



**Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore**  
**Shri Vaishnav Institute of Technology and Science**  
**Choice Based Credit System (CBCS) in Light of NEP-2020**  
**Diploma in Civil Engineering**  
**(2024-2027)**

| COURSE CODE | CATEGORY | COURSE NAME                         | TEACHING & EVALUATION SCHEME  |                  |                         |                               |                         | L | T | P | CREDITS |
|-------------|----------|-------------------------------------|-------------------------------|------------------|-------------------------|-------------------------------|-------------------------|---|---|---|---------|
|             |          |                                     | THEORY                        |                  |                         | PRACTICAL                     |                         |   |   |   |         |
|             |          |                                     | END SEM<br>University<br>Exam | Two Term<br>Exam | Teachers<br>Assessment* | END SEM<br>University<br>Exam | Teachers<br>Assessment* |   |   |   |         |
| DTCE501N    | DCC      | Design of<br>Concrete<br>Structures | 60                            | 20               | 20                      | 30                            | 20                      | 3 | 0 | 2 | 4       |

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit.

\***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

**Course Educational Objectives (CEOs):**

The Objective of the course is to develop an understanding of construction materials, focusing on their properties, applications, and selection criteria.

**Course Outcomes (COs):**

The students will be able to

1. Understand different design philosophies including working stress, ultimate load, and limit state methods.
2. Design reinforced concrete beams considering bending, shear, bond, and torsion.
3. Design one-way and two-way slabs under different support conditions.
4. Design compression members and footings using limit state method
5. Design different types of staircases based on structural requirements

**Syllabus**

**UNIT I**

**9 Hrs.**

**Design Methods-** Working stress method, ultimate load, and limit state methods of design; Basic Concept, assumption, Moment of resistance & lever arm.

**UNIT II**

**9 Hrs.**

**Beams-** Design of Reinforced Concrete Beams, singly reinforced rectangular beams; Simply supported, cantilever beams; Effect of shear, bond, and torsion in beam; Design of doubly reinforced rectangular beam.

**UNIT III**

**9 Hrs.**

**Slabs-** Design of Slabs spanning in one direction; Simply supported and continuous slab; Design of Two-way slab.

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#### UNIT IV

**9 Hrs.**

**Compression Member-** Design of columns; Design of uniaxial column; Design of footing by limit state method.

#### UNIT V

**9 Hrs.**

**Staircase-** Design of Staircases with waist slab; Stair slab spanning longitudinally; Stair slab spanning transversely; Design of slab-less staircase (Tread Riser Staircase).

#### Text Books:

1. Reinforced Concrete Design, S. N. Sinha, McGraw Hill Education; Third edition, 2017.
2. Plain and reinforced concrete, B.C. Punamia, Laxmi Publications; Fifth edition, 2015.
3. Design of Reinforced Concrete Structures - N. Subramanian, Oxford, 2013.
4. Reinforced Concrete: Limit State Design, A K Jain, Nem Chand & Brothers, Roorkee, 2012.

#### Reference Books:

1. Structural Design & Drawing, N.K. Raju, CBS Publishers & Distributors, 2019
2. Reinforced Concrete Structure, Pillai & Menon; Tata McGraw Hill, New Delhi, 2017
3. Limit State Design by P.C. Varghese, Prentice Hall of India, New Delhi, 2008

#### List of Experiments.

1. Details of reinforcement in a simply supported RCC beam (singly reinforced and doubly reinforced) with the given design data regarding the size and number of bars, stirrups their size and spacing.
2. Details of reinforcement in a one-way slab with the given design data regarding the size and spacing of bars.
3. Details of reinforcement in a two-way slab with the given design data regarding the size and spacing of bars.
4. Details of reinforcement for a RCC square and circular column with footing.

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- Details of reinforcement of staircase (Staircase with waist slab and without waist slab) with the given design data regarding the size and spacing of bars.
- Prepare mortar using cement and Fly ash or Granite/marble polishing waste in the proportion 1:6 or 1:3.

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| DTCE504N    | DCC      | Soil<br>Mechanics<br>and<br>Foundation<br>Engineering | 60                            | 20               | 20                      | 30                            | 20                      | 3 | 0 | 2 | 4       |

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### Course Educational Objectives (CEOs)

The students will be able to

1. To develop understanding of soil properties, testing methods, and engineering behavior for geotechnical analysis.
2. To enable students to analyze permeability, shear strength, bearing capacity, and select suitable foundations with soil improvement techniques.

### Course Outcomes (COs)

The students will be able to

1. Identify different soil types and subsurface conditions for engineering applications.
2. Interpret index properties and classify soils for construction suitability.
3. Apply permeability and shear strength concepts in foundation analysis.
4. Analyze bearing capacity and select appropriate foundation systems.
5. Evaluate soil compaction and stabilization techniques for field implementation.

### Syllabus

#### UNIT I: Introduction to Geology and Geotechnical Engineering

**8 Hrs.**

Introduction to geology and its importance in civil engineering; Classification of rocks based on origin: igneous, sedimentary, metamorphic; Engineering properties and uses of rocks; Soil formation and basic types of soils; Role of geotechnical engineering in Foundation design, Pavement design, Earth retaining structures, Earthen dams, Introduction to site investigation methods.

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**UNIT II: Soil Properties and Classification**

**9 Hrs.**

Definition, scope, and historical development of soil mechanics; Soil structure: two-phase and three-phase systems; Index properties: water content, void ratio, porosity, unit weight; Determination of index properties (laboratory methods); Atterberg limits and consistency; Soil classification systems (IS classification); Interpretation of soil test results for engineering decisions.

**UNIT III: Permeability and Shear Strength of Soil**

**8 Hrs.**

Permeability, Definition, Darcy's law Coefficient of Permeability and influencing factors, Determination of coefficient of Permeability by constant head and falling head tests. Seepage through soils and practical applications. Shear strength of soil; concept and importance, Components of shearing resistance of soil: cohesion and internal friction. Determination of Shear strength of soil using: Direct shear test, Vane shear test.

**UNIT IV: Bearing Capacity and Foundation Engineering**

**8 Hrs.**

Concept bearing capacity: ultimate, safe, allowable; Terzaghi's bearing capacity theory (basic concept) Field methods: Plate Load Test; Types of foundations: shallow and deep foundations; Selection criteria of foundations based on soil conditions and loading; Earth pressure: active and passive; Rankine's theory: assumptions and applications.

**UNIT V: Soil Improvement and Field Applications**

**9 Hrs.**

Compaction: factors affecting, field and lab methods, Proctor compaction tests, California Bearing Ratio (CBR) test, Soil stabilization techniques: Mechanical Lime, cement, bitumen stabilization Chemical and grouting methods; Case studies on soil improvement techniques in real projects.

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### Text Books

1. Soil Mechanics and Foundation Engineering – Dr. K. R. Arora, Standard Publishers Distributors, New Delhi, 2020.
2. Soil Mechanics and Foundations – Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications, New Delhi, 2017.
3. Geotechnical Engineering – C. Venkatramaiah, New Age International Publishers, New Delhi, 2017.

### References

1. Soil Mechanics and Foundation Engineering – S. K. Garg, Khanna Publishers, New Delhi, 2003.
2. Geotechnical Engineering Laboratory Manual.
3. Relevant Indian Standard Codes.

### List of Practicals

1. Determination of water content of soil
2. Determination of specific gravity of soil
3. Measurement of field density of soil
4. Evaluation of Atterberg limits of soil
5. Performance of grain size analysis of soil
6. Determination of permeability of soil
7. Assessment of shear strength using direct shear test
8. Determination of shear strength using vane shear test
9. Evaluation of California Bearing Ratio (CBR)
10. Determination of bearing capacity using plate load test
11. Preparation and interpretation of soil test report

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**Course Educational Objectives (CEOs):**

The student will have ability:

1. To develop understanding of water sources, population forecasting, and planning of water supply systems.
2. To enable students to analyze water characteristics and apply appropriate treatment methods for water and sewage systems.

**Course Outcomes (COs):**

The students will be able to

1. Identify the sources of surface and subsurface water.
2. Estimate the quantity of drinking water required and wastewater generated.
3. Evaluate the characteristics and required treatment for water and sewage.
4. Draw labelled layout for water supply scheme and sewage treatment system.
5. Understand treatment processes of water and wastewater.

**Syllabus**

**UNIT I**

**9 Hrs.**

**Sources, Demand and Quality of water:** Water supply schemes: Objectives, Sources of water: Sur-face and Subsurface sources of water, Intake Structures, Factors governing the location of an intake structure, Types of intakes.

Demand of water: Factors affecting rate of demand, Variation in water demands, Forecasting of population, Methods of forecasting of population, (Simple problems on forecasting of population), Design period.

Quality of water: Need for analysis of water, Characteristics of water- Physical, Chemical and Biological, testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, MPN, Sampling of water, Water quality standards as per IS 10500.

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## UNIT II

**9 Hrs.**

**Purification of water:** Objectives of water treatment, Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, process of coagulation, types of sedimentation tanks, Clariflocculator.

Filtration – Mechanism of filtration, classification of filters: slow sand filter, rapid sand filter. Construction and working of slow sand filter and rapid sand filter, operational problems in filtration. Disinfection: Objective, methods of disinfection, Chlorination, forms of chlorination, types of chlorination practices, residual chlorine and its importance, Flow diagram of water treatment plants.

## UNIT III

**8 Hrs.**

**Conveyance and Distribution of water:** Building water supply systems, Introduction to plumbing layouts, choice of pipe material, Types of joints & Types of valves- their use, location and function on a pipeline, Distribution of water: Methods of distribution of water- Gravity, pumping, and combined system, Service reservoirs - functions and types, Layouts of distribution of Water-Dead end system, grid iron system, circular system, radial system; their suitability, advantages, and disadvantages.

## UNIT IV

**10 Hrs.**

**Domestic sewage and System of Sewerages:** Building Sanitation: Necessity of sanitation, Necessity to treat domestic sewage, Definitions Sewage, sullage, types of sewage. Definition of the terms related to Building Sanitation Water pipe, Rainwater pipe, Soil pipe, Sullage pipe, Vent pipe. Building Sanitary Fittings-Water closet – Indian and European type, flushing cistern, wash basin, sinks, Urinals. Trap types, qualities of good trap. Systems of plumbing - one pipe, two pipe, single stack, choice of system. Principles regarding design of building drainage, inspection, and junction chambers, their necessity and location.

Systems of Sewerage and Sewer Appurtenances: Types of Sewers, Systems of sewerage, self-cleansing velocity and non-scouring velocity, Manholes and Drop Manhole-component parts, location, spacing, construction details, Sewer Inlets, Street Inlets.

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## UNIT V

**9 Hrs.**

**Characteristics and treatment of Sewage:** Analysis of sewage: Characteristics of sewage, B.O.D., C.O.D. and its significance., Central Pollution Control Board Norms for discharge of treated sewage, Objective of sewage treatment and flow diagram of conventional sewage treatment plant. Treatment of Sewage: Screening, Types of screens, Grit removal, Skimming, Sedimentation of sewage, Aerobic and anaerobic process, Sludge digestion, trickling filters, Activated sludge process, Disposal of sewage, Oxidation Pond, Oxidation ditch.

### Text Books:

1. Environmental Engineering (Vol. I) Water Supply Engineering- S.K. Garg, Khanna Publishers. (37<sup>th</sup> Edition).
2. Environmental Engineering (Vol. II) Sewage Waste Disposal and Air Pollution Engineering - S.K. Garg, Khanna Publishers. 2024 (43<sup>rd</sup> Edition).
3. Sewage Treatment & Disposal & Waste Water Engineering by Dr. P. M. Modi. Vol. II, 17th Edition, Standard Book House Since 1960, 2020.

### References:

1. Water Supply Engineering - B.C. Punmia - Laxmi Publications (P) Ltd. New Delhi (2nd edition, 2019)
2. Environmental engineering -II - B. C. Punamia, Laxmi Publications (P) Ltd. New Delhi .2019
3. Water Supply & Sanitary Engineering- G.S.Birdie, J.S.Birdie – Dhanpat Rai Publishing. 2026
4. Environmental Engineering – N N Basak, - McGraw Hill Publishers. 2017

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**List of Experiments.**

1. Determine pH value of given sample of water.
2. Determine the turbidity of the given sample of water.
3. Determine suspended, dissolved solids and total solids of given sample of water.
4. Determine the dissolved oxygen in a sample of water.
5. Determine the optimum dose of coagulant in given raw water sample by jar test.
6. Determine B.O.D. of given sample of sewage.
7. Determine pH value of given sample of sewage.
8. Determine C.O.D. of given sample of sewage.
9. Draw sketches of various valves used in water supply pipeline.
10. Draw a sketch of one pipe and two pipe system of plumbing

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**Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore**  
**Shri Vaishnav Institute of Technology and Science**  
**Choice Based Credit System (CBCS) in Light of NEP-2020**  
**Diploma in Civil Engineering**  
**(2024-2027)**

| COURSE CODE | CATEGORY | COURSE NAME                       | TEACHING & EVALUATION SCHEME  |                  |                         |                               |                         | L | T | P | CREDITS |
|-------------|----------|-----------------------------------|-------------------------------|------------------|-------------------------|-------------------------------|-------------------------|---|---|---|---------|
|             |          |                                   | THEORY                        |                  |                         | PRACTICAL                     |                         |   |   |   |         |
|             |          |                                   | END SEM<br>University<br>Exam | Two Term<br>Exam | Teachers<br>Assessment* | END SEM<br>University<br>Exam | Teachers<br>Assessment* |   |   |   |         |
| DTCE404N    | DCC      | Water<br>Resources<br>Engineering | 60                            | 20               | 20                      | 0                             | 0                       | 3 | 0 | 0 | 3       |

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit.

\***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

**Course Educational Objectives (CEOs):**

The students will be able to:

1. Understand principles of irrigation, hydrology, and water resources engineering
2. Analyze crop water requirements and reservoir-related parameters
3. Interpret basic hydraulic structures and their functional components in practice

**Course Outcomes (COs):**

After completion of the course, students will be able to:

1. Understand and analyze hydrological processes and rainfall–runoff relationships
2. Estimate crop water requirements and irrigation parameters
3. Identify and explain types and components of dams and spillways
4. Identify and interpret diversion headworks, canals, and irrigation structures with basic drawings

**Syllabus**

**UNIT I**

**6 Hrs.**

**Irrigation:** Irrigation engineering, advantages and ill effects of over irrigation; types of irrigation projects; methods of irrigation.

**Reservoir & Structures:** Theory of reservoir and canal structures, weirs and barrages, lift irrigation schemes (suitability, advantages, limitations); capacity of reservoir, area-capacity curve; introduction to dams, weirs, barrages with practical examples

**UNIT II**

**6 Hrs.**

**Hydrology:** Hydrological cycle; rainfall, rain gauges and stations; types of rain gauges; average rainfall calculation; runoff definition, factors affecting runoff; estimation of runoff by various methods; basic interpretation of hydrological data

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### UNIT III

**6 Hrs.**

**Water Requirement of Crops:** Cropping seasons and crops in Madhya Pradesh; crop period, base period, duty, delta and their relationships; CCA, GCA, intensity of irrigation; crop rotation; assessment of irrigation water.

**Reservoir Planning:** Survey data for irrigation projects; area-capacity curve; silting of reservoir, rate and control; practical understanding of irrigation planning parameters

### UNIT IV

**6 Hrs.**

**Dams and Spillways:** Types of dams; earthen and gravity dams; components and functions; seepage through embankment and foundation, seepage control; failure of earthen dams and remedial measures.

**Gravity dams:** Profiles, cross-section, drainage gallery, joints; high and low dams.

**Spillways:** Definition, function, location, components; identification through typical drawings

### UNIT V

**6 Hrs.**

**Diversion Head Works:** Weirs and barrages – components, functions, layout; canal head regulators, silt excluders and ejectors.

**Canals:** Classification, canal lining (definition, purpose, types, advantages); cross drainage works, canal falls, escapes, regulators and outlets.

Basic identification of structures using standard drawings and field examples

### Textbooks:

1. Irrigation and Waterpower Engineering by B.C. Punmia, Laxmi Publications (2021).
2. Water Resources Engineering: Irrigation Engineering & Hydraulic Structures by S.K. Garg, Khanna Publishers (2017).
3. Irrigation and Water Resources Engineering by G.L. Asawa, New Age International (2015).
4. Engineering Hydrology by K. Subramanya, McGraw Hill Education (2024).

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**Reference Books:**

1. Hydraulic Structures by P. Novak, CRC Press (2012).
2. Irrigation Engineering and Hydraulic Structures by S.K. Sharma, S. Chand Publication (2017).
3. Water Resources Engineering by Larry W. Mays, Wiley India (2011).

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