engineering, Automobile Engineering, Wood Technology, Food Technology, Quantity Surveying and Public Health Engineering will do **Machine Shop** instead of Electronic shop- II

2. The branches e.g. Electronics and Communication Engineering, Instrumentation and Control, Computer Engineering, Information Technology, and Medical Electronics will do **Electronic shop-II** instead of Machine shop.

3 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-II

1.1 Introduction to joints, their relative advantages and uses.
Job I Preparation of Dovetail joint and glued joint.
Job II Preparation of Mitre Joint
Job III Preparation of a lengthening Joint
Job IV Preparation of at least one utility job with and without lamination.

1.2 Demonstration of job showing use of Rip Saw, Bow saw and Tenon saw, method of sharpening various saws.

1.3 Demonstration of job on Band Saw and Circular Saw, Chain and Chisel, Universal wood working machine, Saw re-sharpening machine, Saw Brazing unit.

1.4 Importance and need of polishing wooden items, Introduction to polishing materials.

Job V Polishing on wooden items.

2. Plumbing Shop

2.1 Introduction to various types of threads (internal, external)-single start, multi-start, left hand and right hand threads.

2.2 Description and demonstration of various types of drills, taps and dies Selection of dyes for threading, selection of drills, taps and reamers for tapping operations.

Job I Making internal and external threads on a job by tapping and dieing operations (manually)

2.3 Precautions while drilling soft metals, e.g. Copper, Brass, Aluminium etc.

Job II Drilling practice on soft metals (Aluminum, Brass and Copper)

Job III Preparation of a job by filing on non- ferrous metal up to an accuracy of ± 0.2mm

Job IV Preparation of job involving thread on GI pipe/ PVC pipe and fixing of different types of elbow, tee, union, socket, stopcock, taps, etc

3. Welding Shop – II

3.1 Introduction to gas welding, spot welding and seam welding and welding techniques. Adjustments of different types of flames in gas welding, demonstration and precautions about handling welding equipment.

Job I Practice in handling gas welding equipment (Low pressure and High pressure) and welding practice on simple jobs.

3.2 Common welding joints generally made by gas welding.

Job II Preparation Butt joint by gas welding.

Job III Preparation of small cot frame from conduit pipe by electric arc welding/gas welding.

Job IV Preparation of square pyramid from MS rods by welding (type of welding to be decided by students themselves).

Job V Exercise of preparing a job on spot/seam welding machine.

3.3 Demonstration and use of TIG and MIG Welding equipment

4. Electric Shop – II

4.1 Importance of three-phase wiring and its effectiveness.

Job I Laying out 3 phase wiring for an electric motor or any other 3 phase machine.

4.2 Estimating and costing of power connection.

Job II Connecting single-phase energy meter and testing it. Reading and working out the power consumption and the cost of energy.

Job III Checking continuity of connection (with tester and series lamp) location of faults with a multimeter) and their rectification in simple machines and/or other electric circuits fitted with earthing.

4.3 Demonstration of dismantling, servicing and reassembling a table fan/ceiling fan/air cooler/mixer/electric iron, Electric heater, geyser, electric oven, air conditioner etc.

Job IV Testing Single phase/three phase electrical motor by using voltmeters, ammeter, clip on meter, tachometer etc.

Job V Reversing the rotation of a motor.

5. Machine Shop

Introduction to various machines used in machine shop. Demonstration of Lathe, Milling Machine Shaper, Slotter, Radial drilling machine, Surface grinder and CNC machine

Job-1 Exercise on simple turning and facing

Job-II Exercise on taper turning

Job-III Marking and drilling practice on mild steel piece

OR

5. Electronic Shop- II

5.1 Demonstrate the jointing methods on general purpose PCB boards mounting and dismantling as well as uses of the items mentioned below:

a) Various types of single, multi-cored insulated screened power, audio video, co-axial, general purpose wires/cables

b) Various types of plugs, sockets connectors suitable for general purpose audio and video use, 2 and 3 pin mains plug and sockets, RF Plugs and Sockets.

Banana-plugs, and sockets, BNG, RCA, DIN, UHF, Ear phone speaker connector, telephone jacks and similar male and female connectors and terminal strips.

c) Various types of switches such as: normal/ miniature toggle, slide, push button, piano key, rotary, micro switches, SPST, SPDT, DPST, DPDT, band selector, multi way Master Mains Switch.

d) Various types of protective devices such as : Wire fuse, cartridge fuse, slow acting/fast acting fuse, HRC fuse, thermal fuse, single/multiple circuit breakers, over and under current relays.

e) Materials: Conducting, insulating and magnetic materials.

f) Single beam simple CRO, Single Generator and function-Generator, function of energy knob on the front panel.

g) Regulated power supply-fixed and variable voltage, single output as well as dual output.

5.2 Identification and familiarization with active and passive components; colour code and types of resistor, capacitors and potentiometers (including VDR, LDR, and thermistor). Identification of components including LED, LCD, UJT, FET, Coils, relays, read relays, transformers, Linear and Digital ICs, Thyristors, etc.

5.3 Demonstrate the following:

1. To make perfect solder joints and soldering on PCBs
2. To remove components/wires by unsoldering.
3. To assemble components on boards, chassis, tape strips.
4. Various laying methods of cables
5. Exposure to modern soldering and de-soldering processes
6. Field visits to relevant work-places
7. Identification of active and passive components
8. Use of Multimeter and testing of active and passive components.

Job I Cut, bend, tin components, leads, inserts and solder components (capacitor, diodes, transistor, IFT, ICs etc) on a PCB.

Job II De-solder, remove and clean all the components, wires from a given equipment, a PCB or a tap strip using the following:

Job III Soldering Iron

Job IV Temperature Control Soldering Iron

Job V De-soldering Pump

Job VI De-soldering Strip

Job VII Wiring of a small circuit on a PCB/tag strip involving lacking, sleeving and use of identifier tags

6. Sheet Metal Shop-II

6.1 Introduction to various metal forming processes e.g. Spinning, Punching, Blanking, cup drawing

6.2 Introduction to soldering and brazing.

6.3 Introduction to metal spinning process.

Job I Preparation of job involving shearing, circular shearing, rolling, folding, beading and soldering process e.g. Funnel or any other job involving above operations.

Job II Exercise on job involving brazing process

Job III Spinning a bowl/cup/saucer

Job IV Visit to a sheet metal industry e.g. coach builders etc.

RECOMMENDED BOOKS

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Choudhary. 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; 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

SEMESTER 3rd

3.1 FLUID MECHANICS

L	T	P
3	-	2

RATIONALE

Subject of Hydraulics is a basic engineering subject and helps in solving fluid flow problems in the field of Civil Engineering. The subject deals with basic concepts and principles in hydrostatics, hydro kinematics and hydrodynamics and their application in solving fluid - mechanics problems.

DETAILED CONTENTS

1. Introduction: (01 hrs)

   1.1 Fluids: Real and ideal fluids

   1.2 Fluid Mechanics, Hydrostatics, Hydrodynamics, Hydraulics

2. Properties of Fluids (definition only) (03 hrs)

   2.1 Mass density, specific weight, specific gravity, viscosity, surface tension - cohesion, adhesion and, capillarity, vapour pressure and compressibility.

   2.2 Units of measurement and their conversion

3. Hydrostatic Pressure: (08 hrs)

   3.1 Pressure, intensity of pressure, pressure head, Pascal's law and its applications.

   3.2 Total pressure, resultant pressure, and centre of pressure.

   3.3 Total pressure and centre of pressure on horizontal, vertical and inclined plane surfaces of rectangular, triangular, trapezoidal shapes and circular. (No derivation)

4. Measurement of Pressure: (05 hrs)

   4.1 Atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure.

   4.2 Piezometer, simple manometer and differential manometer, Bourden gauge and dead weight pressure gauge.

5. Fundamentals of Fluid Flow: (06 hrs)

   5.1 Types of Flow: Steady and unsteady flow, laminar and turbulent flow, uniform and non-uniform flow

   5.2 Discharge and continuity equation (flow equation) {No derivation}

   5.3 Types of hydraulic energy: Potential energy, kinetic energy, pressure energy

   5.4 Bernoulli's theorem; statement and description (without proof of theorem) and simple numerical problems.

6. Flow Measurements (brief description with simple numerical problems) (06 hrs)

   6.1 Venturimeter and mouthpiece
   6.2 Pitot tube
   6.3 Orifice and Orificemeter
   6.4 Current meters
   6.5 Notches and weirs (simple numerical problems)

7. Flow through Pipes: (08 hrs)

   7.1 Definition of pipe flow; Reynolds number, laminar and turbulent flow - explained through Reynold's experiment

   7.2 Critical velocity and velocity distributions in a pipe for laminar flow

   7.3 Head loss in pipe lines due to friction, sudden expansion and sudden contraction, entrance, exit, obstruction and change of direction (No derivation of formula)

   7.4 Hydraulic gradient line and total energy line

   7.5 Flow from one reservoir to another through a long pipe of uniform cross section (simple problems)

   7.6 Pipes in series and parallel

   7.7 Water hammer phenomenon and its effects (only definition and description)

8. Flow through open channels: (09 hrs)

   8.1 Definition of an open channel, uniform flow and non-uniform flow

   8.2 Discharge through channels using
      i) Chezy's formula (no derivation)
      ii) Manning's formula (no derivation)
      iii) Simple Numerical Problems

   8.3 Most economical channel sections (no derivation)
      i) Rectangular
      ii) Trapezoidal
      iii) Simple Numerical Problems

   8.4 Head loss in open channel due to friction

9. Hydraulic Pumps: (02 hrs)

   Hydraulic pump, reciprocating pump, centrifugal pumps (No numericals and derivations) (may be demonstrated with the help of working models)

Note: Visit to Hydraulic research station is must to explain the various concepts.

PRACTICAL EXERCISES

i) To verify Bernoullis Theorem

ii) To find out venturimeter coefficient

iii) To determine coefficient of velocity (C_v), Coefficient of discharge (C_d) Coefficient of contraction (C_c) of an orifice and verify the relation between them

iv) To perform Reynold's experiement

v) To verify loss of head in pipe flow due to
   a) Sudden enlargement
   b) Sudden contraction
   c) Sudden bend

vi) Demonstration of use of current meter and pitot tube

vii) To determine coefficient of discharge of a rectangular notch/triangular notch.

INSTRUCTIONAL STRATEGY

Hydraulics being a fundamental subject, teachers are expected to lay considerable stress on understanding the basic concepts, principles and their applications. For this purpose, teachers are expected to give simple problems in the class room and provide tutorial exercises so as to develop necessary knowledge for comprehending the basic concepts and principles. As far as possible, the teaching of the subject be supplemented by demonstrations and practical work in the laboratory. Visit to hydraulic research stations must be carried out.

RECOMMENDED BOOKS

1. Jagdish Lal, "Fluid Mechanics and Hyraulics" Delhi Metropolitan Book Co. Pvt Ltd.
2. Modi, PN, and Seth, SM; "Hydraulics and Fluid Mechanics", Standard Publishers Distributors, Delhi
3. Khurmi RS, "Hydraulics and Hydraulics Machines", S Chand and Co., Delhi
4. Likhi SK., Laboratory Manual in Hydraulics, Delhi Wiley Eastern.
5. Birinder Singh , "Fluid Mechanics", Kaptian Publishing, New Delhi.
7. Sarao A.S., "Fluid Mechanics", Tech. India Publication, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	01	01
2	03	05
3	08	16
4	05	10
5	06	13
6	06	13
7	08	18
8	09	20
9	02	04
Total	**48**	**100**

3.2 APPLIED MECHANICS

L	T	P
3	-	2

RATIONALE

The subject Applied Mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required by the students for further understanding of other allied subjects. The subject enhances the analytical ability of the students.

DETAILED CONTENTS

1. Introduction (04hrs)

1.1 Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics.

1.2 Definition, basic quantities and derived quantities of basic units and derived units

1.3 Different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another for density, force, pressure, work, power, velocity, acceleration

1.4 Concept of rigid body, scalar and vector quantities

2. Laws of forces (09 hrs)

2.1 Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & Uniformly distributed force, effects of force, characteristics of a force

2.2 Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of super-position

2.3 Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, triangle law of forces, polygon law of forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components

2.4 Free body diagram

2.5 Equilibrant force and its determination

2.6 Lami's theorem (concept only)

[Simple problems on above topics]

3. Moment (09 hrs)

3.1 Concept of moment

3.2 Moment of a force and units of moment

3.3 Varignon's theorem (definition only)

3.4 Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve, reaction at support)

3.5 Parallel forces (like and unlike parallel force), calculating their resultant

3.6 Concept of couple, its properties and effects

3.7 General conditions of equilibrium of bodies under coplanar forces

3.8 Position of resultant force by moment

[Simple problems on the above topics]

4. Friction (06 hrs)

4.1 Definition and concept of friction, types of friction, force of friction
4.2 Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction
4.3 Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane.

5. Centre of Gravity (08 hrs)

5.1 Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies
5.2 Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion
5.3 Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed
[Simple problems on the above topics]

6. Simple Machines (06 hrs)

6.1 Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines
6.2 Simple and compound machine (Examples)
6.3 Definition of ideal machine, reversible and self locking machine
6.4 Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency
6.5 System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency
6.6 Working principle and application of wheel and axle, Weston's Differential Pulley Block , simple screw jack, worm and worm wheel, single and double winch crab. Expression for their velocity ratio and field of their application
[Simple problems on the above topics]

7. Torsion (06 hrs)

7.1 Torsion in shafts/bars
7.2 Modules of rigidity
7.3 Torsional Equation (simple numerical problems)
7.4 Power Transmission in shafts (simple numerical problems)

LIST OF PRACTICALS

1. Verification of the polygon law of forces using greavesand apparatus.
2. To verify the forces in different members of jib crane.
3. To verify the reaction at the supports of a simply supported beam.
4. To find the mechanical advantage, velocity ratio and efficiency in case of an inclined plane.
5. To find the mechanical advantage, velocity ratio and efficiency of a screw jack.
6. To find the mechanical advantage, velocity ratio and efficiency of worm and worm wheel.
7. To find mechanical advantage, velocity ratio and efficiency of single purchase crab.

8. To find out center of gravity of regular lamina.
9. To find out center of gravity of irregular lamina.
10. To determine coefficient of friction between three pairs of given surface.

RECOMMENDED BOOKS

1. A Text Book of Applied Mechanics by S Ramamurtham, Dhanpat Rai Publishing Co. Ltd.
2. Applied Mechanics By, Col. Harbhajan Singh, TL Singha and Parmod Kumar Singla, Published By Abhishek Publication, 57-59, Sector-17, Chandigarh
3. A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.
4. A Text Book of Applied Mechanics by RK Rajput; Laxmi Publications, New Delhi..
5. Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	04	08
2	09	20
3	09	20
4	06	12
5	08	16
6	06	12
7	06	12
Total	**48**	**100**

3.3 SURVEYING - I

L	T	P
2	-	6

RATIONALE

The important functions of a diploma civil engineer includes the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works

While framing the curriculum for the subject of surveying, stress has been given to the development of the skill in each type of survey like chain surveying, compass surveying leveling, that the Civil Engineering diploma holder will normally be called upon to perform and plane table surveying,

Field work should be a selected one so that student can check his work and have an idea of the results the extent of error in the work done by him. As far as possible, the surveys done should be got plotted, as this will also reveal errors in the work and develop skill in plotting.

DETAILED CONTENTS

1. Introduction: (02 hrs)

   1.1 Basic principles of surveying

   1.2 Concept and purpose of surveying, measurements-linear and angular, units of measurements

   1.3 Instruments used for taking these measurements, classification based on surveying instruments

2. Chain surveying: (03 hrs)

   2.1 Purpose of chain surveying, principles of chain surveying and its advantages and disadvantages
   2.2 Obstacles in chain surveying
   2.3 Direct and indirect ranging offsets and recording of field notes
   2.4 Errors in chain surveying and their corrections

3. Compass surveying: (07 hrs)

   3.1 Purpose of compass surveying. Use of prismatic compass: Setting and taking observations

   3.2 Concept of following with simple numerical problems:
   a) Meridian - Magnetic and true
   b) Bearing - Magnetic, True and Arbitrary
   c) Whole circle bearing and reduced bearing
   d) Fore and back bearing
   e) Magnetic dip and declination

   3.3 Local attraction - causes, detection, errors and corrections, problems on local attraction, magnetic declination and calculation of included angles in a compass traverse

4. Levelling: (10 hrs)

4.1 Purpose of levelling, concept of a level surface, horizontal surface, vertical surface, datum, reduced level and bench marks

4.2 Identification of various parts of Dumpy level and use of Dumpy level, Engineer' level, Auto level: advantages and disadvantages, use of auto level.

4.3 Concepts of line of collimation, axis of the bubble tube, axis of the telescope and vertical axis

4.4 Levelling staff: single piece, folding, invar precision staff, telescopic

4.5 Temporary adjustment and permanent adjustment of dumpy level by two peg method.

4.6 Concept of back sight, foresight, intermediate sight, change point, to determine reduce levels

4.7 Level book and reduction of levels by

4.7.1 Height of collimation method and
4.7.2 Rise and fall method

4.8 Arithmetic checks, problem on reduction of levels, fly levelling, check leveling and profile levelling (L-section and X-section), errors in levelling, permissible limits, reciprocal leveling. Numerical problems.

4.9 Computations of Areas of regular figures and irregular figures. Simpson's rule: prismatic formula and graphical method use of planimeter for computation of areas, numerical problems

5. Plane Table Surveying (10 hrs)

5.1 Purpose of plane table surveying, equipment used in plane table survey:

5.2 Setting of a plane table:
(a) Centering
(b) Levelling
(c) Orientation

5.3 Methods of plane table surveying
- (a) Radiation,
- (b) Intersection
- (c) Traversing
- (d) Resection

5.4 Concept of Two point and Three point problems (Concept only)

5.5 Errors in plane table survey and precautions to control them. Testing and adjustment of plane table and alidad

PRACTICAL EXERCISES

I. Chain surveying:

i)
- a) Ranging a line
- b) Chaining a line and recording in the field book
- c) Taking offsets - perpendicular and oblique (with a tape only)
- d) Setting out right angle with a tape

ii) Chaining of a line involving reciprocal ranging

iii) Chaining a line involving obstacles to ranging

iv) Chain Survey of a small area.

II. Compass Surveying:

i)
- a) Study of prismatic compass
- b) Setting the compass and taking observations
- c) Measuring angles between the lines meeting at a point

III. Levelling:

i)
- a) Study of dumpy level and levelling staff
- b) Temporary adjustments of various levels
- c) Taking staff readings on different stations from the single setting and finding differences of level between them

ii) To find out difference of level between two distant points by shifting the instrument

iii) Longitudinal and cross sectioning of a road/railway/canal

iv) Setting a gradient by dumpy and auto-level

IV. Plane Table Surveying:

i) a) Study of the plane table survey equipment
b) Setting the plane table
c) Marking the North direction
d) Plotting a few points by radiation method

ii) a) Orientation by
- Trough compass
- Back sighting

b) Plotting few points by intersection, radiation and resection method

iii) Traversing an area with a plane table (at least five lines)

V. Layout of Buildings (from given drawing of two room residential building) by use of surveying instruments.

INSTRUCTIONAL STRATEGY

This is highly practice-oriented course. While imparting theoretical instructions, teachers are expected to demonstrate the use of various instruments in surveying, stress should be laid on correct use of various instruments so as to avoid/minimize errors during surveying. It is further recommended that more emphasis should be laid in conducting practical work by individual students. Technical visit to Survey of India, Northern Region and Great Trignometrical Survey(GTS), Dehradun.

RECOMMENDED BOOKS

1. Hussain, SK and Nagraj, MS; "Text Book of Surveying"; New Delhi, S Chand and Co Ltd.

2. Deshpande, RS; "A Text Book Surveying and Levelling"; Poona, United Book Corporation

3. Kocher, CL; "A Text Book of Surveying"; Ludhiana, Katson Publishing House

4. Kanetkar,TP and Kulkarni, SV., "Surveying and Leveling", Poona, AVG Parkashan

5. Kanetkar, TP; and Kulkarni, SV; "Surveying and Leveling" Poona, AVG Prakashan

6. Mahajan, Sanjay “Surveying -I”, Tech. Publication, Delhi

7. Punmia, BC; "Surveying and Leveling", Delhi Standard Publishers Distributors.

8. Shahai, PB; "A Text Book of Surveying", Oxford and IBH Publishing Co.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	07
2	03	09
3	07	24
4	10	30
5	10	30
Total	**32**	**100**

3.4 CONSTRUCTION MATERIALS

L	T	P
4	-	2

RATIONALE

Civil Engineering diploma holders have to supervise construction of various types of civil works involving use of various materials like stones, bricks and tiles, cement and cement based products, lime, timber and wood based products, paints and varnishes, metals and other miscellaneous materials. The students should have requisite knowledge regarding characteristics, uses and availability of various building materials and skills in conducting tests to determine suitability of materials for various construction purposes. In addition, specifications of various materials should also be known (PWD/BIS) for effective quality control.

DETAILED CONTENTS
THEORY

1. Building Stones: (06 hrs)

    1.1 Classification of Rocks: (General Review)

        1.1.1 Geological classification: Igneous, sedimentary and metamorphic rocks

        1.1.2 Chemical classification; Calcareous, argillaceous and siliceous rocks

        1.1.3 Physical classification: Unstratified , startified and foliated rocks

    1.2 General characteristics of stones – Marble, Kota stone, Granite, Sand, Trap, Basalt stone, Lime stone and Slate

    1.3 Requirements of good building stones

    **1.4 Identification of common building stones

    1.5 Various uses of stones in construction

    1.6 Quarrying of stones by blasting and its effect on environment

2. Bricks and Tiles: (13 hrs)

    2.1 Introduction to bricks

    2.2 Raw materials for brick manufacturing and properties of good brick making earth

    2.3 Manufacturing of bricks

        2.3.1 Preparation of clay (manual/mechanically)

        **2.3.2 Moulding: hand moulding and machine moulding brick table; drying of bricks, burning of bricks, types of kilns (Bull's Trench Kiln and Hoffman's Kiln), process of burning, size and weight of standard brick; traditional brick, refractory brick, clay-flyash bricks, sun dried bricks, only line diagram of kilns

2.4 Classification and specifications of bricks as per BIS: 1077

2.5 Testing of common building bricks as per BIS: 3495

Compressive strength, water absorption – hot and cold water test, efflorescence, Dimensional tolerance, soundness

2.6 Tiles

2.6.1 Building tiles; Types of tiles-wall, ceiling, roofing and flooring tiles

2.6.2 Ceramic, terrazo and PVC tiles, : their properties and uses,
2.6.3 Vitrified tiles, Paver blocks.

2.7 Stacking of bricks and tiles at site

3. Cement: (10 hrs)

**3.1 Introduction, raw materials, flow diagram of manufacturing of cement

3.2 Various types of Cements, their uses and testing: Ordinary portland cement, rapid hardening cement, low heat cement, high alumina cement, blast furnace slag cement, white and coloured cement, portland pozzolana cement, super sulphate cement, Tests of cement – fineness, soundness, initial and final setting time etc.as per B.I.S. Code.

3.3 Properties of cement

4. Lime: (04 hrs)

4.1 Introduction: Lime as one of the cementing materials

4.2 Classification and types of lime as per BIS Code

4.3 Calcination and slaking of lime

5. Timber and Wood Based Products: (10 hrs)

5.1 Identification and uses of different types of timber: Teak, Deodar, Shisham, Sal, Mango, Kail, Chir, Fir, Hollock, Champ

** 5.2 Market forms of converted timber as per BIS Code

5.3 Seasoning of timber: Purpose, methods of seasoning as per BIS Code

5.4 Properties of timber and specifications of structural timber

5.5 Defects in timber, decay in timber

5.6 Preservation of timber and methods of treatment as per BIS

5.7 Other wood based products, their brief description of manufacture and uses: laminated board, block board, fibre board, hard board, sunmica, plywood, veneers, nu-wood and study of the brand name and cost of the wood based products available in the market, Cement Panel Board, Moulded Door.

6. Paints and Varnishes: (07 hrs)

6.1 Introduction, purpose and use of paints

6.2 Types, ingredients, properties and uses of oil paints, water paints and cement paints

6.3 Covering capacity of various paints

6.4 Types, properties and uses of varnishes

6.5 Trade name of different products.

7. Metals: (04 hrs)

7.1 Ferrous metals: Composition, properties and uses of cast iron, mild steel, HYSD steel, high tension steel as per BIS.

7.2 Commercial forms of ferrous, metals.
7.3 Aluminium & Stainless Steel.

8. Miscellaneous Materials: (10hrs)

8.1 Plastics – Introduction and uses of various plastic products in buildings such as doors, water tanks and PVC pipes

8.2 Fibre Sheets and their manufacture process.

8.3 Types and uses of insulating materials for sound and thermal insulation

8.4 Construction chemicals like water proofing compound, epoxies, polymers

8.5 Water proofing, termite proofing and fire resistance materials – types and uses

8.6 Materials used in interior decoration works like POP, methods of doing POP

NOTE: **A field visit may be planned to explain and show the relevant things

PRACTICAL EXERCISES:

i) To identify the stones used in building works by visual examination

ii) To determine the crushing strength of bricks

iii) To determine the water absorption of bricks and efflorescence of bricks

iv) To identify various types of timbers such as: Teak, Sal, Chir, Sissoo, Deodar, Kail & Hollock by visual examination only

v) To determine fineness (by sieve analysis) of cement

vi) To conduct field test of cement.

vii) To determine normal consistency of cement

viii) To determine initial and final setting times of cement

ix) To determine soundness of cement

x) To determine compressive strength of cement

xi) The students should submit a report work on the construction materials, covering water proofing material, cements, steel, paints and timber products available in the local market. They will also show the competitive study based upon the cost, brand name, sizes available in the local market.

INSTRUCTIONAL STRATEGY

Teachers are expected to physically show various materials while imparting instructions. Field-visits should also be organized to show manufacturing processes and use of various materials in Civil engineering works. Students should be encouraged to collect sample of various building materials so as to create a museum of materials in the polytechnic.

RECOMMENDED BOOKS

1) Sharma, SK; and Mathur, GC; "Engineering Materials;" Delhi-Jalandhar, S. Chand and Co.
2) Surendra Singh; "Engineering Materials;" New Delhi, Vikas Publishing House Pvt. Ltd.
3) Chowdhuri, N; "Engineering Materials;" Calcutta, Technical Publishers of India.
4) Bahl, SK; "Engineering Materials;" Delhi, Rainbow Book Co.
5) TTTI, Chandigarh "Civil Engineering Materials:" New Delhi Tata McGraw Hill Publication
6) Kulkarni, GJ; "Engineering Materials;" Ahmedabad, Ahmedabad Book Depot.
7) Shahane; "Engineering Materials"; Poona, Allied Book Stall.
8) Gurcharan Singh; "Engineering materials", Delhi Standard Publishers Distributors
9) SC Rangawala, "Construction Materials", Charotar Publishers
10) Alam Singh, "Constrution Materials"
11) Dr. Hemant Sood "Lab Manual in Testing of Engineering Materials", New Age International (P) Ltd., New Delhi

12) Handbook of Civil Engineering by PN Khanna.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	08
2	13	20
3	10	16
4	04	08
5	10	14
6	07	12
7	04	08
8	10	14
Total	**64**	**100**

3.5 BUILDING CONSTRUCTION

L	T	P
5	-	2

RATIONALE

Diploma holders in Civil Engineering are supposed to effectively supervise construction of buildings. Effective supervision is essential to obtain/provide a fault free service from contractors to users. To perform above task, it is essential that students should have knowledge of various sub components of buildings like foundations, walls, roofs, staircases, floors etc., and their constructional details as well as preventive, remedial and corrective methods of common construction faults. Therefore, the subject of Building Construction is very important for Civil Engineering diploma holders.

DETAILED CONTENTS

THEORY:

1. Introduction: (01 hr)

    1.1 Definition of a building, classification of buildings based on occupancy
    1.2 Different parts of a building

2. Foundations: (06 hrs)

    2.1 Concept of foundation and its purpose
    2.2 Types of foundation-shallow and deep

        **2.2.1 Shallow foundation - constructional details of: Spread foundations for walls, thumb rules for depth and width of foundation and thickness of concrete block, stepped foundation, masonry pillars and concrete columns

    2.3 Earthwork

        2.3.1 Layout/setting out for surface excavation, cutting and filling
        2.3.2 Excavation of foundation, trenches, shoring, timbering and de- watering

3. Walls: (07 hrs)

    3.1 Purpose of walls
    3.2 Classification of walls - load bearing, non-load bearing, dwarf wall, retaining, breast walls and partition walls
    3.3 Classification of walls as per materials of construction: brick, stone, reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls
    3.4 Partition walls: Constructional details, suitability and uses of brick and wooden partition walls
    3.5 Mortars: types, selection of mortar and its preparation
    3.6 Scaffolding, construction details and suitability of mason's brick layers and tubular scaffolding, shoring, underpinning

4. Masonry (08 hrs)

4.1 Brick Masonry: Definition of terms like header, stretcher, queen closer, king closer, frog and quoin, course, bond, facing, backing, hearting, jambs, reveals, soffit, plinth, pillars and pilasters

4.1.1 Bond – meaning and necessity; English, flemish bond and other types of bonds

4.1.2 Construction of brick walls –methods of laying bricks in walls, precautions observed in the construction of walls, methods of bonding new brick work with old (toothing, raking, back and block bonding), Expansion and contraction joints

4.1.3 Importance towards special care during execution on: soaking of bricks, maintenance of bonds and plumb, filling of horizontal and vertical joints, masonry work, restriction height of construction on a given day, every fourth course, earthquake resistance measure, making of joints to receive finishes

4.2 Stone Masonry

4.2.1 Glossary of terms – natural bed, bedding planes, string course, corbel, cornice, block in course grouting, moulding, templates, corner stone, bond stone, throating, through stone, parapet, coping, pilasters and buttress

4.2.2 Types of stone masonry: rubble masonry - random and coursed; Ashlar masonry, principles to be observed in construction of stone masonry walls

4.2.3 Importance towards special care during execution of stone masonry work on dressing of stone, size and placing of bond and corner stones, filling joints, proper packing of internal cavities of rubble masonry wall, raking of joints to receive finishes

5. Arches and Lintels: (06 hrs)

5.1 Meaning and use of arches and lintels:

5.2 Glossary of terms used in arches and lintels - abutment, pier, arch ring, intrados, soffit, extrados, voussoiers, springer, springing line, crown, key stone, skew back, span, rise, depth of an arch, haunch, spandril, jambs, bearing, thickness of lintel, effective span

5.3 Arches:

5.3.1 Types of Arches - Semi circular, segmental, elliptical and parabolic, flat, inverted and relieving

5.3.2 Stone arches and their construction

5.3.3 Brick arches and their construction

5.4 Lintels

5.4.1 Purpose of lintel

5.4.2 Materials used for lintels

5.4.3 Cast-in-situ and pre-cast lintels

5.4.4 Lintel along with sun-shade or chhajja

**6. Doors, Windows and Ventilators: (05 hrs)

6.1 Glossary of terms with neat sketches

6.2 Classification based on materials i.e. wood, metal and plastic and their suitability for different situations. Different type of doors- panel door, flush door, flazed door, rolling shutter, steel door, sliding door, plastic and alumininium doors

6.3 Window – Panel window, glazed windows (fixed and openable) ventilators, sky light window, Louvres shutters, plastic and aluminium windows.

6.4 Door and window frames – materials and sections, door closures, hold fasts

*7. Damp Proofing and Water Proofing (08 hrs)

7.1 Dampness and its ill effects on bricks, plaster, wooden fixtures, metal fixtures and reinforcement, damage to aesthetic appearance, damage to heat insulating materials, damage to stored articles and health, sources and causes of dampness

7.2 Sources of dampness - moisture penetrating the building from outside e.g. rainwater, surface water, ground moisture. Moisture entrapped during construction i.e. moisture in concrete, masonry construction and plastering work etc. Moisture which originates in the building itself i.e. water in kitchen and bathrooms etc.

7.3 Damp proofing materials and their specifications: rich concrete and mortar, bitumen, bitumen mastic, polymer coating, use of chemicals

7.4 Damp proofing of : basement, ground floors, plinth and walls, special damp proofing arrangements in bathrooms, WC and kitchen, damp proofing for roofs and window sills

**8. Floors (07 hrs)

8.1 Glossary of terms-floor finish, topping, under layer, base course, rubble filling and their purpose

8.2 Types of floor finishes - cast-in-situ, concrete flooring (monolithic, bonded) Terrazzo tile flooring, stone (marble and kota) flooring, PVC flooring, Terrazzo flooring, glazed tiles flooring, Timber flooring, description with sketches. The methods of construction of concrete, terrazzo and timber floors and their BIS specifications

8.3 Special emphasis on level/slope/reverse slope in bathrooms, toilets, kitchen, balcony and staircase

9. Roofs (05 hrs)

9.1 Types of roofs, concept of flat, pitched and arched roofs

9.2 Glossary of terms for pitched roofs - batten, eaves, facia board, gable, hip, lap, purlin, rafter, rag bolt, valley, ridge, rain water gutter, anchoring bolts

9.3 False ceilings using gypsum, plaster boards, cellotex, fibre boards

9.4 Special emphasis on maintenance of slopes, overlaps of roofing materials, applicability and problems of wind ties, size of anchoring bolts

10. Stairs (05 hrs)

10.1 Glossary of terms: Staircase, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand-rail, nosing
10.2 Classification of staircase on the basis of material – RCC, timber, steel, Aluminium
10.3 Planning and layout of staircase: Relations between rise and tread, determination of width of stair, landing etc
10.4 Various types of layout - straight flight, dog legged, open well, quarter turn, half turn (newel and geometrical stairs), bifurcated stair, spiral stair

11. Surface Finishes (05 hrs)

11.1 Plastering - classification according to use and finishes like plain plaster, grit finish, rough cast, pebble dashed, concrete and stone cladding etc., dubbing, proportion of mortars used for different plasters, techniques of plastering and curing
11.2 Pointing - different types of pointing and their methods
11.3 Painting - preparation of surface, primer coat and application of paints on wooden, steel and plastered wall surfaces
11.4 Application of white washing, colour washing and distempering, polishing, application of cement and plastic paints
11.5 Selection of appropriate paints/finishes for interior and exterior surfaces
11.6 Importance of preparation of surfaces such as hacking, grooving etc before application of surface finishes

12. Anti Termite Measures (As per IS 6313 –I – III) (04 hrs)

12.1 Introduction, site preparation and chemicals used in anti-termite treatment
12.2 Treatment of masonry foundation
12.3 Treatment of RCC foundation
12.4 Treatment of top surface of earth filling
12.5 Treatment of junction of walls and floors
12.6 Treatment along external perimeter of building
12.7 Treatment and selection of timber
12.8 Treatment in existing buildings

13. Building Planning (06 hrs)

13.1 Site selection: Factors to be considered for selection of site for residential, commercial, industrial and public building

13.2 Basic principles of building planning, arrangement of doors, windows, cupboards etc for residential building

13.3 Orientation of building as per IS: 7662 in relation to sun and wind direction, rains, internal circulation and placement of rooms within the available area, concept of Vastu-Shastra

13.4 Planning of building services

13.5 Introduction to National Building code.

14 Building Services (05 hrs)

Introduction to fire fighting systems, Ducting for Air-conditioning, service lines for cable telephone, and electrical wiring , garbage disposal systems.

15. Elementary idea of interior decoration, wall paneling, false ceiling, flooring etc. (02 hrs)

Note * An expert may be invited from field/industry for extension lecture

** A field visit may be planned to explain and show the relevant things

PRACTICAL EXERCISES

i) Demonstration of tools and plants used in building construction

ii) To prepare Layout of a building: two rooms building with front verandah

iii) To construct brick bonds (English bond only) in one, one and half and two brick thick: (a) Walls for L, T and cross junction (b) Columns

iv) Demonstration of following items of work at construction site by:

a) Timbering of excavated trenching

b) Damp proof courses laying

c) Construction of masonry walls

d) Laying of flooring on an already prepared lime concrete base

e) Plastering and pointing exercise

f) Constructing RCC work

g) Pre-construction and post construction termite treatment of building and woodwork

INSTRUCTIONAL STRATEGY

While imparting instructions in this subject, teachers are expected to take students to work site and explain constructional process and special details for various sub-components of a buildings. It is also important to make use of audio visual aids/video films (if available) to show specialised operations. The practical work should be given due importance and efforts should be made that each student should perform practical work independently. For carrying out practical works, polytechnics should have construction yard where enough raw materials is made available for students to perform practical work

RECOMMENDED BOOKS

1. Gupta, Sushil Kumar, Singla, DR, and Juneja BM; "A Text Book of Building Construction"; Ludhiana, Katson Publishing House.
2. Deshpande, RS and Vartak, GV; "A Text Book of Building Construction"; Poona, United Book Corporation.
3. Rangwala, SC: "Building Construction"; Anand, Charotar Book Stall
4. Kulkarni, GJ; "A Text Book of Building Construction"; Ahmedabad Book Depot
5. Arora, SP and Bindra, SP; "A Text Book of Building Construction"; New Delhi Dhanpt Rai and Sons.
6. Sharma,SK and Kaul, BK; "A Text Book of Building Construction"; Delhi, S Chand and Co.
7. Sushil Kumar; "Building Construction"; Standard Publishers Distributors, Delhi
8. Moorthy, NKR; "A Text Book of Building Construction"; Poona, Engineering Book Publishing Co.
9. SP – 62 Hand Book of BIS
10. B.I.S. – 6313 Part 1, 2, 3
11. National Building Code
12. Handbook of Civil Engineering by PN Khanna
13. Video films on Damp proofing, water proofing, surface finishes

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	01	01
2	06	08
3	07	08
4	08	10
5	06	08
6	05	06
7	08	11
8	07	08
9	05	06
10	05	06
11	05	06
12	04	06
13	06	08
14	05	06
15	02	02
Total	**80**	**100**

3.6 CIVIL ENGINEERING DRAWING - I

L	T	P
-	-	6

RATIONALE

Drawing is the language of engineers. Engineering is incomplete without a thorough knowledge of drawing. A Civil Engineering diploma holder must be capable of sketching detailed constructional drawing of various components of building for the purpose of communication with the craftsman. Planning of small buildings, developing a line plan, dimensioning, key plan, drainage plan should be a part of curriculum. The diploma engineer must be conversant with reading and interpretation of drawing for execution of work.

DETAILED CONTENTS

Drawing No. 1: (2 sheets)

Details of spread footing foundations, load bearing and non-load bearing wall for given thickness of walls with the help of given data or rule of the thumb, showing offsets, position of DPC. The details of the concrete and brick plinth protection have to be shown in the drawing.

Drawing No. 2: (one sheet)

Plans of 'T' and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond

Drawing No. 3: (2 sheets)

Detailed drawing of basement, single wooden floor, double wooden floor.

Drawing No.4 (3 sheets)

Elevation, sectional plan and sectional side elevation of flush door, glazed door, panelled door and window, Aluminium door and window with wire gauge shutter. Sketches of various joints of different members.

Drawing No.5 (one sheet)

Draw atleast one sheet using CAD software

Drawing No. 6: (2 sheet)
Drawing plan, elevation of a small building by measurement and foundation detail and sectional elevation.

Drawing No.7 (a) (4 sheets)

Drawing detailed plan, elevation and section of a two room residential building from a given line plan, showing details of foundations, roof and parapet

Drawing No. 7 (b)

Draw detailed plan, elevation and section of:

(i) Single flight R.C.C. stair case
(ii) Dog legged wooden stair case

Drawing No. 8 (one sheet)

Drawings of following floors

Cement concrete floors on ground and at first floor

i) Conglomerate (Concrete Flooring)
ii) Bonded cement concrete flooring
iii) Terrazo flooring
iv) Ceramic/vitrified tile flooring

Drawing No. 9: (one sheet)

Drawing of flat roof, showing the heat/thermal insulation provisions.

Drawing No.10

Draw atleast one sheet using CAD software

Drawing No. 11 (one sheet)

Drawing details of damp proofing arrangement of roofs and walls as per BIS Code. Show the rain water drainage arrangement also.

NOTE:

a) All drawings should be as per BIS code and specifications in SI Units
b) Intensive practice of reading and interpreting building drawings should be given
c) Some practice should be done to prepare drawings on AutoCAD

RECOMMENDED BOOKS

1. Civil Engineering Drawing by RS Malik, Asia Publishing House
2. Civil Engineering Drawing by V.B.Sikka. Katson Publishing, Ludhiana
3. Civil Engineering Drawing by NS Kumar; IPH, New Delhi
4. Principles of Building Drawing by MG Shah and CM Kale, MacMillan, Delhi
5. Building Construction by Moorthy NRK
6. Civil Engg Drawing by Layal
7. Zaidi, SKA and Siddiqui, Suhail; Drawing and Design of Residential and Commercial Buildings, Standard Publishers and Distributors, Delhi.
8. SP : 20
9. National Building Code

ECOLOGY AND ENVIRONMENTAL AWARENESS CAMP

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the eco system and controlling pollution by pollution control measures. He should also be aware of environmental laws related to the control of pollution.

This is to be organized at a stretch for 3 to 4 days. Lectures will be delivered on following broad topics. There will be no examination for this subject.

1. Basics of ecology, eco system and sustainable development

2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table

3. Sources of pollution - natural and man made, their effects on living and non-living organisms

4. Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms

5. Pollution of air-causes and effects of man, animal, vegetation and non-living organisms

6. Sources of noise pollution and its effects

7. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods, methods of vermicomposting

8. Mining, blasting, deforestation and their effects

9. Legislation to control pollution and protect environment

10. Environmental Impact Assessment (EIA), Elements for preparing EIA statements

11. Current issues in environmental pollution and its control, Global warming
. Green house gases, non-conventional sources of energy, introduction to clean technology, carbon credits.

12. Introduction to Green buildings, site selection, material efficiency, energy efficiency, water efficiency, building form.

Semester 4th

4.1 CONCRETE TECHNOLOGY

L	T	P
3	-	2

RATIONALE

Diploma holders in Civil Engineering are supposed to supervise concreting operations involving proportioning, mixing, transporting, placing, compacting, finishing and curing of concrete. To perform above functions, it is essential to impart knowledge and skills regarding ingredients of concrete and their properties; properties of concrete in plastic and hardened stage, water cement ratio and workability; proportioning for ordinary concrete; concreting operations and joints in concrete.

DETAILED CONTENTS
THEORY

1. Introduction: Definition of concrete, uses of concrete in comparison to other building materials. (02 hrs)

2. Ingredients of Concrete: (06 hrs)

   2.1 Cement: physical properties of cement; different types of cement as per IS Codes

   2.2 Aggregates:

      2.2.1 Classification of aggregates according to size and shape

      2.2.2 Characteristics of aggregates: Particle size and shape, surface texture, specific gravity of aggregate; bulk density, water absorption, surface moisture, bulking of sand, deleterious materials, soundness

      2.2.3 Grading of aggregates: coarse aggregate, fine aggregate; All-in- aggregate; fineness modulus; interpretation of grading charts

   2.3 Water: Quality requirements as per IS:456-2000

3. Water Cement Ratio: (02 hrs)

   3.1 Hydration of cement, principle of water-cement ratio, Duff Abram's Water-cement ratio law: Limitations of water-cement ratio law and its effects on strength of concrete

4. Workability: (04 hrs)

   4.1 Workability factors affecting workability, Measurement of workability: slump test, compacting factor and Vee Bee consistometer; Recommended slumps for placement in various conditions as per IS:456-2000/SP-23

5. Properties of Concrete: (08 hrs)

   5.1 Properties in plastic state: Workability, Segregation, Bleeding and Harshness

5.2 Properties in hardened state: Strength, Durability, Impermeability, Dimensional changes;

6. Proportioning for Normal Concrete: (04 hrs)

6.1 Objectives of mix design, introduction to various grades as per IS:456-2000; proportioning for nominal mix design as prescribed by IS 456-2000

6.2 Adjustment on site for: Bulking of fine aggregate, water absorption of aggregate, workability

6.3 Difference between nominal and controlled concrete

6.4. Introduction to IS-10262-2009-Code for controlled mix design

7. Introduction to Admixtures (chemicals and minerals) for improving performance of concrete (03 hrs)

8. Special Concretes (only features) (06 hrs)

8.1 Concreting under special conditions, difficulties and precautions before, during and after concreting
- 8.1.1 Cold weather concreting
- 8.1.2 Under water concreting
- 8.1.3 Hot weather concreting

8.2 Ready mix concrete

8.3 Fibre reinforced concrete
8.4 Polymer Concrete
8.5 Fly ash concrete
8.6 Silica fume concrete

9. Concreting Operations: (12 hrs)

**9.1 Storing of Cement:

- 9.1.1 Storing of cement in a warehouse
- 9.1.2 Storing of cement at site
- 9.1.3 Effect of storage on strength of cement
- 9.1.4 Determination of warehouse capacity for storage of Cement

**9.2 Storing of Aggregate: Storing of aggregate at site

9.3 Batching (to be shown during site visit)

- 9.3.1 Batching of Cement
- 9.3.2 Batching of aggregate by:
  - 9.3.2.1 Volume, using gauge box (farma) selection of proper gauge box
  - 9.3.2.2 Weight spring balances and batching machines
- 9.3.3 Measurement of water

** 9.4 Mixing:

9.4.1 Hand mixing

9.4.2 Machine mixing - types of mixers, capacities of mixers, choosing appropriate size of mixers, operation of mixers

9.4.3 Maintenance and care of machines

**9.5 Transportation of concrete: Transportation of concrete using: wheel barrows, transit mixers, chutes, belt conveyors, pumps, tower crane and hoists etc.

9.6 Placement of concrete:

Checking of form work, shuttering and precautions to be taken during placement

** 9.7 Compaction:

9.7.1 Hand compaction

9.7.2 Machine compaction - types of vibrators, internal screed vibrators and form vibrators

9.7.3 Selection of suitable vibrators for different situations

9.8 Finishing concrete slabs - screeding, floating and trowelling

9.9 Curing:

9.9.1 Objectives of curing, methods of curing like ponding, membrane curing, steam curing, chemical curing

9.9.2 Duration for curing and removal of form work

9.10 Jointing: Location of construction joints, treatment of construction joints, expansion joints in buildings - their importance and location

9.11 Defects in concrete: Identification of and methods of repair

10. Importance and methods of non-destructive tests (introduction only) (01 hr)

NOTE: ** A field visit may be planned to explain and show the relevant things

PRACTICAL EXERCISES:

i) To determine the physical properties of cement as per IS Codes
ii) To determine flakiness and elongation index of coarse aggregates
iii) To determine silt in fine aggregate
iv) Determination of specific gravity and water absorption of aggregates
v) Determination of bulk density and voids of aggregates
vi) To determine surface moisture in fine aggregate by displacement method

vii) Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate)
viii) To determine necessary adjustment for bulking of fine aggregate
ix) To determine workability by slump test:
x) To verify the effect of water, fine aggregate/coarse aggregate ratio and aggregate/Cement ratio on slump
xi) Compaction factor test for workability
xii) Non destructive test on concrete by:
  a) Rebound Hammer Test
  b) Ultrasonic Pulse Velocity Test
xiii) Tests for compressive strength of concrete cubes for different grades of concrete

INSTRUCTIONAL STRATEGY

This subject is of practical nature. While imparting instructions, teachers are expected to organize demonstrations and field visits to show various stages of concreting operations. While working in the laboratory, efforts should be made to provide extensive practical training to students so as to make them confident in the preparation and testing of concrete. Teachers should also organize viva examination so as to develop understanding about concepts and principles involved. The experiments may be demonstrated to students through video programmes developed in the field of 'concrete technology' by NITTTR, Chandigarh.

RECOMMENDED BOOKS

i) Kulkarni, PD; Ghosh, RK and Phull, YR; "Text Book of Concrete Technology"; Oxford and IBH Publishing Co. New Delhi

ii) Krishnamurthy, KT; Rao, A Kasundra and Khandekar, AA; "Concrete Technology"; Dhanpat Rai and Sons, Delhi,

iii) Gupta BL and Gupta Amit; "Text Book of Concrete Technology"; Standard Publishers Distributors, Delhi.

iv) Varshney, RS;"Concrete Technology";, Oxford and IBH Publishing, New Delhi

v) Neville, AM; "Properties of Concrete", Pitman (ELBS Edition available), London

vi) Orchard; "Concrete Technology"; Vol I, II, and III

vii) Handoo, BL; Puri, LD and Mahajan Sanjay "Concrete Technology"; Satya Prakashan, New Delhi,

viii) Sood, Hemant, Mittal LN and Kulkarni PD; "Laboratory Manual on Concrete Technology", CBS Publishers, New Delhi, 2002
ix) Vazirani, VN; and Chandola, SP; "Concrete Technology"; Khanna Publishers, Delhi,

x) Gambhir, ML; "Concrete Technology";, MacMillan India Ltd., New Delhi

xi) Siddique, R., "Special Structural Concretes", , Galgotia Publishers Pvt. Ltd. Delhi

xii) Birinder Singh, "Concrete Technology", Kaption Publications, Ludhiana,

(xiii) Module on 'Special Concretes by Dr Hemant Sood , NITTTR Chandigarh

(xiv) Concrete Technology by P Dayaratman

(xv) Video programme on different experiments in 'Concrete Technology' developed by NITTTR, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	04
2	06	12
3	02	04
4	04	08
5	08	18
6	04	08
7	03	07
8	06	12
9	12	25
10	01	02
Total	**48**	**100**

4.2 WATER SUPPLY AND WASTE WATER ENGINEERING

L	T	P
5	-	2

RATIONALE

One of the basic necessities of life is water which is not easily available to a lot of people. Providing potable water at the first place then collection and disposal of waste solids and liquids are important activities of civil engineering field. This subject provides basic knowledge and skills in the field of water supply system and waste disposal system. Classroom instructions should be suplimented by field visits to show functional details of water supply and waste disposal systems. It will also be advantageous to invite professionals from field to deliver extension lectures on specialised operations.

DETAILED CONTENTS

A. WATER SUPPLY

1. Introduction (02 hrs)
   - 1.1 Necessity and brief description of water supply system.

2. Quantity of Water (06 hrs)
   - 2.1 Water requirement
   - 2.2 Rate of demand and variation in rate of demand
   - 2.3 Per capita consumption for domestic, industrial, public and fire fighting uses as per BIS standards (no numerical problems)
   - 2.4 Population Forecasting

3. Quality of Water (04 hrs)
   - 3.1 Meaning of pure water and methods of analysis of water
   - 3.2 Physical, Chemical and bacteriological tests and their significance
   - 3.3 Standard of potable water as per Indian Standard
   - 3.4 Maintenance of purity of water (small scale and large scale quantity)

4. Water Treatment (brief introduction) (09 hrs)
   - **4.1 Sedimentation - purpose, types of sedimentation tanks
   - **4.2 Coagulation floculation - usual coagulation and their feeding
   - **4.3 Filtration - significance, types of filters, their suitability
   - 4.4 Necessity of disinfection of water, forms of chlorination, break point chlorine, residual chlorine, application of chlorine.
   - 4.5 Flow diagram of different treatment units, functions of (i) Areation fountain (ii) mixer (iii) floculator, (iv) classifier, (v) slow and rapid sand filters (vi) chlorination chamber.

5. Conveyance of Water (09 hrs)

**5.1 Different types of pipes - cast iron, PVC, steel, asbestos cement, concrete and lead pipes. Their suitability and uses, types of joints in different types of pipes.

5.2 Appurtenances: Sluice, air, reflux valves, relief valves, scour valves, bib cocks, stop cocks, fire hydrants, water meters their working and uses

5.3 Distribution site: Requirement of distribution, minimum head and rate, methods of layout of distribution pipes

5.3.1 Systems of water supply - Intermittent and continuous service reservoirs - types, necessity and accessories.

5.3.2 Wastage of water - preventive measures

5.3.3 Maintenance of distribution system

5.3.4 Leakage detection

6. Laying out Pipes (06 hrs)

6.1 Setting out alignment of pipes

6.2 Excavation for laying of pipes and precautions to be taken in laying pipes in black cotton soil.

6.3 Handling, lowering beginning and jointing of pipes

6.4 Testing of pipe lines

6.5 Back filling

6.6 Use of boring rods

7. Building Water Supply (02 hrs)

7.1 Connections to water main (practical aspect only)

**7.2 Water supply fixtures and installations and terminology related to plumbing

B. WASTE WATER ENGINEERING

8. Introduction (04 hrs)

8.1 Purpose of sanitation

8.2 Necessity of systematic collection and disposal of waste

8.3 Definition of terms in sanitary engineering

8.4 Collection and conveyance of sewage

8.5 Conservancy and water carriage systems, their advantages and Disadvantages

8.6 (a) Surface drains (only sketches) : various types, suitability

(b) Types of sewage: Domestic, industrial, storm water and its seasonal variation

9. Sewerage System (05hrs)

9.1 Types of sewerage systems, materials for sewers, their sizes and joints

9.2 Appurtenance: Location, function and construction features. Manholes, drop manholes, tank hole, catch basin, inverted siphon, flushing tanks grease and oil traps, storm regulators, ventilating shafts

10. Laying and Construction of Sewers: (6 hrs)

10.1 Setting out/alignment of sewers

10.2 Excavations, checking the gradient with boning rods preparation of bedding, handling and jointing testing and back filling of sewers/pipes.

10.3 Construction of surface mains and different sections required

11 Sewage characteristics: (4hrs)
- 11.1 Properties of sewage and IS standards for analysis of sewage
- 11.2 Physical, chemical and bacteriological parameters

12. Natural Methods of Sewerage Disposal (5 hrs)
- 12.1 General composition of sewage and disposal methods
- 12.2 Disposal by dilution
- 12.3 Self purification of stream
- 12.4 Disposal by land treatment
- 12.5 Nuisance due to disposal

13. Sewage Treatment (9 hrs)
- 13.1 Meaning and principle of primary and secondary treatment and activated sludge process their flow diagrams
- 13.2 Introduction and uses of screens, grit chambers, detritus tanks, skimming tanks, plainsedimentation tanks, primary clarifers, secondary clarifers, filters, control beds, intermittent sand filters, trickling filters, sludge treatment and disposal, oxidation ponds (Visit to a sewage treatment plant)

14. Building Drainage (9 hrs)
- 14.1 Aims of building drainage and its requirements
- **14.2 Different sanitary fittings and installations
- 14.3 Traps, seals, causes of breaking seals

** A field visit may be planned to explain and show the relevant things.

LIST OF PRACTICALS

1) To determine turbidity of water sample
2) To determine dissolved oxygen of given sample
3) To determine pH value of water
4) To perform jar test for coagulation
5) To determine BOD of given sample
6) To determine residual chlorine in water
7) To determine conductivity of water and total dissolved solids
8) To study the installation of following:
   a) Water meter
   b) Connection of water supply of building with main
   c) Pipe valves and bends
   d) Water supply and sanitary fittings
9) To study and demonstrate the joining/threading of GI Pipes, CI Pipes, SW pipes, D.I. pipes and PVC pipes.
10) To demonstrate the laying of SW pipes for sewers
11) Study of water purifying process by visiting a field lab.
12) To test house drainage

INSTRUCTIONAL STRATEGY:

Before imparting the instructions in the class room, visits to water works and sewage treatment plants can go a long way for increased motivation of students for learning in the class room. As

the subject is of practical nature, lecture work be supplemented by field visits from time to time. Home assignments related to collection of information, pamphlets and catalogues from hardware shop dealing water supply and sanitary fittings will be very helpful for the students.

REFERENCES

1. Duggal, KN; "Elements of Public Health Engineering";, S. Chand and Co. New Delhi
2. Rangwala, SC; "Water Supply and Sanitary Engineering"; Anand Charotar Book Stall
3. Kshirsagar, SR; "Water Supply Engineering"; Roorkee Publishing House, Roorkee
4. Kshirsagar, SR; "Sewage and Sewage Tratement"; Roorkee, Roorkee Publishing House
5. Hussain, SK; "Text Book of Water Supply and Sanitary Engineering"; Oxford and IBH Publishing Co, New Delhi,
6. Birdie, GS; "Water Supply and Sanitary Engineering"; Dhanpat Rai and Sons, Delhi
7. Garg, Santosh Kumar; "Water Supply Engineering"; Khanna Publishers, Delhi
8. Garg, Santosh Kumar; "Sewage and Waste Water Disposal Engineering"; Khanna Publishers, Delhi
9. Steel, EW; "Water Supply and Sewerage"; McGraw Hill.
10. Duggal, Ajay K and Sharma, Sanjay, "A Laboratory Manual in Public Health Engineering", , Galgotra Publications, 2006, New Delhi
11. Gurjar,B.R. " Sludge Treatment & Disposal" Oxford and IBH Co Pvt Ltd New Delhi.
12. Mahajan Sanjay, Water Supply and Waste Water Engineering, Satya Prakashan Ltd., Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	03
2	06	07
3	04	05
4	09	12
5	09	11
6	06	07
7	02	03
8	04	05
9	05	06
10	06	07
11	04	05
12	05	06
13	09	12
14	09	11
Total	**80**	**100**

4.3 IRRIGATION ENGINEERING

L	T	P
4	-	-

RATIONALE

Diploma holders in civil engineering have to supervise the construction, repair and maintenance of canals, head works, river training works, cross drainage works, regulatory and other works . Some of diploma holders are also engaged for preventing water logging and irrigation by tubewells. This subject imparts knowledge regarding hydrology, flow irrigation – storage and distribution system, constructional features of head works, river training works, cross drainage works, causes and prevention of water logging and construction of tube wells.

DETAILED CONTENTS

1. Introduction: (02 hrs)

   1.1 Definition of irrigation

   1.2 Necessity of irrigation

   1.3 History of development of irrigation in India

   1.4 Major, medium and minor irrigation projects

2. Water Requirement of Crops (06 hrs)

   2.1 Principal crops in India and their water requirements

   2.2 Crop seasons – Kharif and Rabi

   2.3 Soil water, soil crop and water relationships, duty, delta and base period, their relationship

   2.4 Gross commanded area (GCA), culturable commanded area (CCA), intensity of irrigation, irrigable area

3. Hydrological Cycle Catchment Area and Run-off (06 hrs)

   Rainfall , definition rain-gauges – automatic and non-automatic, methods of estimating average rainfall (Arithmatic system); catchment area runoff, factors affecting runoff, hydrograph, basic concept of unit hydrograph.

4. Methods of Irrigation (07 hrs)

   4.1 Flow irrigation - its advantages and limitations

4.2 Lift Irrigation – Tube well and open well irrigation, their advantages and disadvantages

4.3 Sprinkler irrigation conditions favourable and essential requirements for sprinkler irrigation, sprinkler system – classification and component parts

4.4 Drip irrigation, suitability of drip irrigation, layout, component parts, advantages

5. Canals (08 hrs)

5.1 Classification, apurtenancs of a canal and their functions, sketches of different canal cross-sections (unlined)

5.2 Various types of canal lining - their related advantages and disadvantages, sketches of different lined canal x-sections

5.3 Breaches and their control

5.4 Maintenance of lined and unlined canals

6. Tube Well Irrigation (09 hrs)

6.1 Introduction, occurrence of ground water, location and command, advantages and disadvantages, comparison with canal irrigation

6.2 Tube wells, explanation of terms: water table, radius of influence, depression head, cone of depression, confined and unconfined aquifers. Yield of a well and methods of determining yield of well

6.3 Types of tube wells, cavity, strainer and slotted type;

6.4 Method of boring, installation of well assembly, development of well, pump selection and installation and maintenance

6.5 Water Harvesting Techniques: Need and requirement of various methods, Run-off from roof top and ground surface, construction of recharge pits and recharge wells and their maintenance.

7. Dams (07 hrs)

7.1 Classification of dams; earthen dams - types, causes of failure; cross-section of zoned earthen dams, method of construction, gravity dams – types, cross-sections of a dam, method of construction

7.2 Concept of small and micro dams

7.3 Concept of spillways and energy dissipators

8. Canal Head Works and Regulatory Works (06 hrs)

Definition, object, general layout, functions of different parts of head works. Difference between weir and barrage

9. Cross Drainage Works (04 hrs)

9.1 Functions and necessity of the following types: aqueduct, super passage, level crossing, inlet and outlet, pipe crossing

9.2 Sketches of the above cross drainage works

10. Definitions of following Hydraulic Structures with Sketches (02 hrs)

10.1 Falls

10.2 Cross and head regulators

10.3 Outlets

10.4 Canal Escapes

11. River Training Works (04 hrs)

Methods of river training, guide banks, retired (levees) embankments, groynes and spurs, pitched island, cut-off

12. Water Logging and Drainage and Ground Water Re-charge (03 hrs)

12.1 Definition of water logging – its causes and effects, detection, prevention and remedies

12.2 Reclamation of soil

12.3 Surface and sub-surface drains and their layout

12.4 Concept and various techniques used for ground water re-charge

INSTRUCTIONAL STRATEGY

The teaching of the subject should be supplemented by field visits at regular intervals of time to expose the students to irrigation works. Students should be asked to prepare and interpret drawings of various irrigation works.

RECOMMENDED BOOKS

1. Bharat Singh, `Fundamentals of Irrigation Engineering', , Nem Chand and Bros, Roorkee

2. Garg, Santosh Kumar, `Irrigation Engineering and Hydraulics Structures', Khanna Publishers, Delhi,

3. Punmia, BC; and Pande Brij Bansi Lal, `Irrigation and Water Power Engineering', Delhi, Standard Publishers Distributors, Delhi,

4. Sharma, RK; `Text Book of Irrigation Engineering and Hydraulics Structures', , Oxford and IBH Publishing Company, New Delhi

5. Sharma, SK; `Principles and Practice of Irrigation Engineering', Prentice Hall of India Pvt. Ltd., New Delhi,

6. Varshney RS, Gupta SC, Gupta RL at all. "Theory and Design of Irrigation Structures", Vol. I and II,

7. Saharsabudhe SR, "Irrigation Engineering and Hydraulic Structures"

8. Priyani BB, 'The Fundamental Principles of Irrigtion and Water Power

9. BIS Codes

10. Wan. E. Houk, "Irrigation Engineering" Vol. I and II

11. Central Ground Water Board and Central Water Commission Guidelines and Reference Books.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	03
2	06	08
3	06	08
4	07	13
5	08	12
6	09	15
7	07	12
8	06	09
9	04	06
10	02	03
11	04	06
12	03	05
Total	**64**	**100**

4.4 SURVEYING – II

L	T	P
2	-	6

RATIONALE

The important functions of a civil engineer includes the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works

While framing the curriculum for the subject of surveying, stress has been given to the development of knowledge and skill in theodolite surveying, tachometry surverying, curves and use of minor and modern instruments have been included in this subject.

Field work should be a selected one so that student can check his work and have an idea of the results the extent of error in the work done by him. As far as possible, the surveys done should be got plotted, as this will also reveal errors in the work and develop skill in plotting.

DETAILED CONTENTS

1. Contouring: (05 hrs)

   Concept of contours, purpose of contouring, contour interval and horizontal equivalent, factors effecting contour interval, characteristics of contours, methods of contouring: Direct and indirect, use of stadia measurements in contour survey, interpolation of contours; use of contour map, Drawing cross section from a contour map; marking alignment of a road, railway and a canal on a contour map, computation of earth work and reservoir capacity from a contour map

2. Theodolite Surveying: (09 hrs)

   Working of a transit vernier theodolite, axes of a theodolite and their relation; temporary adjustments of a transit theodolite; concept of transiting, swinging, face left, face right and changing face; measurement of horizontal and vertical angles. Prolonging a line (forward and backward) measurement of bearing of a line; traversing by included angles and deflection angle method; traversing by stadia measurement, theodolite triangulation, plotting a traverse; concept of coordinate and solution of omitted measurements (one side affected), errors in theodolite survey and precautions taken to minimize them; limits of precision in theodolite traversing. Height of objects – accessible and non-accessible bases

3. Tacho-metric surveying (04 hrs)

   Tachometry, Instruments to be used in tachometry, methods of tachometry, stadia system of tachometry, general principles of stadia tachometry, examples of stadia tachometry and Numerical problems.

4. Curves: (10 hrs)

   4.1 Simple Circular Curve:
   Need and definition of a simple circular curve; Elements of simple circular curve - Degree of the curve, radius of the curve, tangent length, point of intersection

(Apex point), tangent point, length of curve, long chord deflection angle, Apex distance and Mid-ordinate. Setting out of simple circular curve:

a) By linear measurements only:
   - Offsets from the tangent
   - Successive bisection of arcs
   - Offsets from the chord produced

b) By tangential angles using a theodolite

4.2 Transition Curve:

Need (centrifugal force and super elevation) and definition of transition curve; requirements of transition curve; length of transition curve for roads; by cubic parabola; calculation of offsets for a transition curve; setting out of a transition curve by tangential offsets only

4.3 Vertical curve

Setting out of a vertical curve

5. Introduction to the use of Modern Surveying equipment and techniques such as: (02 hrs)

a) EDM or Distomat
b) Planimeter
c) Total station
d) Introduction to remote sensing and GPS

6 Minor Instruments:- (02 hrs)

6.1. Introduction and use of minor instruments like Ceylon Ghat Tracer, Clinometer, Pantograph, Abney Level etc.

6.2. Use of planimeter for computing areas

NOTE: No sketch of the instruments may be asked in the examination

PRACTICAL EXERCISES

I. Contouring:

i) Preparing a contour plan by radial line method by the use of a Tangent Clinometer/Tachometer

ii) Preparing a contour plan by method of squares

iii) Preparing a contour plan of a Road/Railway track/Canal by taking cross sections.

II. Theodolite:

i) Taking out the Theodilite, mounting on the tripod and placing it back in the box

ii) Study of a transit vernier theodolite; temporary adjustments of theodolite

iii) Reading the vernier and working out the least count, measurement of horizontal angles by repetition and reiteration methods

iv) Measurement of vertical angles and use of tachometric tables

v) Measurement of magnetic bearing of a line

vi) Running a closed traverse with a theodolite (at least five sides) and its plotting

vii) Height of objects with and without accessible bases

III. Curves

i) Setting out of a simple circular curve with given data by the following methods
   a) Offsets from the chords produced
   b) One theodolite method

IV Minor instruments:

i) Demonstration and use of minor instruments like Ceylon Ghat Tracer, Tangent Clinometer, Pantagraph, Abney level etc.
ii) Use of planimeter for computing areas

V Demonstration of digital instruments through field visits to Survey of India and other government agencies.

VI Total Station (only demonstrations).

INSTRUCTIONAL STRATEGY

This is highly practice-oriented course. While imparting theoretical instructions, teachers are expected to demonstrate the use of various instruments in surveying, stress should be laid on correct use of various instruments so as to avoid/minimize errors during surveying. It is further recommended that more emphasis should be laid in conducting practical work by individual students

RECOMMENDED BOOKS

1. Hussain, SK and Nagraj, MS "Text Book of Surveying";, S Chand and Co Ltd., New Delhi
2. Deshpande, RS "A Text Book Surveying and Levelling"; United Book Corporation, Pune,
3. Kocher, CL; "A Text Book of Surveying"; Katson Publishing House Ludhiana,
4. Kanetkar,TP and Kulkarni, SV., "Surveying and Leveling", Poona, AVG Parkashan, Pune
5. Kanetkar, TP; and Kulkarni, SV; "Surveying and Leveling-Vol.2" AVG Prakashan, Pune
6. Punima, BC; "Surveying and Leveling ", Standard Publishers Distributors, Delhi

7. Shahai, PB; "A Text Book of Surveying ", Oxford and IBH Publishing Co.
8. Lilly Sant "Remote Sensing and Image Interpretation"
9. Mahajan, Sanjay, "Surveying-II", Satya Prakashan, Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	05	16
2	09	28
3	04	12
4	10	34
5	02	05
6	02	05
Total	**32**	**100**

4.5 STRUCTURAL MECHANICS

L	T	P
4	-	2

RATIONALE

This is a basic engineering subject. The purpose of the subject is to impart basic knowledge and skill regarding properties of materials, concept of stresses and strains, bending moment and shear force diagrams, second moment of area, bending and shear stresses, slope and deflection and analysis of trusses. The above knowledge will be useful for designing simple structural components. This subject is very important to develop basic concepts and principles related to strength of materials. This subject will also enable the students to continue their further education.

DETAILED CONTENTS

THEORY:

1. Properties of Materials (02 hrs)

   1.1 Classification of materials, elastic materials, plastic materials, ductile materials, brittle materials.

   1.2 Introduction to tensile test, compressive test, impact test, fatigue test, torsion test on metals.

2. Simple Stresses and Strains: (12 hrs)

   2.1 Concept of stress, normal and shear stresses,

   2.2 Concept of strain and deformation, longitudinal and transverse strain, poisson's ratio, volumetric strain

   2.3 Hooke's law, modulii of elasticity and rigidity, Bulk modulus of elasticity, relationship between the elastic constants.

   2.4 Stresses and strains in bars subjected to tension and compression. Extension of uniform bar under its own weight, stress produced in compound bars (two or three) due to axial load.

   2.5 Stress-strain diagram for mild steel and HYSD steel, mechanical properties, factor of safety.

   2.6 Temperature stresses and strains

3. Shear Force and Bending Moment: (16 hrs)

3.1 Concept of a beam and supports (Hinges, Roller and Fixed), types of beams: simply supported, cantilever, propped, over hang, cantilever and continuous beams (only concept).

3.2 Types of loads (dead load, live load, snow load, wind load seismic load as per IS Codes etc) and types of loading (point, uniformly distributed and uniformly varying loads)

3.3 Concept of bending moment and shear force, sign conventions

3.4 Bending Moment and shear force diagrams for cantilever, simply supported and overhanging beams subjected to concentrated, uniformly distributed

3.5 Relationship between load, shear force and bending moment, point of maximum bending moment, and point of contraflexure.

4. Moment of Inertia: (04 hrs)

Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical sections: rectangle, triangle, circle *(without derivations)*. Second moment of area for L, T and I sections, section modulus.

5. Bending Stresses in Beams: (06 hrs)

5.1 Concept of pure/simple bending

5.2 Assumptions made in the theory of simple bending, derivation and application of bending equation to circular cross-section, I section, T&L sections only

5.3. Moment of resistance

5.4 Calculations of bending stresses in simply supported beam

6. Combined Direct and Bending Stresses: (06 hrs)

6.1. Concentric and eccentric loads single axis eccentricity only
6.2. Effect of eccentric load on the section stresses due to eccentric loads, Numerical in the case of short columns.
6.3. Simple problems on stability of masonry dams and retaining walls

7. Shear Stresses in Beams (04 hrs)

7.1 Concept of shear stresses in beams, shear stress distribution in rectangular, circular I, T, L sections (Formula to be stated, no derivation)

8. Slope and Deflection: (04 hrs)

Necessity for determination of slope and deflection
Moment area theorem (no derivation, numerical problems)

9. Columns: (04 hrs)

9.1 Theory of columns
9.2 Eulers and Rankine Formula (No derivation)

10. Analysis of Trusses: (06 hrs)

10.1 Concept of a perfect, redundant and deficient frames
10.2 Assumptions and analysis of trusses by:

a) Method of joints
b) Method of sections
c) Graphical method

PRACTICAL EXERCISES

i) Determination of yield stress, ultimate stress, percentage elongation and plot the stress strain diagram and compute the value of young's modulus on mild steel

ii) Testing of HYSD Steel

iii) Determination of Young's modulus of elasticity for steel wire with searl's apparatus

iv) Determination of modulus of rupture of a concrete beam

v) Determination of maximum deflection and young's modulus of elasticity in simply supported beam with load at middle third point

vi) Verification of forces in a framed structure

INSTRUCTIONAL STRATEGY

Teachers are expected to give simple exercises involving the applications of various concepts and principles being taught in the subject. Efforts should be made to prepare tutorial sheets on various topics and students should be encouraged/guided to solve tutorial sheets independently. In the practical works, individual students should be given opportunities to do practical work, make observations and draw conclusions. Teachers should also conduct viva examination in which stress should be given on the understanding of basic concepts and principles.

RECOMMENDED BOOKS

i) Ramamrutham, S., "Strength of Materials", Dhanpat Rai and Sons., New Delhi
ii) Ram Chandra, "Applied Mechanics and Strength of Materials", Standard Publishers. Delhi:
iii) Punmia, BC., "Strength of Materials", Standard Publishers, Delhi,
iv) Prasad VS " Structural mechanics Galgotia publications Pvt Ltd, Delhi
v) Sadhu Singh "Strengths of Materials" Standard Publishers, New Delhi

vi) Singh Birinder "Structural Mechanics" Kaption Publishers, Ludhiana

vii) Singh Harbhajan, " Structural Mechanics" ., Abhishek Publishers, Chandigarh

viii) Singh Harbhajan, "Design of Masonry and Timber Structures" Abhishek Publishers, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	04
2	12	17
3	16	27
4	04	04
5	06	10
6	06	10
7	04	06
8	04	06
9	04	06
10	06	10
Total	**64**	**100**

4.6 CIVIL ENGINEERING DRAWING - II

L	T	P
-	-	6

RATIONALE

Diploma holders in Civil Engineering are expected to supervise construction of water supply and wastewater treatment works and irrigation structures. This subject aims at imparting skills for preparing water supply and waste water and irrigation engineering drawings to develop competencies for reading the drawings, and their execution in their field

DETAILED CONTENTS

Drawings Exercises

A) WATER SUPPLY AND WASTE WATER ENGINEERING DRAWING

1. Drains and Sewers

   Cross section of standard types of open drains (circular, v-shaped and μ-shaped) with their foundations
   Cross section of earthen ware and RCC sewer pipes
   Cross sections of masonry sewers (circular and egg shaped)

2. Traps, manholes and inspection chamber

   Detailed section of floor trap and gully trap
   Detailed plan and section of an inspection chamber
   Detailed plan and section of a manhole

3. Septic Tank and Soak Pit

   Detailed plan and cross sections of a domestic septic tank with soak pit for 10 and 50 users

4. Bath room and W.C connections:

   4.1 Cross-section through the external wall of lavatories at ground and first floor showing the one and two pipe system and the connections of the lavatory to inspection chamber

   4.2. Plan of a bathroom showing positions of lavatory, bath tub, wash-basin, taps and showers

5. Draw sectional elevation of a two storeyed building showing details of one pipe and two pipes systems with sanitation system.
6. Practice of reading water supply and sanitary engineering working drawings (PWD/urban Development agencies) including hot water and cold water supply system of a two room set.

7. Detailed Layout Plan of Sewage Treatment Plant for a residential area and Effluent Treatment Plant for an industrial unit.

B) IRRIGATION ENGINEERING DRAWING:

1. Typical cross-section of a channel
   - L-section of a channel for given data
   - Typical cross section of an unlined and lined channel in cutting, partly cutting and partly filling and fully in filling with given design data.

2. Layout plan of a canal head works.
3. Draw the typical L-section of a weir
4. Draw the X-section of an Earthen Dam
   i) Homogeneous
   ii) Zoned type
   iii) Diaphragm type

5. Cross section of a tube well
6 Layout and cross section of rain water harvesting system.

INSTRUCTIONAL STRATEGY

Teachers are expected to develop skills in preparation and interpretation of water supply and waste water engineering drawings as per BIS codes of practice. Attention must be paid towards line work, specifications writing, dimensioning, proportioning and accuracy for industrial unit at different intervals of time. Reading and interpreting actual field drawings should also be practiced so as to develop necessary competency in the students.

RECOMMENDED BOOKS

1. Layal JS "Civil Engineering Drawing", Satya Parkashan, New Delhi

2. Chandel RP " Civil Engineering Drawings"

3. Kumar; NS " Civil Engineering Drawing " IPH, New Delhi

4. Malik RS and Meo GA, "Civil Engineering Drawing" Asian Publishing House, New Delhi

ENTREPRENEURIAL AWARENESS CAMP

The employment opportunities for diploma holders especially in public sector are dwindling. The diploma holders need to explore the possibilities of becoming entrepreneurs. For this, they must be acquainted with entrepreneurship development, scope of setting up small-scale industry, existing business opportunities, financial support available and various aspects of managing business. In this context, an entrepreneurial awareness camp is suggested. During the camp, experts from various organizations such as banks, financial corporations, service institutes etc. may be invited to deliver expert lectures. Successful entrepreneurs may also be invited to interact with the students. Students may be encouraged to read papers or give seminar during the camp on Entrepreneurship Development related topics.

The camp is to be organized at a stretch for two to three days during fourth semester. Lectures will be delivered on the following broad topics. There will be no examination for this subject

1. Who is an entrepreneur?
2. Need for entrepreneurship, entrepreneurial career and self employment
3. Scenario of development of small scale industries in India
4. Entrepreneurial history in India, Indian values and entrepreneurship
5. Assistance from District Industries Centres, Commercial Banks, State Financial Corporations, Small industries Service Institutes, Research and Development Laboratories and other Financial and Development Corporations
6. Considerations for product selection
7. Opportunities for business, service and industrial ventures
8. Learning from Indian experiences in entrepreneurship (Interaction with successful entrepreneurs)
9. Legal aspects of small business
10. Managerial aspects of small business

SEMESTER 5th

5.1 REINFORCED CONCRETE DESIGN

L	T	P
5	-	-

RATIONALE

This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise RC Construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials (bars of different diameters). This subject thus deals with elementary design principles as per IS:456-2000

DETAILED CONTENTS

1. Introduction (02 hrs)

   1.1 Concept of Reinforced Cement Concrete (RCC)
   1.2 Reinforcement Materials:
   - Suitability of steel as reinforcing material
   - Properties of mild steel and HYSD steel
   1.3. Loading on structures as per IS: 875

2. Introduction to following methods of RCC design (02 hrs)
   2.1 Working stress method
   2.2 Limit state method

3. Shear and Development Length (04 hrs)

   3.1 Shear as per IS:456-2000 by working stress method
   i) Shear strength of concrete without shear reinforcement
   ii) Maximum shear stress
   iii) Shear reinforcement

4. Singly Reinforced Beam (Working stress method) (08 hrs)

   4.1 Basic assumptions and stress strain curve, neutral axis, balanced, under-reinforcement and over reinforced beams, Moment of resistance for singly reinforced beam.

   4.2 Design of singly reinforced beam including sketches showing reinforcement details.

5. Concept of Limit State Method (08 hrs)

5.1 Definitions and assumptions made in limit state of collapse (flexure)
5.2 Partial factor of safety for materials
5.3 Partial factor of safetyfor loads
5.4 Design loads
5.5 Stres block, parameters

6. Singly Reinforced beam (10 hrs)

Theory and design of singly reinforced beam by Limit State Method

7. Doubly Reinforced Beams (09 hrs)

Theory and design of simply supported doubly reinforced rectangular beam by Limit State Method

8. Behaviour of T beam, inverted T beam, isolated T beam and 'L' beams (No Numericals) (04 hrs)

9. One Way Slab (10 hrs)

Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method..

10. Two Way Slab (10 hrs)

Theory and design of two-way simply supported slab with corners free to lift, no provisions for torsional reinforcement by Limit State Method including sketches showing reinforcement details (plan and two sections)

11. Axially Loaded Column (10 hrs)

11.1 Definition and classification of columns

11.2. Effective length of column,

11.3. Specifications for longitudinal and lateral reinforcement

11.4. Design of axially loaded square, rectangular and circular short columns by Limit State Method including sketching of reinforcement(sectional elevation and plan)

12. Prestressed Concrete (03 hrs)

12.1. Concept of pre-stressed concrete
12.2. Methods of pre-stressing : pre-tensioning and post tensioning
12.3. Advantages and disadvantages of prestressing
12.4. Losses in pre-stress

Important Note:

Use of BIS:456-2000 is permitted in the examination.

INSTRUCTIONAL STRATEGY

Teachers are expected to give simple problems for designing various RCC structural members. For creating comprehension of the subject, teachers may prepare tutorial sheets, which may be given to the students for solving. It would be advantageous if students are taken at construction site to show form work for RCC as well as placement of reinforcement in various structural members. Commentary on BIS:456 may be referred along with code for relevant clauses.

RECOMMENDED BOOKS

1. Punmia, BC; "Reinforced Concrete Structure Vol I", Standard Publishers, Delhi
2. Ramamurtham, S; "Design and Testing of Reinforced Structures", Dhanpat Rai and Sons, Delhi
3. Gambhir, M.L., "Reinforced Concrete Design", Macmillan India Limited
4. Singh, Birinder "RCC Design and Drawing", Kaption Publishing House, New Delhi
5. Singh Harbhajan " Reinforced Concrete Design" Abhishek Publishers Ltd., Chandigarh
6. Mallick, SK; and Gupta, AP; "Reinforced Concrete", Oxford and IBH Publishing Co, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	03
2	02	03
3	04	05
4	08	10
5	08	10
6	10	12
7	09	12
8	04	5
9	10	12
10	10	12
11	10	12
12	03	04
Total	**80**	**100**

5.2 HIGHWAY ENGINEERING

L	T	P
5	-	2

RATIONALE

Construction of roads is one of the area in which diploma holders in Civil Engineering may get employment. These diploma holders are responsible for construction and maintenance of highways and airports. Basic concepts of road geo-metrics, surveys and plans, elements of traffic engineering, road materials, construction of rigid and flexible pavements, special features of hill roads, road drainage system and various aspects of maintenance find place in above course.

DETAILED CONTENTS

1. Introduction (02 hrs)

   1.1 Importance of Highway engineering

   1.2 Functions of IRC, CRRI, MORT&H, NHAI

   1.3 IRC classification of roads

2. Road Geometrics (10 hrs)

   2.1 Glossary of terms used in road geo-metrics and their importance: Right of way, formation width, road margin, road shoulder, carriage way, side slopes, kerbs, formation levels, camber and gradient

   2.2 Average running speed, stopping and passing sight distance

   2.3 Necessity of curves, horizontal and vertical curves including transition curves. Super elevation and methods of providing super elevation

   2.4 Sketch of typical cross-sections in cutting and filling on straight alignment and at a curve
   (Note: No design/numerical problem to be taken)

3. Highway Surveys and Plan (10 hrs)

   3.1 Topographic map, reading the data given on a topographic map

   3.2 Basic considerations governing alignment for a road in plain and hilly area

   3.3 Highway location; marking of alignment

4. Road Materials (10 hrs)

   4.1 Different types of road materials in use; soil, aggregate, binders – bitumen, cutback, Emulsion and Modified Bitumen (CRMB, PMB)

4.2 Binders: Common binders; bitumen, properties as per BIS specifications, penetration, softening point, ductility and viscosity test of bitumen, procedures and significance, cut back and emulsion and their uses, Bitumen modifiers

5. Road Pavements (12 hrs)

5.1 Road pavement: Flexible and rigid pavement, their merits and demerits, typical cross-sections, functions of various components

5.2. Introduction to California Bearing Ratio, method of finding CBR value and its significance. Aggregate : Source and types, important properties, strength, durability

5.3 Sub-grade preparation:
Setting out alignment of road, setting out bench marks, control pegs for embankment and cutting, borrow pits, making profiles of embankment, construction of embankment, compaction, preparation of subgrade, methods of checking camber, gradient and alignment as per recommendations of IRC, equipment used for subgrade preparation. Stabilization of subgrade. Types of stabilization mechanical stabilization, lime stabilization, cement stabilization, fly ash stabilization etc.(introduction only)

5.4 Introduction to Sub Base Course and Base Course:

a) Granular base course:

(i) Water Bound Macadam (WBM)
(ii) Wet Mix Macadam (WMM)

b) Bitumen Courses:
(i) Bituminous Macadam
(ii) Dense Bituminous Macadam (DBM)

c) *Methods of construction as per MORT&H

5.5 Surfacing:

a) * Types of surfacing

i) Prime coat and tack coat
ii) Surface dressing with seal coat
iii) Open graded premix carpet
iv) Mix seal surfacing
v) Semi dense bituminous concrete
vi) Bituminous Concrete/Asphaltic concrete
vii) Mastic Asphalt

b) * Methods of constructions as per MORT&H specifications and quality control..

5.6 Rigid Pavements:

Construction of concrete roads as per IRC specifications: Form work laying, mixing and placing the concrete, compacting and finishing, curing, joints in concrete pavement, equipment used.

6. Hill Roads: (06 hrs)

6.1 Introduction: Typical cross-sections showing all details of a typical hill road, partly in cutting and partly in filling

6.2 Special problems of hill areas

6.2.1 Landslides: Causes, prevention and control measures, use of geogrids, geoflexiles, geo-synthetics

6.2.2 Drainage

6.2.3 Soil erosion

6.2.4 Snow: Snow clearance, snow avalanches, frost

6.2.5 Land Subsidence

7. Road Drainage: (06 hrs)

7.1 Necessity of road drainage work, cross drainage works

7.2 Surface and subsurface drains and storm water drains. Location, spacing and typical details of side drains, side ditches for surface drainage. Intercepting drains, pipe drains in hill roads, details of drains in cutting embankment, typical cross sections

8. Road Maintenance: (06 hrs)

8.1 Common types of road failures of flexible pavements: Pot hole, rutting, alligator cracking, upheaval - their causes and remedies (brief description)

8.2 Maintenance of bituminous road such as seal-coat, patch-work and recarpetng.

8.3 Maintenance of concrete roads-filling cracks, repairing joints, maintenance of shoulders (berms), maintenance of traffic control devices

10. Road Construction Equipment: (08 hrs)

Output and use of the following plant and equipment

9.1 Hot mix plant

9.2 Tipper, tractors (wheel and crawler) scraper, bulldozer, dumpers, shovels, grader, roller, dragline

9.3 Asphalt mixer and tar boilers

9.4 Road pavers

10 Airport Engineering :- (10 hrs)

10.1 Necessity of study of airport engineering, aviation transport scenario in India.
10.2 Factors to be considered while selecting a site for an airport with respect to zoning laws.
10.3 Introduction to Runways, Taxiways and Apron

* **An expert may be invited from field/industry for extension lecture on this topic.**

PRACTICAL EXERCISES

1. Determination of penetration value of bitumen
2. Determination of softening point of bitumen
3. Determination of ductility of bitumen
4. Determination of impact value of the road aggregate
5. Determination of abrasion value (Los Angeles') of road aggregate
6. Determination of the California bearing ratio (CBR) for the sub-grade soil
7. Visit to Hot mix plant
8. Visit to highway construction site for demonstration of operation of:
   Tipper, tractors (wheel and crawler), scraper, bulldozer, dumpers, shovels, grader, roller, dragline, road pavers, JCB etc.
9. Mixing and spraying equipment
10 A compulsory visit to Ready Mix Concrete plant.

INSTRUCTIONAL STRATEGY

While imparting instructions, it is recommended that emphasis should be laid on constructional details and quality control aspects. Students should be asked to prepare sketches and drawings, clearly indicating specifications and constructional details for various sub components of a highway. It will be also advantageous to organize field visits to show the actual construction of roads at site.

RECOMMENDED BOOKS

i) Khanna, SK and Justo, CEG, "Highway Engineering", Nem Chand and Bros., Roorkee

ii) Vaswani, NK, "Highway Engineering" , Roorkee Publishing House, Roorkee,

iii) Priyani, VB, "Highway and Airport Engineering" Anand, Charotar Book Stall

iv) Sehgal, SB; and Bhanot, KL; "A Text Book on Highway Engineering and Airport" S Chand and Co, Delhi

v) Bindra, SP; "A Course on Highway Engineering" , Dhanpat Rai and Sons, New Delhi

vi) Sharma, RC; and Sharma, SK; "Principles and Practice of Highway Engineering", Asia Publishing House, New Delhi

vii) Duggal AK, Puri VP., "Laboratory Manual in Highway Engineering", New Age Publishers (P) Ltd, Delhi,

viii) NITTTR, Chandigarh "Laboratory Manual in Highway Engineering",

ix) RK Khitoliya, "Principles of Highway Engineering (2005)", Dhanpat Rai Publishing Co., New Delhi

x) Rao, GV' Transportation Engineering

xi) Duggal AK, "Maintenance of Highway – a Reader", NITTTR, Chandigarh

xii) Duggal AK "Types of Highway constitution ", NITTTR Chandigarh

xiii) Rao, "Airport Engineering"

xiv) Singh,Jagrup, "Highway Engineering", Eagle Publications Jalandhar

IRC Publications

i) MORTH Specifications for Road and Bridge Works (Fifth Revision)

ii) MORTH Pocket book for Highway Engineers, 2001

iii) MORTH Manual for Maintenance of Roads, 1983

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	04
2	10	12
3	10	12
4	10	12
5	12	14
6	06	08
7	06	08
8	06	08
9	08	10
10	10	12
Total	**80**	**100**

5.3 SURVEY CAMP

15 Days Duration

Purpose

a) Making the students conversant with the camp life

b) Providing an opportunity to the students to develop team spirit

c) Training the students to communicate with the local population

d) To impart intensive training in the use of all surveying instruments viz. Theodolite , Dumpy level, Compass, tachometer etc.

e) To train the students to appreciate practical difficulties in surveying on the field

f). To train the students for self management

Task:

Preparation of topographical plan of a given area. The survey camp will be organized for a duration of 15 days time span.

The students may be assigned an undulated area of about 1.5 to 2.00 sq.km. with level difference of 15m consisting of good number of physical features such as buildings, roads, bridges, culverts, railway tracks, electric lines etc. They are required to prepare the topographic map of above areas showing various features along with contours using a suitable contour intervals. They will mark a road alignment of given gradient connecting any two stations on the map consisting some horizontal and vertical curves and will prepare estimate of earthwork and submit the detailed technical report indicating therein practical difficulties faced during surveying for the features like ridge, line, valley lines, saddle cliffs etc.

The students should be divided in the groups consisting of 5-7 in numbers. They are required to submit the Report of workdone, during survey camp, which will be dully examined, while awarding the internal assessment.

5.4 COMPUTER APPLICATIONS IN CIVIL ENGINEERING

L	T	P
-	-	6

RATIONALE

Computer applications plays a very vital role in present day life and more so, in the professional life of diploma engineer. In order to enable the students use the computers effectively in problem solving, this course offers applications of various computer softwares in civil engineering.

DETAILED CONTENTS

PRACTICAL EXERCISES

1. Introduction and use of AutoCAD for making 2D Drawings and develop plan, section and elevation of 2 rooms building..

2. Demonstration of various civil engineering softwares like STAAD-Pro, MS Project or Primavera Project Planner, Auto Civil, MX Road or any other equivalent software for above mentioned softwares

Note:

i) The polytechnic may use any other software available with them for performing these exercises

ii) If the above softwares are not available in the institution, the demonstration of the above said software should be arranged outside the institute.

5.5 RAILWAYS, BRIDGES AND TUNNELS

L	T	P
5	-	-

RATIONALE

The subject will cater to the needs of those technicians who would like to find employment in the construction of railway tracks, bridges and tunnels. The subject aims at providing broad based knowledge regarding various components and construction of railway track, bridges and tunnels

DETAILED CONTENTS

PART – I: RAILWAYS (35 hrs)

Introduction to Indian Railways

Railway surveys: Factors influencing the railways route, brief description of various types of railway survey

Classification of permanent way describing its component parts

Rail Gauge: Definition, types, practice in India

Rails – types of rails

Rail Fastenings: Rail joints, types of rail joints, fastenings for rails, fish plates, bearing plates

Sleepers: Functions of sleepers, types of sleepers, requirements of an ideal material for sleepers.

Ballast: Function of ballast, requirements of an ideal material for ballast

Crossings and signallings: Brief description regarding different types of crossings/ signallings (Latest electronics operated signal devices)

Maintenance of track: Necessity, maintenance of track, inspection of soil, track and fixtures; maintenance and boxing of ballast maintenance gauges, tools

Earth work an drainage: Features of rail road, bed level, width of formation, side slopes, drains, methods of construction, requirement of drainage system

PART-II: BRIDGES (35 hrs)

12. Introduction

Bridge – its function and component parts, difference between a bridge and a culvert

13. Classification of Bridges

Their structural elements and suitability:

13.1 According to life-permanent and temporary

13.2 According to deck level – Deck, through and semi-through

13.3 According to material –timber, masonry, steel, RCC, pre-stressed

13.4 According to structural form;

- Grade Seperators-Railway Overbridges (ROB), Railway underbridge (RUB)
- Beam type –RCC, T-Beam, steel girder bridges, plate girder and box girder, balanced cantilever, Trussed bridges.
- Arch type – open spandrel and filled spandrel barrel and rib type
- Suspension type – unstiffened and stiffened and table (its description with sketches)
- According to the position of highest flood level submersible and non submersible

13.5 IRC classification

14. Bridge Foundations: Introduction to open foundation, pile foundation, well foundation

15. Piers, Abutments and Wingwalls

15.1 Piers-definition, parts; types –solid (masonry and RCC), open

15.2 Abutments and wing walls – definition, types of abutments (straight and tee), abutment with wing walls (straight, splayed, return and curved)

15.3 Launching of Equipment Bridges

16. Bridge bearings

Purpose of bearings; types of bearings – fixed plate, rocker and roller.

17. Maintenance of Bridges

    17.1 Inspection of Steel and Equipment bridges

    17.2 Routine maintenance

PART - III: TUNNELS (10 hrs)

18. Definition and necessity of tunnels

19. Typical section of tunnels for a national highway and single and double broad gauge railway track

20. Ventilation –necessity and methods of ventilation, by blowing, exhaust and combination of blowing and exhaust

21. Drainage method of draining water in tunnels

22. Lighting of tunnels

Notes: i) Field visits may be organized to Bridge construction site or a Bridge/Tunnel construction site/Railways tracks to explain the various components and a field visit report shall be prepared by the students, as teamwork

ii) Examiners should set questions from all the parts

INSTRUCTIONAL STRATEGY

This subject is of practical nature. While imparting instructions, teachers are expected to organize demonstrations and field visits to show various components and construction of railway track, bridges and tunnel.

RECOMMENDED BOOKS

1. Vaswani, NK, "Railway Engineering", Publishing House, Roorkee
2. Rangwala, SC, "Railway Engineering", Anand, Charotar Book Stall
3. Deshpande, R, "A Text Book of Railway Engineering", Poonam United Book Corporation
4. Algia, JS "Bridge Engineering", Anand, Charotar Book Stall
5. Victor Johnson, "Essentials of Bridge Engineering" Oxford and IBH, Delhi
6. Rangwala S.C., "Bridge Engineering", Anand, Charotar Book Stall
7. IRC Bridge Codes
8. MORTH drawings for various types of bridges
9. MORTH pocket books for bridge Engineers, 2000 (First Revision)
10. Subhash C Saxena, "Tunnal Engineering", Dhanpat Rai and Sons, Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	35	43
2	35	43
3	10	14
Total	**80**	**100**

5.6 SOIL AND FOUNDATION ENGINEERING

L	T	P
4	-	2

RATIONALE

Civil Engineering diploma engineers are required to supervise the construction of structural buildings, roads, pavements, dams, embankments, and other Civil Engineering structures. As such the knowledge of basic soil engineering is the pre-requisite for these engineers for effective discharge of their duties. This necessitates the introduction of Soil and Foundation Engineering subject in the curriculum for Diploma Course in Civil Engineering.

The subject covers only such topics which will enable the diploma engineers to identify and classify the different types of soils, their selection and proper use in the field for various types of engineering structures.

The emphasis will be more on teaching practical aspect rather than theory.

DETAILED CONTENTS

THEORY

1. Introduction: (03 hrs)

   1.1 Importance of soil studies in Civil Engineering

   1.2 Geological origin of soils with special reference to soil profiles in India: residual and transported soil, alluvial deposits, lake deposits, local soil found in J&K, dunes and loess, glacial deposits, black cotton soils, conditions in which above deposits are formed and their engineering characteristics.

   1.3 Names of organizations dealing with soil engineering work in India, soil map of India

2. Physical Properties of Soils: (04 hrs)

   2.1 Constituents of soil and representation by a phase diagram

   2.2 Definitions of void ratio, porosity, water content, degree of saturation, specific gravity, unit weight, bulk density/bulk unit weight, dry unit weight, saturated unit weight and submerged unit weight of soil grains and correlation between them

   2.3 Simple numerical problems with the help of phase diagrams

3. Classification and Identification of Soils (04 hrs)

   3.1. Particle size, shape and their effect on engineering properties of soil, particle size classification of soils

3.2 Gradation and its influence on engineering properties

3.3 Relative density and its use in describing cohesionless soils

3.4 Behaviour of cohesive soils with change in water content, Atterberg's limit - definitions, use and practical significance

3.5 Field identification tests for soils

3.6 Soil classification system as per BIS 1498; basis, symbols, major divisions and sub divisions, groups, plasticity chart; procedure for classification of a given soil

4. Flow of Water Through Soils: (04 hrs)

4.1 Concept of permeability and its importance

4.2 Darcy's law, coefficient of permeability, seepage velocity and factors affecting permeability

4.3 Comparison of permeability of different soils as per BIS

4.4 Measurement of permeability in the laboratory

5. Effective Stress: (Concept only) (04 hrs)

5.1 Stresses in subsoil

5.2 Definition and meaning of total stress, effective stress and neutral stress

5.3 Principle of effective stress

5.4 Importance of effective stress in engineering problems

6. Deformation of Soils (04 hrs)

6.1 Meaning, conditions/situations of occurrence with emphasis on practical significance of:

a) Consolidation and settlement
b) Creep
c) Plastic flow
d) Heaving
e) Lateral movement
f) Freeze and thaw of soil

6.2 Definition and practical significance of compression index, coefficient of consolidation, degree of consolidation.

6.3 Meaning of total settlement, uniform settlement and differential settlement; rate of settlement and their effects

6.4 Settlement due to construction operations and lowering of water table

6.5 Tolerable settlement for different structures as per BIS

7. Shear Strength Characteristics of Soils: (09 hrs)

7.1. Concept and Significance of shear strength

7.2 Factors contributing to shear strength of cohesive and cohesion less soils, Coulomb's law

7.3 Examples of shear failure in soils

8. Compaction: (04 hrs)

8.1 Definition and necessity of compaction

8.2 Laboratory compaction test (standard and modified proctor test as per BIS) definition and importance of optimum water content, maximum dry density; moisture dry density relationship for typical soils with different compactive efforts

8.3. Compaction control; Density control, measurement of field density by core cutter method and sand replacement method, moisture control, Proctor's needle and its use, thickness control, jobs of an embankment supervisor in relation to compaction

9. Soil Exploration:

(08 hrs)

9.1 Purpose and necessity of soil exploration

9.2 Reconnaissance, methods of soil exploration, Trial pits, borings (auger, wash, rotary, percussion to be briefly dealt)

9.3 Sampling; undisturbed, disturbed and representative samples; selection of type of sample; thin wall and piston samples; area ratio, recovery ratio of samples and their significance, number and quantity of samples, resetting, sealing and preservation of samples.

9.4 Presentation of soil investigation results

10 Bearing Capacity of soil

(10 hrs)

10.1 Concept of bearing capacity

10.2 Definition and significance of ultimate bearing capacity, net safe bearing capacity and allowable bearing pressure

10.3 Guidelines of BIS (IS 6403) for estimation of bearing capacity of soil

10.4 Factors affecting bearing capacity

10.5 Concept of vertical stress distribution in soils due to foundation loads, pressure bulb

10.6 Applications of SPT, unconfined compression test and direct shear test in estimation of bearing capacity

10.7 Plate load test (no procedure details) and its limitations

10.8 Improvement of bearing capacity by sand drain method, compaction, use of geo-synthetics.

11. Foundation Engineering: (10 hrs)

Concept of shallow and deep foundation; types of shallow foundations: isolated, combined, strip, mat, and their suitability. Factors affecting the depth of shallow foundations, deep foundations, type of piles and their suitability; pile classification on the basis of material, pile group and pile cap.

PRACTICAL EXERCISES

1. To determine the moisture content of a given sample of soil

2. Auger Boring and Standard Penetration Test

   a) Identifying the equipment and accessories
   b) Conducting boring and SPT at a given location
   c) Collecting soil samples and their identification
   d) Preparation of boring log and SPT graphs
   e) Interpretation of test results

3. Extraction of Disturbed and Undistrubed Samples

   a) Extracting a block sample
   b) Extracting a tube sample
   c) Extracting a disturbed samples for mechanical analysis.
   d) Field identification of samples

4. Field Density Measurement (Sand Replacement and Core Cutter Method)

   a) Calibration of sand
   b) Conducting field density test at a given location
   c) Determination of water content
   d) Computation and interpretation of results

5. Liquid Limit and Plastic Limit Determination:

   a) Identifying various grooving tools
   b) Preparation of sample
   c) Conducting the test
   d) Observing soil behaviour during tests
   e) Computation, plotting and interpretation of results

6. Mechanical Analysis

   a) Preparation of sample
   b) Conducting sieve analysis
   c) Computation of results
   d) Plotting the grain size distribution curve
   e) Interpretation of the curve

7. Laboratory Compaction Tests (Standard Proctor Test)

   a) Preparation of sample
   b) Conducting the test
   c) Observing soil behaviour during test
   d) Computation of results and plotting
   e) Determination of optimum moisture content and maximum dry density

8. Demonstration of Unconfined Compression Test

   a) Specimen preparation
   b) Conducting the test
   c) Plotting the graph
   d) Interpretation of results and finding/bearing capacity

9. Demonstration of:
   a) Direct Shear and Vane Shear Test on sandy soil samples
   b) Permeability test apparatus

INSTRUCTIONAL STRATEGY

The teacher while imparting instructions are expected to lay greater emphasis on the practical aspects rather than theory and mathematical treatment. To bring clarity regarding concepts and principles involved, teachers should organize demonstrations in the laboratories and fields. It is necessary to create understanding that soils fail either under shear or settlement due to heavy loads. This can be shown by making use of photographs on working models of such failures. Efforts should be made in the practical classes that students perform practical exercises individually. Conduct of viva examination at the end of each practical work will develop clear understanding about the concepts and principles related to this subject.

RECOMMENDED BOOKS

i) Punmia, BC, "Soil Mechanics and Foundations"; Standard Publishers, Delhi

ii) Bharat Singh and Shamsher Prakash; "Soil Mechanics and Foundations Engineering", Nem Chand and Bros, Roorkee,

iii) Sehgal, SB, "A Text Book of Soil Mechanics"; CBS Publishers and Distributors, Delhi,

iv) Gulati, SK and Manoj Dutta, "Geotechnical Engineering ", Tata McGraw Hill, Delhi,

v) Ranjan Gopal and Rao ASR "Basic and Applied Soil Mechanics", New Age Publication (P) Ltd., New Delhi

vi) Singh Harbhajan "Soil and Foundation Engineering", Abhishek Publishers, Chandigarh

vii) S Mittal and JP Shukla, "Soil Testing for Engineers", Khanna Publishers Ltd., Delhi

viii) BIS Codes IS 6403 (latest edition) and IS 1498 (latest edition)

ix) Jagroop Singh, "Soil and Foundation Engineering", Eagle Parkashan, Jalandhar

x) Rabinder Singh, " Soil and Foundation Engg." SK Kataria and Sons, Ludhiana

xi) NITTTR, Chandigarh, "Shallow Foundations"

xii) Video films on Geo-technical Laboratory Practices by NITTTR, Chandigarh

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	03	05
2	04	06
3	04	06
4	04	06
5	04	06
6	04	06
7	09	14
8	04	06
9	08	16
10	10	12
11	10	17
Total	**64**	**100**

5.7. GENERIC SKILLS AND ENTREPRENEURSHIP DEVELOPMENT

L	T	P
3	-	-

RATIONALE

Generic Skills and Entrepreneurship Development is one of the courses from "Human Science" subject area. Generic skills have emerged as an important component of employability skills, which enable an individual to become and remain employable over lifetime and to lead happy and prosperous life. Entrepreneurship development aim at developing conceptual understanding for setting-up one's own business venture/enterprise. This aspect of Human Resource Development has become equally important in the era, when wage employment prospects have become meager.

Both the subject areas are supplementary to each other and soft skills are required to be developed in diploma passouts for enhancing their employability and self confidence.

DETAILED CONTENTS

1. Introduction to Generic Skills (04 hrs)

   1.1 Importance of Generic Skill Development (GSD)
   1.2 Global and Local Scenario of GSD
   1.3 Life Long Learning (LLL) and associated importance of GSD.

2. Managing Self (08 hrs)

   2.1 Knowing Self for Self Development
   - Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc.

   2.2 Managing Self - Physical
   - Personal grooming, Health, Hygiene, Time Management

   2.3 Managing Self – Intellectual development

   - Information Search: Sources of information
   - Listening: Effective Listening
   - Speaking: Effective Oral Communication
   - Reading: Purpose of reading, different styles of reading, techniques of systematic reading; Note Taking: Importance and techniques of note taking
   - Writing: Correspondence - personal and business

Note: Practical sessions should be coupled with teaching of effective listening, speaking, reading and writing.

2.4 Managing Self – Psychological

- Stress, Emotions, Anxiety-concepts and significance (Exercises related to stress management)
- Techniques to manage the above

3. Managing in Team (06 hrs)

3.1 Team - definition, hierarchy, team dynamics
3.2 Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background
3.3 Communication in group - conversation and listening skills

4 Task Management (03 hrs)

4.1 Task Initiation, Task Planning, Task execution, Task close out
4.2 Exercises/case studies on task planning towards development of skills for task management

5. Problem Solving (05 hrs)

5.1 Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving
5.2 Different approaches for problem solving.
5.3 Steps followed in problem solving.
5.4 Exercises/case studies on problem solving.

6. Entrepreneurship

6.1 Introduction (22 hrs)

- Concept/Meaning and its need
- Competencies/qualities of an entrepreneur
- Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level.

6.2 Market Survey and Opportunity Identification (Business Planning)

- How to start a small scale industry
- Procedures for registration of small-scale industry
- List of items reserved for exclusive manufacture in small-scale industry
- Assessment of demand and supply in potential areas of growth.
- Understanding business opportunity
- Considerations in product selection
- Data collection for setting up small ventures.

6.3 Project Report Preparation

- Preliminary Project Report
- Techno-Economic Feasibility Report
- Exercises on Preparation of Project Report in a group of 3-4 students

INSTRUCTIONAL STRATEGY

This subject will require a blend of different teaching and learning methods beginning with lecture method. Some of the topics may be taught using question answer, assignment, case studies or seminar. In addition, expert lectures may be arranged from within the institution or from management organizations. Conceptual understanding of Entrepreneurship, inputs by teachers and outside experts will expose the students so as to facilitate in starting ones own business venture/enterprise. The teacher will discuss success stories and case studies with students, which in turn, will develop managerial qualities in the students. There may be guest lectures by successful diploma holding entrepreneurs and field visits also. The students may also be provided relevant text material and handouts.

RECOMMENDED BOOKS

1. Soft Skills for Interpersonal Communication by S.Balasubramaniam; Published by Orient BlackSwan, New Delhi
2 Generic skill Development Manual, MSBTE, Mumbai.
3 Lifelong learning, Policy Brief (www.oecd.orf)
4 Lifelong learning in Global Knowledge Economy, Challenge for Developing Countries – World Bank Publication
5 Towards Knowledge Society, UNESCO Paris Publication
6 Your Personal Pinnacle of Success by DD Sharma, Sultan Chand and Sons, New Delhi
7 Human Learning, Ormrod
8 A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
9 Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
10. Handbook of Small Scale Industry by PM Bhandari

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	04	05
2.	08	15
3.	06	10
4.	03	10
5.	05	10
6.	22	50
Total	**48**	**100**

5.8 MINOR PROJECT WORK (CONSTRUCTION SITE ORIENTED)

L	T	P
-	-	4

Minor project work aims at exposing the students to field practices, size and scale of operations and work culture at works sites. For this purpose, students during middle of course, are required to be sent at different work sites where some construction activities are in progress or some operations are going on. Depending on the interests of the students, they may be sent to following (or any other field project related to Civil Engineering):

i) Building construction sites

ii) Water treatment plant, Sewage treatment plant

iii) Crusher plant, Cement Manufacturing Plant, Brick kiln

iv) Highway construction site

v) Material and Soil testing laboratory, Soil investigation projects

vi) Hydel Power Project

vii) Land surveying projects

viii) Community development works

ix) Constructional site like building, bridge, tunnel, canal lining, highway, railway track, irrigation works etc

As a minor project activity, each student is supposed to study the operations at site and prepare a detailed project report of the observations/processes seen by him/her and give seminar using computer aided presentation slides using photographs. These students should be guided by respective subject teachers. Each teacher may guide a group of 10 – 15 students.

The teachers along with field supervisors will conduct performance assessment of students. Some of the projects are suggested below:

1. Survey of a village approach road, drawings of L-section and x-sections

2. Estimation of white washing and distempering in hostel building

3. Preparation of detailed estimate with drawings of septic tank for 30-40 users

4. Plumbing work and installation of PVC over-head water tank on a toilet block and then prepare report

5. Construction of different components of a building

6. Identification of water-supply fittings and replacement of defective fittings and then prepare report.

7. Construction of a pipe/slab culvert

8. Ferro-cement construction techniques
   a) Low cost housing
   b) New construction materials

9. Study and preparation of models of hydraulic pumps.

This Industry oriented minor project work will carry 50 marks for internal assessment .

A group of students not exceeding 5 may work on any one project. Each student will prepare the project report of the activities observed by him. They will study the whole process of the plant, and explain the same in their project report. Further they are required to present the Project Report of work done by them through seminar in the class for internal assessment. External examiner will ask the questions on the construction, working, processes observed by the students during their project work: Shortcomings in the works (site) and their remedial measures may be suggested by the students.

PERSONALITY DEVELOPMENT AWARENESS CAMP

This is to be organized at a stretch for two to three days during fifth or sixth semester. Extension Lectures by experts or teachers from the polytechnic will be delivered on the following broad topics. There will be no examination for this subject.

1. Communication Skills
2. Correspondence and job finding/applying/thanks and follow-up
3. Resume Writing
4. Interview Techniques: In-Person Interviews; Telephonic Interview' Panel interviews; Group interviews and Video Conferencing etc.
5. Presentation Techniques
6. Group Discussions Techniques
7. Aspects of Personality Development
8. Motivation
9. Leadership
10. Stress Management
11. Time Management
12. Interpersonal Relationship
13. Health and Hygiene

Semester 6th

6.1 STEEL STRUCTURES DESIGN

L	T	P
5	-	-

RATIONALE

This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise steel construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials. This subject thus deals with elementary design principles as per BIS code of practice IS: 800

DETAILED CONTENTS

THEORY

1. Structural Steel and Sections: (02 hrs)

   1.1 Properties of structural steel as per IS Code
   1.2 Designation of structural steel sections as per IS handbook and IS:800-2007

2. Riveted Connections: (10 hrs)

   Types of rivets, permissible stresses in rivets, types of riveted joints, specifications for riveted joints as per IS 800. Failure of a riveted joint. Assumptions in the theory of riveted joints. Strength and efficiency of a riveted joint. Design of riveted joints for axially loaded members (No Staggered riveting).

3. Welded connections: (06 hrs)

   Types of welds and welded joints, advantages and disadvantages of welded joints design of fillet and butt weld. Plug and slot welds (Descriptive No numerical on plug and slot welds)

4. Tension Members (16 hrs)

   Analysis and design of single and double angle section tension members and their rivetted and welded connections with gusset plate as per IS:800

5. Compression Members (16 hrs)

   Analysis and design of single and double angle sections compression members (struts) and their rivetted and welded connections with gusset plate as per BIS:800

5. Roof Trusses (06hrs)

Form of trusses, pitch of roof truss, spacing of trusses, spacing of purlins, connection between purlin and roof covering. Connection between purlin and principal rafter (no design, only concept)

7. Columns: (10 hrs)

7.1 Concept of buckling of columns, effective length and slenderness ratio, permissible stresses in compression as per IS:800 for different end conditions. Analysis and Design of axially loaded single section steel column

7.2 Types of column bases (Descriptive only)

7.3 Beam and column, frame and seated connections (descriptive only, no design)

8. Beams (10 hrs)

Analysis and design of single section simply supported laterally restrained steel beams. Introduction to plate girder and functions of various elements of a plate girder

9 Fabrication and Erection of Steel Structures like trusses, columns and girders (02 hrs)

10 Masonry structures – Design of brick column and wall foundations (02 hrs)

Important Note:

Use of IS: 800 and Steel Tables are permitted in examination.

INSTRUCTIONAL STRATEGY

Teachers are expected to give simple problems for designing various steel structural members. For creating comprehension of the subject, teachers may prepare tutorial sheets, which may be given to the students for solving. It would be advantageous if students are taken at construction site to show fabrication and erection of steel structures. IS:800 may be referred along with code for relevant clauses

RECOMMENDED BOOKS

1. Duggal SK, "Design of Steel Structures" by Standard Publishers, Delhi
2. Birinder Singh, "Steel Structures Design and Drawing", Kaption Publishing House, Ludhiana
3. Ram Chandra, "Design of Steel Structures", Standard Publishers,Delhi
4. LS Negi, "Design of Steel Structure" Tata McGraw Hill, New Delhi
5. S Ramamurthan, "Design of Steel Structures",
6 Harbhajan Singh ,"Design of Steel Structures" , Abhishek Publishing, Chandigarh
7 IS Code : 800-2007

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	03
2	10	12
3	06	08
4	16	19
5	16	19
6	06	08
7	10	12
8	10	13

9	02	03
10	02	03
Total	**80**	**100**

6.2 EARTHQUAKE RESISTANT BUILDING CONSTRUCTION

L	T	P
3	-	-

RATIONAL

Diploma holders in civil engineering have to supervise construction of various earthquake resistant buildings. Therefore, the students should have requisite knowledge regarding terminology of earthquake and the precautions to be taken while constructing earthquake resistant buildings

DETAILED CONTENTS

1. Elements of Engineering Seismology (08 hrs)

   General features of tectonic of seismic regions. Causes of earthquakes, Seismic waves, earthquake size (magnitude and intensity), Epicentre, Seismograph, Classification of earthquakes, Seismic zoning map of India, Static and Dynamic Loading, Fundamental period.

2. Seismic Behaviour of Traditionally-Built Constructions of India (07 hrs)

   Performance of building during earthquakes and Mode of failure (Out-of-plane failure, in-plane failure, Diaphragm failure, Connection failure, Non-structural components failure)

3. Special construction method, tips and precautions to be observed while planning, designing and construction of earthquake resistant building. (08 hrs)

4. Introduction to IS: 4326, IS: 13828, IS: 1893(Part 1), 154326 and IS: 13920 (latest edition) (05 hrs)

5. Seismic Provision of Strengthening and Retrofitting Measures for Traditionally-Built Constructions, Brick and RCC Structures (08 hrs)

6. Provision of reinforcement detailing in masonry and RC constructions (06 hrs)

7. Disaster Management: Disaster rescue, psychology of rescue, rescue workers, rescue plan, rescue by steps, rescue equipment, safety in rescue operations, debris clearance and casuality management. (06hrs)

INSTRUCTIONAL STRATEGY

The student may be taken for visit to various building construction sites where precautions related to earthquake resistant construction are being taken so that the students may appreciate the importance of the subject.

RECOMMENDED BOOKS

1. Elements of Earthquake Engineering by Jai Krishana and AR Chandersekaran; Sarita Parkashan, Meerut.

2. Manual Published by Earthquake Engineering department, IIT Roorkee / IIT Kanpur

3. IS 13920, IS: 13827, IS: 13828, IS 1893, IS 4326 (latest edition)

4 Singh, Harbhajan " Earthquake Resistant Building Construction" Abhishek Publishers, Chandigarh

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	19
2	07	15
3	08	17
4	05	10
5	08	19
6	06	08
7	06	12
Total	**48**	**100**

6.3 STRUCTURAL DRAWINGS

L	T	P
-	-	6

RATIONALE

Diploma holders in Civil Engineering are required to supervise the construction of RC and steel structures. Thus one should be able to read and interpret structural drawings of RC and steel structures. The competence to read and interpret structural drawings is best learnt by being able to draw these drawings. Hence there is a need to have a subject devoted to preparation of structural drawings.

DETAILED CONTENTS

PART A

Drawing Exercises

1. RC Structures:

   Reinforcement details from the given data for the following structural elements with bar bending schedules

   (i) Drawing No. 1: RC Slabs - One way slab, Two way slab and Cantilever Slab.

   (ii) Drawing No.2 : Beams - Singly and doubly reinforced rectangular beams and Cantilever beam (All beams with vertical stirrups)

   (iii) Drawing No.3 : Columns and Footings – Square, Rectangular and Circular Columns with lateral ties and their isolated sloped column footings.

   (iv) Drawing No. 4 : Portal Frame – Three bay two storey RC portal frame with blow up of column beam junctions.

   (v) Drawing No.5: Dog legged stairs for single storey building

   (vi) Drawing No.6 : Draw atleast one sheet using CAD software

PART B

2. Steel Structures:

   Structural drawing from given data for following steel structural elements.

   (i) Drawing No. 1: Roof Truss – Drawing of Fink Roof Truss with details of joints, fixing details of purlins and roof sheets.

   (ii) Drawing No.2 : Column and Column Bases - Drawing of splicing of steel columns. Drawings of slab base, gusseted base and grillage base for single section steel columns.

(iii) Drawing No.3 : Column Beam Connections

(a) Sealed and Framed Beam to Beam Connections
(b) Sealed and Framed beam o Column Connections

(iv) Drawing No. 4 : Plate Girder

Plan and Elevation of Plate Girder with details at supports and connection of stiffness, flange angles and cover plate with web highlighting curtailment of plates.

(v) Drawing No. 5 : Draw atleast one sheet using CAD software

RECOMMENDED BOOKS

6. Layal JS "Civil Engineering Drawing", Satya Parkashan, New Delhi

7. Chandel RP " Civil Engineering Drawings"

8. Kumar; NS " Civil Engineering Drawing " IPH, New Delhi

9. Malik RS and Meo GA, "Civil Engineering Drawing" Asian Publishing House, New Delhi

10. Singh, Birinder "RCC Design and Drawing" Kaption Publishing House, New Delhi.

11. Singh, Birinder "Steel Structures Design and Drawing", Kaption Publishing House, New Delhi

12. Singh, Harbhajan, "Structural Drawings", Abhishek Publishers, Chandigarh

13. B.V. Sikka, Civil Engineering Drawing.

6.4 QUANTITY SURVEYING AND VALUATION

L	T	P
5	-	-

RATIONALE

Diploma holders in Civil Engineering are supposed to prepare material estimates for various Civil Engineering works namely; buildings, irrigation works, public health works and roads etc. In addition, they must have basic knowledge regarding analysis of rates, contracting, principles of valuation. Therefore, this subject has great importance for diploma holders in Civil Engineering.

DETAILED CONTENTS

1. Introduction to quantity surveying and its importance. Duties of quantity surveyor (02 hrs)

2. Types of estimates (03 hrs)

   2.1 Preliminary estimates
   - Plinth area estimate
   - Cubic rate estimate
   - Estimate per unit base

   2.2 Detailed estimates
   - Definition
   - Stages of preparation – details of measurement and calculation of quantities and abstract

3. Measurement (03 hrs)

   3.1 Units of measurement for various items of work as per BIS:1200
   3.2 Rules for measurements
   3.3 Different methods of taking out quantities – centre line method and long wall and short wall method

4. Preparation of Detailed and Abstract Estimates from Drawings for: (30 hrs)

   4.1 A small residential building with a flat roof and pitched roof building comprising of
   - Two rooms with W.C., bath, kitchen and verandah

   4.2 Earthwork for unlined channel
   4.3 WBM road and pre-mix carpeting
   4.4 Single span RCC slab culvert
   4.5 Earthwork for plain and hill roads
   4.6 RCC work in beams, slab, column and lintel, foundations
   4.7 users septic tank - 10 users
   - 50 users

5. Calculation of quantities of materials for (08 hrs)

   5.1 Cement mortars of different proportion
   5.2 Cement concrete of different proportion

5.3 Brick/stone masonry in cement mortar
5.4 Plastering and pointing
5.5 White washing, painting
5.6 R.C.C. work in slab, beams

6. Analysis of Rates (10 hrs)

6.1 Steps involved in the analysis of rates. Requirement of material, labour, sundries, contractor's profit and overheads
6.2 Analysis of rates for finished items when data regarding labour, rates of material and labour is given:

- Earthwork in excavation in hard/ordinary soil and filling with a concept of lead and lift
- RCC in roof slab/beam/lintels/columns
- Brick masonry in cement mortar
- Cement Plaster
- White washing, painting
- Stone masonry in cement mortar
-

6.3 Running and maintenance cost of construction equipment

7 Contractorship (06 hrs)

- Meaning of contract
- Qualities of a good contractor and their qualifications
- Essentials of a contract
- Types of contracts, their advantages, dis-advantages and suitability, system of payment
- Single and two cover-bids; tender, tender forms and documents, tender notice, submission of tender and deposit of earnest money, security deposit, retention money, maintenance period
- Classification and types of contracting firms/construction companies

8 Preparation of Tender Document based on Common Schedule Rates (CSR) (12 hrs)

- Introduction to CSR and calculation of cost based on premium on CSR
- Exercises on writing detailed specifications of different types of building works from excavation to foundations, superstructure and finishing operation
- Exercises on preparing tender documents for the following

a) Earth work
b) Construction of a small house as per given drawing
c) RCC works
d) Pointing, plastering and flooring
e) White-washing, distempering and painting
f) Wood work including polishing
g) Sanitary and water supply installations
h) False ceiling, aluminum (glazed) partitioning
i) Tile flooring including base course

j) Construction of W.B.M/Concrete road

9. Exercises on preparation of comparative statements for item rate contract (02 hrs)

10. Valuation (04 hrs)

a) Purpose of valuation, principles of valuation
b) Definition of various terms related to valuation like depreciation, sinking fund, salvage and scrap value, market value, fair rent, year's purchase etc.
c) Methods of valuation (i) replacement cost method (ii) rental return method

INSTRUCTIONAL STRATEGY

This is an applied engineering subject. Teachers are expected to provide working drawings for various Civil Engineering works and students be asked to calculate the quantities of materials required for execution of such works and use of relevant software for preparing estimates. Teachers should conceptualize making analysis of rates for different items of works. It will be advantageous if students are given valuation reports for reading.

RECOMMENDED BOOKS

1. Pasrija, HD, Arora, CL and S. Inderjit Singh, "Estimating, Costing and Valuation (Civil)", New Asian Publishers, Delhi,

2. Rangwala, S.C, Estimating and Costing", Anand, Charotar Book Stall

3. Chakraborti, M, "Estimating, Costing and Specification in Civil Engineering", Calcutta

4. Dutta, BN, "Estimating and Costing

5. Mahajan Sanjay, "Estimating and Costing" Satya Parkashan, Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	03
2	03	04
3	03	04
4	30	40
5	08	08
6	10	12
7	06	08
8	12	12
9	02	03
10	04	06
Total	**80**	**100**

6.5 CONSTRUCTION MANAGEMENT AND ACCOUNTS

L	T	P
5	-	-

RATIONALE

This is an applied civil engineering subject. The subject aims at imparting basic knowledge about construction planning and management, site organisation, construction labour, control of work progress, inspection and quality control, accidents and safety and accounts.

DETAILED CONTENTS
THEORY

CONSTRUCTION MANAGEMENT:

1. Introduction: (06 hrs)

   1.1 Significance of construction management

   1.2 Main objectives of construction management and overview of the subject

   1.3 Functions of construction management, planning, organising, staffing, directing, controlling and coordinating, meaning of each of these with respect to construction job.

   1.4 Classification of construction into light, heavy and industrial construction

   1.5 Stages in construction from conception to completion

   1.6 The construction team: owner, engineer, architect and contractors, their functions and inter-relationship

2. Construction Planning: (12 hrs)

   2.1 Importance of construction planning

   2.2 Stages of construction planning

   - Pre-tender stage
   - Contract stage

   2.3 Scheduling construction works by bar charts

   - Definition of activity, identification of activities
   - Preparation of bar charts for simple construction work
   - Preparation of schedules for labour, materials, machinery and finances for small works
   - Limitations of bar charts

   2.4 Scheduling by network techniques

- Introduction to network techniques; PERT and CPM, differences between PERT and CPM terminology

3. Organization: (06 hrs)

3.1 Types of organizations: Line, line and staff, functional and their characteristics

4. Site Organization: (06 hrs)

4.1 Principle of storing and stacking materials at site

4.2 Location of equipment

4.3 Preparation of actual job layout for a building

4.4 Organizing labour at site

5. Construction Labour: (08 hrs)

5.1 Conditions of construction workers in India, wages paid to workers

5.2 Important provisions of the following Acts:

- Labour Welfare Fund Act 1936 (as amended)
- Payment of Wages Act 1936 (as amended)
- Minimum Wages Act 1948 (as amended)

6. Control of Progress: (04 hrs)

6.1 Methods of recording progress

6.2 Analysis of progress

6.3 Taking corrective actions keeping head office informed

6.4 Cost time optimization for simple jobs - Direct and indirect cost, variation with time, cost optimization

7. Inspection and Quality Control: (08hrs)

7.1 Need for inspection and quality control

7.2 Principles of inspection

7.3 Stages of inspection and quality control for

- Earth work
- Masonry
- RCC

- Sanitary and water supply services

8. Accidents and Safety in Construction: (10 hrs)

8.1 Accidents – causes and remedies

8.2 Safety measures for

- Excavation work
- Drilling and blasting
- Hot bituminous works
- Scaffolding, ladders, form work
- Demolitions

8.3 Safety campaign and safety devices

ACCOUNTS

9. Public Work Accounts: (20 hrs)
Introduction, technical sanction, administrative approval, allotment of funds, re-appropriation of funds bill, contractor ledger, measurement book running and final account bills complete, preparation of bill of quantities (BOQ), completion certificate & report, hand receipt, aquittance roll. Muster Roll labour, casual labour roll-duties and responsibility of different cadres, budget-stores, returns, account of stock, misc. P.W. advances T & P – verification, survey report, road metal material charged direct to works, account - expenditure & revenue head, remittance and deposit head, defination of cash, precaution in custody of cash book, imprest account, temporary advance, treasury challan, preparation of final bills. Students must learn to prepare accounts register, stock register.

INSTRUCTIONAL STRATEGY

This is highly practice-based course and efforts should be made to relate process of teaching with direct experiences at work sites. Participation of students should be encouraged in imparting knowledge about this subject. To achieve this objective the students should be taken to different work sites for clear conception of particular topics, such as site organization, inspection of works at various stages of construction and working of earth moving equipment

RECOMMENDED BOOKS

1. Harpal Singh, "Construction Management and Accounts", Tata McGraw Hill Publishing Company., New Delhi
2. Peurifoy, RL, "Construction Planning, Equipment and Methods", McGraw Hill, Tokyo
3. Singh, Harbhajan " Construction Project Management" Abhishek Publishers, Chandigarh
4. Verma, Mahesh; "Construction Equipment and its Planning and Application
5. Dharwadker, PP; "Management in Construction Industry", , Oxford and IBH Publishing Company, New Delhi
6. Gahlot PS; Dhir, BM; "Construction Planning and Management", Wiley Eastern Limited, New Delhi
7. Softwares :
(a) MS Project – Microsoft USA

(b) **Primavera**

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	09
2	12	14
3	06	09
4	06	08
5	08	12
6	04	06
7	08	09
8	10	11
9	20	22
Total	**80**	**100**

(Elective)

6.6.1 REPAIR AND MAINTENANCE OF BUILDINGS

L	T	P
3	-	-

RATIONALE

One of the major concerns of a civil engineer is to take care of the building works, already constructed, in order to keep these buildings in utmost workable conditions. Usually it is being felt that the buildings deteriorate faster for want of care and proper maintenance. The buildings usually have a shabby appearance due to cracks, leakage from the roofs and sanitary/water supply fittings. Thus the need for teaching the subject in proper perspective has arisen making students aware of importance of maintenance of buildings.

DETAILED CONTENTS

1. Need for Maintenance (06 hrs)

    1.1 Importance and significance of repair and maintenance of buildings

    1.2 Meaning of maintenance

    1.3 Objectives of maintenance

    1.4 Factors influencing the repair and maintenance

2. Agencies Causing Deterioration (Sources, Causes, Effects) (06 hrs)

    2.1 Definition of deterioration/decay

    2.2 Factors causing deterioration, their classification

        2.2.1 Human factors causing deterioration
        2.2.2 Chemical factors causing deterioration
        2.2.3 Environmental conditions causing deterioration
        2.2.4 Miscellaneous factors

    2.3 Effects of various agencies of deterioration on various building materials i.e. bricks, timber, concrete, paints, metals, plastics, stones

3. Investigation and Diagnosis of Defects (06 hrs)

    3.1 Systematic approach/procedure of investigation

    3.2 Sequence of detailed steps for diagnosis of building defects/problems

    3.3 List non-destructive and others tests on structural elements and materials to evaluate the condition of the building and study of three most commonly used tests

4. Defects and their root causes (06 hrs)

4.1 Define defects in buildings

4.2 Classification of defects

4.3 Main causes of building defects in various building elements
- 4.3.1 Foundations, basements and DPC
- 4.3.2 Walls
- 4.3.3 Column and Beams
- 4.3.4 Roof and Terraces
- 4.3.5 Joinery
- 4.3.6 Decorative and protective finishes
- 4.3.7 Services
- 4.3.8 Defects caused by dampness

5. Materials for Repair, maintenance and protection (06 hrs)

5.1 Compatibility aspects of repair materials

5.2 State application of following materials in repairs:
- 5.2.1 Anti corrosion coatings
- 5.2.2 Adhesives/bonding aids
- 5.2.3 Repair mortars
- 5.2.4 Curing compounds
- 5.2.5 Joints sealants
- 5.2.6 Waterproofing systems for roofs
- 5.2.7 Protective coatings

6. Remedial Measures for Building Defects (18 hrs)

6.1 Preventive maintenance considerations

6.2 Surface preparation techniques for repair

6.3 Crack repair methods
- 6.3.1 Epoxy injection
- 6.3.2 Grooving and sealing
- 6.3.3 Stitching
- 6.3.4 Adding reinforcement and grouting
- 6.3.5 Flexible sealing by sealant

6.4 Repair of surface defects of concrete
- 6.4.1 Bug holes
- 6.4.2 Form tie holes
- 6.4.3 Honey comb and larger voids

6.5 Repair of corrosion in RCC elements
- 6.5.1 Steps in repairing
- 6.5.2 Prevention of corrosion in reinforcement

6.6 Material placement techniques with sketches
- 6.6.1 Pneumatically applied (The gunite techniques)
- 6.6.2 Open top placement
- 6.6.3 Pouring from the top to repair bottom face
- 6.6.4 Birds mouth
- 6.6.5 Dry packing
- 6.6.6 Form and pump
- 6.6.7 Preplaced – aggregate concrete
- 6.6.8 Trowel applied method

6.7 Repair of DPC against Rising Dampness
- 6.7.1 Physical methods
- 6.7.2 Electrical methods
- 6.7.3 Chemical methods

6.8 Repair of walls
- 6.8.1 Repair of mortar joints against leakage
- 6.8.2 Efflorescence removal

6.9 Waterproofing of wet areas and roofs
- 6.9.1 Water proofing of wet areas
- 6.9.2 Water proofing of flat RCC roofs
- 6.9.3 Various water proofing systems and their characteristics

6.10 Repair of joints in buildings
- 6.10.1 Types of sealing joints with different types of sealants
- 6.10.2 Techniques for repair of joints
- 6.10.3 Repair of overhead and underground water tanks

INSTRUCTIONAL STRATEGY

This is very important course and efforts should be made to find damaged/defective work spots and students should be asked to think about rectifying/finding solution to the problem. Visits to work site, where repair and maintenance activities are in progress can be very useful to students. The students will also prepare a project report based upon the available water proofing materials, sealant, special concrete for repair and adhesives and other repair material available in the market.

RECOMMENDED BOOKS

1. Gahlot P.S. and Sanjay Sharma, “Building Defects and Maintenance Management”, CBS Publishers, New Delhi

2. Nayak, BS, "Maintenance Engineering for Civil Engineers", Khanna Publishers, Delhi

3. Ransom, WH "Building Failures - Diagnosis and Avoidance", Publishing E and F.N. Span

4. Hutchinson, BD; et al, "Maintenance and Repair of Buildings", Published by Newness – Butterworth

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	13
2	06	13
3	06	13
4	06	13
5	06	13
6	18	35
Total	**48**	**100**

Elective

6.6.2 ENVIRONMENTAL ENGINEERING

L	T	P
3	-	-

RATIONALE

Civil Engineering diploma holders must have the knowledge of different types of environmental aspects related to development activities so that they may help in maintaining the ecological balance and control pollution. They should also be aware of the related environmental laws for effectively combating environmental pollution. The class room instructions should be supplemented by field visits to show the pollution caused by urbanization and the combatment measures being adopted at site. Extension lectures by experts may be encouraged.

DETAILED CONTENTS

1. Study of Importance of Environmental Engineering (02 hrs)

   Importance of clean environment, control of environmental pollution with respect to air, land and water. Conservation of natural resources, environmental education and awareness, sustainable development.

2. Environments and Ecology (05 hrs)

   Definition and understanding of environment and ecology concept, ecosystem and types of ecosystems, energy flow in an ecosystem, food chain, ecological pyramids, consortium and ecological balance

3. Water Pollution (04 hrs)

   Causes of pollution in surface and underground water eutrophication of lakes and its preventing measure; BIS standards for water quality.

4. Air Pollution (07 hrs)

   Definition, principal air pollutants, atmospheric parameters influencing air pollution, types of air contaminants and their sources, effects of air pollution on human beings, plants, animals, automobile pollution, BIS ambient air quality standards and measures to combat air pollution

5. Noise Pollution (03 hrs)

   Definition, unit of measurement of noise, sources and effects of noise pollution and control of noise pollution

6. Effects of mining, blasting and deforestation (02 hrs)

   Ill effects of mining, blasting and deforestation on the environment human life and wild life.

7. Land Use (06 hrs)

Effect of land use on environmental quality, land use and natural disasters,(land slides etc) soil degradation problems - erosion, water logging, soil pollution etc.

8. Environmental Impact Assessment (06 hrs)

Definition and requirements, environmental impact assessment. Flour chart of environmental impact assessment methodology. Describe the need and importance of EIA.

9. Legislation to Control Environmental Pollution (idea) (03 hrs)

Indian legislative acts for water, land and air pollution control – provisions, scope and implementation

10. Global Issues of Environmental Engineering (05 hrs)

Global warming, ozone depletion, acid rain, oil pollution; radiation hazards and their control, concept of clean technology and carbon credits.

11. Renewable Source of Energy (05 hrs)

Role of non-conventional sources of energy (biogas, solar, wind etc) in environmental protection. Conservation of energy resources like coal, oil etc., alternative fuels, bio-diesel etc.

INSTRUCTIONAL STRATEGY

Students should be encouraged to undertake project work related to environmental problems. They should visit industrial effluent treatment plant, water treatmet plant and environmental engineering laboratory and study the impact of utilization of reclaimed by products

RECOMMENDED BOOKS

1. Deswal DS and Deswal SS "Environmental Engineering" Dhanpat Rai and Company (P) Ltd., Delhi

2. Odum EP, "Fundamentals of Ecology", Amarind Publication Co., Delhi

3. Dhamija SK "Environmental Engineering and Management ; SK Kataria and Sons, Delhi

4. De AK, "Engineers Chemistry", New Age Publication, Delhi

5. Kendeigh SC, "Ecology", Prentice Hall of India, Delhi

6. Khitoliya, RK, "Environmental Pollution', S Chand & Co. Ltd., New Delhi

7. Bhatia, HS, "A text book of Environmental Pollution and Control", Galgotia. Publishers, Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	04
2	05	10
3	04	08
4	07	14
5	03	06
6	02	04
7	06	12
8	06	14
9	03	07
10	05	11
11	05	10
Total	**48**	**100**

(Elective)

6.6.3 PRESTRESSED CONCRETE

L	T	P
3	-	-

RATIONALE

Now a days, diploma holders in Civil Engineering have to supervise prestressed concrete construction. So, it is necessary that they should have basic knowledge of prestressed concrete.

DETAILED CONTENTS

1. Introduction (10 hrs)

   Basic concept of prestressed concrete, advantages of prestressed concrete in comparison with RCC application of prestressed to various building elements, bridges, water tanks and precast elements

2. Materials (08 hrs)

   Materials requirement for prestressing concrete – High strength concrete, prestressing steel wires, strands and high strength bars. Stresses in high strengh steel and stress-strain relationship, tendon profile

3. Prestressing Methods (08 hrs)

   Introduction to prestressing methods – pre-tensioning and post-tensioning, their suitability and comparison, circular prestressing and its application

4. Bending and Shear Capacity (12 hrs)

   Concept of bending and shear capacity of prestressed members. Calculation of bending stresses in rectangular simply supported beams with straight and parabolic profile of tendons

5. Losses in Prestressing (10 hrs)

   Types of losses in prestress – Elastic shortening, creep and shrinkage of concerete, friction loss and stress relaxation in prestress steel. Computation of losses for simple beam problems

RECOMMENDED BOOKS

1. N Krishna Raju "Prestressed Concrete" , Tata McGraw Hill, Delhi
2. P Dayaratnam "Prestressed Concrete", Oxford & IBH Publishing Co. Delhi
3. S Ramamurthum "Prestressed Concrete" , Dhanpat Rai & Sons, Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	20
2	8	16
3	8	16
4	12	32
5	10	16
Total	**48**	**100**

6.7 MAJOR PROJECT WORK
(INDUSTRY/FIELD ORIENTED - PRACTICE BASED)

L	T	P
.	-	-	10

As far as possible students should be given live project problems with a view to :

i) Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the courses of study.

ii) Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.

iii) Provide first hand experience to develop confidence amongst the students to enable them to use and apply classroom based knowledge and skills to solve practical problems of the world of work.

iv) Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience. It is necessary that each organization is visited well in advance by respective teachers and activities to be performed by students are well defined. The chosen activities should be such which are of curricular interest to students and of professional value to industrial/field organizations. Each teacher is expected to supervise and guide 5 - 6 students.

Effort should be made to identify actual field problems to be given as project work to the students. Project selected should not be too complex which is beyond the comprehension level of the students. The placement of the students for such a practical cum project work should match with the competency profile and interest of students. Students may be assessed both by industry and polytechnic faculty. The suggested performance criteria is given below:

a)	Punctuality and regularity	10	
b)	Initiative in learning/working at site		10
c)	Level/proficiency of practical skills acquired		10
d)	Sense of responsibility	10	
e)	Self expression/Communication skills	10	
f)	Interpersonal skills	10	
g)	Report writing skills	20	
h)	Viva voce	20	

Some of suggested projects are given below: These are only guidelines, teacher may take any project related to Civil Engineering depending upon the availability of projects. Preference should be given to practical oriented projects.

According to the need of the polytechnic, the following major projects are suggested:

1. Construction of a small concrete road consisting of following activities
   - Survey and preparation of site plan
   - Preparation of drawings i.e. L-Section and X-Section

- Estimating earth work
- Preparation of sub grade with stone ballast
- Laying of concrete
- Testing of slump, casting of cubes and testing
- Material estimating and costing with specifications
- Technical report writing

2. Water Supply system for a one or two villages
   - Surveying
   - Design of water requirements and water distribution system
   - Preparation of drawing of overhead tank
   - Material estimating and costing
   - Specifications
   - Technical report writing

3. Construction of seating benches in polytechnic campus

4. Welding of angle iron and Expanded metal jali to prepare fencing in polytechnic campus

5. Construction of toilets and baths for a shopping complex in a township

6. Construction of bridal path 4 kms long

7. Construction of shopping complex by detailing of RCC drawings, estimating and costing of material

8. Rainwater harvesting
   - Assessment of catchment's area
   - Intensity of rainfall
   - Collection of water
   - Soak pit design
   - Supply of water
   - Monitoring during rainy season

9. Design and construction of septic tank with soak pit for 100 users

10. Preparing plumbing detailed drawings of a two storey building and material estimate and costing

11. Planning and design of sports stadium in a township or cluster of villages

12. Design of small residential building including structural members, specifications, estimating and costing of materials, report writing and municipal drawings for water supply and sewerage system

13. Concrete Mix Design

14. Construction of concrete cubes by mixing appropriate quantity of fly ash with fibres
    (i) the fibres like polypropylene, carbon, steel etc. can be used
    (ii) students will show the comparison between concrete mixed with fibres verses the quality controlled concrete.

15. Estimation and designing of a State Highway Road
    (i) Reconniance survey of proposed road
    (ii) To take L - section and cross sections
    (iii) Fixing of grades
    (iv) Estimation of cutting and filling of earth mass
    (v) Plane tabling survey of proposed road
    (vi) Estimation of proposed road

16. Designing a small height gravity dam
    (i) Constructing of catchment area
    (ii) Calculating the reservoir capacity
    (iii) Designing of gravity dam by taking into account various forces

17. Designing of ferro-cement water tank and toilet. Testing of the ferro-cement products in civil engineering labs.

Note: The projects undertaken should be field oriented