

Programme Structure

School of Polytechnic

Diploma in Civil Engineering

Programme Code:SPB09

Batch: 2023-2026

Vision of the University

To be recognized as an Institution of excellence, facilitating learning, fostering creativity, knowledge creation, innovations, consultancy and leadership in multiple areas to build a conscious community that will positively impact living beings for a sustainable future.

Mission of the University

1. Offers a wide range of Undergraduate and Post graduate Courses.

To create conducive environment for an interactive and application oriented experiential learning making the Institute a preferred destination for work and study.

2. Research, Innovation, Consultancy & Entrepreneurial Culture

To Foster creativity, research and innovation orientation in students and faculty in basic and applied areas in all of its disciplines, provide cost effective solutions and nurture entrepreneurial capabilities to accelerate growth.

3. Social Relevance with local actions on global thoughts

To act as a catalyst in social change by developing academic, social, political, technological, scientific, industrial and business leadership in the spirit “Think Globally and Act Locally”; by providing ample opportunities to develop team spirit, sportsmanship and love for culture and national heritage.

Core Values

Integrity

Leadership

Diversity

Community

Vision of the School of Polytechnic

To become a centre of excellence for providing quality and value based education in the field of diploma engineering that will produce skilled technocrats to meet industry requirements.

Mission of the School of Polytechnic

- To provide technical knowledge and skills by using latest engineering tools.
- To facilitate industry-institute interaction to explore the industrial knowledge of the students.
- To inculcate ethical and professional values among students.
- To impart quality education to the students coming from rural parts and to conduct different curricular & co-curricular activities to enhance the academic.

Core Values

Integrity

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Programme Educational Objectives (PEO's)

- PEO 1.** To provide solid foundation in electronics engineering along with good communication and entrepreneurship skills for tackling social issues.
- PEO 2.** To impart students with good scientific and engineering knowledge in order to analyse, design and create novel products for giving practical solutions to real life problems.
- PEO 3.** To create engineers with sound technical knowledge for facing all sorts of challenges in industry or in pursuance of higher studies.
- PEO 4.** To motivate students, to acquire aptitude for lifelong learning along with leadership skills, team spirit and ethical values so that they upgrade themselves with the latest trends in the field of engineering in order to serve the society.

PROGRAMME OUTCOMES (POs)

- PO 1. **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, natural sciences and engineering fundamentals and civil engineering specialization to solve complex engineering problems.
- PO 2. **Problem analysis:** Identify, formulate, and analyze complex civil engineering problems reaching substantiated conclusions using principles of mathematics, natural sciences, and engineering sciences.
- PO 3. **Design/ development of solutions:** Design solutions for complex civil engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, and environmental considerations.
- PO 4. **Engineering Tools, Experimentation and Testing:** Apply modern engineering tools, techniques, and resources to civil engineering activities, with an understanding of the limitations.
- PO 5. **Engineering practices for society, sustainability and environment:** Apply knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to professional engineering practice.
- PO 6. **Project Management:** Demonstrate knowledge and understanding of civil engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO 7. **Communication:** Communicate effectively on complex engineering activities with the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO 8. **Teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO 9. **Life-long Learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

- PSO 1. An ability to design, analyze, and evaluate structural components and systems by applying principles of structural engineering to ensure safety, reliability, and efficiency in the built environment.
- PSO 2. An ability to understand and implement modern construction practices, project management techniques, and use of construction materials and equipment to deliver quality construction projects within constraints such as cost, time, and sustainability.

- PSO 3.** An ability to apply concepts of soil mechanics and foundation engineering to design and analyze foundations, retaining structures, and other geotechnical systems, ensuring stability and performance under various loading conditions.
- PSO 4.** An ability to perform land surveying, mapping, and utilize remote sensing and GIS technologies for planning, designing, and managing civil engineering.
- PSO 5.** An ability to communicate effectively in both oral and written forms, present technical information clearly, work collaboratively in multidisciplinary teams, and demonstrate professional ethics, social responsibility, and awareness of environmental impacts in civil engineering practices.



SDGI GLOBAL UNIVERSITY, GHAZIABAD

SCHOOL OF ENGINEERING & TECHNOLOGY

STUDY AND EVALUATION SCHEME FOR DIPLOMA IN CIVIL ENGINEERING

Session- 2023-26

Semester - I

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	DC	DE-ASH-23101	*Applied Mathematics -1	3	0	0	3	3	50	50	100	45
2	DC	DE-ASH-23102	*Applied Physics-1	3	0	0	3	3	50	50	100	45
3	DC	DE-ASH-23103	*Applied Chemistry	3	0	0	3	3	50	50	100	45
4	AE	DE-ASH-23104	*Communication Skill -H & E	2	0	0	2	2	50	50	100	45
5	DC	DE-CVE-23105	Construction Materials	3	0	0	3	3	50	50	100	45
6	DC	DE-ME-23106	*Engineering Drawing-I	0	0	4	4	2	50	50	100	45
7	DC	DE-ASH-23112	*Applied Physics-1 Lab	0	0	2	2	1	60	40	100	45
8	DC	DE-ASH-23113	*Applied Chemistry Lab	0	0	2	2	1	60	40	100	45
9	AE	DE-ASH-23114	*Communication Skill H & E Lab	0	0	2	2	1	60	40	100	45
10	DC	DE-CVE-23115	Construction Materials Lab	0	0	2	2	1	60	40	100	45
11	SE	DE-ME-23116	*General Workshop Practice - I	0	0	4	4	2	60	40	100	45
Total				14	0	16	30	22	600	500	1100	495



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SCHOOL OF ENGINEERING & TECHNOLOGY

SCHEME OF STUDIES AND EVALUATION FOR DIPLOMA IN CIVIL ENGINEERING

Session- 2023-26

Semester - II

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	DC	DE-ASH-23201	*Applied Mathematics -II	3	0	0	3	3	50	50	100	40
2	OE	DE-EE-23202	Basics of Mechanical and Electrical Engineering	4	0	0	4	4	50	50	100	40
3	OE	DE-ME-23203	*Applied Mechanics	4	0	0	4	4	50	50	100	40
4	OE	DE-EE-23212	Basics of Mechanical and Electrical Engineering Lab	0	0	2	2	1	60	40	100	40
5	OE	DE-ME-23213	*Applied Mechanics Lab	0	0	2	2	1	60	40	100	40
6	DC	DE-CVE-23214	Computer Aided Drawing Lab	0	0	6	6	3	60	40	100	40
7	SE	DE-CSE-23215	*Basics of Inforamation Technology Lab	0	0	4	4	2	60	40	100	40
8	SE	DE-ME-23216	*General Workshop Practice - II	0	0	4	4	2	60	40	100	40
Total				11	0	18	29	20	450	350	800	320



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SCHOOL OF POLYTECHNIC

SCHEME OF STUDIES AND EVALUATION FOR DIPLOMA IN CIVIL ENGINEERING

Session- 2023-26

Semester - III

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	DC	SPB09230301	Hydraulics and Hydraulic Machines	3	0	0	3	3	50	50	100	40
2	DC	SPB09230302	Concrete Technology	3	0	0	3	3	50	50	100	40
3	DC	SPB09230303	Structural Mechanics	3	0	0	3	2	50	50	100	40
4	DC	SPB09230304	Building Construction	3	0	0	3	2	50	50	100	40
5	DC	SPB09230305	Building Drawings	4	0	0	4	3	50	50	100	40
6	VAC	SPB09230306	*Environmental Studies	2	0	0	2	2	50	50	100	40
7	DC	SPB09230351	Hydraulics and Hydraulic Machines Lab	0	0	2	2	1	60	40	100	40
8	DC	SPB09230352	Concrete Technology Lab	0	0	2	2	1	60	40	100	40
9	DC	SPB09230353	Structural Mechanics Lab	0	0	2	2	1	60	40	100	40
10	DC	SPB09230354	Building Construction Lab	0	0	2	2	1	60	40	100	40
11	VAC	SPB09230356	*Environmental Studies Lab	0	0	2	2	1	60	40	100	40
Total				18	0	10	28	20	600	500	1100	440



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SCHEME OF STUDIES AND EVALUATION FOR DIPLOMA IN CIVIL ENGINEERING

Session- 2023-26

Semester - IV

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	DC	SPB09230401	Highway Engineering	3	0	0	3	2	50	50	100	40
2	DC	SPB09230402	Surveying -I	3	0	0	3	2	50	50	100	40
3	DC	SPB09230403	Irrigation Engineering	3	0	0	3	3	50	50	100	40
4	DC	SPB09230404	Reinforced Cement Concrete Structures	3	0	0	3	2	50	50	100	40
5	AE	SPB09230405	*Communication Skill H&E-II	2	0	0	2	2	50	50	100	40
6	VAC	SPB09230406	*Energy Conservation	2	0	0	2	2	50	50	100	40
7	DC	SPB09230407	Reinforced Cement Concrete Drawing	4	0	0	4	2	50	50	100	40
8	DC	SPB09230451	Highway Engineering Lab	0	0	2	2	1	60	40	100	40
9	DC	SPB09230452	Surveying -I Lab	0	0	4	4	2	60	40	100	40
10	AE	SPB09230455	*Communication Skill H & E-II Lab	0	0	2	2	1	60	40	100	40
11	VAC	SPB09230456	*Energy Conservation Lab	0	0	2	2	1	60	40	100	40
Total				20	0	10	30	20	590	510	1100	440



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SCHEME OF STUDIES AND EVALUATION FOR DIPLOMA IN CIVIL ENGINEERING

Session- 2023-26

Semester - V

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	DC	SPB09230501	Water & Waste Water Engineering	3	0	0	3	2	50	50	100	40
2	DC	SPB09230502	Railways, Bridges and Tunnels	3	0	0	3	2	50	50	100	40
3	DC	SPB09230503	Earthquake Engineering	3	0	0	3	2	50	50	100	40
4	DC	SPB09230504	Soil Mechanics & Foundation Engineering	3	0	0	3	2	50	50	100	40
5	DC	SPB09230505	Surveying-II	3	0	0	3	2	50	50	100	40
6	DC	SPB09230506	Waste Water and Irrigation Engineering Drawing	4	0	0	4	2	50	50	100	40
7	VAC	SPB09230507	Universal Human Values	2	0	2	4	2	60	40	100	40
8	DC	SPB09230551	Water & Waste Water Engineering Lab	0	0	2	2	1	60	40	100	40
9	DC	SPB09230554	Soil Mechanics & Foundation Engineering Lab	0	0	2	2	1	60	40	100	40
10	DC	SPB09230555	Surveying-II Lab	0	0	4	4	2	60	40	100	40
11	DC	SPB09230560	Summer Internship / Industrial Training	0	0	0	0	2	0	100	100	40
Total				21	0	10	31	20	540	560	1100	440

*Universal Human Values will be evaluated via practical exam only.



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SCHEME OF STUDIES AND EVALUATION FOR DIPLOMA IN CIVIL ENGINEERING

Session- 2023-26

Semester - VI

S. No	Status	Paper Code	Subjects	Study Scheme Lec / Week			Hours	Credits	CIE	ESE	Total	Pass Marks
				L	T	P						
1	DC	SPB09230601	Quantity Surveying And Valuation	3	0	0	3	3	50	50	100	40
2	DC	SPB09230602	Construction Management, Accounts and Entrepreneurship Development	3	0	0	3	3	50	50	100	40
3	DC	SPB09230603	Design of Steel Structure	3	0	0	3	2	50	50	100	40
4	DE	SPB09230604/ SPB09230605/ SPB09230606	Elective: * Repair and Maintenance of Buildings * Plumbing Services * Analysis of Structure	3	0	0	3	3	50	50	100	40
5	DC	SPB09230660	Steel Structure Drawing Lab	0	0	4	4	2	50	50	100	40
6	SE	SPB09230661	Software Applications in Civil Engineering Lab	0	0	4	4	2	60	40	100	40
7	DC	SPB09230662	Survey Camp	0	0	0	0	2	120	80	100	40
8	DC	SPB09230663	Project Work	0	0	4	4	3	120	80	100	40
Total				12	0	12	24	20	550	450	1000	320

Semester-01



JUSTIFICATION

This course offers a fundamental understanding of elementary mathematics and its applications in engineering problem-solving. Students will learn to utilize key mathematical functions, including logarithms, partial fractions, matrices, as well as basic 2D geometry and curves. By mastering these concepts, students will gain the necessary skills to address engineering challenges across all disciplines effectively.

LEARNING OUTCOMES

After completing this course, students will be able to:

1. Identify arithmetic or geometric progressing series and Utilize Determinants and Cramer's Rule to solve systems of linear equations and analyse engineering problems that involve multiple variables, leading to efficient solutions in real-world scenarios.
2. Incorporate Vectors and Complex Numbers to address various engineering problems, allowing them to analyse AC circuits, control systems, and other phenomena that involve harmonic oscillations and phase shifts.
3. Apply trigonometric functions (sine, cosine, tangent, cosecant, secant, and cotangent) and inverse trigonometric functions to model and analyse periodic phenomena, such as oscillations and waves, determining angles and distances in real-world applications like navigation, surveying, and control systems.
4. Apply differential calculus to analyse functions, identify their domains and ranges, and determine continuity and differentiability using elementary tests. They will apply various methods to find derivatives, including trigonometric, exponential, and logarithmic differentiation, as well as derivatives of inverse trigonometric and implicit functions.
5. Apply Higher Order differential calculus to find tangents, normals, points of maxima/minima, identify increasing/decreasing functions, and analyse rates, measures, velocity, acceleration, errors, and approximations in various engineering applications.

DETAILED CONTENTS

UNIT 1: Algebra	8 Periods
1.1 Series : AP and GP; Sum, nth term, Mean	
1.2 Matrices and Determinants : Matrix, Types and basic properties, Elementary properties of determinant of order 2 and 3, Consistency of equation, Cramer's rule	
UNIT 2: Algebra -II	8 Periods
2.1 Complex number: Complex numbers, Representation, Modulus and amplitude Demoivre theorem, its application in solving algebraic equations.	
2.2 Addition and subtraction of Vectors, Resolution of vectors, Dot and Cross product of Vectors	
UNIT 3: Trigonometry and Inverse Trigonometric Functions	10 Periods
3.1 Trigonometric Functions and Identities.	
3.2 Inverse Trigonometric functions : Simple case only	
UNIT 4: Differential Calculus - I	16 Periods

- 4.1 Functions, limits, continuity, functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.
- 4.2 Methods of finding derivative, Trigonometric functions, exponential function, Function of a function, Logarithmic differentiation, Differentiation of Inverse trigonometric function, Differentiation of implicit functions.

UNIT 5: Differential Calculus - II

16 Periods

- 5.1 Higher order derivatives, Simple applications.
- 5.2 Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration.

RECOMMENDED BOOKS

1. **Applied Mathematics-I** by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut
2. **Elementary Engineering Mathematics** by BS Grewal, Khanna Publishers, New Delhi
3. **Engineering Mathematics, Vol I & II** by SS Sastry, Prentice Hall of India Pvt. Ltd.,
4. **Applied Mathematics-I** by Chauhan and Chauhan, Krishna Publications, Meerut.



JUSTIFICATION

Physics is a field that explores various subjects relevant to our surroundings. It seeks to understand the natural world through observation and predicting how objects interact. The course emphasizes a strong understanding of physical laws and their practical applications in engineering and technology across different disciplines. Through this study, students gain insights into the behaviour of objects and their relevance in real-world scenarios.

LEARNING OUTCOMES

After completing this course, students will be able to:

1. Demonstrate a thorough understanding of fundamental and derived physical quantities, systems of units (FPS, CGS, SI), and conversion between different unit systems. They will be proficient in handling measurement errors, accuracy, and precision of instruments, along with representation and operations with scalar and vector quantities.
2. Analyse various forces and their effects on linear and circular motion. They will understand the principles of conservation of linear momentum and conservation of mechanical energy, applying them to real-world examples involving impulsive forces, circular motion, and work-energy transformations.
3. Demonstrate the concepts related to work, friction, power, and energy, along with their practical applications in various engineering scenarios. They will be able to analyse and solve problems involving these principles and apply them to real-world situations.
4. Demonstrate the concepts of translatory and rotational motions, torque, angular momentum, and moment of inertia. They will apply these principles in solving problems related to rotational kinetic energy, rolling motion, and the comparison of linear and rotational motion.
5. Demonstrate the concepts of elasticity, stress, strain, and different types of moduli of elasticity. They will apply Hooke's law and understand stress-strain curves. Additionally, they will learn about pressure, surface tension, viscosity, and fluid dynamics, including the application of Bernoulli's theorem and Reynold's number.

DETAILED CONTENTS

UNIT 1: Fundamentals of Units, Measurement, Errors and Vector Analysis	12 Periods
1.1 Need of Measurement, physical Quantity - fundamental and derived, systems of units (FPS, CGS and SI units), Dimensions and dimensional formulae of physical quantities. conversion of numerical values of physical quantities from one system of units into another	
1.2 Error in measurement, accuracy and precision of instruments, percentage error, Combination of errors in addition, subtraction, multiplication, division and powers, rules for representing significant figures in calculation.	
1.3 Scalar and vector quantities – examples, representation of vector, types of Vectors, Unit Vector, Vector Addition and Subtraction, Triangle and Parallelogram law (Statement only), difference between vector and scalar addition using examples, Scalar and Vector Product, Resolution of Vectors using the example of stationary object, falling object, moving object.	
UNIT 2: Force and Motion	10 Periods

- 2.1 Force, Momentum, Statement of Conservation of linear momentum, discuss using examples such as recoil of gun, Impulsive force and its examples,
- 2.2 Circular motion (Uniform and Non-uniform), definition of angular, displacement, angular velocity, angular acceleration, frequency, time period, Relation between linear and angular velocity, linear acceleration and angular acceleration (numerical practice)
Centripetal and centrifugal forces with examples such as banking of roads and bending of cyclist, Principle of centrifuge, Application of various forces in lifts, cranes, large steam engines and turbines.

UNIT 3: Work, Power and Energy

10 Periods

- 3.1 Work: and its units, examples of zero work, positive work and negative work, conservative and non-conservative force,
Friction: modern concept, types, laws of limiting friction, Coefficient of friction and its Engineering Applications, Work done in moving an object on horizontal and inclined plane for rough and plane surfaces with its applications
Application of Friction in brake system of moving vehicles, bicycle, scooter, car trains etc.
- 3.2 Power and its units, calculation of power in numerical problems
- 3.3 Energy and its units: Kinetic energy and potential energy with examples and their derivation, work energy theorem, Principle of conservation of mechanical energy for freely falling bodies, examples of transformation of energy.

UNIT 4: Rotational Motion and Gravitational Force

10 Periods

- 4.1 Concept of translatory and rotatory motions with examples, Definition of torque with examples, Angular momentum, Conservation of angular momentum and its examples
- 4.2 Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid) (Formulae only). Concept of Fly wheel.
- 4.3 Rotational kinetic energy, Rolling of sphere on the slant plane, Comparison of linear motion and rotational motion, Application of rotational motions in transport vehicles, and machines
- 4.4 Gravitational force, Acceleration due gravity and its variation

UNIT 5: Properties of Matter & Thermodynamics

14 Periods

- 5.1 Elasticity: definition of stress and strain, different types of moduli of elasticity, Hooke's law, significance of stress strain curve
- 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, Capillary action and determination of surface tension from capillary rise method, applications of surface tension, effect of temperature and impurity on surface tension
- 5.4 Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems.
- 5.5 Concept of fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem and their applications
- 5.6 Difference between heat and temperature, Modes of transfer of heat (Conduction, convection and radiation with examples), Different scales of temperature and their relationship, Isothermal and Adiabatic process, Zeroth, First and second law of thermodynamics, Heat engine (concept Only), Carnot cycle, Application of various systems of thermometry in refrigeration and air-conditioning etc

RECOMMENDED BOOKS

1. **Text Book of Physics for Class XI** (Part-I, Part-II); N.C.E.R.T., Delhi
2. **Concepts in Physics** by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3. **Comprehensive Practical Physics**, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd.
4. **Engineering Physics** by PV Naik, Pearson Education Pvt. Ltd, New Delhi
5. **Engineering Physics** by DK Bhattacharya & Poonam Tandan; Oxford University Press.
6. **Modern Engineering Physics** by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications
7. **Physics-I** by V. Rajendran, Tata McGraw-Hill raw Hill publication, New Delhi.



APPLIED CHEMISTRY

(DE-ASH-23103)

L T P
3 0 2

JUSTIFICATION

The use of various chemicals and chemical products in diverse technical and Engineering fields have repeatedly proved the importance of Applied Chemistry, which enhances its role to a new peak. On the other hand, ever increasing use of such materials will compel engineers, technocrats to acquire essential applied chemistry knowledge in order to select engineering materials, which not only suit them but also provide more environmental compatibility. This situation demands principles of Applied Chemistry in diploma engineering courses. Principles of Applied Chemistry will enable budding engineers and technocrats to develop scientific temper and appreciate physical, chemical and engineering properties of materials. Hence the subject of Applied Chemistry.

LEARNING OUTCOMES

After undergoing this subject, the student will be able to:

1. Classify various substances based on state of aggregation
2. Substantiate the laws and principles on which structure of atom is established.
3. Explain and predict properties of substances.
4. Explain sources of water and various characteristics of water (quantitatively).
5. Explain cause and factors which can adversely affecting natural water quality and remedial measures Available for water purification
6. Think critically, develop and adapt water conservation techniques.
7. Explain corrosion of metal and their preventive measures.
8. Explain chemical nature and causes of corrosion
9. Apply correct and efficient methods of corrosion prevention.
10. Explain chemistry of fuels and their relative advantages.
11. Select most efficient fuel for the engine and engineering applications.
12. Suggest how to subside air pollution caused by the use of fossil fuels
13. Explain the chemistry of various polymers and plastics
14. Verify suitability and select polymer/rubber/plastic materials for engineering applications.

DETAILED CONTENTS

UNIT 1: Atomic Model and Chemical Bonding

15 Periods

- 1.1 Bohr's model of atom and successes and limitations of atomic theory (qualitative treatment only).
- 1.2 Atomic number, atomic mass number isotopes and isobars.
- 1.3 Definition of orbit and orbitals, shapes of s and p orbitals only, quantum numbers and their significance, Aufbau's principle, Pauli's exclusion principle and Hund's rule
- 1.4 Electronic configuration of elements with atomic number (Z) = 30 only. Modern periodic law and periodic table, groups and periods, classification of elements into s, p, d and f blocks (periodicity in properties - excluded),
- 1.5 Chemical bonding and cause of bonding.

UNIT 2: Fuels

10 Periods

- 2.1 Definition of fuel, Calorific value-higher calorific value, lower calorific value, classification of fuels, characteristics of good fuel, relative merits of gaseous, liquid and solid fuels, Determination of calorific value fuel using Bomb calorimeter.
- 2.2 Coal - types of coal and proximate analysis of coal
Petroleum and its refining process, Fuel rating – Octane number and Cetane number.
Gaseous fuels like natural gas (CNG), LPG, producer gas, water gas and biogas, their calorific value and applications.
Elementary idea on – hydrogen as future fuels

UNIT 3: Water

15 Periods

- 3.1 Demonstration of water resources on Earth using pie chart.
Classification of water – soft water and hard water, types of hardness, causes of hardness, units of hardness – mg per liter (mgL^{-1}) and part per million (ppm) and simple numerical.
Removal of hardness -Permutit process and Ion-exchange process.
- 3.2 pH and buffer solutions and their applications
- 3.3 Physico-Chemical methods for Water Quality Testing
 - a) Determination of pH using pH meter, total dissolved solids (TDS)
 - b) Testing and Estimation of- alkalinity, indicator their types and application
 total hardness by EDTA method (chemical reaction of EDTA method are excluded).

UNIT 4: Electrochemistry & Corrosion

10 Periods

- 4.1 Redox Reaction, Electrochemical cell (Galvanic and Electrolytic), application of electrochemistry – electroplating, galvanisation
- 4.2 Definition of corrosion and factors affecting corrosion rate.
- 4.3 Theories of a) Dry (chemical) corrosion & b) Wet corrosion in acidic atmosphere
Galvanic series,
- 4.4 Corrosion control: Internal corrosion preventive measures

UNIT 5: Organic compounds, Polymers and Plastics

10 Periods

- 5.1 Classification of organic compounds and IUPAC Nomenclature
- 5.2 Functional Groups and IUPAC Nomenclature
- 5.3 Definition of polymer, monomer and degree of polymerization
- 5.4 Classification of addition and condensation polymers with suitable examples (PE, PS, PVC, Teflon, Nylon -66 and Bakelite). Applications of polymers in industry and daily life.
- 5.5 Definition of plastics, thermo plastics and thermo setting plastics with suitable examples, distinctions between thermo and thermo setting plastics

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuricose & J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C. Jain & Monika Jain, Dhanapat Rai Publishing Company, New Delhi.
3. Eagle's Applied Chemistry - I by S. C. Ahuja & G. H. Hugar, Eagle Prakashan, Jalandhar.
4. Engineering Chemistry - A Text Book by H. K. Chopra & A. Parmar, Narosa Publishing House, New Delhi.
5. Applied Chemistry - I by Dr. P. K Vij & Shiksha Vij, Lords Publications, Jalandhar.



JUSTIFICATION

Proficiency in the Hindi & English language plays a pivotal role in advancing one's career. This subject focuses on instilling fundamental principles of effective communication while prioritizing the cultivation of essential skills such as active listening, articulate speaking, proficient reading, and proficient writing as integral components of Communication Skills development.

LEARNING OUTCOMES

After completing this course, students will be able to:

1. Identify the building blocks of sentences (like nouns and verbs), and write sentences that make sense using the right words.
2. Understand the importance of communication well in life, both personally and professionally.
3. Identify how people share ideas, feelings, and information, and you'll be able to explain it to others.
4. Become proficient in reading and comprehending unseen passages. They will also have the ability to perform tasks such as one-word substitution, identifying prefixes and suffixes, and recognizing antonyms and synonyms based on the passages.
5. Read and understand new texts, and write different types of things like stories, announcements, and essays, using the right rules and style.

DETAILED CONTENTS

UNIT 1: Basics of Communication	8 Periods
1.1 Definition and process of communication	
1.2 Types of communication - formal and informal, oral and written, verbal and non-verbal	
1.3 Communications barriers and how to overcome them	
1.4 Barriers to Communication, Tools of Communication	
UNIT 2: Application of Grammar	8 Periods
2.1 Parts of Speech (Noun, verb, adjective, adverb) and modals	
2.2 Sentences and its types	
2.3 Tenses	
2.4 Active and Passive Voice	
2.5 Punctuation	
2.6 Direct and Indirect Speech	
UNIT 3: English Reading Practices	10 Periods
3.1 Reading unseen passage	
3.2 Analyse language elements such as one-word substitutions, prefixes, suffixes, antonyms, synonyms, and more.	
UNIT 4: English Reading & Writing Practices	10 Periods
4.1 Writing practice: Summarizing short passages.	
4.2 Introduction to formal letter writing.	
4.3 Introduction to Notice writing.	

UNIT 5: Hindi Reading & Writing Practices

16 Periods

- 5.1 Writing practice: Summarizing short passages.
- 5.2 Introduction to formal letter writing.
- 5.3 Introduction to common Hindi idioms (Muhavare) and proverbs (Lokpriya Kahavatein)
- 5.4 Writing practice: Short essays on Hindi culture and literature.
- 5.5 Learning about famous Hindi writers, poets, Indian present and past personalities, and their works.

RECOMMENDED BOOKS

1. **Communicating Effectively in English, Book-I** by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. **Communication Techniques and Skills** by R. K. Chadha; DhanpatRai Publications, New Delhi.
3. **High School English Grammar and Composition** by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. **Communication Skills – I** by R Thakur, Nageen Prakashan Publication, Meerut, UP, India
5. **Excellent General English**-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra
6. **The Functional aspects of Communication Skills** – Dr. P. Prasad, S.K. Katria & Sons, New Delhi



DETAILED CONTENTS

UNIT 1: Building Stones, Bricks and Tiles	18 Periods
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, stratified 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	
1.7 Introduction to bricks	
1.8 Raw materials for brick manufacturing and properties of good brick making earth	
1.9 Manufacturing of bricks, Preparation of clay (manual/mechanically), 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, CLC, AAC, Paver blocks, clay-flyash bricks, sun dried bricks, only line diagram of kilns	
1.10 Classification and specifications of bricks as per BIS: 1077	
1.11 Testing of common building bricks as per BIS: 3495	
Compressive strength, water absorption - hot and cold water test, efflorescence, Dimensional tolerance, soundness	
1.12 Tiles	
Building tiles; Types of tiles-wall, ceiling, roofing and flooring tiles, Ceramic, terrazzo and PVC tiles, : their properties and uses, Vitrified tiles, Paver blocks, interlocking tiles	
1.13 Stacking of bricks and tiles at site	
UNIT 2: Cement	16 Periods
2.1 Introduction, raw materials, flow diagram of manufacturing of cement	
2.2 Various types of Cements, their uses and testing: Ordinary portland cement, rapid hardening cement, low heat cement, white and coloured cement, Portland Pozzolana cement	
2.3 Properties of cement	
UNIT 3: Timber and Wood Based Products	06 Periods
3.1 Identification and uses of different types of timber: Teak, Deodar, Shisham, Sal, Mango, Kail, Chir, Fir, Hollock, Champ	
3.2 Market forms of converted timber as per BIS Code	
3.3 Seasoning of timber: Purpose, methods of seasoning as per BIS Code	
3.4 Properties of timber and specifications of structural timber	
3.5 Defects in timber, decay in timber	
3.6 Preservation of timber and methods of treatment as per BIS	
3.7 Other wood based products, their brief description of manufacture and uses: Laminated board, gypsum 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 Doors.	

UNIT 4: Paints and Varnishes**03Periods**

- 4.1 Introduction, purpose and use of paints
- 4.2 Types, ingredients, properties and uses of oil paints, water paints and cement
- 4.3 Paints**
- 4.4 Covering capacity of various paints
- 4.5 Types, properties and uses of varnishes

UNIT 5: Metals and Miscellaneous Materials**09Periods**

- 5.1 Ferrous metals: Composition, properties and uses of cast iron, mild steel, HYSD steel, high tension steel as per BIS.
- 5.2 Commercial forms of ferrous, metals.
- 5.3 Aluminium & Stainless Steel.
- 5.4 Plastics - Introduction and uses of various plastic products in buildings such as doors, water tanks and PVC pipes
- 5.5 Fibre Sheets and their size and uses
- 5.6 Types and uses of insulating materials for sound and thermal insulation
- 5.7 Construction chemicals like water proofing compound, epoxies, polymers
- 5.8 Water proofing, termite proofing and fire resistance materials - types and uses
- 5.9 Materials used in interior decoration works like POP, methods of doing POP, PVC panelling

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. Bahl, SK; "Engineering Materials;" Delhi, Rainbow Book Co.
4. TTTI, Chandigarh "Civil Engineering Materials:" New Delhi Tata McGraw Hill Publication



SCHOOL OF ENGINEERING & TECHNOLOGY

ENGINEERING DRAWING - I

(DE-ME-23106)

L	T	P
0	0	4

JUSTIFICATION

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

Note:

- First angle projection is to be followed
- Minimum of 18 sheets to be prepared and at least 2 sheets on AutoCAD
- Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students

LEARNING OUTCOMES

After completing this course, students will be able to:

- Identify and use of different grades of pencils and other drafting instruments which are used in engineering field.
- Draw free hand sketches of various kinds of objects.
- Utilize various types of lines used in engineering drawing.
- Read and apply different dimensioning methods on drawing of objects.
- Use different types of scales and their utilization in reading and reproducing drawings of objects and maps.
- Draw 2 - dimensional view of different objects viewed from different angles (orthographic views)
- Draw and interpret complete inner hidden details of an object which are otherwise not visible in normal view
- To make projections of Solid
- Generate isometric (3D) drawing from different 2D (orthographic) views/sketches
- Identify conventions for different engineering materials, symbols, sections of regular objects and general fittings used in Civil and Electrical household appliances.

DETAILED CONTENTS

UNIT 1 Introduction to Engineering Drawing & Dimensioning Technique	6 Periods
1.1 Introduction to drawing instruments, materials, layout and sizes of drawing	
1.2 Sheets and drawing boards.	
1.3 Different types of lines in Engineering drawing as per BIS specifications	
1.4 Practice of vertical, horizontal and inclined lines, geometrical figures such as	
1.5 Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)	
1.6 Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches	
1.7 Scales - their needs and importance (theoretical instructions), type of scales,	

1.8	Definition of R.F. and length of scale	
UNIT 2	English Reading & Writing Practices	6 Periods
2.1	Theory of orthographic projections (Elaborate theoretical instructions)	
2.2	Projection of Points in different quadrant	
2.3	Projection of Straight Line (1st and 3rd angle)	
	4.3.1. Line parallel to both the planes	
	4.3.2. Line perpendicular to any one of the reference plane	
	4.3.3. Line inclined to any one of the reference plane.	
2.4	Projection of Plane - Different lamina like square, rectangular, triangular and circle inclined to one plane, parallel and perpendicular to another plane in 1st angle only	
2.5	Three views of orthographic projection of different objects. (At least one sheet in 3rd angle)	
2.6	Identification of surfaces	
UNIT 3	Projection of Solid	6 Periods
3.1	Definition and salient features of Solid	
3.2	Types of Solid (Polyhedron and Solid of revolution)	
3.3	To make projections, sources, Top view, Front view and Side view of various types of Solid.	
3.4	Importance and salient features Sections	
3.5	Drawing of full section, half section, partial or broken out sections, Offset	
3.6	Sections, revolved sections and removed sections.	
3.7	Convention sectional representation of various materials, conventional breaks	
UNIT 4	Isometric Views and Common Symbols used in Engineering	16 Periods
4.1	Fundamentals of isometric projections and isometric scale.	
4.2	Isometric views of combination of regular solids like cylinder, cone, cube and	
4.3	Civil Engineering sanitary fitting symbols	
4.4	Electrical fitting symbols for domestic interior installations	
UNIT 5	Basic of various commands in AutoCAD	2 Periods
5.1	Basic introduction and operational instructions of various commands in AutoCAD. At least two sheets on AutoCAD of cube, cuboid, cone, pyramid, truncated cone and pyramid, sphere and combination of above solids.	
	* Auto CAD drawing will be evaluated internally by sessional marks and not by final theory paper.	

RECOMMENDED BOOKS

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



SCHOOL OF ENGINEERING & TECHNOLOGY

APPLIED PHYSICS-1 LAB

(DE-ASH-23112)

L	T	P
0	0	2

JUSTIFICATION

The diploma holder in Computer Science & Engineering needs to have hands-on knowledge of basic electrical measurements and electronic circuits, which they will encounter in their professional careers.

LEARNING OUTCOMES

After completing this course, students will be able to:

1. Demonstrate the use of high precision measuring callipers.
2. Demonstrate the laws of vector addition and subtraction.
3. Demonstrate the methods for the measurement of moment of inertia, acceleration due to gravity etc.
4. Demonstrate the concepts of Stoke's Law and Hooke's Law.
5. Demonstrate the conservation of energy.

DETAILED CONTENTS

- 1 To find radius of wire and its volume and the maximum permissible error in these quantities by using both screw gauge.
- 2 To find diameter of metallic bob and use it to calculate its volume. Also Find the maximum permissible error in these quantities by using Vernier callipers.
- 3 To verify parallelogram law of vector addition and Subtraction.
- 4 To find the Moment of Inertia of a flywheel about its axis of rotation.
- 5 To find the value of acceleration due to gravity on the surface of earth by using a simple pendulum.
- 6 To study conservation of energy of a ball or cylinder rolling down an inclined plane.
- 7 To determine the viscosity of glycerin by Stoke's method
- 8 To determine force constant of spring using Hooks law
- 9 Simulation Practical-1
- 10 Simulation Practical-2



SCHOOL OF ENGINEERING & TECHNOLOGY

APPLIED CHEMISTRY LAB

(DE-ASH-23113)

L	T	P
0	0	2

JUSTIFICATION

The use of various chemicals and chemical products in diverse technical and Engineering fields have repeatedly proved the importance of Applied Chemistry, which enhances its role to a new peak. On the other hand, ever increasing use of such materials will compel engineers, technocrats to acquire essential applied chemistry knowledge in order to select engineering materials, which not only suit them but also provide more environmental compatibility. This situation demands principles of Applied Chemistry in diploma engineering courses. Principles of Applied Chemistry will enable budding engineers and technocrats to develop scientific temper and appreciate physical, chemical and engineering properties of materials. Hence the subject of Applied Chemistry.

DETAILED CONTENTS

- 1 Estimation of total hardness of water using standard EDTA solution
- 2 Estimation of total alkalinity of given water sample by titrating it against standard sulfuric acid solution.
- 3 Proximate analysis of solid fuel
- 4 Estimation of temporary hardness of water sample by O' Hener' s Method.
- 5 Determination of flash and fire point of given lubricating oil using Able' s flash point apparatus

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuricose & J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi
2. Engineering Chemistry by P.C. Jain & Monika Jain, Dhanapat Rai Publishing Company, New Delhi.
3. Eagle' s Applied Chemistry - I by S. C. Ahuja & G. H. Hugar, Eagle Prakashan, Jalandhar.
4. Engineering Chemistry - A Text Book by H. K. Chopra & A. Parmar, Narosa Publishing House, New Delhi.
5. Applied Chemistry - I by Dr. P. K Vij & Shiksha Vij, Lords Publications, Jalandhar.



SCHOOL OF ENGINEERING & TECHNOLOGY

COMMUNICATION SKILL H & E LAB

(DE-ASH-23114)

L	T	P
0	0	2

JUSTIFICATION

Proficiency in the Hindi & English language plays a pivotal role in advancing one's career. This subject focuses on instilling fundamental principles of effective communication while prioritizing the cultivation of essential skills such as active listening, articulate speaking, proficient reading, and proficient writing as integral components of Communication Skills development.

DETAILED CONTENTS

- 1 Self and peer introduction
- 2 Newspaper reading
- 3 Just a minute session-Extempore
- 4 Greeting and starting a conversation
- 5 Leave taking
- 6 Thanking
- 7 Wishing well
- 8 Talking about likes and dislikes
- 9 Group Discussion
- 10 Listening Exercises.

RECOMMENDED BOOKS

1. **Communicating Effectively in English, Book-I** by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. **Communication Techniques and Skills** by R. K. Chadha; Dhanpat Rai Publications, New Delhi.
3. **High School English Grammar and Composition** by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. **Communication Skills – I** by R Thakur, Nageen Prakashan Publication, Meerut, UP, India
5. **Excellent General English**-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra
6. **The Functional aspects of Communication Skills** – Dr. P. Prasad, S.K. Katria & Sons, New Delhi



JUSTIFICATION

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.

LEARNING OUTCOMES

After completing this course, students will be able to:

1. Classify rocks and identify particular type of stones.
2. Classify different types of bricks and BLOCKS.
3. Perform laboratory tests of cement to determine properties of cement.
4. Identify types of defects of timber.
5. Identify and use different types of metals/alloys.

DETAILED CONTENTS

- 1 To identify the stones used in building works by visual examination
- 2 To determine the crushing strength of bricks, CLC, AAC and Paver Blocks.
- 3 To determine the water absorption of bricks and efflorescence of bricks
- 4 To identify various types of timbers such as: Teak, Sal, Chir, Shisham, Deodar, Kail & Hollock by visual examination only
- 5 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.

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. Bahl, SK; "Engineering Materials;" Delhi, Rainbow Book Co.
4. TTTI, Chandigarh "Civil Engineering Materials:" New Delhi Tata McGraw Hill Publication



JUSTIFICATION

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 hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

LEARNING OUTCOMES

After completing this course, students will be able to:

1. Identify tools and equipment used and their respective functions.
2. Identify different types of materials and their basic properties.
3. Use and take measurements with the help of basic measuring tools/equipment.
4. Select proper tools for a particular operation.
5. Select materials, tools, and sequence of operations to make a job as per given specification/drawing.

DETAILED CONTENTS

1. **CARPENTRY SHOP**
 - 1.1 **General Shop Talk**
 - 1.1.1 Name and use of raw materials used in carpentry shop : wood & alternative materials
 - 1.1.2 Names, uses, care and maintenance of hand tools such as different types of Saws, C-Clamp, Chisels, Mallets, Carpenter's vices, Marking gauges, Try-squares, Rulers and other commonly used tools and materials used in carpentry shop by segregating as cutting tools, supporting tools, holding tools , measuring tools etc.
 - 1.1.3 Specification of tools used in carpentry shop.
 - 1.1.4 Different types of Timbers, their properties, uses & defects.
 - 1.1.5 Seasoning of wood.
 - 1.2 **Practice**
 - 1.2.1 Practices for Basic Carpentry Work
 - 1.2.2 Sawing practice using different types of saws
 - 1.2.3 Assembling jack plane – Planning practice including sharpening of jack plane cutter
 - 1.2.4 Chiselling practice using different types of chisels including sharpening of chisel
 - 1.2.5 Making of different types of wooden pin and fixing methods. Marking measuring and inspection of jobs.
 - 1.3 **Job Practice**
 - Job 1 Marking, sawing, planning and chiselling and their practice
 - Job II Half Lap Joint (cross, L or T - any one)
 - Job III Mortise and Tenon joint (T-Joint)
 - Job IV Dove tail Joint (Lap or Bridle Joint)Demonstration of job showing use of Rip Saw, Bow saw and Tenon saw, method of sharpening various saws.
2. **PAINTING AND POLISHING SHOP**

- 2.1 Introduction of paints, varnishes, Reason for surface preparation, Advantages of Painting, other method of surface coating ie. Electroplating etc.
- 2.2 Job Practice
 Job 1: To prepare a wooden surface for painting apply primer on one side and to paint the same side. To prepare french polish for wooden surface and polish the other side.
 Job II: To prepare metal surface for painting, apply primer and paint the same.
 Job III: To prepare a metal surface for spray painting, first spray primer and paint the same by spray painting gun and compressor system.
 The sequence of polishing will be as follows:
 i) Abrasive cutting by leather wheel
 ii) Polishing with hard cotton wheel and with polishing material
 iii) Buffing with cotton wheel or buff wheel.
3. **ELECTRICAL SHOP**
- 3.1 Study, demonstration and identification of common electrical materials with standard ratings and specifications such as wires, cables, switches, fuses, cleats, clamps and allied items, tools and accessories.
- 3.2 Study of electrical safety measures and protective devices.
 Job I Identification of phase, Neutral and Earth wires for connection to domestic electrical appliances and their connections to three pin plugs.
 Job II Carrying out house wiring circuits using fuse, switches, sockets, ceiling rose etc. in batten or P.V.C. casing-caping.
- 3.3 Study of common electrical appliances such as auto electric iron, electric kettle, ceiling/table fan, desert cooler etc.
- 3.4 Introduction to the construction of lead acid battery and its working.
 Job III Installation of battery and connecting two or three batteries in series and parallel.
- 3.5 Introduction to battery charger and its functioning.
 Job IV Charging a battery and testing with hydrometer and cell tester
4. **WELDING SHOP**
- 4.1 Introduction and importance of welding as compared to other material joining processes. Specifications and type of welding machines, classification and coding of electrodes, welding parameters, welding joints and welding positions. Materials to be welded, safety precautions.
- 4.2 Job Practice
 Job I Practice of striking arc (Minimum 4 beads on 100 mm long M.S. flat).
 Job II Practice of depositing beads on plate at different current levels. (Minimum 4 beads on M.S. plate at four setting of current level).
 Job III Preparation of lap joint using arc welding process.
 Job IV Preparation of T-joint using gas welding or arc welding on 100 mm x 6 mm MS Flat
5. **PLUMBING SHOP**
- 5.1 Use of personal protective equipments, safety precautions while working and cleaning of shop.
- 5.2 Introduction and demonstration of tools, equipment and machines used in plumbing shop.
- 5.3 Introduction of various pipes and pipe fittings of elbow, nipple, socket, union etc.
- 5.4 Job Practice
 Job 1 : Preparation of job using elbow, bend and nipple
 Job II: Preparation of job using Union, Tap, Plug and Socket.
 Job III: Threading practice on pipe with die

RECOMMENDED BOOKS

1. Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi

Semester-02



JUSTIFICATION

Basic elements of integral calculus, differential calculus, numerical methods, differential equations included in this course will play a vital role in understanding engineering problem mathematically. This will also develop analytical as well as conceptual abilities among students.

LEARNING OUTCOMES

After completing this course, students will be able to:

1. Calculate simple integration by methods of integration
2. Evaluate the area under curves, surface by using definite integrals.
3. Calculate the area and volume under a curve along areas.
4. Solve the engineering problems with numerical methods.
5. Understand the geometric shapes used in engineering problems by co-ordinate geometry.

DETAILED CONTENTS

UNIT 1: Integral Calculus-I	12 Periods
Method of Indefinite Integration: Integration by substitution, Integration by rational function, Integration by partial fraction, Integration by Parts, Integration of special function	
UNIT 2: Integral Calculus -II	10 Periods
Meaning and properties of definite integrals, Evaluation of definite integrals, Application : Length of simple curves, Finding areas bounded by simple curves Volume of solids of revolution, centre of mean of plane areas.	
UNIT 3: Numerical Iteration Methods	10 Periods
Simposns 1/3rd and Simposns3/8th rule and Trapezoidal Rule : their application in simple cases. Numerical solutions of algebraic equations; Bisections method, Regula-Falsi method, Newton-Raphson's method(without proof), Numerical solutions of simultaneous equations; Gauss elimination method(without proof)	
UNIT 4: Co-ordinate Geometry (2 Dimension)	11 Periods
Circle , Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.	
UNIT 5: Co-ordinate Geometry (3 Dimension)	12 Periods
Straight lines and planes in space Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line (without proof)	

RECOMMENDED BOOKS

1. **Applied Mathematics-II** by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut
2. **Elementary Engineering Mathematics** by BS Grewal, Khanna Publishers, New Delhi
3. **Engineering Mathematics, Vol I & II** by SS Sastry, Prentice Hall of India Pvt. Ltd.,
4. Applied Mathematics-II by Chauhan and Chauhan, Krishna Publications, Meerut.



SCHOOL OF ENGINEERING & TECHNOLOGY

BASICS OF MECHANICAL AND ELECTRICAL ENGINEERING

(DE-EE-23202)

L	T	P
4	0	0

JUSTIFICATION

A part from the common core subjects, some engineering subjects are included in the diploma course of electrical engineering. One of these subjects is Elementary Mech. Engg. To impart some necessary knowledge and skill about mechanical nature. Inclusion of the subject is further justified by the fact that in practical field, any job of electrical and civil technician is intermingled with either civil or mechanical engineering. As such the relevant basic topics of these disciplines are included in the content of the subject. Some study exercises along with some field work have been suggested to give feel of jobs and equipments involved.

LEARNING OUTCOMES

After completing this course, students will be able to:

1. Apply thermodynamics Laws.
2. Use of various energy sources.
3. Solve basics problems related to fuel and combustion.
4. Have an idea of loading on machine components.
5. Explain the application of different types of bearings.
6. Explain the uses of different types of gears and springs.
7. Explain the working principle of different lubrication systems.

DETAILED CONTENTS

SECTION – A (Mechanical Engineering)

UNIT 1: Thermal Engineering	8 Periods
1.1 Sources of Energy: Definition, Concept of thermodynamic system and surroundings, Closed system, Open system, Isolated system, Thermodynamics definition of work. Zeroth law of thermodynamics Basic ideas, conventional and nonconventional forms- Thermal, Hydro, Tidal, wind, Solar, Biomass and Nuclear and their uses. Fuels & Combustion: Combustion of fuels- their higher and lower calorific values. Combustion equations for carbon, sulphur, hydrogen and their simple compounds. Calculation of minimum amount of air required for complete combustion. Combustion analysis on mass basis and on volume basis. Concept of excess air in boiler furnace combustion. Heat carried away by flue gases. Analysis of flue gases by Orsat apparatus. Simple numerical problems Idea of specific properties of liquid fuels such as detonation knock resistance (cetane and octane numbers), viscosity, solidification point, flash point and flame point.	
UNIT 2: Machine Components	12 Periods
Brief idea of loading on machine components. (i) Pins, Cotter and Knuckle Joints. (ii) Keys, Key ways and spline on the shaft. (iii) Shafts, Collars, Cranks, Eccentrics. (iv) Couplings and Clutches. (v) Bearings: Plane, Bushed, Split-step, ball, Roller bearing, Journal bearing, Foot step bearing, thrust bearing, collar bearing and Special type bearing and their applications.	

vi) Gears : Different types of gears, gear trains and their use for transmission of motion. Determination of velocity ratio for spur gear trains; spur gear, single and double helical gears, Bevel gears, Mitre wheel, worms, Rack and Pinion. Simple and compound and epicyclic gear trains and their use. Definition of pitch and pitch circle & module.

(vii) Springs: Compression, Tension, Helical springs, Torsion springs, Leaf and Laminated springs. Their use and material.

Lubrication: Different lubrication system for lubricating the components of machines. Principle of working of wet sump and dry sump system of lubrication. (Explain with simple line diagram). Selection of lubricant based on different application (Requirement with the help of manufacturer catalogue). **4 Periods**

Section B : Electrical Engineering

- UNIT 3: Overview of DC Circuits** **12 Periods**
Definition of basic terms, such as current, EMF, Potential Difference (PD); Ohm's Law and its limitations; Factors affecting resistors; simple problems on series and parallel combinations of resistors with their wattage considerations. Application of Kirchhoff's current law and Kirchhoff's voltage law to simple circuits. Star – Delta connections and their conversion. DC Circuit Theorems: Thevenin's theorem, Norton's theorem, application of network theorems in solving D.C. circuit problems.
- UNIT 4: Batteries** **8 Periods**
Basic idea of primary and secondary cells, Construction, working principle and applications of Lead-Acid, Nickel- Cadmium and Silver-Oxide batteries. Charging methods used for lead-acid battery (accumulator), Care and maintenance of lead-acid battery, Series and parallel connections of batteries. General idea of solar cells, solar panels and their applications
- UNIT 5: Single phase and poly-phase AC System** **10 Periods**
Concept of alternating quantities, Difference between ac and dc, Different AC and DC waveforms, Concepts of: cycle, frequency, time period, amplitude, instantaneous value, average value, r.m.s. value, maximum value, form factor and peak factor. Equation of sinusoidal wave form for an alternating quantity and its derivation, Effect of alternating voltage applied to a R, L, C, RL, RC, RLC circuits, Power Factor, Methods of Power Factor improvement. 3-phase Ac circuits, advantages of polyphase system over single phase system. Relations between line and phase value of voltages and currents for star and delta connections.

RECOMMENDED BOOKS

1. Thermal Engineering by RK Rajput; Laxmi Publications, Delhi.
2. Theory Machines by SS Rattan; Tata McGraw Hill, New Delhi.
3. Basic Electrical Engineering by PS Dhogal, Tata McGraw-Hill Education Pvt Ltd., New Delhi.
4. Experiments in Basic Electrical Engineering by SK Bhattacharya, KM Rastogi; New Age International (P) Ltd.; Publishers New Delhi.
5. Electrical Technology by BL Theraja, S Chand and Co, New Delhi.



SCHOOL OF ENGINEERING & TECHNOLOGY

APPLIED MECHANICS

(DE-ME-23203)

L	T	P
4	0	0

JUSTIFICATION

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.

LEARNING OUTCOMES

After completing this course, students will be able to:

1. Interpret various types of units and their conversion from one to another.
2. Analyse different types of forces acting on a body and draw free body diagrams.
3. Determine the resultant of coplanar concurrent forces.
4. Calculate the co-efficient of friction for different types of surfaces.
5. Calculate the least force required to maintain equilibrium on an inclined plane.
6. Determine the centroid/centre of gravity of plain and composite laminar and solid bodies.
7. Determine velocity ratio, mechanical advantage and efficiency of simple machines

DETAILED CONTENTS

UNIT 1: Introduction	12 Periods
1.1 Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics.	
1.2 Concept of rigid body, scalar and vector quantities	
1.3 Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines, Simple and compound machine (Examples)	
1.4 Definition of ideal machine, reversible and self locking machine	
UNIT 2: Laws of Forces	07 Periods
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 superposition.	
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, Equilibrant Force and its determination, Lami's Theorem (Concept Only)	
2.5 Type of Load, supports, Beams- analysis for simply supported, cantilever beams	
UNIT 3: Moment	07 Periods
3.1 Concept of Moment, Moment of a force and units of moment, Varignon's Theorem (Definition Only), Principle of moment and its applications, Parallel forces (like and unlike parallel force), calculating their resultant.	

3.2 Concept of couple, its properties and effects, General conditions of equilibrium of bodies under coplanar forces.

3.3 Position of resultant force by moment [Simple problems on the above topics]

UNIT 4: Friction

08 Periods

4.1 Definition and concept of friction, types of friction, force of friction, Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction.

4.2 Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane.

4.3 Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force:

a) Acting along the inclined plane Horizontally

b) At some angle with the inclined plane

UNIT 5: Centre of Gravity

08 Periods

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 centre of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed [Simple problems on the above topics]

RECOMMENDED BOOKS

1. A Text Book of Applied Mechanics by S Ramamurtham , Dhanpat Rai Publishing Co. Ltd.
2. A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.
3. A Text Book of Applied Mechanics by RK Rajput; Laxmi Publications, New Delhi.
4. Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi.
5. Test Book of Applied Mechanics by AK Upadhya, SK Kataria & Sons, New Delhi



SCHOOL OF ENGINEERING & TECHNOLOGY

BASICS OF MECHANICAL AND ELECTRICAL ENGINEERING LAB

(DE-EE-23212)

L	T	P
0	0	2

JUSTIFICATION

A part from the common core subjects, some engineering subjects are included in the diploma course of electrical engineering. One of these subjects is Elementry Mech. Engg. To impart some necessary knowledge and skill about mechanical nature. Inclusion of the subject is further justified by the fact that in practical field, any job of electrical and civil technician is intermingled with either civil or mechanical engineering. As such the relevant basic topics of these disciplines are included in the content of the subject. Some study exercises along with some field work have been suggested to give feel of jobs and equipments involved.

LEARNING OUTCOMES

After completing this course, students will be able to:

1. Apply thermodynamics Laws.
2. Use of various energy sources.
3. Solve basics problems related to fuel and combustion.
4. Have an idea of loading on machine components.
5. Explain the application of different types of bearings.
6. Explain the uses of different types of gears and springs.
7. Explain the working principle of different lubrication systems.

DETAILED CONTENTS

- 1 Apply thermodynamics Laws.
- 2 Use of various energy sources.
- 3 Solve basics problems related to fuel and combustion.
- 4 Have an idea of loading on machine components.
- 5 Explain the application of different types of bearings.
- 6 Explain the uses of different types of gears and springs.
- 7 Explain the working principle of different lubrication systems.
- 8 Identify and take readings on various electrical equipment.
- 9 Determine voltage-current relationship in a DC circuit under specific physical conditions
- 10 Measure resistance of an ammeter and a voltmeter
- 11 Verify DC circuits (Thevenin and Norton Theorem)
- 12 Verify Kirchoff's Current and Voltage Laws in a dc circuit
- 13 Measure voltages and currents in polyphase a.c. circuits for star and delta connections.



SCHOOL OF ENGINEERING & TECHNOLOGY

APPLIED MECHANICS LAB

(DE-ME-23213)

L	T	P
0	0	2

JUSTIFICATION

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.

LEARNING OUTCOMES

After completing this course, students will be able to:

1. Demonstrate the knowledge of Polygon law of forces using Gravesend apparatus.
2. Study and verify the reaction at the supports of Beams
3. Demonstrate the mechanical advantage , velocity ratio, efficiency of Screw Jack, Worm & Worm wheel, Single purchase crab
4. Demonstrate to measure the centre of gravity of Regular & Irregular Lamina.
5. Study of Friction of forces .

DETAILED CONTENTS

- 1 Verification of the polygon law of forces using gravesend 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 centre of gravity of regular lamina.
- 9 To find out centre of gravity of irregular lamina.
- 10 To determine coefficient of friction between three pairs of given surface.



SCHOOL OF ENGINEERING & TECHNOLOGY

COMPUTER AIDED DRAWING LAB

(DE-CVE-23214)

L	T	P
0	0	6

JUSTIFICATION

A diploma holder is expected to prepare and interpret CAD Drawings. Hence this subject.

LEARNING OUTCOMES

On completion of this course, students will be able to :

1. Know the advantages of using CAD in comparison with conventional method.
2. Draw and interpret CAD drawings using drawing, editing and viewing in CAD software.
3. Create 2D plans of building
4. **Create 3 D views from given 2D plans**

DETAILED CONTENTS

1. Introduction to Computer Aided Drafting (2D) commands of any one software(Auto CAD, ProE, Solid works, Unigraphics etc. (6drawing sheets) 16 Sheets
 - a. Concept of AutoCAD, Tool bars in CAD software, coordinate system, snap,grid, and ortho mode (Absolute, Relative andPolar), setting of units andlayout.
 - b. Drawing commands - point, line, arc, circle, ellipse,
 - c. Editing commands - scale, erase, copy, stretch, lengthen and explode.
 - d. Dimensioning and placing text in drawing area
 - e. Sectioning and hatching
 - f. Inquiry for different parameters of drawing entity
 - g. Create layers within a drawing
 - h. 1.8 Specifying Geometrical Dimensioning & tolerancing (GD&T)parameters in drawing
2. 2-D Plan of a 2-Room Building
3. Isometric Drawing by CAD using any part modeling Software (3D) (one sheet) Drawings of following on computer:
 - a. Cone
 - b. Cylinder
 - c. Cube
 - d. Spring
 - e. Isometric view of objects
4. Introduction to any part modeling software(ProE, Solid works, AutoCAD, Unigraphic , Catia etc.)
Introduction to Sketcher: Sketch Entities, Sketch Tools, Blocks, Dimensioning
Part modeling (4 models)
 - I. Part Modelling Tools:-
 - a. Creating reference planes
 - b. Creating Extrude features Creating Revolve Creating Swept features
 - c. Creating Loft features
 - d. Creating Reference - points, axis, coordinates
 - e. Creating Fillet features
 - f. Inserting Hole types
 - g. Creating Chamfer
 - h. Creating Shell
 - i. Environment& Utilities - Working with views and manipulating views.
 - II. Preparing 3-D view of existing 2-D plan.



SCHOOL OF ENGINEERING & TECHNOLOGY

BASIC OF INFORMATION TECHNOLOGY LAB

(DE-CSE-23215)

L	T	P
0	0	4

JUSTIFICATION

Information technology has great influence on all aspects of 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 using MS Office/Open Office/Libre 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.

LEARNING OUTCOMES

After completing this course, students will be able to:

1. Identify Computer Hardware Components, Network Components and Peripherals.
2. Explain the role of an Operating System.
3. Install System and Application Software.
4. Explain the function of the system components including Processor, Motherboard and Input-output devices.
5. Use Word Processing Software to prepare document.
6. Use Spreadsheet Software to create workbooks and automate calculation.
7. Use Presentation Software to create interactive presentation.
8. Perform fundamental tasks common to most application software including print, scan, save, edit, cut, copy, paste, format, spell and grammar check.
9. Use online office tools (Google suits)
10. Install Antivirus.

DETAILED CONTENTS

1. **Identify various components, peripherals of computer and list their functions.**
2. **Installation of various application software and peripheral drivers**
3. **Installation of operating system (windows/linux/others)**
4. **Creation and Management (Rename, delete, search of file and folders)**
5. **Installation of Antivirus and remove viruses**
6. **Scanning and printing documents**
7. **Browsing, Downloading, Information using Internet**
8. **E-Mail ID creation, comparing, sending and receiving e-mail. Attaching a file with e-mail message.**
9. **Word Processing (MS Office/Open Office)**
 - a) File Management: Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, giving password protection for a file
 - b) Page set up: Setting margins, tab setting, ruler, indenting
 - c) Editing a document: Entering text, cut, copy, paste using tool- bars

d) 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, autotext, Inserting date, time, special symbols, importing graphic images, drawing tools

e) 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

f) Using Tools like: Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelopes and labels, Using shapes and drawing toolbar, Working with more than one window.

10. **Spread Sheet Processing (MS Office/Open Office/Libre Office)**

a) Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, save worksheet, switching between different spread sheets

b) Menu commands: Create, format charts, organise, manage data, solving problem by analyzing data. Programming with Excel Work Sheet, getting information while working

c) Work books: Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet, conditional formatting

d) 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

e) Retrieve data with query: Create a pivot table, customizing a pivot table. Statistical analysis of data

f) Exchange data with other application: Embedding objects, linking to other applications, import, export document.

11. **PowerPoint Presentation (MS Office/Open Office/Libre office)**

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

b) Addition, deletion and saving of slides

c) Insertion of multimedia elements

Adding text boxes, Adding/importing pictures, Adding movies and sound. Adding tables and charts etc. , Adding organizational chart Editing objects, Working with Clip Art

d) Formatting slides

Using slide master, Text formatting, Changing slide layout, Changing slide colour scheme, Changing background, Applying design template

12. **Google Suits Using Google drive, Google shut, Google docs, Google slides**

RECOMMENDED BOOKS

1. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Information Technology for Management by Henery Lucas, Tata McGraw Hills, New Delhi
3. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar
4. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi



SCHOOL OF ENGINEERING & TECHNOLOGY

GENERAL WORKSHOP PRACTICE –II

(DE-ME-23216)

L	T	P
0	0	4

JUSTIFICATION

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 hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

LEARNING OUTCOMES

After completing this course, students will be able to:

1. Identify tools and equipment used and their respective functions.
2. Identify different types of materials and their basic properties.
3. Use and take measurements with the help of basic measuring tools/equipment.
4. Select proper tools for a particular operation.
5. Select materials, tools, and sequence of operations to make a job as per given specification/drawing.
6. Prepare simple jobs independently and inspect the same.
7. Follow safety procedures and precautionary measures.
8. Use safety equipment and Personal Protection Equipment.

DETAILED CONTENTS

UNIT 1: FITTING SHOP

12 Periods

Use of personal protective equipment and safety precautions while working.

Basic deburring processes.

Introduction to fitting shop tools, marking and measuring devices/equipment.

Identification of materials. (Iron, Copper, Stainless Steel, Aluminium etc.)

Identification of various steel sections (flat, angle, channel, bar etc.).

Introduction to various fitting shop operations/processes (Hacksawing, Drilling, Chipping and Filing).

Job Practice:

Job I Marking of job, use of marking tools, filing and use of measuring instruments. (Vernier caliper, Micrometer and Vernier height gauge).

Job II Filing a rectangular/square piece to maintain dimensions within an accuracy of $\pm .25$ mm.

Job III Making a cut-out from a square piece of MS flat using hand hacksaw and chipping

Job IV Drilling and tapping practice on MS Flat.

UNIT 2: SHEET METAL SHOP

6 Periods

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.

Introduction and demonstration of hand tools used in sheet metal shop.

Introduction and demonstration of various machines and equipment used in sheet

metal shop e.g. Shearing Machine, Bar Folder, Burring Machine,

Introduction and demonstration of various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet,

aluminium sheet etc.

Study of various types of nuts, bolts, rivets, screws etc.

Job Practice:

Job I: Shearing practice on a sheet using hand shears.

Job II: Practice on making Single riveted lap joint/Double riveted lap Joint.

Job III: Practice on making Single cover plate chain type, zig-zag type and single rivetted Butt Joint.

UNIT 3: WELDING SHOP-I

12 Periods

Introduction and importance of welding as compared to other material joining processes. Specifications and type of welding machines, classification and coding of electrodes, welding parameters, welding joints and welding positions. Materials to be welded, safety precautions.

Job Practice:

Job I Practice of striking arc (Minimum 4 beads on 100 mm long M.S. flat).

Job II Practice of depositing beads on plate at different current levels. (Minimum 4 beads on M.S. plate at four setting of current level).

Job III Preparation of lap joint using arc welding process.

Job IV Preparation of T-joint using gas welding or arc welding on 100 mm x 6 mm MS Flat

UNIT 4: FOUNDRY SHOP

6 Periods

Study of metal and non metals

Study and Sketch of the Foundry tools

Study and sketch of Cupola and pit furnace

To prepare green moulding sand and to prepare moulds (single piece and double piece pattern sweep mould)

Casting of non ferrous (lead or aluminium)

UNIT 5: MACHINE SHOP

12 Periods

Study and sketch of lathe machine

Study and Sketch of grinders, milling machine, drilling machine and CNC machine.

Plain and step turning and knurling practice.

Study and sketch of planing/shaping machine and to plane a rectangle of cast iron.

RECOMMENDED BOOKS

1. Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5. Basic Workshop Practice Manual by T Jeyapooan; Vikas Publishing House (P) Ltd., New Delhi

Semester-03



SCHOOL OF POLYTECHNIC
HYDRAULICS AND HYDRAULIC MACHINES
(SPB09230301)

L **T** **P**
3 **0** **0**

DETAILED CONTENTS

UNIT 6: Introduction		10 Periods
1.1	Fluids: Real and ideal fluids	
1.2	Fluid Mechanics, Hydrostatics, Hydrodynamics, Hydraulics	
1.3	Properties of Fluids (definition only)	
1.4	Mass density, specific weight, specific gravity, viscosity, surface tension -cohesion, adhesion and, capillarity, vapour pressure and compressibility. Newton's Law of viscosity, Newtonian and Non-Newtonian fluids, simple numerical problems.	
UNIT 7: Hydrostatic Pressure		10 Periods
2.1	Pressure, intensity of pressure, pressure head, Pascal's law and its applications	
2.2	Total pressure, resultant pressure, and centre of pressure	
2.3	Total pressure and centre of pressure on horizontal, vertical and inclined plane surfaces of rectangular, triangular, trapezoidal shapes and circular. (No derivation - Simple Numerical Problems) Pressure on curved surfaces (concept only).	
2.4	Measurement of Pressure	
2.5	Atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure.	
2.6	Piezometer, simple manometer and differential manometer, micro Manometers, Bourden gauge and dead weight pressure gauge, numerical problems related to manometers.	
UNIT 8: Fundamentals of Fluid Flow		10 Periods
3.1	Types of Flow: Steady and unsteady flow, laminar and turbulent flow, uniform and non-uniform flow, stream line, stream tubes, streak line and path line.	
3.2	Discharge and continuity equation (flow equation) {No derivation}, Simple numerical problems	
3.3	Types of hydraulic energy: Potential energy, kinetic energy, pressure energy	
3.4	Bernoulli's theorem; statement and description (without proof of theorem), Simple numerical problems.	
3.5	Venturimeter and orifice meter	
3.6	Pitot tube	
3.7	Flow Measurements	
3.8	Orifices and mouthpieces	
3.9	Current meters	
3.10	Notches and weirs	
UNIT 9: Flow through Pipes		10 Periods
4.1	Definition of pipe flow; Reynolds number, laminar and turbulent flow - explained through Reynold's experiment	
4.2	Critical velocity and velocity distributions in a pipe for laminar flow	
4.3	Head loss in pipe lines due to friction, sudden expansion and sudden contraction, entrance, exit, obstruction and change of direction (No derivation of formula), Simple numerical problems related to flow through pipes and siphons.	
4.4	Hydraulic gradient line and total energy line. Simple numerical problems	
4.5	Pipes in series and parallel	
4.6	Water hammer phenomenon and its effects (only definition and description)	

- 4.7 **Flow through open channels**
- 4.8 Definition of an open channel, uniform flow and non-uniform flow
- 4.9 Discharge through channels using
 - i) Chezy's formula (no derivation)
 - ii) Manning's formula (no derivation)
- 4.10 Most economical channel sections (no derivation, only simple numerical problems)
 - i) Rectangular
 - ii) Trapezoidal
- 4.11 Head loss in open channel due to friction
- 4.12 Concept of specific energy and specific force- hydraulic jump

UNIT 10: Hydraulic Machines

10 Periods

- 5.1 Hydraulic pump, reciprocating pump, centrifugal pumps (No numerical and No derivations), impulse and reaction turbines (may be demonstrated with the help of working models)

TEXT BOOKS

- 1. Hydraulic and Hydraulics machines by Hemendra Kumar Singh, J.N.P. Meerut.
- 2. Hydraulic and Hydraulics machines by R K Bansal, Laxami, Publication Meerut.
- 3. Hydraulic And Hydraulics machines by J.K. Kapoor bharat bharti prakashan Meerut.

REFERENCE BOOKS

- 5. Fluid Mechanics and Hydraulics by Jagdish Lal; Delhi Metropolitan Book Co. Pvt Ltd.
- 6. Hydraulics and Fluid Mechanics by Modi, PN, and Seth, SM; Delhi Standard Publishers Distributors.
- 7. Hydraulics and Hydraulics Machines by Khurmi RS ; S Chand and Co., Delhi
- 8. Laboratory Manual for Fluid Mechanics by Poonia MP and Jakhar OP; Standar Publishers Distributors, Delhi.



SCHOOL OF POLYTECHNIC
CONCRETE TECHNOLOGY
(SPB09230302)

L **T** **P**
3 **0** **0**

DETAILED CONTENTS

UNIT 6: Introduction		7 Periods
1.1	Definition of concrete, properties of concrete, uses of concrete in comparison to other building materials. Advantages and disadvantages of concrete.	
1.2	Cement: physical properties of cement; different types of cement as per IS Codes	
1.3	Aggregates: Classification of aggregates according to size and shape, 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, Grading of aggregates: coarse aggregate, fine aggregate and All-in- - one aggregate; fineness modulus; interpretation of grading charts	
1.4	Water: Water Quality requirements as per IS:456-2000	
UNIT 7: Water Cement Ratio		7 Periods
2.1	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	
2.2	Properties in plastic state: Workability, Segregation, Bleeding and Harshness, 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	
2.3	Properties of Concrete: Properties in hardened state: Strength, Durability, Impermeability, Dimensional changes;	
UNIT 8: Properties of Concrete		8 Periods
3.1	Objectives and parameters of mix design, introduction to various grades as per IS:456-2000; proportioning for nominal mix design as prescribed by IS 456-2000	
3.2	Adjustment on site for: Bulking of fine aggregate, water absorption of aggregate, workability	
3.3	Difference between nominal and controlled concrete	
3.4	Introduction to IS-10262-2009-Code for controlled mix design.	
3.5	Mix design problems of concrete for desired mix strength or grade.	
3.6	Introduction to Admixtures (chemicals and minerals) for improving performance of concrete.	
UNIT 9: Special Concretes (only features)		22 Periods
4.1	Concreting under special conditions, difficulties and precautions before, during and after concreting	
	<ul style="list-style-type: none">• Cold weather concreting• Under water concreting• Hot weather concreting	
4.2	Ready mix concrete	
4.3	Fibre reinforced concrete	
4.4	Polymer Concrete	
4.5	Fly ash concrete	

- 4.6 Silica fume concrete
 - 4.7 Self compacting concrete
 - 4.8 **Storing of Cement:** Storing of cement in a warehouse, Storing of cement at site, Effect of storage on strength of cement, Determination of warehouse capacity for storage of Cement
 - 4.9 Storing of Aggregate: Storing of aggregate at site
 - 4.10 **Batching** (to be shown during site visit): Batching of Cement, Batching of aggregate by: Volume, using gauge box (farma) selection of proper gauge box, Weight spring balances and batching machines, Measurement of water
 - 4.11 **Mixing:** Hand mixing, Machine mixing - types of mixers, capacities of mixers, choosing appropriate size of mixers, operation of mixers, Maintenance and care of mixers, Batching and mixing plants
 - 4.12 **Transportation of concrete:** Transportation of concrete using: wheel barrows, transit mixers, chutes, belt conveyors, Dumpers and trucks, tremie, mono rail system, pumps, tower crane and hoists.
 - 4.13 Placement of concrete Type of form works and scaffoldings, Checking of form work, shuttering and precautions to be taken during placement
 - 4.14 **Compaction:** Hand compaction, Machine compaction - types of vibrators, internal screed vibrators and form vibrators, Selection of suitable vibrators for different situations
 - 4.15 **Finishing concrete slabs** - screeding, floating and trowelling
 - 4.16 **Curing:** Objective of curing, methods of curing like ponding, membrane curing, steam curing, chemical curing, Duration for curing and removal of form work
 - 4.17 **Jointing:** Location of construction joints, treatment of construction joints, expansion joints in buildings - their importance and location
 - 4.18 **Defects in concrete:** Identification of defects and methods of removing defects
- UNIT 10: Importance and methods of non-destructive tests (introduction only) 06 Periods**
- 5.1 Rebound Hammer Test
 - 5.2 Pulse Velocity method

TEXT BOOKS

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- 8. Concrete Technology by D.V Gupta Asian Publishers Distributors, Mujaffarnagar
 - 9. Concrete Technology by G Das Nav bhrat Publication, Meerut.

REFERENCE BOOKS

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- 1. Concrete Technology by Krishnamurthy, KT Rao, A Kasundra and Khandekar, AA; Dhanpat Rai and Sons, Delhi
 - 2. Text Book of Concrete Technology by Gupta BL and Gupta Amit; Standard Publishers Distributors, Delhi.
 - 3. Concrete Tecnology by Handoo, BL, Puri, LD and Mahajan Sanjay; Satya Prakashan, New Delhi.
 - 4. Laboratory Manual on Concrete Technology by Sood, Hemant, Mittal LN and Kulkarni PD; CBS Publishers, New Delhi.
 - 5. Concrete Technology by Birinder Singh; Kaption Publications, Ludhiana,
 - 6. Module on Special Concretes by Dr. Hemant Sood; NITTTR Chandigarh.



SCHOOL OF POLYTECHNIC
STRUCTURAL MECHANICS
(SPB09230303)

L **T** **P**
3 **0** **0**

DETAILED CONTENTS

UNIT 6:	Properties of Materials	15 Periods
1.5	Classification of materials, elastic materials, plastic materials, ductile materials, brittle materials	
1.6	Introduction to tensile test, compressive test, impact test, fatigue test, torsion test on metals	
1.7	Communications barriers and how to overcome them	
1.8	Barriers to Communication, Tools of Communication	
1.5	Concept of stress, normal and shear stresses,	
1.6	Concept of strain and deformation, longitudinal and transverse strain, poisson's ratio, volumetric strain	
1.7	Hooke's law, moduli of elasticity and rigidity, Bulk modulus of elasticity, relationship between the elastic constants.	
1.8	Stresses and strains in bars subjected to tension and compression. Extension of uniform bar under its own weight, stress produced in compound and tapering bars due to axial load	
1.9	Stress-strain diagram for mild steel and HYSD steel, proof stress, mechanical properties, factor of safety.	
1.10	Temperature stresses and strains	
UNIT 7:	Shear Force and Bending Moment	15 Periods
2.1	Concept of a beam and supports (Hinges, Roller and Fixed), types of beams: Simply supported, cantilever, propped, over hang, fixed and continuous beams (only concept).	
2.2	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).	
2.3	Concept of bending moment and shear force, sign conventions.	
2.4	Bending Moment and shear force diagrams for cantilever, simply supported and overhanging beams subjected to concentrated, uniformly distributed and varying loads.	
2.5	Relationship between load, shear force and bending moment, point of maximum bending moment, and point of contra flexure.	
2.6	Fixed and continuous beams-simple numerical problems.	
2.7	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	
UNIT 8:	Bending Stresses in Beams	10 Periods
3.1	Concept of pure/simple bending	
3.2	Assumptions made in the theory of simple bending, derivation and application of bending equation to circular cross-section, I section, T&L sections only	
3.3	Moment of resistance	

- 3.4 Calculations of bending stresses
- 3.5 Concept of shear stresses in beams, shear stress distribution in rectangular, circular I, T, L sections for beams.

UNIT 9: Shear Stresses in Beams

05 Periods

- 4.1 Determination of slope and deflection using Moment Area Theorem for simply supported beam for pointed load and U.D.L, Conjugate beam method and double integration method. (no derivation, numerical problems only)
- 4.2 Theory of columns- long and short columns, slenderness ratio
- 4.3 Problem solving using Euler's and Rankine formula

UNIT 10: Analysis of Trusses

05 Periods

- 5.1 Concept of a perfect, redundant and deficient frames
- 5.2 Assumptions and analysis of trusses by:
 - a) Method of joints
 - b) Method of sections

TEXT BOOKS

- 7. Structural Mechanics by Vijay Mittal Asian Publishers Distributors, Mujaffarnagar.
- 8. Structural Mechanics by C.M. Verma J.P.N Publication Meerut.

REFERENCE BOOKS

- 1. Strength of Materials by Ramamrutham, S ; Dhanpat Rai and Sons., New Delhi.
- 2. Applied Mechanics and Strength of Materials by Ram Chandra; Standard Publishers. Delhi.
- 3. Strength of Materials by Punmia, BC ; Standard Publishers, Delhi,
- 4. Strengths of Materials by Sadhu Singh; Standard Publishers, New Delhi
- 5. Structural Mechanics by Singh Birinder; Kaption Publishers, Ludhiana
- 6. The Functional aspects of Communication Skills – Dr. P. Prasad, S.K. Katria & Sons, New Delhi



SCHOOL OF POLYTECHNIC
BUILDING CONSTRUCTION
(SPB09230304)

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DETAILED CONTENTS

UNIT 1: Introduction		10 Periods
1.1	Definition of a building, classification of buildings based on occupancy	
1.2	Different parts of a building	
1.3	Concept of foundation and its purpose	
1.4	Types of foundation-shallow and deep	
	**2.2.1 Shallow foundation - constructional details of: Spread foundations for walls, min. depth criteria, thumb rules for depth and width of foundation and thickness of concrete block, stepped foundation for masonry pillars and concrete columns, Raft foundation, combined footing grillage foundation.	
	2.2.2 Introduction to deep foundation and their types	
UNIT2: Walls		15 Periods
2.1	Purpose of walls	
2.2	Classification of walls - load bearing, non-load bearing, dwarf wall, retaining, breast walls and partition walls	
2.3	Classification of walls as per materials of construction: brick, stone, reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls	
2.4	Partition walls: Constructional details, suitability and uses of brick and wooden partition walls	
	Masonry	
2.5	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 (tooting, raking, back and block bonding),Expansion and contraction joints	
	4.1.3 Mortars: types, selection of mortar and its preparation	
2.6	Stone Masonry	
2.7	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	
2.8	Types of stone masonry: rubble masonry - random and coursed; Ashlar masonry, principles to be observed in construction of stone masonry walls	
UNIT3: Arches and Lintels		10 Periods
3.1	Meaning and use of arches and lintels:	
3.2	Glossary of terms used in arches and lintels - abutment, pier, arch ring, intrados, soffit, extrados, voussoirs, springer, springing line, crown, key stone, skew back, span, rise, depth of an arch, haunch, spandrel, jambs, bearing, thickness of lintel, effective span	

- 3.3 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
- 3.4 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

UNIT4: Doors, Windows and Ventilators

05 Periods

- 4.1 Glossary of terms with neat sketches
- 4.2 Classification based on materials i.e. wood, metal and plastic and their suitability for different situations. Different type of doors- panel door, flush door, glazed door, rolling shutter, steel door, sliding door, plastic and aluminium doors
- 4.3 Window - Panel window, glazed windows (fixed and openable) ventilators, sky light window, Louveres shutters, plastic and aluminium windows
- 4.4 Door and window frames - materials and sections, fixtures and fasteners, hold fasts.

UNIT5: Damp Proofing and Water Proofing

10 Periods

- 5.1 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
- 5.2 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.
- 5.3 Damp proofing materials and their specifications: rich concrete and mortar, bitumen, bitumen mastic, polymer coating, use of chemicals
- 5.4 **Green Buildings:** Importance, components: Site, Rain water harvesting/water efficiency, energy efficiency, material efficiency Indoor air quality design and innovation rating system.
- 5.5 **Stairs Glossary of terms:** Staircase, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand-rail, nosing
- 5.6 Classification of staircase on the basis of material - RCC, timber, steel, Aluminium

TEXT BOOKS

1. Building Construction & Maintenance Engineering by D.V Gupta Asian Publishers Distributors, Mujaffarnagar
2. Building Construction by DP Singh, J.N.P Meerut.

REFERENCE BOOKS

1. Building Construction by Rangwala, SC; Charotar Book Stall, Anand
2. A Text Book of Building Construction by Kulkarni, GJ; Ahmedabad Book Depot
3. A Text Book of Building Construction by Arora, SP and Bindra, SP; Dhanpat Rai and Sons, New Delhi.
4. Building Construction by Sushil Kumar; Standard Publishers Distributors, Delhi



SCHOOL OF POLYTECHNIC

BUILDING DRAWINGS

(SPB09230305)

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DETAILED CONTENTS

UNIT 1: Drawing Number: 01	2 Sheets
1.1 Details of spread footing foundations for a 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 apron have to be shown in the drawing.	
UNIT2: Drawing Number: 02	1 Sheet
2.1 Concept of foundation and its purpose of "T" and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond	
Drawing Number: 03	
2.2 Drawing plan, elevation of arches: circular arch, segmental arch	
UNIT3: Drawing Number: 04	1 Sheet
3.1 Elevation, sectional plan and sectional side elevation of flush door, fully glazed door, fully panelled door with wire gauge shutter. Partly panelled and partly glazed door.	
UNIT4: Drawing Number: 05	2 Sheet
4.1 Drawing plan, elevation of a small building by measurement and foundation detail and sectional elevation.	
4.2 Drawing detailed working plan, elevation and section of a residential building from a given line plan or given data showing details of foundations, roof and parapet.	
UNIT5: Drawing Number: 06	4 Sheet
5.1 Drawings of following floors: Cement concrete floors at ground level and at first floor level.	
Drawing Number: 07	1 Sheet
5.2 Drawing of flat roof, showing the heat/thermal insulation provisions.	
Drawing Number: 08	1 Sheet
5.3 Drawing details of damp proofing arrangement of roofs and walls as per BIS Code. Show the rain water drainage arrangement also.	

TEXT BOOKS

1. Building Drawing by Gajendra Singh, J.P.N.P Meerut.
2. Building Construction & Maintenance Engineering by K.C Mittal Asian Publishers Distributors, Mujaffarnagar

REFERENCE 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.



**SCHOOL OF POLYTECHNIC
ENVIRONMENTAL STUDIES**

(SPB09230306)

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DETAILED CONTENTS

UNIT 6: Introduction	8 Periods
1.5 Basics of ecology, eco system- concept, and sustainable development, Resources renewable and non-renewable.	
1.2 Source of air pollution. Effect of air pollution on human health, economy, plant, animals. Air pollution control methods.	
UNIT 7: Water Pollution	8 Periods
2.1 Impurities in water Cause of water pollution, Source of water pollution. Effect of water pollution on human health, Concept of dissolved O ₂ , BOD, COD. Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.	
2.2 Disposal of Solid Waste- Solid Waste Management	
UNIT 8: Soil Pollution	10 Periods
3.1 Sources of soil pollution	
3.2 Types of Solid waste- House hold, Hospital, From Agriculture, Biomedical, Animal and human, excreta, sediments and E-waste	
3.3 Effect of Solid waste	
UNIT 9: Noise pollution	14 Periods
4.1 Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise Level, Different method of minimizing noise pollution.	
4.2 Environmental Legislation	
4.3 Introduction to Water (Prevention and Control of Pollution) Act 1974, Introduction to Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board and National Green Tribunal (NGT), Environmental Impact Assessment (EIA).	
UNIT 10: Impact of Energy Usage on Environment	10 Periods
5.1 Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain. Eco friendly Material, Recycling of Material, Concept of Green Buildings.	

TEXT BOOKS

1. Environmental and Pollution Awareness by Upadhyay, Shiv Dutt bharat bharti prakashan Meerut.
2. Environmental Studies by Dr. Rajesh Kumar Sharma & Aditi Singh Asian publishers Muzaffarnagar.
3. Environmental Studies by Sharma J.P.N Publication Meerut.

REFERENCE BOOKS

1. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
2. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications,
10. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi.
11. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.
12. Environmental Studies by Erach Bharucha; University Press (India) Private Ltd. Hyderabad.
13. Environmental Studies by Rajesh Sharma Asian Publishers Distributors, Mujaffarnagar.



SCHOOL OF POLYTECHNIC
HYDRAULICS AND HYDRAULIC MACHINES LAB

(SPB09230351)

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DETAILED CONTENTS

S. No	Name of Practical
1	To verify Bernoulli's Theorem
2	To find out venturimeter coefficient
3	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
4	To perform Reynolds's experiment
5	To verify loss of head in pipe flow due to a. Sudden enlargement b. Sudden contraction c. Sudden bend
6	Demonstration of use of current meter and pitot tube
7	To determine coefficient of discharge of a rectangular notch and triangular notch.

TEXT BOOKS

1. Hydraulic and Hydraulics machines by Hemendra Kumar Singh, J.N.P. Meerut.
2. Hydraulic and Hydraulics machines by R K Bansal, Laxami, Publication Meerut.
3. Hydraulic And Hydraulics machines by J.K. Kapoor, Bharat bharti prakashan Meerut.

REFERENCE BOOKS

1. Fluid Mechanics and Hydraulics by Jagdish Lal; Delhi Metropolitan Book Co. Pvt Ltd.
2. Hydraulics and Fluid Mechanics by Modi, PN, and Seth, SM; Delhi Standard Publishers Distributors.
3. Hydraulics and Hydraulics Machines by Khurmi RS; S Chand and Co., Delhi
4. Laboratory Manual for Fluid Mechanics by Poonia MP and Jakhar OP; Standar Publishers Distributors, Delhi.



SCHOOL OF POLYTECHNIC

CONCRETE TECHNOLOGY LAB

(SPB09230352)

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DETAILED CONTENTS

S. No	Name of Practical
1	To determine the physical properties of cement such as fineness, consistency, setting time, soundness and compressive strength of cement as per IS Codes
2	To determine flakiness and elongation index of coarse aggregate
3	To determine silt content in fine aggregate
4	Determination of specific gravity and water absorption of aggregates
5	Determination of bulk density and voids of aggregates
6	Determination of particle size distribution of fine, coarse and all-in-one aggregate by sieve analysis (grading of aggregate)
7	To determine bulking of fine aggregates
8	To determine workability by slump test and to verify the effect of water, fine aggregate/coarse aggregate ratio and aggregate/Cement ratio on slump
9	To determine compressive strength of concrete cubes for different grades of concrete
10	Rebound Hammer Test

TEXT BOOKS

1. Concrete Technology by D.V Gupta Asian Publishers Distributors, Mujaffarnagar
2. Concrete Technology by G Das Nav bhrat Publication, Meerut.

REFERENCE BOOKS

1. Concrete technology by krishnamurthy, kt rao, a kasundra and khandekar, aa; Dhanpat Rai And Sons, Delhi
2. Text book of concrete technology by Gupta bl and Gupta amit; Standard Publishers Distributors, Delhi.
3. Concrete tecnology by Handoo, Bl, Puri, Ld And Mahajan Sanjay; Satyaprakashan, New Delhi.
4. Engineering chemistry - A Text Book By H. K. Chopra & A. Parmar, Narosapublishing House, New Delhi.



SCHOOL OF POLTECHNIC

STRUCTURAL MECHANICS LAB

(SPB09230353)

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DETAILED CONTENTS

S. No	Name of Practical	
1	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	
2	Testing of HYSD Steel	
3	Determination of Young's modulus of elasticity for steel wire with sear'l's apparatus	
4	Determination of modulus of rupture of a concrete beam	
5	Determination of maximum deflection and young's modulus of elasticity in simply supported beam with load at middle third point	
6	Verification of forces in a framed structure	

TEXT BOOKS

1. Structural Mechanics by Vijay Mittal Asian Publishers Distributors, Muzaffarnagar.

REFERENCE BOOKS

1. Strength of Materials by Ramamrutham, S; Dhanpat Rai and Sons. New Delhi
2. Applied Mechanics and Strength of Materials by Ram Chandra; Standard Publishers. Delhi:
3. Strength of Materials by Punmia, BC; Standard Publishers, Delhi,
4. Strengths of Materials by Sadhu Singh; Standard Publishers, New Delhi
5. Structural Mechanics by Singh Birinder; Kaption Publishers, Ludhiana
6. Strength of Material by Karamveer Saini, Krishna Publishing House, Meerut.



SCHOOL OF POLTECHNIC
BUILDING CONSTRUCTION LAB
(SPB09230354)

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DETAILED CONTENTS

- 1 Demonstration of tools and plants used in building construction
- 2 To prepare Layout of a building: two rooms building with front verandah
- 3 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
- 4 Demonstration of following items of work at construction site by:
 - a) Timbering of excavated trenching
 - b) Laying damp proof courses
 - c) Construction of masonry walls
 - d) Laying of tile 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
 - h) Interlocking tiles

TEXT BOOKS

1. Building Construction by DP Singh, J.N.P Meerut.

REFERENCE BOOKS

1. Building Construction by Rangwala, SC; Charotar Book Stall, Anand
2. A Text Book of Building Construction by Kulkarni, GJ; Ahmedabad Book Depot
3. A Text Book of Building Construction by Arora, SP and Bindra, SP; Dhanpat Rai and Sons, New Delhi.
4. Building Construction by Sushil Kumar; Standard Publishers Distributors, Delhi.



SCHOOL OF POLYTECHNIC
ENVIRONMENTAL STUDIES LAB

(SPB00230356)

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DETAILED CONTENTS

S. No	Name of Practical
1	Determination of pH of drinking water
2	Determination of TDS in drinking water
3	Determination of TSS in drinking water
4	Determination of hardness in drinking water
5	Determination of oil & grease in drinking water
6	Determination of alkalinity in drinking water
7	Determination of acidity in drinking water
8	Determination of organic/inorganic solid in drinking water
9	Determination of pH of soil
10	Determination of N&P (Nitrogen & Phosphorus) of soil.

TEXT BOOKS

1. Environmental Studies by Rajesh Sharma Asian Publishers Distributors, Mujaffarnagar.
2. Environmental Studies by Dr. Rajesh Kumar Sharma & Aditi Singh Asian publishers Muzaffarnagar.
3. Environmental Studies by Sharma J.P.N Publication Meerut.

REFERENCE BOOKS

1. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
2. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
3. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi
4. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.

Semester-04



SCHOOL OF POLYTECHNIC

HIGHWAY ENGINEERING

(SPB09230401)

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DETAILED CONTENTS

UNIT 1: Introduction	10 Periods
1.1 Importance of Highway engineering	
1.2 Functions of IRC, CRRI, MoRT & H, NHAI	
1.3 Classification of roads	
1.4 Mass Transportation system	
1.5 Concept of Smart highways	
Road Geometrics	
1.6 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	
1.7 Average running speed, stopping and overtaking sight distance	
1.8 Necessity of curves, horizontal and vertical curves including transition curves. Super elevation and methods of providing super elevation	
1.9 Sketch of typical L-section and X-section in cutting and filling on straight alignment and at a curve	
UNIT 2: Highway Alignment	12 Periods
2.1 Basic considerations governing alignment for a road in plain and hilly area	
2.2 Highway location, marking of alignment on ground, setting out alignment of road, setting out bench marks, control pegs for embankment and cutting	
Road Materials:	
2.3 Introduction to California Bearing Ratio, method of finding CBR value and its Significance. Aggregate : Source and types, important properties, strength, durability	
2.4 Different types of road materials in use; soil, aggregate and binders	
2.5 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 (CRMB, PMB)	
2.6 Use of recycled materials in pavements.	
UNIT 3: Road Pavements	12 Periods
3.1 Road pavement: Flexible and rigid pavement, their merits and demerits, typical cross-sections, functions of various components	
3.2 Sub-grade preparation Borrow pits, making profiles of embankment, construction of Embankment, compaction, preparation of sub grade, methods of checking camber, gradient and alignment as per recommendations of IRC, equipment used for sub grade preparation.	
3.3 Stabilization of sub grade. Types of stabilization mechanical stabilization, lime stabilization, cement stabilization, fly ash stabilization etc.(introduction only)	
3.4 Base Course Granular base course: (a) Water Bound Macadam (WBM)	

- (b) Wet Mix Macadam (WMM)
- Bitumen Courses:
 - (a) Bituminous Macadam
 - (b) Dense Bituminous Macadam (DBM)
- *Methods of construction as per MoRT&H

3.5 **Surfacing**

3.6 Types of surfacing

- a) Prime coat and tack coat
- b) Surface dressing with seal coat
- c) Open graded premix carpet
- d) Mix seal surfacing
- e) Semi dense bituminous concrete
- f) Bituminous Concrete

3.7 **Rigid Pavements**

- 3.8 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. Roller compacted concrete.

UNIT 4: Hill Roads

12 Periods

- 4.1 **Introduction:** Typical cross-sections showing all details of a typical hill road, partly in cutting and partly in filling
- 4.2 Special problems of hill areas
 - 4.2.1 Landslides: Causes, prevention and control measures, use of geogrids, geo flexible, geo synthetics
 - 4.2.2 Drainage
 - 4.2.3 Soil erosion
 - 4.2.4 Snow: Snow clearance, snow avalanches, frost
- 4.3 **Road Drainage**
- 4.4 Necessity of road drainage work, cross drainage
- 4.5 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
- 4.6 **Road Maintenance**
- 4.7 Common types of road failures of flexible pavements: Pot hole, cracks, rutting, alligator, cracking, upheaval - their causes and remedies (brief description)
- 4.8 Maintenance of bituminous road such as crack sealing, patch-work and resurfacing
- 4.9 Maintenance of concrete roads-filling cracks, repairing joints, maintenance of shoulders (beams)
- 4.10 **Road Construction Equipment**
- 4.12 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
 - 9.5 Paver finisher

UNIT 5: Airport Engineering

04 Periods

- 5.1 Necessity of study of airport engineering, aviation transport scenario in India
- 5.2 Factors to be considered while selecting a site for an airport with respect to zoning laws
- 5.3 Introduction to Runways, Taxiways, Apron and Hanger

TEXT BOOKS

1. Highway Engineering by D.V Gupta, Asian Publishers Distributors, Mujaffarnagar.

REFERENCE BOOKS

1. Highway Engineering by Khanna, SK and Justo, CEG; Nem Chand and Bros., Roorkee
2. A Text Book on Highway Engineering and Airport by Sehgal, SB; and Bhanot, KL; Chand and Co, Delhi
3. A Course on Highway Engineering by Bindra, SP; Dhanpat Rai and Sons, New Delhi
4. Laboratory Manual in Highway Engineering by Duggal AK, Puri VP; New Age Publishers (P) Ltd, Delhi
5. Laboratory Manual in Highway Engineering, by NITTTR, Chandigarh
6. Maintenance of Highway - a Reader by Duggal AK; NITTTR, Chandigarh
7. Types of Highway Construction by Duggal AK; NITTTR Chandigarh



DETAILED CONTENTS

UNIT 1: Introduction	05 Periods
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	
UNIT 2: Chain	06 Periods
2.1 Purpose and principles of Chain Surveying	
2.2 Introduction, advantages and disadvantages	
2.3 Direct and indirect ranging, offsets and recording of field notes	
2.4 Obstacles in Chain Surveying	
2.5 Errors in Chain Surveying and their correction.	
2.6 Drip irrigation, suitability of drip irrigation, layout, component parts, advantages	
UNIT 3: Compass surveying	10 Periods
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, Arbitrary 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 (Simple Numerical Problems)	
UNIT 4: Levelling	15Periods
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 Levelling staff: single piece, folding, invar precision staff, telescopic	
4.4 Temporary adjustment and permanent adjustment of dumpy level by two peg method. Concept of back sight, foresight, intermediate sight, change point, to determine reduce levels	
4.5 Level book and reduction of levels by 4.7.1 Height of collimation method and 4.7.2 Rise and fall method	
4.6 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.	

UNIT 5: Plane Table Surveying**14 Periods**

- 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

TEXT BOOKS

1. Surveying-I by DV Gupta, Asian Publishers Distributors, Mujaffarnagar.

REFERENCE BOOKS

1. A Text Book of Surveying by Kochar, CL; Katson Publishing House, Ludhiana,
2. Surveying and Leveling by Kanetkar, TP and Kulkarni, SV; AVG Parkashan, Poona
3. Surveying -I by Mahajan, Sanjay; Tech. Publication, Delhi
4. Surveying and Leveling by Punmia, BC; Standard Publishers Distributors, Delhi.



SCHOOL OF POLYTECHNIC
IRRIGATION ENGINEERING

(SPB09230403)

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DETAILED CONTENTS

UNIT 1: Introduction	06 Periods
1.1 Definition of irrigation	
1.2 Necessity of irrigation, Role of Irrigation in country's economy.	
1.3 History of development of irrigation in India	
1.4 Major, medium and minor irrigation projects of India	
Water Requirement of Crops	
1.5 Principal crops in India and their water requirements	
1.6 Crop seasons - Kharif and Rabi	
1.7 Soil water, soil crop and crop water relationships, Duty, Delta and Base Period, their relationship	
1.8 Gross commanded area (GCA), culturable commanded area (CCA), Intensity of Irrigation, Paleo, Kor, Crop Ratio, Crop period, Base period, Duty, Delta. Relation between Duty-Delta and Base period	
UNIT 2: Hydrological Cycle Catchment Area and Run-off	08 Periods
2.1 Rainfall, definition rain-gauges - automatic and non-automatic, methods of estimating average rainfall, Advantages of keeping rainfall records, (Arithmetic system); catchment area, runoff, factors affecting runoff, hydrograph, basic concept of unit hydrograph.	
2.2 Methods of Irrigation	
2.3 Flow irrigation - its advantages and limitations	
2.4 Lift Irrigation - Tube well, submersible and well irrigation advantages and disadvantages	
2.5 Sprinkler irrigation conditions favourable and essential requirements for sprinkler irrigation, sprinkler system - classification and component parts	
2.6 Drip irrigation, suitability of drip irrigation, layout, component parts, advantages	
UNIT 3: Canals	12 Periods
3.1 Factors to be considered in Canal Alignment	
3.2 Functions/Purpose of various components of Canal	
3.3 Classification of Canals and their functions, sketches of different canal cross-sections	
3.4 Various types of canal lining - their related advantages and disadvantages, sketches of different lined canal X-sections	
3.5 Breaches - Causes, Method to plug canal breaches and their control	
3.6 Maintenance of lined and unlined canals	
Tube well Irrigation	
3.8 Introduction, occurrence of ground water, location and command, advantages and disadvantages, comparison with canal irrigation	
3.9 Tube wells, explanation of terms: water table, radius of influence, depression head,	

and cone of depression, confined and unconfined aquifers. Yield of a well and methods of determining yield of well

- 3.10 Types of tube wells (cavity type, strainer type and slotted type) and their choice
- 3.11 Method of boring, installation of well assembly, development of well, pump selection and installation and maintenance
- 3.12 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

UNIT 4: Dams

12 Periods

- 4.1 Classification of dams; earthen dams - types, causes of failure; cross-section of homogeneous, zoned and diaphragm type earthen dams, method of construction. Gravity dams - types, cross-sections of a dam, method of construction
- 4.2 Concept of small and micro dams
- 4.3 Concept of spillways and energy dissipaters
- Canal Head Works and Regulatory Works**
- 4.4 Choice of location of Canal Head Works, definition, object, general layout, functions of different parts of head works. Difference between weir and barrage
- Cross Drainage Works**
- 4.5 Functions and necessity Cross Drainage Works, Types of Cross Drainage Works: aqueduct, super passage, level crossing, inlet and outlet
- 4.6 Sketches of the above cross drainage works

UNIT 5: Definitions of following Hydraulic Structures with Sketches

12 Periods

- 5.1 Falls
- 5.2 Cross and head regulators
- 5.3 Introduction to Runways, Taxiways, Apron and Hanger
- 5.4 Outlets
- 5.6 Canal Escapes
- River Training Works**
- 5.7 Various River Stages, Purpose/functions of River Training works, Meandering of rivers, Methods of river training, guide banks, Marginal Embankment, retired (levees) embankments, groynes and spurs, pitched island, cut-off
- Water Logging and Drainage and Ground Water Re-charge**
- 5.8 Definition of water logging - its causes and ill effects, detection, prevention and remedies
- 5.9 Surface and sub-surface drains and their layout
- 5.10 Concept and various techniques used for ground water re-charge

TEXT BOOKS

-
- 1. Irrigation Engineering by DV Gupta, Asian Publishers Distributors, Mujaffarnagar

REFERENCE BOOKS

-
- 1. Irrigation Engineering and Hydraulics Structures by Garg, Santosh Kumar; Khanna Publishers, Delhi
 - 2. Irrigation and Water Power Engineering by Punmia, BC and Pande Brij Bansi Lal; Standard Publishers Distributors, Delhi
 - 3. Irrigation Engineering and Hydraulic Structures by Saharsabudhe SR BIS Codes
 - 4. Central Ground Water Board and Central Water Commission Guidelines and Reference Books.



SCHOOL OF POLYTECHNIC
REINFORCED CEMENT CONCRETE STRUCTURES
(SPB09230404)

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DETAILED CONTENTS

UNIT 1:	Introduction	05 Periods
1.1	Concept of Reinforced Cement Concrete (RCC)	
1.2	Reinforcement Materials: - Suitability of steel as reinforcing material - Properties of mild steel, HYSD steel and TMT bars	
1.3	Loading on structures as per IS: 875	
1.4	Major, medium and minor irrigation projects of India Introduction to following methods of RCC design	
1.5	Working stress method: Definition and basic assumptions	
1.6	Limit state method: Definition and basic assumptions	
1.7	Problems of singly, doubly and T beam analysis by working stress method	
UNIT 2:	Shear and Development Length	10 Periods
2.1	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	
2.2	Concept of Limit State Method	
2.3	Definitions and assumptions made in limit state of collapse (flexure)	
2.4	Partial factor of safety for materials	
2.5	Partial factor of safety for loads	
2.6	Design loads	
2.7	Stress block, parameters	
UNIT 3:	Singly Reinforced Beam	15 Periods
3.1	Theory and design of singly reinforced beam by Limit State Method Doubly Reinforced Beams	
3.2	Theory and design of simply supported doubly reinforced rectangular beam by Limit State Method	
3.3	Behavior of T beam, inverted T beam, isolated T beam and ‘L’ beams. Simple problems related to moment capacity.	
UNIT 4:	One Way Slab	12 Periods
4.1	Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method. Two Way Slab	
4.2	Theory and design of two-way simply supported slab with corners free to lift, no provisions for tensional reinforcement by Limit State Method including sketches showing reinforcement details (plan and two sections)	
UNIT 5:	Axially Loaded Column	08 Periods
5.1	Definition and classification of columns	
5.2	Effective length of column,	
5.3	Specifications for longitudinal and lateral reinforcement	
5.4	Design of axially loaded square, rectangular and circular short columns by Limit Pre-stressed Concrete	
5.5	Concept of pre	

- Methods of pre
- 5.6 Advantages and disadvantages of pre
- 5.7 Losses in pre-stress
- 5.8 Use of BIS: 456-2000 is permitted in the examination.

TEXT BOOKS

1. Reinforced Cement Concrete Structure by D.V. Gupta, Asian Publishers Distributors, Mujaffarnagar.

REFERENCE BOOKS

1. Design of Reinforced Concrete Structures by Alok Srivastava
2. Reinforced Concrete Structure Vol I by Punmia, BC; Standard Publishers, Delhi
3. Design and Testing of Reinforced Structures by Ramamurtham, S; Dhanpat Rai and Sons, Delhi
4. RCC Design and Drawing by Singh, Birinder; Kaption Publishing House, New Delhi



SCHOOL OF POLYTECHNIC
COMMUNICATION SKILLS H&E -II
(SPB09230405)

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DETAILED CONTENTS

UNIT 1: Introduction	16 Periods
1.1 Prepositions	
1.2 Framing Questions	
1.3 Conjunctions	
1.4 Tenses	
UNIT 2: Reading	10 Periods
2.1 Unseen Passage for Comprehension (Vocabulary enhancement - Prefixes, Suffixes, one word substitution, Synonym and Antonym) based upon the passage should be covered under this topic.	
UNIT 3: Writing Skill	08Periods
3.1 Correspondence	
a) Business Letters- Floating Quotations, Placing Orders, Complaint Letters.	
b) Official Letters- Letters to Government and other Offices	
UNIT 4: Office Order	08 Periods
4.1 Memos, Circular, Office Orders	
4.2 Agenda & Minutes of Meeting	
UNIT 5: Writing Skills	08 Periods
5.1 Report Writing	

REFERENCE BOOKS

1. Communication Skill-2nd by Malti Agrawal, Krishna Publications.

REFERENCE BOOKS

1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.
3. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.



SCHOOL OF POLYTECHNIC

ENERGY CONSERVATION

(SPB09230406)

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DETAILED CONTENTS

UNIT 1: Basics of Energy	08 Periods
1.1 Classification of energy- primary and secondary energy, commercial and noncommercial energy, non-renewable and renewable energy with special reference to solar energy, Capacity factor of solar and wind power generators.	
1.2 Global fuel reserve	
1.3 Energy scenario in India and state of U.P. Sector-wise energy consumption (domestic, industrial, agricultural and other sectors)	
1.4 Impact of energy usage on climate Energy Conservation and EC Act 2001	
1.5 Introduction to energy management, energy conservation, energy efficiency and its need	
1.6 Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation.	
1.7 Standards and Labeling: Concept of star rating and its importance, Types of product available for star rating	
UNIT 2: Electrical Supply System and Motors	08 Periods
2.1 Types of electrical supply system	
2.2 Single line diagram	
2.3 Losses in electrical power distribution system	
2.4 Understanding Electricity Bill: Transformers Tariff structure, Components of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)	
2.5 Transformers: Introduction, Losses in transformer, transformer Loading, Tips for energy savings in transformers	
2.6 Electric Motors Types of motors, Losses in induction motors Features and characteristics of energy efficient motors, Estimation of motor loading, Variation in efficiency and power factor with loading, Tips for energy savings in motors	
UNIT 3: Energy Efficiency in Electrical Utilities	12 Periods
3.1 Pumps: Introduction to pump and its applications, Efficient pumping system operation, Energy efficiency in agriculture pumps, Tips for energy saving in pumps Compressed Air System: Types of air compressor and its applications, Leakage test, Energy saving opportunities in compressors.	
3.2 Energy Conservation in HVAC and Refrigeration System: Introduction, Concept of Energy Efficiency Ratio (EER), Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems.	
3.3 Behavior of T beam, inverted T beam, isolated T beam and 'L' beams. Simple problems related to moment capacity.	
3.4 Lighting and DG Systems	
3.5 Lighting Systems: Basic definitions- Lux, lumen and efficacy, Types of different	
3.6 DG Systems: Introduction, Energy efficiency opportunities in DG systems, Loading estimation	

UNIT 4: Energy Efficiency in Thermal Utilities	12 Periods
4.1 Thermal Basics: Thermal energy, Energy content in fuels, Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE)	
4.2 Energy Conservation in boilers and furnaces : Introduction and types of boilers, Energy performance assessment of boilers, Concept of stoichiometric air and excess air for combustion, Energy conservation in boilers and furnaces, Do' s and Don' ts for efficient use of boilers and furnaces	
4.3 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)	
4.4 Cooling Towers: Basic concept of cooling towers, Tips for energy savings in cooling towers	
4.5 Efficient Steam Utilization	
Energy Conservation Building Code (ECBC)	
4.6 ECBC and its salient features	
4.7 Tips for energy savings in buildings: New Buildings, Existing Buildings	
UNIT 5: Waste Heat Recovery and Co-Generation	10 Periods
5.1 Concept, classification and benefits of waste heat recovery	
5.2 Concept and types of co-generation system	
5.3 General Energy Saving Tips	
5.4 Energy saving tips in:	
5.41 Lighting	
5.42 Room Air Conditioner	
5.43 Refrigerator	
5.44 Water Heater	
5.45 Computer	
5.46 Fan, Heater, Blower and Washing Machine	
5.47 Colour Television	
5.48 Water Pump	
5.49 Cooking	
5.10 Transport	
Energy Audit	
5.5 Types and methodology	
10.2 Energy audit instruments	
10.3 Energy auditing reporting format	

TEXT BOOKS

-
1. Energy Conservation by D.P. Singh, Bharat Bharti Publications, Meerut.

REFERENCE BOOKS

-
1. Guide book on General Aspects of Energy Management and Energy Audit by Bureau of Energy Efficiency, Government of India. Edition 2015
 2. Guide book on Energy Efficiency in Electrical Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
 3. Guide book on Energy Efficiency in Thermal Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015.



SCHOOL OF POLYTECHNIC
REINFORCED CEMENT CONCRETE DRAWING
(SPB09230407)

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DETAILED CONTENTS

	RCC Drawing:	
	Reinforcement details from the given data for the following structural elements with bar bending schedules, General instruction and rules,	
1	Drawing No. 1: - lap, joint, development drawing: length, rings, hook etc.	
2	Drawing No. 2: RC Slabs - One way slab, Two way slab and Cantilever Slab.	
3	Drawing No. 3: Beams - Singly and doubly reinforced rectangular beams and Cantilever beam (All beams with vertical stirrups), T Beam, Tapered Beam	
4	Drawing No.4: Columns and Footings - Square, Rectangular and Circular Columns with lateral ties and their isolated sloped column footings, column and beam junction	
5	Drawing No. 5: Portal Frame - Three bay two storeys RC portal frame with blow up of column beam junctions.	
6	Drawing of cantilever retaining wall showing details of all the members and reinforcement.	
7	Drawing of Intze type water tank showing details of all the members and reinforcement.	
8	Drawing No. 6 : Draw at least one sheet using AutoCAD software	

TEXT BOOKS

1. RCC Drawing by M.K. Varshney, Asian Publishers Distributors, Mujaffarnagar.

REFERENCE BOOKS

1. Civil Engineering Drawing by Layal JS; Satya Parkashan, New Delhi
2. Civil Engineering Drawing by Kumar NS; IPH, New Delhi
3. RCC Design and Drawing by Singh, Birinder; Kaption Publishing House, New Delhi.
4. Steel Structures Design and Drawing by Singh, Birinder; Kaption Publishing House, New Delhi
5. RCC Drawing by M.K. Varshney, Asian Publishers Distributors, Mujaffarnagar.



SCHOOL OF POLYTECHNIC

HIGHWAY ENGINEERING LAB

(SPB09230451)

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DETAILED CONTENTS

- 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 crushing strength of aggregate
- 7 Determination of the California bearing ratio (CBR) for the sub-grade soil
- 8 Demonstration of working of hot mix plant through a field visit
- 9 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
- 10 Demonstration of working of mixing and spraying equipment through a field visit

TEXT BOOKS

1. Highway Engineering by D.V Gupta Asian Publishers Distributors, Mujaffarnagar

REFERENCE BOOKS

1. Highway Engineering by Khanna, SK and Justo, CEG; Nem Chand and Bros., Roorkee
2. A Text Book on Highway Engineering and Airport by Sehgal, SB; and Bhanot, KL; Chand and Co, Delhi
3. A Course on Highway Engineering by Bindra, SP; Dhanpat Rai and Sons, New Delhi
4. Laboratory Manual in Highway Engineering by Duggal AK, Puri VP; New Age Publishers (P) Ltd, Delhi
5. Laboratory Manual in Highway Engineering, by NITITR, Chandigarh.



SCHOOL OF POLYTECHNIC

SURVEYING-I LAB

(SPB09230452)

L	T	P
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DETAILED CONTENTS

- 1 **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.
- 2 **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
- 3 **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) a) 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
- 4 **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)
- 5 Layout of Buildings (from given drawing of two room residential building) by use of surveying instruments

TEXT BOOKS

1. Surveying-I by DV Gupta, Asian Publishers Distributors, Mujaffarnagar.

REFERENCE BOOKS

1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh
2. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.
3. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. Surveying-I by DV Gupta, Asian Publishers Distributors, Mujaffarnagar.



SCHOOL OF POLYTECHNIC
COMMUNICATION SKILLS H&E -II LAB
(SPB09230455)

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DETAILED CONTENTS

S. No Name of Practical

- 1 Debate
- 2 Telephonic Conversation: general etiquette for making and receiving calls
- 3 Offering- Responding to offers.
- 4 Requesting - Responding to requests
- 5 Congratulating
- 6 Exploring sympathy and condolences
- 7 Asking Questions- Polite Responses
- 8 Apologizing, forgiving
- 9 Complaining
- 10 Warning
- 11 Asking and giving information
- 12 Getting and giving permission
- 13 Asking for and giving opinions

TEXT BOOKS

1. Communication Skill-2nd By Malti Agrawal, Krishna Publications.

REFERENCE BOOKS

1. Building Construction by Rangwala, SC; Charotar Book Stall, Anand
2. A Text Book of Building Construction by Kulkarni, GJ; Ahmedabad Book Depot
3. A Text Book of Building Construction by Arora, SP and Bindra, SP; Dhanpat Rai and Sons, New Delhi.
4. Building Construction by Sushil Kumar; Standard Publishers Distributors, Delhi



SCHOOL OF POLYTECHNIC

ENERGY CONSERVATION LAB

(SPB09230456)

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DETAILED CONTENTS

S. No	Name of Practical
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- | | |
|---|---|
| 1 | To conduct load survey and power consumption calculations of small building. |
| 2 | To check efficacy of different lamps by measuring power consumption and lumens using lux meter. |
| 3 | To measure energy efficiency ratio (EER) of an air conditioner. |
| 4 | To measure effect of valve throttling and variable frequency drive (VFD) on energy consumption by centrifugal pump. |
| 5 | To measure and calculate energy saving by arresting air leakages in compressor. |
| 6 | To measure the effect of blower speed on energy consumed by it. |

TEXT BOOKS

-
1. Energy Conservation by D.P. Singh, Bharat Bharti Publications, Meerut.

REFERENCE BOOKS

-
1. Guide book on General Aspects of Energy Management and Energy Audit by Bureau of Energy Efficiency, Government of India. Edition 2015
 2. Guide book on Energy Efficiency in Electrical Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
 3. Guide book on Energy Efficiency in Thermal Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015

Semester-05



SCHOOL OF POLYTECHNIC
WATER & WASTE WATER ENGINEERING
(SPB09230501)

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DETAILED CONTENTS

A. WATER SUPPLY

UNIT 1: Introduction		08 Periods
1.3	Necessity and brief description of water supply system.	
1.4	Sources of water - surface/sub-surface sources	
	Quantity of Water	
1.3	Water requirement	
1.4	Rate of demand and variation in rate of demand	
1.5	Per capita consumption for domestic, industrial, public and fire fighting uses as per BIS standards (no numerical problems)	
1.5	Population Forecasting	
UNIT 2: Quality of Water		12 Periods
2.1	Meaning of pure water and methods of analysis of water	
2.2	Physical, Chemical and bacteriological tests and their significance	
2.3	Standard of potable water as per Indian Standard	
2.4	Maintenance of purity of water	
	Water Treatment (brief introduction)	
2.5	Sedimentation - purpose, types of sedimentation tanks	
2.6	Coagulation/flocculation - usual coagulation and their feeding	
2.7	Filtration - significance, types of filters, their suitability	
2.8	Necessity of disinfection of water forms of chlorination, break point chlorine, residual chlorine, application of chlorine.	
2.9	Flow diagram of different treatment units, functions of (i) Aeration fountain (ii) Mixer (iii) flocculator, (iv) classifier, (v) slow and rapid sand filters (vi) chlorination chamber.	
UNIT 3: Conveyance of Water		10 Periods
3.1	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.	
3.2	Appurtenances: Sluice, air, reflux valves, relief valves, scour valves, bib cocks, stop cocks, fire hydrants, water meters their working and uses	
	Laying of Pipes	
3.3	Setting out alignment of pipes	
3.4	Excavation for laying of pipes and precautions to be taken	
3.5	Handling, lowering and jointing of pipes	
3.6	Testing of pipe lines	
3.7	Back filling	
	Building Water Supply	
3.8	Connections to water main (practical aspect only)	
3.9	Water supply fittings (with sketches) and terminology related to plumbing	

B. WASTE WATER ENGINEERING

UNIT 4: Introduction**08 Periods**

- 4.1 Purpose of sanitation
 - 4.2 Necessity of systematic collection and disposal of waste
 - 4.3 Definition of terms in sanitary engineering
 - 4.4 Collection and conveyance of sewage
 - 4.5 Conservancy and water carriage systems, their advantages and Disadvantages
 - 4.6 (a) Surface drains (only sketches) : various types, suitability
(b) Types of sewage: Domestic, industrial, storm water and its seasonal variation
- Sewerage System**
- 4.7 Types of sewerage systems, materials for sewers, their sizes and joints
 - 4.8 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

UNIT 5: Laying and Construction of Sewers**12 Periods**

- 5.1 Setting out/alignment of sewers
 - 5.2 Excavations, checking the gradient with boning rods preparation of bedding, handling and jointing testing and back filling of sewers/pipes.
 - 5.3 Construction of surface drains and different sections required
- Sewage Characteristics**
- 5.4 Properties of sewage and IS standards for analysis of sewage
 - 5.5 Physical, chemical and bacteriological parameters
- Natural Methods of Sewerage Disposal**
- 5.6 General composition of sewage and disposal methods
 - 5.7 Disposal by dilution
 - 5.8 Self-purification of stream
 - 5.9 Disposal by land treatment
 - 5.10 Nuisance due to disposal
- Sewage Treatment**
- 5.11 Meaning and principle of primary and secondary treatment and activated sludge process their flow diagrams
 - 5.12 Introduction and uses of screens, grit chambers, detritus tanks, skimming tanks, plain sedimentation tanks, primary clarifiers, secondary clarifiers, filters, control beds, intermittent sand filters, trickling filters, sludge treatment and disposal, oxidation ponds (Visit to a sewage treatment plant) Oxidation ditch, duckweed pond, Vermin culture
- Building Drainage**
- 5.13 Aims of building drainage and its requirements
 - 5.14 Different sanitary fittings and installations
 - 5.15 Traps
 - 5.16 Introduction to smart water supply and waste water management
A field visit may be planned to explain and show the relevant things.

TEXT BOOKS

-
- 1. Public Health Engineering by D.V Gupta Asian Publishers Distributors, Muzaffarnagar.

REFERENCE BOOKS

1. Water Supply and Sanitary Engineering by Rangwala, SC; Charotar Book Stall, Anand
2. Water Supply Engineering by Kshirsagar, SR; Roorkee Publishing House, Roorkee
3. Sewage and Sewage Treatment by Kshirsagar, SR; Roorkee Publishing House, Roorkee
4. Water Supply and Sanitary Engineering by Birdie, GS; Dhanpat Rai and Sons, Delhi
5. Water Supply Engineering by Garg, Santosh Kumar; Khanna Publishers, Delhi
6. Sewage and Waste Water Disposal Engineering by Garg, Santosh Kumar; Khanna Publishers, Delhi
7. A Laboratory Manual in Public Health Engineering by Duggal, Ajay K and Sharma, Sanjay; Galgotia Publications, 2006, New Delhi
8. Public Health Engineering by D.V Gupta Asian Publishers Distributors, Muzaffarnagar.



SCHOOL OF POLYTECHNIC
RAILWAYS, BRIDGES AND TUNNELS
(SPB09230502)

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DETAILED CONTENTS

PART - I: RAILWAYS

UNIT 1: Introduction		08 Periods
1.1	Introduction to Indian Railways	
1.2	Mass Transit System: Metro, Mono-rail, Tube	
1.3	Railway surveys: Factors influencing the railways route, brief description of various types of railway survey	
1.4	Classification of permanent way describing its component parts	
1.5	Rail Gauge: Definition, types, practice in India (gauges in different countries knowledge scale)	
1.6	Rails - types of rails	
1.7	Rail Fastenings: Rail joints, types of rail joints, fastenings for rails, fish plates, bearing plates	
UNIT 2: Sleepers		08 Periods
2.1	Sleepers: Functions of sleepers, types of sleepers, requirements of an ideal material for sleepers.	
2.2	Points of Crossings and signalling: Brief description regarding different types of crossings/ signalling	
2.3	Maintenance of track: Necessity, maintenance of track, inspection of soil, track and fixtures; maintenance and boxing of ballast maintenance gauges, tools	
2.4	Earth work and drainage: Features of rail road, bed level, width of formation, side slopes, drains, methods of construction, requirement of drainage system	
2.5	Station and yards: purpose and types of stations and yards	

PART - II: BRIDGES

UNIT 3: Introduction		14 Periods
3.1	Bridge - its function and component parts, difference between a bridge and a culvert	
3.2	Classification of Bridges	
3.3	Their structural elements and suitability:	
3.4	According to life-permanent and temporary	
3.5	According to deck level - Deck, through and semi-through	
3.6	According to material - timber, masonry, steel, RCC, pre-stressed	
3.7	According to structural form	
	- Grade Separators-Railway Road Over Bridges (ROB), Road Under Bridge (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	
3.8	IRS, IRC introduction of IRS and IRC	
3.9	Concept of Railway ROB and RUB - Precast components of ROB, drainage	

problems and solutions of RUB

- 3.10 Bridge Foundations: Introduction to open foundation, pile foundation, well foundation.

UNIT 4: Bridges

12 Periods

- 4.1 Piers, Abutments, Retaining walls, Wing walls and Toe walls
4.2 Piers-definition, parts; types -solid (masonry and RCC), open
4.3 Abutments and wing walls - definition, types of abutments (straight and tee), abutment with wing walls (straight, splayed, return and curved)
4.4 Toe walls: Importance and Functions
4.5 Retaining Walls: Types, functions, parts, MSE(Mechanically stabilized earth) walls
4.6 Bridge bearings
4.7 Purpose of bearings; types of bearings - fixed plate, rocker and roller and pin bearing, Elastomeric bearings, PTFE bearing, Sliding bearing.
4.8 Super structure: Components, features, cross-section and services, footpath, median crash banner, light pole
4.9 Maintenance of Bridges
4.10 Inspection of bridges
4.11 Routine maintenance

PART - III: TUNNELS

UNIT 5: Conveyance of Water

08 Periods

- 5.1 Definition and necessity of tunnels, method of tunneling, machinery used in tunnelling
5.2 Typical section of tunnels for a national highway and single and double broad gauge railway track
Ventilation -necessity and methods of ventilation, by blowing, exhaust and combination of blowing and exhaust
5.3 Drainage method of draining water in tunnels
5.4 Lighting of tunnels
5.5 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
5.6 Examiners should set questions from all the parts

REFERENCE BOOKS

1. Railway Bridges & Tunnels by D.V Gupta Asian Publishers Distributors, Mujaffarnagar

REFERENCE BOOKS

1. Railway Engineering by Vaswani, NK; Publishing House, Roorkee
2. Railway Engineering by Rangwala, SC; Anand, Charotar Book Stall
3. A Text Book of Railway Engineering by Deshpande, R; Poonam United Book Corporation
4. Bridge Engineering by Algia, JS; Charotar Book Stall, Anand
5. Essentials of Bridge Engineering by Victor Johnson; Oxford and IBH, Delhi
6. Bridge Engineering by Rangwala S.C; Charotar Book Stall, Anand IRC Bridge Codes.



SCHOOL OF POLYTECHNIC
EARTHQUAKE ENGINEERING
(SPB09230503)

L **T** **P**
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DETAILED CONTENTS

UNIT 1: Elements of Engineering Seismology		08 Periods
1.1	General features of tectonic of seismic regions. Causes of earthquakes, Seismic waves, earthquake size (magnitude and intensity), Epicentre, Seismograph, Classification of earthquakes, Plate Tectonics, Elastic Rebound Theory.	
UNIT 2: Seismic Behaviour of Traditionally-Built Constructions of India		08 Periods
2.1	Performance of building during earthquakes and Mode of failure (Out-of-plane failure, in-plane failure, Diaphragm failure, Connection failure, Non-structural components failure) single degree of freedom system, fundamental time period, mode Shapes.	
UNIT 3: Special construction method		08 Periods
3.1	Special construction method, tips and precautions to be observed while planning, designing and construction of earthquake resistant building.	
UNIT 4: Seismic zone of India		08 Periods
4.1	Introduction to seismic zone of India provision given by IS: 1893: 2002 (part I) static and dynamic loading, base shear calculation.	
UNIT 5: Retrofitting		18 Periods
5.1	Seismic provision of strengthening and retrofitting measures for traditionally-built constructions	
5.2	Provision of reinforcement detailing in masonry and RCC constructions as per IS 13920 and IS 4326.	
5.3	Introduction to Earthquake early warning system	
5.4	Disaster Management: Disaster rescue, psychology of rescue, rescue workers, rescue plan, rescue by steps, rescue equipment, safety in rescue operations, debris clearance and casualty management.	

TEXT BOOKS

1. Earthquake Engineering by Sanjay Kumar, J.N.P Meerut..

REFERENCE BOOKS

1. Elements of Earthquake Engineering by Jai Krishana and AR Chandrasekaran; Sarita Parkashan, Meerut.
2. Building Construction by BL Gupta and NL Arora; Satya Prakashan, New Delhi
3. Manual Published by Earthquake Engineering department, IIT Roorkee / IIT Kanpur
4. IS 13920, IS: 13827, IS: 13828, IS 1893-2002, IS 4326 (latest edition)
5. Earthquake Resistant Building Construction by Neelam Sharma
6. e-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.
7. Earthquake Engineering by Sanjay Kumar, J.N.P Meerut.



SCHOOL OF POLYTECHNIC
SOIL MECHANICS AND FOUNDATION ENGINEERING
(SPB09230504)

L **T** **P**
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DETAILED CONTENTS

UNIT 1: Introduction		08 Periods
1.6	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 UP, 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	
1.4	Physical Properties of Soils	
1.5	Constituents of soil and representation by a phase diagram	
1.6	Definitions of void ratio, porosity, degree of saturation, water content, 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	
1.7	Simple numerical problems with the help of phase diagrams	
UNIT 2: Flow of Water Through Soils		12 Periods
2.1	Darcy's law, coefficient of permeability, seepage velocity and factors affecting permeability	
2.2	Comparison of permeability of different soils as per Indian Standards	
2.3	Measurement of permeability in the laboratory	
2.4	Simple numerical problems	
2.5	Effective Stress (Concept only)	
2.6	Stresses in subsoil	
2.7	Definition and meaning of total stress, effective stress and neutral stress	
2.8	Principle of effective stress	
2.9	Importance of effective stress in engineering problems	
2.10	Deformation of Soils 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	
2.11	Definition and practical significance of compression index, coefficient of consolidation, degree of consolidation.	
2.12	Meaning of total settlement, uniform settlement and differential settlement; rate of settlement and their effects	
2.13	Settlement due to construction operations and lowering of water table	
2.14	Tolerable settlement for different structures as per IS	
2.15	Simple numerical problems	
UNIT 3: Shear Strength Of Soil		12 Periods
3.1	Concept and Significance of shear strength	
3.2	Determination of shearing strength by direct shear test, unconfined compression	

- test and vane shear test. Drainage conditions of test and their significance
- 3.3 Factors contributing to shear strength of cohesive and cohesion less soils, Coulomb's law
- 3.4 Stress and strain curve, peak strength and ultimate strength, their significance
- 3.5 Examples of shear failure in soils
- 3.6 Numerical problems
- 3.6.1 Compaction
- 3.6.2 Definition and necessity of compaction
- 3.6.3 Laboratory compaction test (standard and modified proctor test as per IS) definition and importance of optimum water content, maximum dry density; moisture dry density relationship for typical soils with different compactive efforts
- 3.6.4 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
- 3.6.5 Soil Exploration
- 3.6.6 Purpose and necessity of soil exploration
- 3.6.7 Reconnaissance, methods of soil exploration, Trial pits, borings (auger, wash, rotary, percussion to be briefly dealt)
- 3.6.8 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.
- 3.6.9 Presentation of soil investigation results

UNIT 4: Bearing Capacity of soil

10 Periods

- 4.1 Concept of bearing capacity
- 4.2 Definition and significance of ultimate bearing capacity, net safe bearing capacity and allowable bearing pressure
- 4.3 Guidelines of BIS (IS 6403) for estimation of bearing capacity
- 4.4 Factors affecting bearing capacity
- 4.5 Concept of vertical stress distribution in soils due to foundation loads, pressure bulb
- 4.6 Applications of SPT, unconfined compression test and direct shear test in estimation of bearing capacity
- 4.7 Plate load test (no procedure details) and its limitations
- 4.8 Simple numerical problems on bearing capacity.

UNIT 5: Foundation Engineering

08 Periods

- 5.1 Concept of shallow and deep foundation; types of shallow foundations: combined, isolated, strip, mat, and their suitability.
- 5.2 Factors affecting the depth of shallow Foundations
- 5.3 Deep foundations
- 5.4 Type of piles and their suitability
- 5.5 Pile group and pile cap.
- 5.6 Pile classification on the basis of material,
- 5.7 Ground improvement techniques
- 5.8 Pre-loading, vibro compaction, stone columns, soil nailing, grouting, sand drain.

TEXT BOOKS

1 Soil Mechanics & Foundation Engineering by SK Sharma, Asian Publishers Distributors, and Mujaffarnagar

REFERENCE BOOKS

1. Soil Mechanics and Foundations by Punmia, BC; Standard Publishers, Delhi
2. Soil Mechanics and Foundations Engineering by Bharat Singh and Shamsheer Prakash; Nem Chand and Bros, Roorkee,
3. Soil Sampling and Testing - A Laboratory Manual by Duggal, AK. Ramana, TR., Krishnamurthy, S; Galgotia Publications, Delhi
4. BIS Codes IS 6403 (latest edition) and IS 1498 (latest edition)
5. Shallow Foundations by NITTTTR, Chandigarh
6. Video films on Geo-technical Laboratory Practices by Vinod Kumar; NITTTTR, Chandigarh



DETAILED CONTENTS

UNIT 1: Contouring Survey	08 Periods
1.1 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	
UNIT 2: Theodolite Survey	14 Periods
2.1 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	
UNIT 3: Tacho-metric surveying	08 Periods
3.1 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.	
3.2 Assumptions made in the theory of simple bending, derivation and application of bending equation to circular cross-section, I section, T&L sections only	
UNIT 4: Curves	12 Periods
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	
4.4 Setting out of a vertical curve	
4.5 Introduction to the use of Modern Surveying equipment and techniques such as	
4.5.1 EDM or Distomat	
4.5.2 Planimeter (Digital)	
4.5.3 Total station	

4.5.4 Introduction to remote sensing and GPS

4.5.5 Auto level

4.5.6 Digital theodolite

UNIT 5: Total station

08 Periods

5.1 Installation, calibration concept of coordinate system

5.2 Analysis of data, plotting, Remote sensing , GIS & GPS concept and application in various fields

REFERENCE BOOKS

1. Surveying-II by D.V. Gupta, Asian Publishers Distributors, Mujaffarnagar,

REFERENCE BOOKS

1. A Text Book of Surveying by Kocher, CL; Katson Publishing House Ludhiana,

2. Surveying and Leveling by Kanetkar,TP and Kulkarni, SV; AVG Parkashan, Pune

3. Surveying and Leveling-Vol.2 by Kanetkar, TP and Kulkarni, SV; AVG Prakashan, Pune

4. Surveying and Leveling by Punima, BC; Standard Publishers Distributors, Delhi

5. Surveying-II by Mahajan, Sanjay; Satya Prakashan, Delhi



SCHOOL OF POLYTECHNIC

WASTE WATER & IRRIGATION ENGINEERING DRAWING

(SPB09230506)

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DETAILED CONTENTS

UNIT 1: Drains and Sewers	08 Periods
1.1 Cross section of standard types of open drains (circular, V-shaped and U-shaped) with their foundations	
1.2 Cross section of earthen ware and RCC sewer pipes	
1.3 Cross sections of masonry sewers (circular and egg shaped)	
1.4 Traps, manholes and inspection chamber	
1.5 Detailed section of floor trap and gully trap	
1.6 Detailed plan and section of an inspection chamber	
1.7 Detailed plan and section of a manhole	
1.8 Septic Tank and Soak Pit Detailed plan and cross sections of a domestic septic tank for 10 users. Draw detailed X-section of an empty soak pit and filled soak.	
UNIT 2: Bath room and W.C connections:	14 Periods
2.1 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.	
2.2 Plan of a bathroom showing positions of lavatory, bath tub, wash-basin, taps and showers	
2.3 Study of drawing of two storied building showing details of one pipe and two pipes systems with sanitation system.	
2.4 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.	
UNIT 3: Typical cross-section of a channel	08 Periods
3.1 - 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.	
3.2 Layout plan of a canal head works	
3.3 Draw the typical L-section of a weir	
UNIT 4: Draw the X-section of an Earthen Dam	18 Periods
4.1 Homogeneous	
4.2 Zoned type	
4.3 Diaphragm type	
UNIT 5: Cross section of a tube well with pump house.	08 Periods
5.1 Layout and cross section of rain water harvesting system.	

TEXT BOOKS

1. Water Waste & Irrigation Engineering by Keshav Kumar,, Bharat Bharti Publications, and Meerut.

REFERENCE BOOKS

1. Civil Engineering Drawing by Loyal JS; Satya Parkashan, New Delhi
2. Civil Engineering Drawings by Chandel RP
3. Civil Engineering Drawing by Kumar NS; IPH, New Delhi
4. Civil Engineering Drawing by Malik RS and Meo GA ; Asian Publishing House, New Delhi
5. Civil Engineering Drawing by S.K. Garg; Khanna Publishers.



SCHOOL OF POLYTECHNIC
UNIVERSAL HUMAN VALUES

(SPB09230507)

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DETAILED CONTENTS

UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education	8 Periods
<ul style="list-style-type: none">1.1 Understanding the need, basic guidelines, content and process for Value Education1.2 Self-Exploration-what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration1.3 Continuous Happiness and Prosperity- A look at basic Human Aspirations1.4 Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority1.5 Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario1.6 Method to fulfill the above human aspirations: understanding and living in harmony at various levels	
UNIT2: Understanding Harmony in the Human Being - Harmony in Myself!	8 Periods
<ul style="list-style-type: none">2.1 Understanding human being as a co-existence of the sentient ‘I’ and the material the Body’2.2 Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha2.3 Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)2.4 Understanding the characteristics and activities of ‘I’ and harmony in ‘I’	
UNIT3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship	8 Periods
<ul style="list-style-type: none">3.1 Understanding Harmony in the family – the basic unit of human interaction3.2 Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti;<ul style="list-style-type: none">a.Trust (Vishwas) and Respect (Samman) as the foundational values of relationship3.3 Understanding the meaning of Vishwas; Difference between intention and competence3.4 Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship3.5 Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitvaas comprehensive Human Goals3.6 Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family! -Practice Exercises and Case Studies will be taken up in Practice Sessions.	
UNIT4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence	8 Periods
<ul style="list-style-type: none">4.1 Understanding the harmony in the Nature4.2 Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self regulation in nature4.3 Understanding Existence as Co-existence (Sah-astitva) of mutually interacting	

units in all-pervasive space

4.4 Holistic perception of harmony at all levels of existence

-Practice Exercises and Case Studies will be taken up in Practice Sessions

UNIT5: Implications of the above Holistic Understanding of Harmony on 6 Periods Professional Ethics

5.1 Natural acceptance of human values

5.2 Definitiveness of Ethical Human Conduct

5.3 Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

5.4 Competence in professional ethics:

a) Ability to utilize the professional competence for augmenting universal human order.

b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems.

c) Ability to identify and develop appropriate technologies and management patterns for above production systems.

5.5 Case studies of typical holistic technologies, management models and production systems

5.6 Strategy for transition from the present state to Universal Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b) At the level of society: as mutually enriching institutions and organizations

5.7 To inculcate Human Values among Students: The Role of self ,Parents and Teachers

-Practice Exercises and Case Studies will be taken up in Practice Sessions.

5.8 Practical Session also Includes Different Yogic Exercises and Meditation Session

REFERENCE BOOKS

1. Universal Human Values by Ankit Kumar, J.N.P Meerut.

REFERENCE BOOKS

1. Value Education websites, <http://uhv.ac.in>, and <http://www.aktu.ac.in>

2. Story of Stuff, <http://www.storyofstuff.com>

3. Al Gore, an Inconvenient Truth, Paramount Classics, USA

4. Charlie Chaplin, Modern Times, United Artists, USA

5. IIT Delhi, Modern Technology–the Untold Story

6. Case study Hevade Bazar Movie.



SCHOOL OF POLYTECHNIC
WATER & WASTE WATER ENGINEERING LAB
(SPB09230551)

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DETAILED CONTENTS

S. No	Name of Practical
1	To determine turbidity of water sample by (i) JTU (ii) NTU
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/Periodseading of GI Pipes, CI Pipes, SWG pipes, PVC pipes and copper pipes.
10	To demonstrate the laying of SWG pipes for sewers
11	Study of water purifying process by visiting a field lab.
12	Demonstration of plumbing tools.
13	Testing of pipes (GI, CI, PVC, and SWG) as per BJI standards.

TEXT BOOKS

1. Public Health Engineering by Anant Prakash, J.N.P Meerut.

REFERENCE BOOKS

1. Elements of Public Health Engineering by Duggal, KN; S. Chand and Co. New Delhi
2. Water Supply and Sanitary Engineering by Rangwala, SC; Charotar Book Stall, Anand
3. Water Supply Engineering by Kshirsagar, SR; Roorkee Publishing House, Roorkee
4. Sewage and Sewage Treatment by Kshirsagar, SR; Roorkee Publishing House, Roorkee
5. Water Supply and Sanitary Engineering by Birdie, GS; Dhanpat Rai and Sons, Delhi
6. Water Supply Engineering by Garg, Santosh Kumar; Khanna Publishers, Delhi
7. Sewage and Waste Water Disposal Engineering by Garg, Santosh Kumar; Khanna Publishers, Delhi
8. A Laboratory Manual in Public Health Engineering by Duggal, Ajay K and Sharma, Sanjay; Galgotia publications, 2006, New Delhi.



SCHOOL OF POLYTECHNIC
SOIL MECHANICS & FOUNDATION
ENGINEERING LAB

(SPB09230554)

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DETAILED CONTENTS

S. No	Name of Practical
1	To determine the physical properties of cement such as fineness, consistency, setting time, soundness and compressive strength of cement as per IS Codes
2	To determine flakiness and elongation index of coarse aggregate
3	To determine silt content in fine aggregate
4	Determination of specific gravity and water absorption of aggregates
5	Determination of bulk density and voids of aggregates
6	Determination of particle size distribution of fine, coarse and all-in-one aggregate by sieve analysis (grading of aggregate)
7	To determine bulking of fine aggregates
8	To determine workability by slump test and to verify the effect of water, fine aggregate/coarse aggregate ratio and aggregate/Cement ratio on slump
9	To determine compressive strength of concrete cubes for different grades of concrete
10	Rebound Hammer Test

TEXT BOOKS

6. Soil Mechanics & Foundation Engineering by SK Sharma, Asian Publishers Distributors, and Mujaffarnagar.

REFERENCE BOOKS

1. Concrete Technology by Krishnamurthy, KT Rao, A Kasundra and Khandekar, AA; Dhanpat Rai And Sons, Delhi
2. Text Book of Concrete Technology by Gupta BL and Gupta Amit; Standard Publishers Distributors, Delhi.
3. Concrete Tecnology by Handoo, BL, Puri, LD and Mahajan Sanjay; Satya Prakashan, New Delhi.
4. Engineering Chemistry - A Text Book by H. K. Chopra & A. Parmar, Narosa Publishing House, New Delhi.
5. Concrete Technology by Birinder Singh; Kaption Publications, Ludhiana.



SCHOOL OF POLYTECHNIC

SURVEYING-II LAB

(SPB09230555)

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DETAILED CONTENTS

Contouring

- 1 Preparing a contour plan by radial line method by the use of a Tangent Clinometer/Tachometer
- 2 Preparing a contour plan by method of squares
- 3 Preparing a contour plan of a Road/Railway track/Canal by taking cross-sections

Theodolite

- 4 Taking out the Theodolite, mounting on the tripod and placing it back in the box
- 5 Study of a transit vernier theodolite; temporary adjustments of theodolite
- 6 Reading the vernier and working out the least count, measurement of horizontal angles by repetition and reiteration methods
- 7 Measurement of vertical angles and use of tachometric tables
- 8 Measurement of magnetic bearing of a line
- 9 Running a closed traverse with a theodolite (at least five sides) and its plotting
Height of objects with and without accessible bases

Curves

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

Minor instruments

- 11 Demonstration and use of minor instruments like Ceylon Ghat Tracer, Tangent Clinometer, Pantagraph, Abney level etc.
- 12 Use of planimeter for computing areas
- 13 Demonstration of digital instruments Periodic field visits to Survey of India and other government agencies.
- 14 To plot an area with the help of Total Station

TEXT BOOKS

1. Surveying-II by D.V. Gupta, Asian Publishers Distributors, Mujaffarnagar.

REFERENCE BOOKS

1. A Text Book of Surveying by Kocher, CL; Katson Publishing House Ludhiana,
2. Surveying and Leveling by Kanetkar, TP and Kulkarni, SV; AVG Parkashan, Pune
3. Surveying and Leveling-Vol.2 by Kanetkar, TP and Kulkarni, SV; AVG Prakashan, Pune
4. Surveying and Leveling by Punima, BC; Standard Publishers Distributors, Delhi
5. Surveying-II by Mahajan, Sanjay; Satya Prakashan, Delhi
6. Surveying-II by D.V. Gupta, Asian Publishers Distributors, Mujaffarnagar.

SEMESTER-06



SCHOOL OF POLYTECHNIC
QUANTITY SURVEYING AND VALUATION
(SPB09230601)

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DETAILED CONTENTS

UNIT 1: Introduction		10 Periods
1.1	Introduction to quantity surveying and its importance. Duties of quantity surveyor	
1.2	Types of estimates Preliminary estimates - Plinth area estimate - Cubic content estimate	
1.3	Detailed estimates - Definition, Type of detailed estimate- Detail estimate you new work, Revised Estimate, Supplementary estimate, Maintenance and Repair estimate - Stages of preparation - details of measurement and calculation of quantities and abstract	
UNIT 2: Measurement		12 Periods
2.1	Units of measurement for various items of work as per BIS:1200	
2.2	Rules for measurements	
2.3	Different methods of taking out quantities - centre line method and long wall and short wall method	
2.4	Preparation of Detailed and Abstract Estimates from Drawings by following CSR rates for: A small residential building with a flat roof comprising of - Two rooms with W.C., bath, kitchen and verandah	
2.5	Earthwork for unlined channel	
2.6	WBM road and pre-mix carpeting	
2.7	Single span RCC slab culvert	
2.8	Earthwork for plain and hill roads	
2.9	RCC work in beams, slab, column and lintel, foundations 10 users septic tank	
UNIT 3: Calculation of quantities of materials for		10 Periods
3.1	Cement mortars of different proportion	
3.2	Cement concrete of different proportion Brick/stone masonry in cement mortar of different proportion	
3.3	Plastering, pointing and painting	
3.4	D.P.C. and flooring	
3.5	Steel in beam, slab, column, foundation	
3.6	Analysis of Rates	
3.7	Steps involved in the analysis of rates. Requirement of material, labour, sundries, contractor's profit and overheads 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 along with lead diagram - RCC in roof slab/beam/lintels/columns - Brick masonry in cement mortar - Cement Plaster - White washing, painting- RCC foundation	
3.8	C.C Flooring	



SCHOOL OF POLYTECHNIC
CONSTRUCTION MANAGEMENT, ACCOUNTS AND
ENTERPRENURESHIP DEVELOPMENT

(SPB09230602)

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DETAILED CONTENTS

CONSTRUCTION MANAGEMENT

UNIT 1: Introduction		08 Periods
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, and 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	
1.7	Construction Planning	
1.7.1	Importance of construction planning	
1.7.2	Stages of construction planning - Pre-tender stage - Contract stage	
1.7.3	Contracts and e-tendering - Different types of contracts - Penalties and Arbitration	
1.7.4	Scheduling construction works by bar charts - Definition of activity, identification of activities though - Preparation of bar charts for simple construction work - Preparation of schedules for labour, materials, machinery and finances for small works - Limitations of bar charts Scheduling by network techniques - Introduction to network techniques; PERT and CPM, differences between PERT and CPM terminology	
1.8	Organization	
1.9	Types of organizations: Line, line and staff, functional and their characteristics	
UNIT 2: Site Organization		10 Periods
2.1	Principle of storing and stacking materials at site	
2.2	Location of equipment	
2.3	Preparation of actual job layout for a building	
2.4	Organizing labour at site Construction Labour	
2.5	Conditions of construction workers in India, wages paid to workers	
2.6	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) - Acts relating to Labour Safety	
2.7	Control of Progress	

- 2.8 Methods of recording progress
- 2.9 Analysis of progress
- Taking corrective actions keeping head office informed
- Cost time optimization for simple jobs - Direct and indirect cost, variation with time, cost optimization

UNIT 3: Construction Labour

10 Periods

- 3.1 Conditions of construction workers in India, wages paid to workers
- 3.2 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)
 - Acts relating to Labour Safety
- Control of Progress**
- 3.3 Methods of recording progress
- 3.4 Analysis of progress
- 3.5 Taking corrective actions keeping head office informed
- 3.6 Cost time optimization for simple jobs - Direct and indirect cost, variation with time, cost optimization
- Inspection and Quality Control**
- 3.7 Need for inspection and quality control
- 3.8 Principles of inspection
- 3.9 Stages of inspection and quality control for Earth work
 - Masonry
 - RCC
 - Sanitary and water supply services

UNIT 4: Accidents and Safety in Construction

12 Periods

- 4.1 Accidents - causes and remedies
- 4.2 Safety measures for
 - Excavation work
 - Drilling and blasting
 - Hot bituminous works
 - Scaffolding, ladders, form work
 - Demolitions
- 4.3 Safety campaign and safety devices, safety training
- 4.4 Fire safety
- 4.5 Preparation of Tender Document based on Common Schedule Rates (CSR)
- 4.6 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
- 4.7 - 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) Preparation of comparative statement for item rate contract.

ACCOUNTS

UNIT 5: Public Work Accounts

10 Periods

- 5.1 Introduction, technical sanction, 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, acquittance 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, definition of cash, precaution in custody of cash Book, impress account, temporary advance, treasury challan, preparation of final bills. Students must learn to prepare accounts register.
Filling of PWD accounts forms
Definition and concept , role and significance, risk and awards,
- 5.2 **Entrepreneurship**
entrepreneur development, Programmes Existing in India, Forms of business Enterprises, sole proprietorship-partnership-private limited- cooperatives.
Industrial legislation and taxes:
- GST
- Income Tax
- Excise duty
- Labourcess

TEXT BOOKS

1. Construction Management by D.V., Asian Publishers Distributors, and Mujaffarnagar.

REFERENCE BOOKS

1. Civil Engineering Management by Wakhlo, ON; Light and Life Publishers, New Delhi
2. Construction Equipment and its Planning and Application by Verma, Mahesh
3. Management in Construction Industry by Dharwadker, PP; Oxford and IBH Publishing Company, New Delhi
4. Construction Planning and Management by Gahlot PS; Dhir, BM; Wiley Eastern Limited, New Delhi
5. MS Project - Microsoft USA



SCHOOL OF POLYTECHNIC
DESIGN OF STEEL STRUCTURE
(SPB09230603)

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DETAILED CONTENTS

CONSTRUCTION MANAGEMENT

UNIT 1: Structural Steel and Sections:		12 Periods
1.1	Properties of structural steel	
1.2	Designation and classification of structural steel sections as per IS handbook and IS: 800: 2007	
1.3	Tubular Sections	
	Riveted Connections	
1.4	Types of Rivet, Permissible stresses in rivets, types of riveted joints, specifications as per IS800, Failure of riveted joint, strength and efficiency of riveted joint, Design of Riveted Connection only axially loaded member (No staggered rivetting)	
	Bolt Connections:	
1.5	Types of bolt, permissible stresses in bolt, types of bolted joints, specifications for bolted joints as per IS 800. Failure of a bolted joint. Assumptions in the theory of bolted joints. Strength and efficiency of a bolted joint. Design of bolted joints for axially loaded members (No Staggered bolts). Organization Types of organizations: Line, line and staff, functional and their characteristics	
UNIT 2: Welded connections:		10 Periods
2.1	Types of welds and welded joints, advantages and disadvantages of welded joints design of fillet and butt weld for axially loaded members	
	Tension Members	
2.2	Analysis and design of single and double section tension members and their riveted and welded connections with gusset plate as per IS:800-2007. Introduction to Lug Angle and Tension splice.	
UNIT 3: Compression Member		10 Periods
3.1	Angle struts, type of section used, effective length, radius of gyration, slenderness ratio and its limits, permissible compressive stress Analysis and design of single and double angle sections compression members subjected to axial load. Introduction to analysis and design of axially loaded column. Introduction to lacing and battening (No numerical problem on lacing and battening)	
3.2	Roof Truss 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)	
UNIT 4: Column		08 Periods
4.1	Types of column bases i.e. slab base, gusseted base. Design of slab base and concrete block. Introduction to gusseted base (no numerical problems on gusseted base). Introduction to beam columns design of simple built up beams (Symmetrical I section with cover plates only)	
UNIT 5: Beam		10 Periods
5.1	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	

TEXT BOOKS

1. Design of Steel Structure by D.V. Gupta, Asian Publishers Distributors, Mujaffarnagar.

REFERENCE BOOKS

1. Design of Steel Structures by Duggal SK; Standard Publishers, Delhi
2. Steel Structures Design and Drawing by BirinderSingh; Kaption Publishing House, Ludhiana
3. Design of Steel Structures by Ram Chandra; Standard Publishers, Delhi
4. Design of Steel Structures by S Ramamurthan
5. Design of Steel structure by M.K. Varshney, Asian Publishers Distributors, and Mujaffarnagar.
6. Design of Steel Structure by D.V. Gupta, Asian Publishers Distributors, Mujaffarnagar.



SCHOOL OF POLYTECHNIC
REPAIR AND MAINTENANCE OF BUILDINGS
(SPB09230604)

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DETAILED CONTENTS

UNIT 1:	Need for Maintenance	12 Periods
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	
1.5	Agencies Causing Deterioration (Sources, Causes, Effects)	
1.6	Definition of deterioration/decay	
1.7	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	
1.8	Effects of various agencies of deterioration on various building materials i.e. Bricks, timber, concrete, paints, metals, plastics, stones.	
UNIT 2:	Investigation and Diagnosis of Defects	12 Periods
2.1	Investigation and Diagnosis of Defects	
2.2	Systematic approach/procedure of investigation	
2.3	Sequence of detailed steps for diagnosis of building defects/problems	
2.4	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	
2.5	Defects and their root causes	
2.6	Define defects in buildings	
2.7	Classification of defects	
2.8	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 4.3.8 Defects caused by dampness	
UNIT 3:	Materials for Repair, maintenance and protection	10 Periods
3.1	Materials for Repair, maintenance and protection	
3.2	Investigation and Diagnosis of Defects	
	Investigation and Diagnosis of Defects	
3.3	Compatibility aspects of repair materials	
3.4	State application of following materials in repairs:	
	5.2.1 Anti-corrosion coatings	
	5.2.2 Adhesives/bonding aids	

- 5.2.3 Repair mortars
- 5.2.5 Joints sealants
- 5.2.6 Waterproofing systems for roofs
- 5.2.7 Protective coatings

UNIT 4: Remedial Measures for Building Defects

08 Periods

- 4.1 Remedial Measures for Building Defects
- 4.2 Preventive maintenance considerations
- 4.3 Surface preparation techniques for repair
- 4.4 Crack repair methods
 - Epoxy injection
 - Stitching
 - Adding reinforcement and grouting
 - Flexible sealing by sealant
- 4.5 Repair of surface defects of concrete
 - Bug holes
 - Form tie holes
 - Honey comb and larger voids
- 4.6 Repair of corrosion in RCC elements
 - Steps in repairing
 - Prevention of corrosion in reinforcement

UNIT 5: Repair of corrosion in RCC elements

08 Periods

- 5.1 Material placement techniques with sketches
 - Pneumatically applied (The gunite techniques)
 - Pouring from the top to repair bottom face
 - Birds mouth
 - Dry packing
 - Form and pump
 - Trowel applied method
- 5.2 Repair of DPC against Rising Dampness
 - Physical methods
 - Electrical methods
 - Chemical methods
- 5.4 Waterproofing of wet areas and roofs
 - Water proofing of wet areas
 - Water proofing of flat RCC roofs
 - Various water proofing systems and their characteristics
- 5.5 Repair of joints in buildings
 - Types of sealing joints with different types of sealants
 - Repair of overhead and underground water tanks

TEXT BOOKS

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1. Repair & Maintenance of Buildings by DP Singh, J.N.P Meerut.

REFERENCE BOOKS

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1. Building Defects and Maintenance Management by Gahlot P.S. and Sanjay Sharma; CBS Publishers, New Delhi
 2. Maintenance Engineering for Civil Engineers by Nayak, BS; Khanna Publishers, Delhi
 3. Building Failures - Diagnosis and Avoidance by Ransom; WH Publishing.



SCHOOL OF POLYTECHNIC

PLUMBING SERVICES

(SPB09230605)

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DETAILED CONTENTS

- UNIT 1:** Plumber's Tools: Selection, use and care of tools required for plumbing work, **12 Periods**
such as threading die, bit brace, ratchet brace, pipe wrench, spanner set, pipe cutter, pipe vice, hacksaw, chisel, files and other common hand tools, bench drilling machine, soldering iron
- UNIT 2:** Pipes and Pipe Fitting: Selection and use of different pipes like GI Pipes, Plastic pipes, PVC pipes, HDPE pipes, Cast iron pipes, Plumbing symbols; Bends, Elbows, Sockets, Tees, Unions, Pipe cutting, Pipe bending, Pipe Threading, Pipe joints, Pipe fitting, Alignment of pipes, Branching of pipes, Safety precautions, relevant IS codes are to be taught **12 Periods**
- UNIT 3:** Water Supply System: Sources of water; Rainwater harvesting; Water supply systems in a town; Water distribution systems; Distribution reservoirs; Pumps; Valves; Fire hydrants; Storage of water in buildings; Types of tanks; Laying water supply pipe lines **10 Periods**
- UNIT 4:** Domestic Drainage: Drainage system (two pipe, one pipe, single stack and other systems), Trap, Cesspool, Sceptic tank, Cleaning blocked pipes and drains, Laying sanitary and sewer pipes, Manholes, Inspection and testing (pressure & leakage test, testing straightness of pipes, ball test etc.); Fixing accessories, Problems in drainage and their solution **08 Periods**
- UNIT 5:** Sanitary Appliances: Flush toilet, Squat toilet, Wash basin, Sink, Floor traps, Urinal, Bathtub, Shower, Bidet, Mixing tap, Pop-up waste, water efficient appliance. **08 Periods**
- 5.1 Heating System (10 Periods) Heat transfer, Water heater, Geyser, Domestic hot water supply system, Central heating, Solar water heater

TEXT BOOKS

1. Plumber by G. S. Sethi; Computech Publications Ltd, New Delhi (Available in English and Hindi)
2. Maintenance Engineering for Civil Engineers by Nayak, BS; Khanna Publishers, Delhi

REFERENCE BOOKS

1. e-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.



SCHOOL OF POLYTECHNIC

ANALYSIS OF STRUCTURE

(SPB09230606)

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DETAILED CONTENTS

UNIT 1: Fixed and continuous Beams	08 Periods
1.1 Calculation of fixed end moments using moment theorem and to draw bending moment and shear force diagrams. Three moment theorem (no derivation) for continuous beams and to draw shear force and bending moment diagrams.	
UNIT 2: Principal stress and strain: Stress on inclined planes, principal plane and principal stress in elements subjected to direct and shear stress and their combinations. Mohr Circle for calculation of stress on inclined planes and principal strain for above cases	08 Periods
UNIT 3: Combined Direct and Bending stress: Eccentric loading middle third rule columns subjected to uni-axial and bi-axial eccentric loading. Dams- application of middle third rule for finding the base width calculation of stresses at the base of dam and stability of dam against overturning and sliding vertical structures like chimney subjected to movement due to wind forces. Redundant frames (10 Periods) Statically indeterminate structures. The second theorem of castigliano redundant trusses Degree of redundancy. Portal frames further application of principle of least work.	10 Periods
UNIT 4: Strain Energy: Strain energy stored in a member due to axial loading and vinding. Strain energy stored by a beam due to uniform vending moment. Work done by a force on a member law of reciprocal deflection, Betti's law. The first theorem of castigliano. Deflection of truss joints.	08 Periods
UNIT 5: Moment Distribution Method: Basic proposition relative stiffness, continuous beams with and without fixed ends. Sinking of support portal frames with and without sway (simple problem only) Slope Deflection Method: Basic concepts, stiffness of members with far end fixed or linged. Development of slope deflection equations and their application to beam and frames.	16 Periods

TEXT BOOKS

1. Analysis of structures by Rama murtham.

REFERENCE BOOKS

1. Analysis of structures by R.S Khurmi
2. Analysis of structures by Vazirani & Ratwani Vol I & II.



SCHOOL OF POLYTECHNIC
STEEL STRUCTURES DRAWING LAB
(SPB09230660)

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DETAILED CONTENTS

Steel Structures Drawings:

- Structural drawing from given data for following steel structural elements
1. **Drawing No. 1:** Roof Truss - Drawing of Fink Roof Truss with details of joints, fixing details of purlins and roof sheets.
 2. **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.
 3. **Drawing No.3 :** Column Beam Connections
(a) Sealed and Framed Beam to Beam Connections
(b) Sealed and Framed Beam o Column Connections
 5. **Drawing No. 4 :** Plate Girder (Bolted)
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.
 6. **Drawing No. 5 :** Draw at least one sheet using CAD software

TEXT BOOKS

1. Steel Structure Drawing by Keshav Kumar, J.N.P Meerut.

REFERENCE BOOKS

1. Civil Engineering Drawing by Layal JS; SatyaParkashan, New Delhi
2. Civil Engineering Drawings by Chandel RP
3. Civil Engineering Drawing by Kumar; NS; IPH, New Delhi
4. Civil Engineering Drawing by Malik RS and Meo GA; Asian Publishing House, New Delhi
5. Steel Structures Design and Drawing by SinghBirinder; Kaption Publishing House, New Delhi



SCHOOL OF POLYTECHNIC
SOFTWARE APPLICATION IN CIVIL ENGINEERING LAB

(SPB09230661)

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DETAILED CONTENTS

S. No	Name of Practical
1.	Introduction and use of AutoCAD for making 2D Drawings and develop plan, section and elevation of a residential building
2.	Demonstration of various Civil Engineering softwares like STAAD-Pro/Revit/MS Project Primavera Project Planner, Auto CIVIL or any other equivalent software

TEXT BOOKS

1. Soft Application in Civil Engineering by Aarti Chaurasiya, Asian Publishers Distributors, Mujaffarnagar

REFERENCE BOOKS

1. Building Defects and Maintenance Management by Gahlot P.S. and Sanjay Sharma; CBS Publishers, New Delhi
2. Maintenance Engineering for Civil Engineers by Nayak, BS; Khanna Publishers, Delhi
3. Building Failures - Diagnosis and Avoidance by Ransom; WH Publishing
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SCHOOL OF POLYTECHNIC

PROJECT WORK

(SPB09230663)

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DETAILED CONTENTS

General Guidelines:

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interest to him/her as a major project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred. This practical training cum project work should not be considered as merely conventional industrial training in which students are sent at work places with either minimal or no supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faculty. For the fulfilment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial/ field organizations. Each teacher is expected to supervise and guide 5-6 students.

Some of the projects are listed below for the benefit of the students:

1. Study and detailed estimate of different component of modern residential and commercial building
2. Preparation of detailed estimate for low cost two room set residential building
3. Review/ and existing for various parameters as per green building, Railing system building
4. Design of rain water harvesting for a given building
5. Analysis of accidents prone area in your city and remedial measure for them
6. Case study of safety practices in multi-storied buildings under constructions
7. Concrete Mix Design
8. Case study of repair and maintenance of a given building
9. Preparation of DNIT of a given building for Civil Engineering works
10. Detailed estimate for installing plumbing fixtures
11. Preparing a standard measurement book of a given building
12. Construction of concrete road by using latest techniques
13. Water supply scheme for a govt approved colony
14. Construction estimates of shopping complex
15. Analysis and design of Effluent Treatment Plant (ETP) for an industry
16. Design of soak pit with septic tank for 100 users
17. Design and estimate of two room set building
18. Design of concrete mix by using flyash
19. Study of setting up of an interlocking paver's fabrication plant
20. Preparation of different Civil Engineering models e.g. beam, one way, two way slab, column etc.
21. Reinforcement detailing as per IS: 13920
22. Design of car parking in your polytechnic
23. To prepare analysis of rates for non -schedule items e.g. aluminium door, windows, work stations etc.
24. Study of retrofitting of a given Civil Engineering works.

25. Survey of your polytechnic by using total station.
26. Traffic volume study and analysis on different roads in a city
27. Case study of a flyover with regard to its various construction components
28. Study and preparation of detailed project report of ready mix concrete (RMC) unit
29. Study and preparation of detailed project report of prefabricated/pre stressed concrete components unit
30. 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
31. Water Supply system for a locality
 - Surveying
 - Design of water requirements and water distribution system
 - Preparation of drawing of overhead tank
 - Material estimating and costing
 - Specifications
 - Technical report writing
32. Construction of shopping complex by detailing of RCC drawings, estimating and costing of material
33. 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