TECHNO INDIA UNIVERSITY
WESTBENGAL

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
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3-Year Diploma Engineering Curriculum and
Syllabus for Civil Engineering (CE)

THIRD SEMESTER

A. THEORY

Sl No.	Code Number	Subject	L	T	P	Total	Credit Point
1	TIU-DEN-T201	Career Advancement & Skill Development	3	0	0	3	3
2	TIU-DCE-T201	Surveying - I	3	0	0	3	3
3	TIU-DCE-T203	Building Materials and Construction	3	0	0	3	3
4	TIU-DCE-T205	Concrete Technology	3	0	0	3	3
5	TIU-DCE-T207	Mechanics of Structures	4	0	0	4	4
6	TIU-DCE-T209	Hydraulics	3	0	0	3	3
		Total Theory				19	19

B. PRACTICAL

Sl No.	Code Number	Subject	L	T	P	Total	Credit Point
7	TIU-DCE-L201	Surveying Practical - I	0	0	3	3	2
		Total Practical				3	2

C. SESSIONAL

Sl No.	Code Number	Subject	L	T	P	Total	Credit Point
8	TIU-DCE-S201	Civil Engineering Drawing - I	0	0	3	3	2
9	TIU-DES-S299	Entrepreneurship Skill Development	0	0	0	0	2
		Total Sessional				3	4

Total of Semester   25   25

External Expert	External Expert	HOD	Dean	Vice Chancellor

SURVEYING- I

TIU-DCE-T201

L-T-P: 3-0-0   **Credits: 3**

UNIT1: INTRODUCTION

Definition and object of surveying, Primary divisions of surveying, Classification of surveying, Principles of surveying, Measurements, units of measurements, Work of the surveyor, Scales.

UNIT2: LINEAR MEASUREMENTS

Method of determining distances, Instruments for measurements of distance and their use Engineers, Gunter's & metric chain, & other minor instruments, Ranging out survey lines, line ranger, Methods of chaining survey lines: (i) on level ground (ii) on sloping ground, Degree of accuracy in chaining, Errors and mistake in chaining, Numerical Problem on correction in chain and tape measurements.

UNIT3: CHAIN SURVEYING

Triangulation & traversing, Chain triangulation, Reconnaissance, fixing stations well conditioned triangle, Chain line, check line, tie line, base line, etc., Offsets, Booking field notes., Right angle setting in field, use of cross staff and optical square and with chain and tape, Obstacles in chaining, Numerical problems on chaining past obstacles, Plotting. Calculation of areas, Demonstration of Mouza map & use.

UNIT4: COMPASS SURVEYING

Compass traverse, Methods of traversing, Instruments for measurement of angles, Clinometers, Ghat tracer etc.Bearing of lines, designation of bearings-relation of included angles and bearing latitude and departure, Local attraction-causes, effects & elimination, Dip of the needle, magnetic declination-causes, Traversing with chain and compass, Plotting of the traverse, Closing error and its adjustment, Errors in compass surveying, Numerical problems.

UNIT5: PLANE TABLE SURVEYING

Definition, objects and suitability, Equipment necessary in plane table surveying, Advantage and disadvantage of plane table surveying, Setting up of the plane table, Methods of plane table surveying, Three point problem and its solution, Errors in plane table surveying.

UNIT6: COMPUTATION OF AREAS

Methods of computation of areas, Determination of area from Mouza map, Numerical problems.

UNIT7: LEVELLING

Definition of terms used in levelling, Types of levels, Types of levelling staff, Temporary adjustment of dumpy level, Principles of levelling, Bench mark, reduced level, level surface and horizontal surface, Booking staff readings, Classification of levelling, Profile levelling, Numerical Problems.

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BUILDING MATERIALS & CONSTRUCTION
TIU-DCE-T203

L-T-P: 3-0-0   **Credits: 3**

UNIT -1 BUILDING COMPONENTS AND MATERIALS

Building components & their function, Substructure – foundation, plinth, Superstructure – walls, sill, lintel, doors & windows, floor, roof, parapet, beams, columns; Types of structures – load bearing structures, framed Structures, composite structures.

Masonry materials; Building stones- classification of rocks (physical, chemical), requirement of good building stone, dressing of stones, quarrying of stones, artificial or cast Stones; Bricks – conventional bricks, standard bricks, composition of clay brick, strength of bricks, proportions of burnt clay bricks, testing of bricks, special bricks (fire clay brick, refractory brick, hollow blocks, fly ash bricks); Mortars – classifications, lime mortar, cement mortar, composite mortar, special mortars, functions of mortar, proportions, properties of mortar and tests for mortar; Timber & Timber based material - Use of timber, characteristics of good timber, defects in timber, plywood, particle board, veneer, sun mica, artificial timber, rubber wood; Miscellaneous materials - Glass, plastic, fibers, aluminum, steel, galvanized iron, asphalt bitumen etc, micro silica, pvc, cpvc, ppf, waterproofing and termite proofing materials, epoxy resins, polishing materials etc

UNIT 2. CONSTRUCTION OF SUBSTRUCTURE:

Job layout, Site clearance, layout for load bearing structure and framed structure by center line, precautions while marking layout on ground.

Earthwork , Excavation for foundation, Shoring and strutting, earthwork for embankment, material for plinth filling, tools and plants used for earthwork.

Foundation, Types of foundation – open foundations, shallow foundation, stepped foundation, isolated and combined column footing, raft foundation, deep foundation and pile foundation; Pumping method of dewatering, cofferdams, bearing capacity of foundation soil, under reamed pile foundation.

UNIT 3: CONSTRUCTION OF SUPERSTRUCTURE

Stone masonry - Terms used in stone masonry – facing, backing, hearting, through stone, Corner stone, point to be observed in construction of stone masonry, mortars for stone masonry, tools and plants used for stone masonry, col-grout masonry.

Brick masonry - Common terms used in brick masonry, requirements of good brickwork, bonds in brick masonry (English, flemish, stretcher and header bonds, junction of wall – main wall to main wall and main wall to partition wall only), brick laying, line level and plumb of brickwork,

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striking and raking of Joints, lead and lift, precautions in brick masonry, tools and plants used in brick masonry, pointing, comparison between brick and stone masonry. Hollow concrete block masonry, composite masonry, Cavity wall- purpose and construction.

Doors and windows; Doors -components and construction of panelled doors, battened doors, flush doors, collapsible doors, rolling shutters, revolving doors, glazed doors, sizes of door, PVC door; Windows - component and construction of fully panelled, partly panelled and glazed, glazed wooden, steel, aluminum windows, sliding windows, louvered window, ventilators, cement grills, protective treatment for doors and windows, fixtures and fastenings for doors and window, sill, lintel and weather shed - functions, types and construction.

Vertical communication - Means of vertical communication – stair case, elevator, ramp, requirement of good staircase, types of staircase, fabricated stair.

Scaffolding and shoring- Purpose, types of scaffolding, process of erection and dismantling; purpose and types of shoring, underpinning, safety precautions.

UNIT 4: BUILDING FINISHES

Floors and roofs - floor finishes - shahabad, kota, marble, granite, kadappa, ceramic tiles, vitrified, mosaic tiles, chequered tiles, glazed tiles, pavement blocks, concrete floors, premix floor, skirting and dado, terrazzo flooring, IPS flooring; Process of laying - process of laying and construction, finishing and polishing of floors.

Roofing materials – AC sheets, G.I sheets, plastic sheets, fibre sheets, Mangalore tiles etc. Steel trusses. Timber trusses, R.C.C. slab

Water Proofing Treatment, Introduction, material required for water proofing and its specifications, Terrace and basement water proofing, Precautions to be taken while water proofing.

Termite Proofing, Introduction, general principles of termite proofing, Methods of termite proofing, Material used in termite proofing treatment.

Damp Proofing, Sources of dampness & its effects, Material used for damp proofing, Methods of damp – proofing. Damp proofing treatment in building such as basement, floors, walls.

UNIT 5: WALL FINISHES

Plastering – necessity of plastering, single coat plaster, double coat plaster, special plasters stucco plaster, Plaster board and wall claddings. Precaution to be taken while plastering, defects in plaster.

Pointing – necessity, types and procedure of pointing.

Painting – necessity, surface preparation, method of application, selecting suitable painting material, white wash and colour wash.

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CONCRETE TECHNOLOGY

TIU-DCE-T205

L-T-P: 3-0-0   **Credits: 3**

UNIT1: CONSTITUENT MATERIALS

Cement-Different types-Chemical composition and Properties-Tests on cement-IS Specifications-Aggregates-Classification-Mechanical properties and tests as per BIS Grading requirements-Water-Quality of water for use in concrete.

UNIT2: CHEMICAL AND MINERAL ADMIXTURES

Accelerators-Retarders-Plasticisers-Super plasticizers-Water proofers-Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline-Their effects on concrete properties.

UNIT3: PROPORTIONING OF CONCRETE MIX

Principles of Mix Proportioning-Properties of concrete related to Mix Design-Physical properties of materials required for Mix Design-Design Mix and Nominal Mix-BIS Method of Mix Design-Mix Design Examples.

UNIT4: FRESH AND HARDENED PROPERTIES OF CONCRETE

Workability-Tests for workability of concrete-Slump Test and Compacting factor Test-Segregation and Bleeding-Determination of Compressive and Flexural strength as per BIS-Properties of Hardened concrete-Determination of Compressive and Flexural strength-Stress-strain curve for concrete-Determination of Young's Modulus.

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MECHANICS OF STRUCTURES

TIU-DCE-T207

L-T-P: 4-0-0   **Credits: 4**

UNIT -1: ELASTIC CONSTANTS & PRINCIPAL STRESSES

Volumetric strain due to uni-axial force and change in volume, Biaxial and tri-axial stresses and volumetric strain & change in volume, Definition of bulk modulus, volumetric strain. Relation between modulus of elasticity, modulus of rigidity and bulk modulus.Definition of principal planes & principal stresses, Principal planes & stress due to bi-axial stress system & due to state of simple shear. (Analytical method and by Mohr's circle diagram)[simple numerical problems]

UNIT-2: SHEAR FORCE AND BENDING MOMENT

Shear force and bending moment diagrams for simply supported beams, overhanging beams and cantilever subjected to couples and uniformly varying load point of contra flexure (simple numerical problem)

UNIT – 3 STRESSES IN BEAMS

Bending Stresses in Beams: Concept of pure bending, theory of simple bending, assumptions in theory of bending, neutral axis, neutral plane bending stresses and their nature, bending stress distribution diagram, moment of resistance. Application of theory of bending to symmetrical and unsymmetrical sections. (rectangular, circular, T-section and I-section) [simple numerical problems] Shear stresses in beams: Shear stress equation (no deduction), meaning of terms in equation, shear stress distribution for rectangular, hollow rectangular, circular and hollow circular sections, T-section and I-section [Stresses in Beams] Relation between maximum shear stress and average shear stress. [simple numerical problems] Introduction to concept of torsion, its formula (no deduction) and signification of notation used, some practical application [simple numerical problems]

UNIT- 4: ANALYSIS OF TRUSSES

Definition frames, classification of frames, perfect, imperfect, redundant and deficient frame, relation between members and joints, assumption in analysis. Method of joint, method of section and graphical method to find nature of forces.

UNIT 5: STRAIN ENERGY

Types of loading – gradual, suddenly applied load & Impact load. Definition of strain energy, modulus of resilience and proof resilience. Comparison of stresses due to gradual load, sudden load and impact load. Strain energy principle: Castiglino's theorems, Deflection analysis of determinate structures.

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UNIT -6: DIRECT AND BENDING STRESSES

Concept of direct and eccentric loads, eccentricity about one principal axis, nature of stresses, maximum and minimum stresses, resultant stress distribution diagram. Condition for no tension or zero stress at extreme fiber, limit of eccentricity, core of section for rectangular and circular cross sections. Columns, pillars and chimneys of uniform section subject to lateral wind pressure, coefficient of wind resistance, stress distribution at bases.

UNIT -7 SLOPE AND DEFLECTION

Concept of slope and deflection, stiffness of beam. Relation between slope, deflection and radius of curvature, differential equation (no derivation), double integration method to find slope and deflection of simply supported and cantilever beam.

UNIT –8 BEAMS WITH ONE OR BOTH END FIXED

Concept of fixity, effect of fixity, advantages and disadvantages of fixed beam. Principle of superposition and its application in finding fixed end moments for beam subjected to UDL over entire span, point load and moment at any point, drawing SF and BM diagram

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HYDRAULICS

TIU-DCE-T209

L-T-P: 3-0-0   **Credits: 3**

UNIT -1 PROPERTIES OF FLUID

Definition of fluid, Difference in behaviour of fluid with respect to solids. Introduction to fluid mechanics and hydraulics, Branches of hydraulics- Hydrostatics and hydrodynamics. Physical properties of fluid Mass density, Weight density, Specific volume, Specific gravity, Surface tension and capillarity, capillary rise, Compressibility, Viscosity, Newton's law of viscosity – Dynamic and kinematics viscosity., classification of different types of fluid with respect to its viscosity, concept of adhesion and cohesion and related physical phenomenon, Ideal and Real liquids

UNIT -2 HYDROSTATIC PRESSURES

Free liquid surface, Definition of pressure and its SI unit, Hydrostatic pressure at point, Pascal's law Variation of pressure in horizontal and vertical direction in static liquid, Pressure diagram, concept of pressure prism and its use in determination of force developed on the immersed surface or surface in contact with the liquid. Concept of pressure head and its unit, concept of gauge pressure, atmospheric pressure and absolute pressure, Conversion of pressure head of one liquid in to other, devices for pressure measurements in pipes – Piezometer, U-tube manometer, Bourdon's pressure gauge, their principle of working and limitations, Measurement of pressure difference using differential manometer – U-tube differential manometer and inverted U-tube differential manometer. Numerical Problems.

Total hydrostatic pressure and centre of pressure, Determination of total pressure & centre of pressure on vertical & inclined faces of dams, sluice gates, sides and bottom of water tanks, determination of total hydrostatics pressure & centre of pressure on sides and bottom of tank containing two liquids, determination of net hydrostatic pressure and centre of pressure on vertical surface in contact with liquid on either side. Numerical Problems.

UNIT – 3 FUNDAMENTALS OF FLUID FLOW

Concept of flow, Gravity flow and pressure flow. Types of flow – steady and Unsteady, uniform and non-uniform and their combination with practical example, Laminar and turbulent. various combinations of flow with practical examples, Reynolds number and its application, one, two and three dimensional flow, description of flow pattern - stream line, pathline, stream tube, streak line Basic principles of fluid flow – principle of conservation of mass, principles of conservation of energy and conservation of momentum, concept of control volume, discharge and its units, Continuity equation for fluid flow, Datum head, pressure head, velocity head and total head, Bernoulli's theorem (no deduction, statement only), Loss of head and modified Bernoulli's

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theorem, limitation of Bernouli's theorem, Impulse momentum theorem, Numerical Problems based on the above principles. Concept of flow net and its properties, stream line and equipotential line and their salient features and practical use of flow net

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UNIT – 4 FLOW OF LIQUID THROUGH PIPES

Loss of head due to friction, Darcy-Weisbach Equation, Friction factor, relative roughness. Moody's diagram and its use. Common range of friction factor for different types of pipe material. Minor loss of head in pipe flow- loss of head due to sudden contraction, sudden expansion, gradual contraction & expansion (no deduction), at entrance and exit of pipe, in various pipe fittings, pipes in series and parallel equivalent pipe – Dupuit's equation, numerical problem.

UNIT – 5 FLOW THROUGH OPEN CHANNEL

Types of channels- artificial & natural, purposes of artificial channel, Different shapes of artificial channels, Geometrical properties of channel section – wetted area, wetted perimeter, hydraulics radius, Prismatic channel sections, steady- uniform flow through prismatic channel section. Chezy's equation and Manning's equation for calculation of discharge through an open channel, common range of values of Chezy's constants and Manning's constant of different types of channel surfaces, Most economical channel section, conditions for most economical channel sections – for rectangular and trapezoidal section. Concept of specific energy, Froud's number and its significance. Alternate depth, expression for critical depth, critical velocity and minimum specific energy, Critical, sub-critical and supercritical flow in channel, physical phenomenon, numerical problems, hydraulic jump its occurrence in field, uses of hydraulic jump, equation for sequent depth, simple numerical problems.

UNIT – 6 FLOW MEASURING DEVICES

Velocity measuring devices for open channels, Floats-surface, subsurface and float rod Pitot tube – principle, expression for velocity, Current meter-cup type & propeller type (simple numerical problems). Discharge measuring devices for channels Notches -Types of notches, expression for discharge. Francis formula, end contraction and velocity of approach Weirs - Broad crested weir, ogee spillway and expression for discharge. Flumes - Venturi flume, standing, wave flume, expression for discharge. Velocity area method for measurement of discharge through open channels. Discharge measuring devices for pipes. (simple numerical problems)
Venturimeter – Component parts, principle of working, Study and use of venturi meter, Flow through orifice Orifice- Definition and use, Types of orifice - based on various criteria. Coefficient of contraction, coefficient of velocity and coefficient of discharge, Relationship between them. Discharge through small sharp-edged circular orifice and large orifice (discharging free condition), Determination of hydraulic coefficient of orifice, Orificemeter – component parts, working principles, study and use of orificemeter, Numerical.

UNIT – 7 HYDRAULIC MACHINES

Introduction to hydraulic machines

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SURVEYING PRACTICAL- I

TIU-DCE-L201

: 0-0-3   **Credits: 2**

UNIT1: CHAIN & COMPASS TRAVERSE SURVEY

A Simple Closed Traverse Of 5-6 Sides Enclosing A Building
Reconnaissance, preparation of index map, selection of station and finalisation of station, taking FB & BB of lines, ranging a line, chaining a line, calculation of included angles, angular error adjustment, closing error and its balancing by Bowditch method, taking offset with chain and tape, setting out right angles, locating details and plotting them on a A1 size imperial drawing Sheet.

UNIT2: PROFILE LEVELLING SURVEY

Running a longitudinal section for a length of 500 m for a road/canal /railway   alignment. Cross section shall be taken suitably. Plotting plan, L- section including profile leveling and Cross section on a A1 size imperial drawing sheet.

UNIT3: BLOCK CONTOURING

A block of 100 x 150m with spot levels at 10x10m plotting the contours (indirect method) on A-1 size imperial drawing sheet with a contour interval suitable for the site.

UNIT4: PLANE TABLE SURVEYING

Demonstration of accessories and other function; centering, levelling and orientation of plane table; traversing by plane table and adjustment of closing error graphically; plane surveying of a small area including filling in details by radiation and intersection method on a A1 size imperial drawing sheet

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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CIVIL ENGINEERING DRAWING- I

TIU-DCE-S201

L-T-P: 0-0-3   **Credits: 2**

UNIT 1 PLANNING OF BUILDING

Principles of planning of Residential and Public building. Space requirements and norms for various units of Residential and Public building.

Drawing of line plans for Residential and Public building. Development of line plan – ground floor plan and roof plan with provision for drainage layout Elevation (front elevation)

Two Sectional elevation (section must pass through stair-case, bath WC, kitchen and front verandah) Site plan Foundation details (trench plan, section of main wall and a partition wall/ isolated footing with tie beam if provided)

Drawing various types of doors and windows etc. used in construction

UNIT – 2 CULVERTS

Introduction to culvert & it's different components and types and specific use along with demonstration of a model.

Half sectional plan and half sectional elevation and side view of a single span slab culvert

Half sectional elevation of a single span two Hume-pipe culvert

UNIT – 3 STEEL CONNECTIONS

Plan elevation and side view of stanchion connected with base plate with gusset plate in concrete foundation.

Connection of beam with column , primary beam with secondary beam of varying depth and column splicing.

Practical:

1. Prepare line plans of Residential and Public Buildings
2. Prepare Detailed Plans, Elevations, Sections and other working drawings for the buildings.

Plate 1 to 3 are to be submitted as 'Term Work' during semester

Skills to be developed: *Intellectual Skills:* Read and interpret the building drawings

Plan residential and public buildings

Apply the building rules, regulations and byelaws.

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Practical:

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Skills to be developed: *Intellectual Skills:* Read and interpret the building drawings
                                        Plan residential and public buildings
                                        Apply the building rules, regulations and byelaws.

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