UTTARAKHAND BOARD OF TECHNICAL EDUCATION
JOINT ENTRANCE EXAMINATION AND TRAINING, RESEARCH DEVELOPMENT CELL, DEHRADUN
STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME
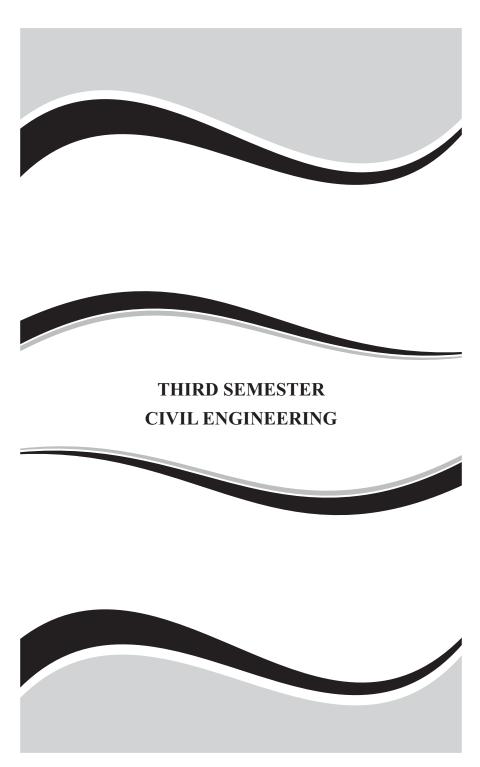
BRANCH NAME – CIVIL ENGINEERING   **SEMESTER – III**

Subject Code	Subject	L	T	P	TOT	Internal Theory Max Marks	Internal Practical Max Marks	External Theory Max Marks	External Theory Hrs.	External Practical Max Marks	External Practical Hrs.	Total Marks	Credit Point
		Period/Weeks											
023006	Fluid Mechanics	5	-	2	7	25	15	75	2.5	50	3.0	165	4
023001	Engineering Mechanics*	4	-	2	6	25	10	75	2.5	50	3.0	160	5
023002	Basic Surveying	4	-	6	10	25	25	75	2.5	75	6.0	200	5
023004	Building Material and Construction	5	-	4	9	25	15	75	2.5	50	3.0	165	5
023003	Building Drawing	-	-	6	6	-	25	100	3.0	-	-	125	5
023005	Electrical & Mechanical Engineering Systems	4	-	2	6	25	10	75	2.5	25	3.0	135	4
023052	Industrial Exposure(Assessment at institute level)+	-	-	-	-	-	25	-	-	-	-	25	1
013054	General Proficiency#	-	-	4	4	-	25	-	-	-	-	25	1
	Total	22	-	26	48	125	150	475	-	250	-	1000	30

\#   General Proficiency will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS, cultural activities and discipline etc.

\+   Industrial visit compulsory at minimum 2 industry or department.

Note: 1- Each period will be 50 minutes. 2- Each session will be of 16weeks. 3- Effective teaching will be at least 12.5 week + Industrial Visit

Branch Code - 02

THIRD SEMESTER
CIVIL ENGINEERING

FLUID MECHANICS

Subject Code - 023006

L	T	P
5	-	2

RATIONALE

Subject of Fluid Mechanics helps in solving fluid flow problems in the field of Civil Engineering. The subject deals with basic concepts and principles in hydrostatics, hydro kinematics and hydrodynamics and their application in solving fluid - mechanics problems. It also includes the study of various Hydraulic Pumps.

DETAILED CONTENTS

1. Introduction   **(2 periods)**

   1.1 Fluids: Real and ideal fluids

   1.2 Fluid Mechanics, Hydrostatics, Hydrodynamics, Hydraulics

2. Properties of Fluids (definition only)   **(6 periods)**

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

   2.2 Units of measurement and their conversion

3. Hydrostatic Pressure   **(12 periods)**

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

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

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

4. Measurement of Pressure   **(7 periods)**

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

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

5. Fundamentals of Fluid Flow   **(11 periods)**

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

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

5.3 Types of hydraulic energy: Potential energy, kinetic energy, pressure energy. Hydraulic gradient line and total energy line.

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

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

(10 periods)

6.1 Venturimeter and mouthpiece

6.2 Pitot tube

6.3 Orifice and Orifice meter

6.4 Current meters

6.5 Notches and weirs (simple numerical problems)

7. Flow through Pipes   **(13 periods)**

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

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

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

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

7.5 Pipes in series and parallel

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

8. Flow through open channels   **(14 periods)**

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

8.2 Discharge through channels using

   i) Chezy's formula (no derivation)

   ii) Manning's formula (no derivation)

   iii) Simple Numerical Problems

8.3 Most economical channel sections (no derivation)

   i) Rectangular

   ii) Trapezoidal

   iii) Simple Numerical Problems

8.4 Head loss in open channel due to friction

9. Hydraulic Pumps and Turbines   (5 periods)

Hydraulic pump, reciprocating pump, centrifugal pumps, overview of different types of turbines. (No numerical and derivations) (May be demonstrated with the help of working models)

PRACTICAL EXERCISES

i) To verify Bernoulli's Theorem

ii) To find out venturimeter coefficient

iii) To determine coefficient of velocity (Cv), Coefficient of discharge (Cd) and Coefficient of contraction (Cc) of an orifice and verify the relation between them

iv) To perform Reynolds's experiment

v) To verify loss of head in pipe flow due to

     a) Sudden enlargement

     b) Sudden contraction

     c) Sudden bend

vi) Demonstration of use of current meter and pitot tube

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

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

1. Jagdish Lal, "Fluid Mechanics and Hyraulics" Delhi Metropolitan Book Co. Pvt Ltd.

2. Modi, P.N, and Seth, SM; "Hydraulics and Fluid Mechanics", Standard Publishers Distributors, Delhi

3. Khurmi R.S, "Hydraulics and Hydraulics Machines", S Chand and Co., Delhi

4. Likhi SK., Laboratory Manual in Hydraulics, Delhi Wiley Eastern.

5. Birinder Singh , "Fluid Mechanics", Kaptian Publishing, New Delhi.

6. Sarao A.S., "Fluid Mechanics", Tech. India Publication, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	2	2
2	6	7
3	12	17
4	7	11
5	11	12
6	10	12
7	13	17
8	14	18
9	5	4
Total	**80**	**100**

ENGINEERING MECHANICS

Subject Code - 023001

L	T	P
4	-	2

RATIONALE

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

DETAILED CONTENTS

1. **Introduction** (08 periods)

   1.1 Concept of engineering mechanics definition of mechanics, statics, dynamics, Application of engineering mechanics in practical fields, Definition of Engineering Mechanics.

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

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

   1.4 Concept of rigid body, scalar and vector quantities

2. **Laws of forces** (12 period)

   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 and characteristics of a force

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

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

   2.4 Free body diagram

   2.5 Equilibrant force and its determination

   2.6 Lami's theorem (concept only)

   [Simple problems on above topics]

3. Moment   (10 period)

3.1 Concept of moment

3.2 Moment of a force and units of moment

3.3 Varignon's theorem (definition only)

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

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

3.6 Concept of couple, its properties and effects

3.7 General conditions of equilibrium of bodies under coplanar forces and beams, fixed support, roller support, over hanging, Uniformly distributed load, point load, varying load

3.8 Position of resultant force by moment

[Simple problems on the above topics]

4. Centre of Gravity   (08 period)

4.1 Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies

4.2 Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion

4.3 Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed

[Simple problems on the above topics]

5. Moment of Inertia   (06 periods)

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.

6. Simple Machines   (10 periods)

6.1 Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines

6.2 Simple and compound machine (Examples)

6.3 Definition of ideal machine, reversible and self locking machine

6.4 Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency

6.5 System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency

6.6 Working principle and application of wheel and axle, different pulley blocks, simple screw jack, worm and worm wheel, single and double winch crab. Expression for their velocity ratio and field of their application

[Simple problems on the above topics]

7. Analysis of Trusses   (10 periods)

7.1 Concept of perfect, redundant and deficient frames

7.2 Assumptions and analysis of trusses by:

   i) Method of joints

   ii) Method of sections

   iii) Graphical method

LIST OF PRACTICALS

1. Verification of the following laws:
   a) Parallelogram law of forces
   b) Triangle law of forces
   c) Polygon law of forces

2. To verify the forces in different members of jib crane.

3. To verify the reaction at the supports of a simply supported beam.

4. To find the Mechanical Advantage, Velocity Ratio and efficiency in case of an inclined plane.

5. To find the Mechanical Advantage, Velocity Ratio and efficiency of a screw jack.

6. To find the Mechanical Advantage, Velocity Ratio and efficiency of worm and worm wheel.

7. To find Mechanical Advantage, Velocity Ratio and efficiency of single purchase crab.

8. To find out center of gravity of regular lamina.

9. To find out center of gravity of irregular lamina.

10. Verification of forces in a framed structure.

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. Text Book of Applied Mechanics by C.M.Verma, JPN publication Meerut.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	08	10
2	12	20
3	10	20
4	08	10
5	06	10
6	10	10
7	10	20
Total	**64**	**100**

BASIC SURVEYING

Subject Code : 023002

L	T	P
4	-	6

RATIONALE

The important functions of a Diploma Civil Engineer includes the jobs of preliminary & detailed surveying, plotting of survey data, preparation of survey maps and setting out works.

While framing the curriculum for the subject of Basic surveying, stress has been given to the development of the skills in chain surveying, compass surveying, levelling that the Civil Engineering diploma holder will normally be called upon to perform. The use of various Minor Instruments in surveying work is also included in the subject.

Practical Exercises are framed so that student would be able to check his work, have an idea of the results and the extent of error in the work done by him. The plotting skills of the students should be developed for various surveys done with necessary adjustment of errors occurred.

DETAILED CONTENTS

1. Introduction   (06 periods)

1.1 Definition & Classifications of Surveys.

1.2 Basic principles of surveying

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

1.4 Instruments used for taking these measurements

2. Chain surveying   (14 periods)

2.1 Purpose of chain surveying, principles of chain surveying and its advantages and disadvantages

2.2 Obstacles in chain surveying

2.3 Direct and indirect ranging, offsets and recording of field notes

2.4 Errors in chain surveying and their corrections

3. Compass surveying   (16 periods)

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

3.2 Concept of following with simple numerical problems:

a) Meridian - Magnetic and true

b) Bearing - Magnetic, True and Arbitrary

c) Whole circle bearing and reduced bearing

d) Fore and back bearing

e) Magnetic dip and declination

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

4. Levelling   (20 periods)

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, Engineers level, Auto level: advantages and disadvantages, use of auto level.

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

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

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

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

4.7 Level book and reduction of levels by

4.7.1 Height of collimation method and

4.7.2 Rise and fall method

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

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

5. Minor Instruments   (08 periods)

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

5.2 Use of planimeter for computing areas.

PRACTICAL EXERCISES

I. Chain surveying:

i) a) Ranging a line

b) Chaining a line and recording in the field book

c) Taking offsets - perpendicular and oblique (with a tape only)

d) Setting out right angle with a tape

ii) Chaining of a line involving reciprocal ranging

iii) Chaining a line involving obstacles to ranging

iv) Chain Survey of a small area.

II. Compass Surveying:

i) a) Study of prismatic and surveyors compass

b) Setting the compass and taking observations

c) Measuring angles between the lines meeting at a point

III. Levelling :

i) a) Study of dumpy level and levelling staff

b) Temporary adjustments of various levels

c) Taking staff readings on different stations from the single setting and finding differences of level between them

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

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

iv) Setting a gradient by dumpy and auto-level

IV. Minor instruments:

i) Demonstration and use of minor instruments like Ceylon Ghat Tracer, Tangent Clinometers, Pantograph, Abney level etc.

ii) Use of planimeter for computing areas.

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

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

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

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

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

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

6. Mahajan, Sanjay "Surveying -I", Tech. Publication, Delhi

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

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

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	06	10
2	14	25
3	16	25
4	20	30
5	08	10
Total	**64**	**100**

BUILDING MATERIAL & CONSTRUCTION

Subject Code : 023004

L	T	P
5	-	4

RATIONALE

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

DETAILED CONTENTS
THEORY

1. Building Stones   **(04 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 stone, Trap, Basalt stone, Lime stone and Slate.

   1.3 Requirements of good building stones

   1.4 Identification of common building stones

   1.5 Various uses of stones in construction

   1.6 Quarrying of stones by blasting and its effect on environment

2. Bricks and Tiles   **(10 periods)**

   2.1 Introduction to bricks

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

   2.3 Manufacturing of bricks

      2.3.1 Preparation of clay (manual/mechanically)

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

2.4 Classification and specifications of bricks as per BIS: 1077

2.5 Testing of common building bricks as per BIS: 3495 Compressive strength, water absorption–hot and cold water test, efflorescence, Dimensional tolerance, soundness

2.6 Tiles

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

2.6.2 Ceramic, terrazzo and PVC tiles, : their properties and uses.

2.6.3 Vitrified tiles, Paver blocks.

2.7 Stacking of bricks and tiles at site.

3. Cement   (4 periods)

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

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

3.3 Properties of cement

4. Lime   (02 periods)

4.1 Introduction: Lime as one of the cementing materials

4.2 Classification and types of lime as per BIS Code

4.3 Calcinations and slaking of lime

5. Timber and Wood Based Products   (7 periods)

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

5.2 Market forms of converted timber as per BIS Code

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

5.4 Properties of timber and specifications of structural timber

5.5 Defects in timber, decay in timber

5.6 Preservation of timber and methods of treatment as per BIS

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

6. Paints and Varnishes (04 periods)

6.1 Introduction, purpose and use of paints

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

6.3 Covering capacity of various paints

6.4 Types, properties and uses of varnishes

6.5 Trade name of different products.

7. Foundations (05 periods)

7.1 Concept of foundation and its purpose

7.2 Types of foundation-shallow and deep

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

7.3 Earthwork

    7.3.1 Layout/setting out for surface excavation, cutting and filling

    7.3.2 Excavation of foundation, trenches, shoring, timbering and de-watering

8. Walls (04 periods)

8.1 Purpose of walls

8.2 Classification of walls - load bearing, non-load bearing, dwarf wall, retaining wall, breast walls, partition walls & cavity walls.

8.3 Mortars & Scaffolding brief description.

9. *Masonry (07 periods)

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

    9.1.1 Bond – meaning and necessity; English, Flemish bond and other types of bonds

9.2 Stone Masonry: 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

    9.2.1 Types of stone masonry: Rubble & Ashlars masonry

10. Arches and Lintels   (06 periods)

10.1 Meaning and use of arches and lintels:

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

10.3 Arches:

    10.3.1 Types of Arches - Semi circular, segmental, elliptical and parabolic, flat, inverted and relieving arch.

    10.3.2 Stone arches and their construction.

    10.3.3 Brick arches and their construction.

10.4 Lintels

    10.4.1 Purpose of lintel

    10.4.2 Materials used for lintels

    10.4.3 Cast-in-situ and pre-cast lintels

    10.4.4 Lintel along with sun-shade or chhajja.

11. Doors, Windows and Ventilators   (05 periods)

11.1 Glossary of terms with neat sketches

11.2 Different type of doors- panel door, flush door, flazed door, rolling shutter, steel door, sliding door, plastic and aluminium doors

11.3 Window – Panel window, glazed windows (fixed and openable) ventilators, sky Light window, Louvers shutters, plastic and aluminium windows.

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

12. Damp Proofing and Water Proofing   (04 periods)

12.1 Dampness and its ill effects on bricks, plaster, wooden fixtures, sources and causes of dampness, damp proofing materials, damp proofing of : basement, ground floor, plinth and walls, special damp proofing arrangements in bathrooms, WC and kitchen, damp proofing for roofs and window sills.

13. Floors   (05 periods)

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

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

14. Roofs   (04 periods)

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

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

15. Stairs   (04 periods)

15.1 Glossary of terms: Staircase, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand-rail, nosing

15.2 Planning and layout of staircase : Relations between resented read determination of width of stair, landing etc

15.3 Various types of layout - straight flight, dog legged, open well, quarter turn, half turn (newel and geometrical stairs), bifurcated stair, spiral stair

16. *Surface Finishes   (05 periods)

16.1 Plastering- classification according to use and finishes like plain plaster, grit finish, rough cast, pebble dashed, concrete and stone cladding etc., dubbing proportion of mortars used for different plasters, techniques of plastering and curing

16.2 Pointing - different types of pointing and their methods

16.3 Application of white washing, colour washing and distempering, polishing, application of cement and plastic paints

16.4 Importance of preparation of surfaces such as hacking, grooving etc before application of surface finishes

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

PRACTICAL EXERCISES:

i) To determine the crushing strength of bricks

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

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

iv) To conduct field test of cement.

v) To determine normal consistency of cement

vi) To determine initial and final setting times of cement

vii)To determine soundness of cement

viii)To determine compressive strength of cement

ix) Demonstration of tools and plants used in building construction.

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

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

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

1- Timbering of excavated trenching

2- Damp proof courses laying

3- Construction of masonry walls

4- Laying of flooring on an already prepared lime concrete base

5- Plastering and pointing exercise

6- Constructing RCC work

7- Pre-construction and post construction termite treatment of building and woodwork

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

1. Gupta, Sushil Kumar, Singla, DR, and Juneja BM; "A Text Book of Building Construction"; Ludhiana, Katson Publishing House.

2. Deshpande, RS and Vartak, GV; "A Text Book of Building Construction"; Poona, United Book Corporation.

3. Rangwala, SC: "Building Construction"; Anand, Charotar Book Stall

4. Kulkarni, GJ; "A Text Book of Building Construction"; Ahmedabad Book Depot

5. Arora, SP and Bindra, SP; "A Text Book of Building Construction"; New Delhi Dhanpt Rai and Sons.

6. Sharma, SK and Kaul, BK; "A Text Book of Building Construction"; Delhi, S Chand and Co.

7. Sushil Kumar; "Building Construction"; Standard Publishers Distributors, Delhi

8. Moorthy, NKR; "A Text Book of Building Construction"; Poona, Engineering Book Publishing Co.

9. SP – 62 Hand Book of BIS

10. B.I.S. – 6313 Part 1, 2, 3

11. National Building Code

12. Handbook of Civil Engineering by PN Khanna

13. Video films on Damp proofing, water proofing, surface finishes

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	4	5
2	10	13
3	4	5
4	2	3
5	7	9
6	4	5
7	5	6
8	4	5
9	7	9
10	6	7
11	5	6
12	4	5
13	5	6
14	4	5
15	4	5
16	5	6
Total	**80**	**100**

BUILDING DRAWING

Subject Code : 023003

L	T	P
-	-	6

RATIONALE

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

DETAILED CONTENTS

Drawing No. 1:   **(2 sheets)**

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

Drawing No. 2:   **(2 sheets)**

Plans of T and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond

Drawing No. 3:   **(2 sheets)**

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

Drawing No.4   **(4 sheets)**

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

Drawing No.5   **(1 sheet)**

Draw at least one sheet using CAD software

Drawing No. 6:   **(2 sheet)**

Drawing plan, elevation of a small building by measurement and foundation detail and sectional elevation.

Drawing No.7   **(4 sheets)**

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

Drawing No. 8   **(2 sheets)**

Drawings of following floors

Cement concrete floors on ground and at first floor

- iv)   Conglomerate (Concrete Flooring)
- v)   Bonded cement concrete flooring
- vi)   Terrazzo flooring
- vii) Ceramic/vitrified tile flooring

Drawing No. 9:   **(1 sheet)**

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

Drawing No.10   **(1 sheet)**

Draw at least one sheet using CAD software

NOTE:

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

RECOMMENDED BOOKS

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

ELECTRICAL & MECHANICAL ENGINEERING SYSTEMS

Subject Code : 023005

L	T	P
4	-	2

RATIONALE

A diploma holder has to assist in activities of installation, operation and maintenance etc of different machines and equipment. These activities are not branch specific and instead require him to know basics of electrical and mechanical engineering. This subject has been included to impart basic knowledge of electrical and mechanical engineering to the students.

DETAILED CONTENTS

PART-A

MECHANICAL ENGINEERING

Theory

1. **Transmission of Power**   (8 periods)

    1.1 Belt Drives:

    Types of belts, belt materials, cross and flat belt drives, advantages of V-belt drive Over flat belt drive.

    1.2 Gears Drives:

    Types of gears (briefly), types of gear trains

2. **Internal Combustion Engines**   (09 periods)

    2.1 Classification of IC engines

    2.2 Working principles of two stroke and four stroke engines

    2.3 Working principles of petrol engine and diesel engines

    2.4 Gas turbines (working principle only)

    2.5 Using principle of prime motor used in high power single phase and three phase generators used in building

3. **Refrigeration and Air Conditioning System**   (8 periods)

    3.1 Different types of refrigeration principles and refrigerants

    3.2 Working of domestic refrigerator

    3.3 Working of Window type AC system

3.4 Working of Split AC System

3.5 Working of Centralized Air Conditioning System

4. Hydraulics   (6 periods)

4.1 Classification of pumps (reciprocating and centrifugal)

4.2 Working principles of both reciprocating and centrifugal pumps

4.3 Turbine: Working principles of impulse turbine and reaction turbine

5. Working principle of lift used in modern building   (1 period)

PRACTICAL EXERCISES IN MECHANICAL ENGINEERING

1. Demonstration and study of main parts of 4 stroke petrol and diesel engines by actually dismantling them (The idea is to acquaint the students with the most common troubles occurring in the engines)

2. Demonstration and study of main parts of 2 stroke petrol engine by actually dismantling it. (The idea is to acquaint the students with the most common trouble occurring in the engines)

3. Demonstration and study of gas turbines through models

4. Demonstration and study of different hydraulic pumps

5. Demonstration and study of various drives for transmission of powers i.e. models of belts and gears.

6. Demonstration and study of air conditioning system in a building

7. Demonstration and study of domestic refrigerating system

8. Demonstration and study of Prime motor used in three phase generating set

PART B

ELECTRICAL ENGINEERING

Theory

1. Basic Quantities of Electricity   (4 periods)

1.1 Definition of voltage, current, power and energy with their units

1.2 Basic of the instruments used for measurement of different electrical quantities such as voltmeter, ammeter, wattmeter, energy meter.

1.3 Connection of the instruments in electric circuit

2. Application and Advantages of Electricity   (3 periods)

   2.1 Difference between AC and DC

   2.2 Various applications of electricity

   2.3 Advantages of electrical energy over other types of energy

3. Various Types of Power Plants   (3 periods)

   3.1 Elementary block diagram of thermal, hydro and nuclear power stations

   3.2 Brief explanation of the principle of power generation in above power stations

4. Transmission and Distribution System   (6 periods)

   4.1 Key diagram of 3 phase transmission and distribution system

   4.2 Brief functions of accessories of transmission line

   4.3 Distinction between high and low voltage distribution system

   4.4 Identification of three phase wires, neutral wires and the earth wire on a low voltage distribution system

   4.5 Identification of the voltage between phases and between one phase and neutral

   4.6 Distinction between three phase and single phase supply

5. Supply from the Poles to the Distribution Board   (4 periods)

   5.1 Arrangement of supply system from pole to the distribution board

   5.2 Function of service line, energy meter, mainswitch, distribution board

6. Domestic Installation   (4 periods)

   6.1 Distinction between light and fan circuits and single phase power circuit, sub circuits

   6.2 Various accessories and parts of installation, identification of wiring systems, such as batton, conduct, caring and coping

   6.3 Common safety measures and earthing

   6.4 Introduction to BIS code of safety and wiring installation

7. Electric Motors and Pumps: (4periods)

   7.1 Definition and various applications of single phase and three phase motors

   7.3 Conversion of horse power in watts or kilowatts

   7.4 Type of pumps and their applications

   7.5 Use of direct online starter and star delta starter

8. Installation of Generators   **(2 periods)**

   8.1 Working of single phase and three phase generators.

   8.2 Installation of generators with panel diagram etc.

9. Electrical circuits idea used in buildings   **(2 periods)**

   9.1 Basic elementary circuit idea of lift, stage lightening, internal wiring for Telephone, internet and PBX.

PRACTICAL EXERCISES IN ELECTRICAL ENGINEERING:

1. Use of Megger:

Objective: To make the students familiar with different uses of different electrical instruments.

2. Connection of a three phase motor and starter including fuses and reversing of direction of rotation.

Objective: Students may be made familiar with the equipment needed to control a three-phase motor

The students must experience that by changing any two phases, the direction of rotation is reversed.

3. Connection of a lamp, ceiling fan, socket outlet, geyser, floor grinder, voltage stabilizer etc.

Objective: Students may be made familiar with the different types of equipment and circuits used in the domestic installations

4. Treatment of electric shock

Note: The teacher may give a demonstration how an electric shock must be treated.

Objective: Students must be trained to treat the persons suffering from an electric shock

5. Demonstration and study of Domestic installation components used in single phase and three phase wiring

6. Demonstration and study of distribution line components

7. Demonstration and study of different electrical circuits used in Generator, Lift, Stage lightening etc.

8. Demonstration and study of distribution board

Note: Students may be asked to study the distribution board in the institution and note down all accessories.

Objective: Students must be made familiar with the distribution board

9. Connections and taking reading of an energy meter (1↗ & 3↗)

Objective: Students may be asked to connect an energy meter to a load and calibrate reading

10. Demonstration and study of submersible motor pump set and its working

Objective: To tell use of the set in water supply and irrigation works.

RECOMMENDED BOOKS

Mechanical Engineering

1. General Mechanical Engineering by M. Adithan; TTTI, Chandigarh

2. Basic Civil and Mechanical Engineering by Jayagopal; Vikas Publications, New Delhi

3. IC Engines and Automobile Engineering by Dr. M.P. Poonia, Standard Publishers, New Delhi

4. Refrigeration and Air Conditioning by R.K. Rajput; S.K. Kataria and sons; Ludhiana

5. Theory of Machines by R.S. Khurmi and J.K. Gupta; S. Chand and Company Ltd., New Delhi

Electrical Engineering

1. Electrical Technology Part 1: Basic Electrical Engineering by Theraja, BL; S Chand and Company, New Delhi

2. Principles of Electrical Engineering by Gupta BR, S Chand and Company, New Delhi

3. Basic Electrical Engineering by Mehta VK; S Chand and Company, New Delhi

4. Basic Electricity and Measurements by Suryanarayan NV and N Delhi; Tata McGraw Hill, 1987, New Delhi

5. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and sons, New Delhi

6. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill, New Delhi

7. Basic Electricity by BR Sharma; Satya Parkashan, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Part-A

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	8	25
2	9	29
3	8	25
4	6	19
5	1	2
Total	**32**	**100**

Part-B

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	4	12
2	3	9
3	3	9
4	6	18
5	4	16
6	4	14
7	4	14
8	2	4
9	2	4
Total	**32**	**100**