



**3-Year Diploma Engineering Curriculum and
Syllabus for Civil Engineering (CE)**

FIFTH SEMESTER

A. THEORY

Sl No.	Code Number	Subject	Contact Hours				Credit Point
			L	T	P	Total	
1	TIU-DEN-T301	Career Advancement & Skill Development	3	0	0	3	3
2	TIU-DCE-T301	Building Services	3	0	0	3	3
3	TIU-DCE-T303	Geotechnical Engineering – II	3	0	0	3	3
4	TIU-DCE-T305	Transportation Engineering-I	3	1	0	4	4
5	TIU-DCE-T307	Design of R.C.C. Structures	3	1	0	4	4
6	TIU-DCE-T309	Contracts, Tenders and Valuation	3	0	0	3	3
Total Theory			20				20

B. PRACTICAL

7	TIU-DCE-L301	Surveying Practical - II	0	0	3	3	2
8	TIU-DCE-L303	Road Materials Testing Lab	0	0	3	3	2
Total Practical			6				4

C. SESSIONAL

9	TIU-DCE-S301	AutoCAD in Civil Engineering	0	0	2	2	2
10	TIU-DES-S399	Entrepreneurship Skill Development	0	0	0	0	2
Total Sessional			2				4

Total of Semester 33 31



BUILDING SERVICES

TIU-DCE-T301

L-T-P: 3-0-0

Credits: 3

UNIT 1: ELEMENTS OF PLUMBING

Objectives of plumbing, purpose of plumbing, role of plumber, licensing of plumbers their functions, sewer Air, supply pipes, drainage & vent pipes application for obtaining supply connection. 2 Pipes joints & fittings Introduction.

Types of Pipe – G.I. Pipes, PVC Pipes, Copper pipes, C.I. Pipes, A.C. Pipes, prestressed concrete pipes, joints in pipes, method of fixing pipes such as G.I. fitting C.I. fitting. Valves & Terminal Fittings Types of valves & its purpose, sluice valve, reflux valve, scour valve, Air relief valve, pressure relief valve, gate valves, Bio-taps & stop valve self closing valve. Flush valve, mixing valve.

Sanitary fixture & Building drainage system Building sanitary fittings – water closet, flushing appliances, urinals, washbasins, flushing cisterns, principles of building drainage, siphon action, traps & its types, capacity & sizing of pipe, soil pipe, waste pipe, rain water pipe, system of plumbing, Installation of pipes, testing of pipes.

UNIT 2: VERTICAL NAVIGATION

Lift , Lift floor, Lift Landing, Storey, Nomenclature of Floors & Storey, Total Headroom, Lift Landing, Lift landing door, Lift car, Lift door, Call indicator, Lift suspension ropes, Lift guides, Lift well, Lift pit, Lift well Enclosure, Lift rated load, Lift rated Speed, Lift contrac, Speed, Lift machine, Lift Overhead Beam (Definitions only).

Classification of Lift Passenger lift, Goods Lift, Hospital Lift, Service Lift (Dumb waiter), Fireman's Lift.

Design Considerations Number of Lifts & capacity: Occupated Load, Quantity of service, Quality of Service, Car speed, Determination of handling capacity $[(H=300*Q*100/T*P)$ where $T=Rt/N]$ - Positioning of Lifts =Shape & Size of Lift car-Access to Machine Room & Lift Pits—Safety Measures.

UNIT 3: GENERAL CLASSIFICATION OF BUILDINGS BASED ON OCCUPANCY CRITERIA OF FIRE RESISTANCE

Combustible Material, Occupancy or use Group, Types of construction.

General Requirements of Fire Protection Maximum Height, FAR, Open Spaces: additional Provisions for high rise buildings, Mixed Occupancy, Fire Wall, Fire Stop or enclosure of all openings, Automatic Fire Detection & Alarm system, Fixed fire fighting



Installations/Requirements for A, B & Occupancy buildings :Wet Riser, Wet riser –cum—downcomer, Automatic Sprinkler installation, Static reservoir, Dry riser.

Exit Requirements Types of Fire Exits, General Exit Requirement, Occupant Load, Capacity of Exits, Arrangement of exits: travel distance, Doorways, Corridors & Passageways, Internal Staircases, Fire Escapes or external Stairs, Roof exit, horizontal exits, Fire tower, Ramps.

UNIT 4: VENTILATION AND LIGHTING OF BUILDING

Natural Ventilation Wind action---Stack Effect---Cross Ventilation ----Position of openings ----Size of openings----Control of openings: sashes, canopies, louvers---Humidity control: Wind scoop. Mechanical Ventilation Fans: Propeller & Centrifugal----Installation of Fans: local & Central---Systems of ventilation: exhaust, plenum (positive ventilation) & combined ---- Filters: dry, wet, washing & electrostatic----Determining rate of ventilation--- Mechanical cooling (Heat –Pump circuit): refrigerant, compressor, condenser, pressure release valve, evaporator---refrigerator & Air cooler -----Ton of refrigeration—Simple Air conditioner: Propelling , filtering, washing, humidifying, cooling, dehumidifying, heating or re-heating— Building installation of air conditioners: central handling, local handling & induction system—control systems: sensors, control unit, servo -- mechanisms.

Principles of Lighting Aims of God Lighting –Planning the Brightness Pattern—Considering the Visual task, the immediate background of the task(central field & visual field)and the general surroundings(peripheral field) ---Glare, direct, reflected & veiling—Recommended values of illumination level for homes, restaurants, cinemas, theatres, schools & colleges, hospitals, offices(values only).

4 Day lighting Sources of light of a point inside a building, skylight, externally reflected light, internally reflected light, direct sunlight—working plane, Daylight factor. 4.5 Artificial lighting Necessity of Artificial lighting—Selection of light sources & luminaries depending on general lighting, direct lighting, local lighting --Determination of luminous flux & number of lamps. Lighting Arrester.



GEOTECHNICAL ENGINEERING-II

TIU-DCE-T303

L-T-P: 3-0-0

Credits: 3

UNIT 1: FOUNDATION – types and design criteria

UNIT 2: BEARING CAPACITY OF SOIL

Concept of bearing capacity, ultimate bearing capacity, net ultimate bearing capacity.

Factor of safety and safe bearing capacity and allowable bearing pressure

Terzaghi's analysis and assumptions made and formula

Effect of water table on bearing capacity

Determination of bearing capacity for different foundation (isolated and strip foundation only on homogeneous soil deposits) as per IS code method

Field methods for determination of Bearing capacity- Plate load test and Standard penetration test.

Test procedures as Per IS:1888& IS:2131

Typical values of bearing capacity from building code IS:1904

Basic concept of Soil-Structure interaction. Method of calculation of allowable bearing pressure and settlement criteria (no numerical problems) and permissible values (uniform and differential) of settlement as per relevant IS code

UNIT 3: SHALLOW FOUNDATION

Introduction, general requirements of foundations, types of foundations, contact pressure.

Bearing capacity of soil, modes of failure, bearing capacity theories, factors affecting bearing capacity. Evaluation of bearing capacity from plate load test, cone penetration, standard penetration test and other tests.

Settlement of foundations, immediate and consolidation settlement, allowable settlement.

UNIT 2: PILE FOUNDATION

Introduction, uses of piles, types of piles.

Pile foundations; types of piles, pile capacity, static and dynamic formulae, design of piles groups, pile load test.

UNIT 3: WELL FOUNDATIONS

Introduction, types of wells, components of a well foundation, shapes of wells.

Forces acting on well foundation. Construction of well foundations.



TRANSPORTATION ENGINEERING-I

TIU-DCE-T305

L-T-P: 3-1-0

Credits: 4

UNIT -1 ROAD ENGINEERING:

Importance of road in India. Characteristics of road transport, Scope of highway Engineering
Classification of roads according to Nagpur plan (Location and function), and modified
classification of road by third road development plan(1981-2001) Traffic and tonnage,
Classification of urban roads.
Road patterns

UNIT -2 INVESTIGATION FOR ROAD PROJECT:

Reconnaissance survey, Preliminary survey and Location survey for a road project.
Detailed survey for cross drainage- L-section and C/S sections.
Fixing the alignment of road, factors affecting alignment of road.
Drawings required for road project- Key map, Index map, Preliminary survey plan and detailed
location survey plan, L section and C/S sections cross drainage work, land acquisition plan,
drawing of road intersections
Survey for availability of construction material, location plan of quarries.

UNIT – 3 GEOMETRIC DESIGN OF HIGHWAYS

Camber- definition, purpose, types, IRC – specifications.
Kerbs, traffic separators or medians, road margin, carriage way, road formation, right of way
Design speed- IRC – specifications
Gradient – definition, types, IRC specification.
Sight distances– definition, types, IRC specification.
Curves–Necessity, types– horizontal, vertical and transition curves.
Widening of roads on curves.
Super Elevation – definition, formula for calculating super elevation, minimum and maximum
values of super elevation, and methods of providing super elevation, design of super elevation
Sketching of standard C/S of national highway in embankment and cutting.
Simple problems on geometric design of road.



UNIT – 4 CONSTRUCTION OF ROADS PAVEMENTS AND MATERIALS

Types of road materials and Tests – soil, aggregates, bitumen, Cement Concrete. Test on soil sub grade- C.B.R. test, Test on Aggregate – Los Angeles abrasion, impact, and shape test. Tests on bitumen- Penetration, Ductility and Softening point test.

Pavement – objective of pavement, structure of pavement, function of pavement components, types of pavement.

Construction of earthen road – general terms used- borrows pits, spoil bank, lead and lift, balancing of earthwork.

Soil stabilized roads – necessity, methods of soil stabilization, steps involved in constructing mechanically stabilized road

Water bound macadam roads – materials used, size and grading of aggregates and screening, construction procedure including precautions in rolling.

Construction of bituminous roads - Terms used– bitumen, asphalt, emulsion, cutback, tar, common grades adopted for construction. Types of bituminous surface – prime coat, tack coat, seal coat, Surface dressing – procedure of construction, bituminous penetration macadam, and Bitumen/Tar carpets – procedure of construction.

Cement concrete pavements- Construction procedure and equipments, Construction joints, joint filler, joint sealer.

UNIT – 5 TRAFFIC ENGINEERING

Traffic volume study

Traffic control devices- road signs, marking, Signals, Traffic island.

Highway intersection – a. at grade intersections (non channelized, channelized intersection and traffic rotaries) and b. grade separated or fly over intersections and interchange

Road accident. Building code IS:1904

UNIT – 6 HILL ROADS

Parts and functions of hill road components, types of curves, Hill road formation.

Land slides- causes and prevention.

Structures- drainage structures.

UNIT – 7 INTRODUCTION TO AIRPORT ENGINEERING

Introduction & Role of civil engineer.

Terminology

Layout of airport & function of different units.

Airport Grading and Drainage



DESIGN OF RCC STRUCTURES

TIU-DCE-T307

L-T-P: 3-1-0

Credits: 4

UNIT 1: INTRODUCTION

Principles of design of reinforced concrete members -Working stress, and Limit State method of design.

UNIT 2: WORKING STRESS METHOD OF DESIGN

Basic concepts and IS code provisions (IS: 456 2000) for design against bending moment Balanced, under reinforced and over-reinforced rectangular sections; design of singly reinforced sections.

UNIT 3: LIMIT STATE METHOD OF DESIGN

Basic concepts and IS code provisions (IS: 456 2000) for design against bending moment and shear forces; concepts of bond stress and development length.

Analysis, design and detailing of singly reinforced rectangular, 'T' and doubly reinforced beam sections by limit state method.

Design and detailing of slab panels as per IS code provisions. Design and detailing of continuous beams and slabs as per IS code provisions.

Design and detailing of reinforced concrete short columns of rectangular and circular cross-sections under axial load. Design of short columns subjected to axial load with moments (uniaxial and biaxial bending)– using SP 16.

Design and detailing of reinforced concrete isolated square and rectangular footing for columns as per IS code provisions by limit state method.



CONTRACTS TENDERS & VALUATION

TIU-DCE-T309

L-T-P: 3-0-0

Credits: 3

UNIT-1: PROCEDURE OF EXECUTION OF WORK BY P.W.D.

Organization of P.W.D., functions of their personnel.

P.W.D. procedure of initiating the work, administrative Approval, technical sanction, budget provision.

Methods used in P.W.D. for carrying out works contract method and departmental method, rate list method, piece work method, Day's work method, department method (NMR and casual muster roll.)

UNIT -2: CONTRACT

Definition of contract, objects of contract, requirements of valid 'Contract'

Types of engineering contract - lump sum contract, item rate contract, percentage rate contract, cost plus percentage, cost Plus fixed fee, cost plus variable percentage and cost plus variable fee contract, labor contract, demolition contract, fee contract, Target contract, negotiated contract .

Class of contractor, Registration of contractor.

UNIT – 3: TENDER & TENDER DOCUMENTS

Definition of Tender, Necessity of Tender, Types-Local and Global.

Tender Notice, Points To Be Included While Drafting Tender Notice, Drafting Of Tender Notice.

Meaning of Terms: Earnest Money, Security Deposit, Validity Period, Right To Reject One or All Tenders, Corrigendum To Tender Notice And Its Necessity.

Tender Documents – List, Scheduled A, Schedule B, Schedule C.

Terms Related To Tender Documents – Contract Conditions, Time Limit, Time Extension, Penalty, Defective Material And Workmanship, Termination of Contract, Suspension Of Work, Subletting Of Contract, Extra Items, Escalation, Arbitration, Price Variation Clause, Defect Liability Period, Liquidated And Unliquidated Damages.

Filling the tender by contractor and points to be observed by him.

Procedure of submitting filled in tender document, procedure of opening tender , comparative statement , scrutiny of tenders, award of contract, acceptance letter and work order.

Unbalanced Tender, Ring Formation.



UNIT – 4: ACCOUNTS IN P.W.D.

Various Account Forms and their Uses, Measurement-books, Nominal Muster Roll, Imprest Cash, Indent, Invoice, Bills, Vouchers, Cash Book, Temporary Advance.

Payments to Contractors Mode of payment to the contractor, interim payment and its necessity, advance payment, secured advance, on account payment, final payment, first and final payment, retention money, reduced rate payment, petty advance, mobilization advance.

UNIT – 6: SPECIFICATIONS

Necessity and importance of specifications of an items, points to be observed in framing specifications of an item, types of specification –brief and detailed, standard and manufacturers specification.

Preparing detailed specifications of items in civil engineering works. Standard specification book
Legal Aspects Of Specification.

UNIT – 7: VALUATIONS

Definition, necessity of valuation, Definitions – cost price, value, difference between them, characteristics of value, factors affecting value.

Types of value: - book value, scrap value, salvage, Value, speculative value, distress value, market value, monopoly value, sentimental value, factors affecting value .

Depreciation, obsolescence, sinking fund; Methods of calculation of depreciation – straight line method, Sinking fund method constant percentage method quantity survey method.

Computation of capitalized value, gross income, outgoing, net Income, years purchase. types of outgoing and their percentages.

Valuation of lands & buildings, factors affecting their valuation, Book value method, replacement value method and comparison method. Use of valuation tables .deferred value of land.

Fixation of rent as per PWD practice

UNIT 8: ARBITRATION

Introduction

Procedure of Arbitration



SURVEYING PRACTICAL-II

TIU-DCE-L301

: 0-0-3

Credits: 2

List Of Projects:

1) Theodolite traverse

Survey for a closed traverse of 5-6 sides for a small area. Computation by Gale's traverse table. Plotting the traverse with details on A1 size imperial drawing sheet.

2) Setting out simple circular curve

Field setting of simple circular curve by Rankine's method of Deflection angles(both one theodolite and two theodolite methods) for a given problem supplied by the concerned teachers and plotting the details of curve on A-1 size imperial drawing sheet

3) Layout of the building

Field layout of the same Building plan as used in drawing or estimation subject may be used

4) Determination of the height of institution building with the help of Theodolite

Instructions:-

- 1) Group size for survey practical work should be maximum 15 students. (May be compromised depending on instrument condition and other local condition of the polytechnic)
- 2) Each student from a group should handle the instrument independently to understand the function of different components and use of the instrument.
- 3) Drawing, plotting should be considered as part of practical. A student from a group should know the basic philosophy of raw data collection, data handling, calculation required for plotting and drawing.
- 4) 3-4 full days per project is required for carrying out project work.



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ROAD MATERIALS TESTING LABORATORY

TIU-DCE-L303

L-T-P: 0-0-3

Credits: 2

GROUP I: TEST ON ROAD AGGREGATES

Aggregate impact test

Aggregate crushing test

Los Angeles abrasion test on aggregates

Elongation & flakiness index of aggregates

GROUP II: TEST ON BITUMEN

Determination of grade of bitumen sample

Determination of softening point, flush point and fire point of a bitumen sample

Determination of ductility of bitumen

Determination of viscosity of bitumen

Marshall stability test



AutoCAD IN CIVIL ENGINEERING

TIU-DCE-S301

L-T-P: 0-0-2

Credits: 2

Practicals/ Sessionals:

1. Getting started: Starting up AutoCAD, introduction to the graphics window, command window, drop down menus, toolbars (flying out, calling up and arranging etc of toolbars)
2. Basic command to get started Point and line command, coordinates, relative coordinates, Cartesian and Polar coordinates, drawing a box (as an example rectangle) by coordinate; offset, fillet, extend, divide and trim commands (use to generate walls and opening as exercise).
3. Setting up a drawing unit, drawing size and scale, the grid, drawing limit, drawing with grid and shape, saving a drawing
4. Developing drawing strategies Note: the preliminary exercise should be based on rectangular building because at the initial stage too complex drawing may distract and confuse the students Laying out the walls, exterior walls and interior walls, creating wall opening, creating doors, swing of doors, copying objects, mirroring objects, finishing the swinging doors, drawing a sliding glass door, paneled door (by using fillet command) drawing steps and threshold The balcony (balcony should be circular/elliptical to learn the control over circle and elliptical command) Laying out Kitchen: counter, stove and refrigerator sink Constructing bathroom and W.C. (setting and running object shapes): drawing shower unit, bathing block and W.C.
5. Using layers to organize drawing Layers as an organizing tool, setting up layers, layers and line- type properties dialog box. Assigning objects to layers. Freezing and turning off layers, drawing the header (portion above opening beneath the ceiling), Drawing the roof, Color, Line types and layers. Assigning a color or line-type to an object, making a color and a line-type current. Assigning an individual line-type scale factor
6. Using Blocks and W blocking Making a block for a door, Inserting the door block, Finding the block in a drawing, Using grips to detect a block, Using the list command to detect a block. Using the properties button to detect a block, Creating the window block,



7. inserting the window block, rotating a block during insertion, using guidelines when inserting a block, using point filters to insert a block, using blips to help in inserting block, finishing the windows revising a block, W blocking, inserting a DWG file into a DWG file.

8. Generating elevation Drawing the front elevation, setting up lines for height, trimming lines in elevation, drawing the roof in elevation, putting in the door, step and windows, finishing touches, generating the other elevations, making rear elevation making the left and right elevation, drawing scale consideration, interior elevations/sections

9. Working with hatches and fills Ornamenting the front elevation by hatching looking at hatch pattern special effects modifying hatch pattern providing hatch to floor (for ornamentation)

10. Controlling drawing texts setting up text styles, text and drawing scales, defining text styles, using single line text, placing title of views in the drawing, placing room label in the floor plan, using text in a grid, creating a title block and border, using multiline text

11. Dimensioning in drawing Dimension styles, making a new dimension style, placing dimension on the drawing, horizontal dimension, vertical dimension, other dimension, radial, leader line, angular and aligned dimension modifying dimension text, dimension overrides, dimensioning short distances

12. External references Drawing site plan, using bearings (surveyor's unit), laying out property lines, setting up external reference dialog box, controlling the appearance of an External reference (External reference), Modifying an External reference drawing, application for Externalreference, additional features of external references, the External reference path, binding External reference, other features of External reference

13. Getting families with proper shape Setting up proper space, drawing a border in paper space, designing a title block for paper space, creating floating view path, zooming view part to 1/Xp, working with multiple viewport in paper space, setting u multiple viewports, aligning viewports, finishing drawing setting up viewports to different scale adding text to paper space turning off viewports, tile mode variable and tiled viewpoint



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14. Printing an auto CAD drawing The print / plot configuration dialog box, device and default information, pen parameter, paper size, and orientation, scale rotation and origin, additional parameters, printing a drawing, determining line weight for a drawing setting up the other parameters for the print, previewing a print, printing a drawing with paper space, printing drawing with multiple viewports, printing site plan

Assignments:

1. Draw a wooden door (2/3 rd glazed and 1/3 paneled using sash-bar) with standard dimension
2. Draw a wooden window (raised panel with fanlight) with standard dimension
3. Building drawing

Note 1 : single storied building shall comprise of two rooms, bath, WC, kitchen, front verandah with a provision of staircase and muntz for utilisation of roof space. Same plan used in subject 'Estimating and Costing' as well as 'Civil Engineering Drawing' is to be used.