

GUJARAT TECHNOLOGICAL UNIVERSITY
COURSE NAME : ELEMENTS OF CIVIL ENGINEERING

1. RATIONALE :

In the era of technology integration, it has become unavoidable to possess the basic knowledge of various engineering disciplines. The advancement in technology is the best on multi technology integration and hence in performance too. The motive of this subject is to enhance the knowledge & skill level in the inter disciplinary area to strengthen the present practices.

This course is specially designed with a view to impart basic knowledge of other conventional disciplines (other than his own discipline). In this course, the Civil Engg. students will study the curriculum of other two disciplines i.e. Mechanical and Electrical Engg. portions of this course. Similarly, Mechanical Engg. students will study the curriculum of other two disciplines i.e. Electrical Engg. and Civil Engg. portions of this course. Similarly, Electrical Engg. students will study the curriculum of other two disciplines

2. SCHEME OF TEACHING

TOPIC NO.	TOPICS	THEORY hrs.	PRACT. hrs.	TOTAL hrs.
1.	Chain and Tape Survey	04	04	08
2.	Compass Survey	03	08	11
3.	Levelling	03	04	07
4.	Interpretation of Civil Engg. Drg.	04	02	06
5.	Site selection for factory buildings	02	02	04
6.	Building Bye-Laws for Industrial building/Sheds	02	—	02
7.	Layout for industrial sheds	02	06	08
8.	Machine foundations	02	—	02
9.	Construction Materials	04	02	06
10.	Strength of cement concrete	02	—	02
	Total	28	28	56

3. OBJECTIVES :-

1. Know the principles of survey
2. Know the components of survey instruments
3. Know the conventional signs and its use in survey drawing.
4. Know the procedure to conduct chain and tape survey (by Chain triangulation method).
5. Understand use of prismatic compass
6. Define : levelling and different terms used in levelling
7. Know the parts and functions of Dumpy level.
8. Interpret simple building drawings
9. Understand importance and provisions of building bye-laws for industrial sheds.
10. Understand the sketch for machine foundation with reference to requirement of equipment.
11. Know the ideal site for an industrial shed for typical industry.
12. Know various construction materials commonly used, their properties, uses and selection
13. Know the approx. market cost of each material and their suitability for the job on the basis of strength, durability, economy etc.
14. Know the various parameters influencing the strength of cement concrete
15. Know the factors to be kept in mind while planning & designing a layout

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for any industrial building.

16. Know rules & provisions for showing details in a layout

4. TOPICS AND SUB-TOPICS

1. CHAIN AND TAPE SURVEY

4 Hrs

- Principles of survey
- Define: Plane surveying
- Purpose of reconnaissance survey
- List of instruments required
- Explain various components of Instruments.
- Use of survey instruments on the field
- Ranging of survey lines
 - * Base line
 - * Tie line
 - * Check line
- Signs used in ranging - types of ranging
- Explain ranging a line on field
- Conventional signs- its importance, types etc.
- Location sketches, key plan, offset, running measurements, selection of stations. Field book, recording, plotting of details to the scale
- Preparation of sheet-using survey details

2. COMPASS SURVEY

3Hrs

- Use of Prismatic compass in surveying .
- Procedure of using compass
- Component parts of compass & functions
- Explain : whole circle bearing (WCB), Fore bearing (F.B.), Back bearing (B.B.)
- Computation of included angles from WCB.
- Computation of correct included angles
- Effect of local attraction
- Establish station from given bearing & length
- Explain the procedure for conducting “Chain and Compass Survey”

3. LEVELLING

3Hrs

- Purpose of levelling
- Define : Temp.bench mark, Back, Intermediate & fore sight, collimation plane, Line of collimation, Height of instrument, Reduced level.
- Procedure of taking out & placing in of levelling instrument in the box.
- Types of levels e.g.Dumpy, Tilting, Wye.
- Temp.adjustments of levels.
- Taking staff readings & recording them in level book correctly
- Computation of reduced levels (RLs)
- Apply arithmetic checks.

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4. INTERPRETATION OF CIVIL ENGG. DRG. 4Hrs

- Define : Building plan, map & distinguish them.
- Methods of projections-first & third angle projections.
- 1st & 3rd angle method of projections used in building drawings.
- Abbreviations, conventions, symbols etc. used for different building components in the drawings.
- Sketch the symbols used in structural drawings.
- Show drawings to develop interpretation ability.

5. SITE SELECTION FOR FACTORY BUILDINGS: 2Hrs

- Various considerations in selecting site for factory building/industrial sheds.
- Sources from where the maps & plans are available
- Various factors influencing location of sites for industrial sheds.
- Probable/Possible areas where site can be located
- Compare the alternative available sites
- Selection of most suitable & economical site for industrial shed/building considering the following salient features:
 - Locally available materials of construction & their approx. cost
 - Labour rates prevailing in that area & its quantity & skills
 - Availability of essential services like water, electricity, fuel, gas, telephone, fax, internet, transport, road network, nearby railway station, airport, port, godowns, transit sheds, job work sheds, marketing agencies, hotels & guest house etc.
- Soil data for sound foundation of structures.
- Application of Government bye-laws & regulations.

6. BUILDING BYE-LAWS FOR INDUSTRIAL SHEDS/BUILDINGS 2Hrs

- Define : Bye-law
- Provisions of bye-laws related to industrial buildings in I.S.
- Application of bye-laws as per IS-1256 explaining the purpose of each bye-law
- Layout of industrial shed using relevant bye-laws.
- Comment on application of bye-laws for industrial sheds & its design.

7. LAYOUT OF INDUSTRIAL - SHEDS 2Hrs

Planning a layout

- Factors affecting planning
- Various considerations like north light, orientation, margins, storages incoming & outgoing materials despatch etc.
- Specific requirement for each
- Comment on a given layout
- Provisions to be made for preparing lay-out
 - * Grouping of working spaces
 - * Rules for parking spaces
- Factors in designing industrial sheds like internal roads, light & ventilation, margins, set back, water and sanitary rooms, recreation & retiring rooms, tool room, tiffin room store room etc.
- Rules for showing details in layout like margins, road width, compound walls and gates,

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north line, machine foundations, trees, electric and telephone poles etc.

8. MACHINE FOUNDATIONS

2Hrs

- Procedure of designing machine foundations.
- its purpose
- Factors to be considered while designing machine foundations like
 - Shear settlement
 - Vibrations, resonance
 - Operating frequency
 - Dead load etc.
- Various types of failures of machine foundations
- Design foundations for simple machine like lathe, compression press, universal testing machine (20 T capacity), electric power hammer etc.
- Provision made by I.S. specifications for machine foundations
 - * Provisions made in I.S.- 2974 - Part - II
 - * Prepare proper foundation plan for IS specifications for the given sample machine.
 - * Precautions to be taken while selecting a design when vibrational forces are predominant.
- Selection of appropriate types of machine foundation identifying governing factor causing failure
- Types of dynamic loads & their effects on foundations
- Selections of appropriate foundation design for withstanding dynamic loads referring IS-2974-Part I and II etc.

9. CONSTRUCTION MATERIALS

4 Hrs

- Various types of construction materials commonly used like :
 - Bricks
 - Stones(natural)
 - Wood
 - Steel(bars and sections)
 - Lime
 - Cements
 - Aggregates
 - Glass
 - Aluminium
 - Paints
 - Water
 - Plastics(PVC)
 - Bitumen(tar) etc.
- Properties of each material & their acceptable standards
- Where they are most suitably used
- Estimated market cost of above referred construction materials
- Select most suitable construction materials for industrial structures with respect to durability, appearance, economy etc.
- Compare the following materials and construction works :
 - * Brick work & stone work, on the basis of strength and economy
 - * Lime & cement, on the basis of strength and economy
 - * Wood & steel (as structural members) on the grounds of

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- strength-weight ratio, life & maintenance
- * Steel & Aluminium, as construction materials
- * Stone work & concrete work, on the basis of strength, economy & weathering effects
- * Wood and PVC, on the basis of durability, weight, maintenance & safety
- * Stone flooring, IPS flooring and granolithic C.C. flooring, in factory areas where heavy loads are expected on floors.

10. STRENGTH OF CEMENT CONCRETE

2 Hrs.

- Ingredients of cement concrete
- Water cement ratio & its effect on the strength of cement concrete
- Relationship of compressive strength of concrete with w/c ratio.
- Draw graph : strength v/s water-cement ratio.
- Effect of degree of compaction on strength of concrete
- Role of % air voids on strength of concrete
- Influence of other parameters on the strength of concrete Parameters like :
 - Aggregate cement ratio
 - Grading of aggregates
 - Size & shape of aggregates
 - Strength & type of aggregates
 - Quantity of materials
 - Compaction
 - Curing method & curing period
 - Workmanship & handling of concrete (mixing, Transporting)
 - Property of cement used

5. List of Laboratory Experiences :

1. Conduct “ Chain and compass survey” (max. 5 stations) (On any Saturday)

- * Practice for ranging, chaining, offsetting, recording field book etc.
- * Practice for working on prismatic compass, Bearing of lines, recording/computing included angles using bearings etc.

Preparing drawing plate using A2 size sheet of ‘chain & compass survey’

2. Spot levelling using a Dumpy Level

- * Practice with the instrument-selecting suitable position for the instrument, temp. adjustments, taking change points (C.P.), reading level staff, recording level book, calculations, arithmetic checks, T.B.M., Reduced levels etc.
- * Interpretation of contour map.

3. Interpretation of Civil Engg. Drawing.

- * The small groups of students be supplied with prints and they will interpret the given drawing for details like - wall thickness, room size, orientation, lighting and ventilation,

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roominess, locations of doors, windows, ventilators, stair-case etc, economy, aspects, effect of elevation, grouping, circulation, built up & plot-area relationship, F.S.I, open spaces, location of W.C & bath, rise & tread, foundation details, abbreviations & conventional signs used, services details, bye-laws applicable etc.(for residential buildings)

After showing this one print for commercial complex and a print for any industrial shed may also be given in the group for further clarity.

4. Visit to an industrial factory building and all details may be taken on paper (On Saturday)
5. Prepare a layout plan of the visited industrial building (not to scale)
6. Given a drawing dimensioned sketch of any small RCC unit/component like lintel, steps, beam, pillar or column etc., the student will calculate the quantity of materials used in making concrete and will find out the rate of concrete per

6. REFERENCES :-

- | | |
|---|-------------------|
| 1. Pumps operation and maintenance | Tyler and Hicks |
| 2. Elements of Workshop Technology (Vol. 1,2) | Hazara chaudhary |
| 3. Theory of Machines | R.C.Patel |
| 4. Heat engine | Shah & Pandya |
| 5. Material Handling equipments | M.Rundenko |
| 6. Material Handling | John Immer |
| 7. Hydraulic Machines | Jagdish Lal |
| 8. Hydraulics | R.C.Patel |
| 9. Text book on Surveying & levelling | T.P.Kanitkar |
| 10. Text book on Surveying & levelling
cubicmeter. | B.C.Punmia |
| 11. Civil Engg. Drawing | Shah,Kale & Patki |
| 12. IS.1256-1967, IS.-962 | Indian standard |
| 13. Engg. Material | S.C.Rangwala |
| 14. IS-2974 part-1 and part-2 | |
| 15. Engg.material | Rajaraman |
| 16. Properties of concrete | A.M.Neville |
| 17. Estimating and costing | B.N.Dutta |
| 18. Estimating and costing | G.S.Birdie |
| 19. Estimating and costing | S.C.Rangwala |
| 20. Planning and designing buildings | Y.S.Sane |
| 21. Planning and designing buildings | Gurucharan Singh |
| 22. Fundamentals of Elect. Engg. | B.L.Theraja |
| 23. Fundamentals of Elect. Engg | V.K.Mehta |
| 24. A Text book of Elect. Engg. | S.L.Uppal |
| 25. Elementary Electrical Engg. | M.L.Gupta |