

| GANPAT UNIVERSITY                   |                     |    |                 |    |                                     |                   |    |           |       |
|-------------------------------------|---------------------|----|-----------------|----|-------------------------------------|-------------------|----|-----------|-------|
| FACULTY OF ENGINEERING & TECHNOLOGY |                     |    |                 |    |                                     |                   |    |           |       |
| Programme                           | Diploma Engineering |    |                 |    | Branch                              | Civil Engineering |    |           |       |
| Semester                            | V                   |    |                 |    | Version                             | 1.0.0.0           |    |           |       |
| Effective from Academic Year        |                     |    | 2020-21         |    | Effective for the batch Admitted in |                   |    | July 2018 |       |
| Subject code                        | 1CI2502             |    | Subject Name    |    | CONCRETE TECHNOLOGY                 |                   |    |           |       |
| Teaching scheme                     |                     |    |                 |    | Examination scheme (Marks)          |                   |    |           |       |
| (Per week)                          | Lecture(DT)         |    | Practical(Lab.) |    | Total                               |                   | CE | SEE       | Total |
|                                     | L                   | TU | P               | TW |                                     |                   |    |           |       |
| Credit                              | 3                   | 0  | 1               | 0  | 4                                   | Theory            | 40 | 60        | 100   |
| Hours                               | 3                   | 0  | 2               | 0  | 5                                   | Practical         | 30 | 20        | 50    |

**Pre-requisites:**

The students should have adequate knowledge of the subject Engineering Materials so that they can understand the subject better.

**Course Learning Outcomes:**

The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes:

CO1. Evaluate physical properties of cement sand and aggregates.

CO2. Describe proper method for making and curing of concrete.

CO3. Measure important properties of fresh and hardened cement concrete including NDT and Design concrete Mix as per IS method.

CO4. Explain properties of various types of Admixtures and their utility and Explain various types of special concrete and their use.

The practical should be carried out in such a manner that students are able to acquire different learning outcomes from covered course.

**Course Content**

| Name of UNIT                                   | Unit Content  | Unit Learning Outcomes   | Marks | Hr |
|--|---|--|-------|----|
| <b>UNIT – 1<br/>MATERIALS FOR<br/>CONCRETE</b> | 1.1 Importance of cement in preparation of concrete, chemical compound of ordinary Portland cement, Bougue’s compounds and its functions<br>1.2 Types and Grades of cement and its uses<br>1.3 Physical properties- Fineness, consistency of Cement, IST & FST, Soundness & Compressive Strength of cement and its I.S. Requirements, Its Importance & their related Test as per Indian Standards<br>1.4 Role of Coarse & Fine Aggregates in Concrete, Classifications of aggregate on the basis of its size, shape, texture and weight Sieve Analysis, Water Absorption Specific Gravity of Fine Aggregate & Coarse Aggregate, Coarse Aggregate Impact Value, Crushing | 1a Evaluate physical properties Of cement.<br>1b Evaluate Physical Properties of sand and aggregates used In concrete.<br>1c Test quality of water used in Concrete. | 10    | 08 |

|                                       |  |  |    |    |
|---------------------------------------|--|--|----|----|
|                                       | <p>Value &amp; Abrasion Value, Flakiness &amp; Elongation Index, its importance &amp; their related Test as per Indian Standards</p> <p>1.5 Requirements of quality for water in concrete.</p>   |  |    |    |
| <b>UNIT – 2<br/>FRESH CONCRETE</b>    | <p>2.1 Fresh concrete and its properties - Workability, harshness, Segregation and Bleeding.</p> <p>2.2 Factors affecting workability</p> <p>2.3 Methods of measurement of workability Slump Test &amp; Compaction Factor Test</p> <p>2.4 Relation between workability and Strength of concrete</p> <p>2.5 Methods of mixing of concrete – Hand &amp; Machine Mixing and its Transportation and Placing</p> <p>2.6 Methods of compaction of concrete and its suitability</p> <p>2.7 Factors affecting compaction.</p> <p>2.8 Curing and its importance, its methods and suitability</p> <p>2.9 Effect of curing on development of Strength of concrete</p>   | <p>2a Evaluate workability, harshness, segregation and bleeding properties of fresh concrete.</p> <p>2b List the factors affecting Workability.</p> <p>2c Describe methods of measurement of workability, slump test &amp; compaction factor test.</p> <p>2d Describe methods of mixing of concrete.</p> <p>2e Describe methods of compaction of concrete.</p> <p>2f Describe methods of Curing.</p> <p>2g List Effect of curing on development of strength of concrete.</p> | 10 | 09 |
| <b>UNIT – 3<br/>ADMIXTURES</b>        | <p>3.1 Admixtures and its benefits, Types of Admixtures - Accelerator and Retarder Plasticizer and Super Plasticizer Water roofing and Air entraining admixture</p> <p>3.2 Utility of Admixtures</p>   | <p>3a Explain properties of various types of concrete</p>  | 05 | 03 |
| <b>UNIT – 4<br/>HARDENED CONCRETE</b> | <p>4.1 Hardened Concrete and its Properties</p> <p>4.2 Compressive Strength ,Tensile Strength, Bond Strength, Flexure Strength Durability, impermeability</p> <p>4.3 Factors affecting Compressive Strength</p> <p>4.4 Creep of Concrete &amp; its effect, factors affecting Creep</p> <p>4.5 IS Test Procedure to find Compressive &amp; Tensile Strength of Concrete, Acceptance Criteria, Mean Strength &amp; Standard Deviation</p> <p>4.6 Durability of Concrete &amp; factors affecting it</p> <p>4.7 Economy of Concrete &amp; factors affecting it</p> <p>4.8 Methods of Non Destructive Test of Concrete Rebound Hammer Test, Ultrasonic Pulse Velocity Test</p> <p>4.9 Importance of NDT</p> | <p>4a Evaluate Properties of Hardened Concrete.</p> <p>4b Describe the steps to conduct Non Destructive Test of Concrete.</p>  | 10 | 09 |

|  |   |   |           |           |
|--|---|---|-----------|-----------|
| <p><b>UNIT – 5<br/>CONCRETE MIX<br/>DESIGN</b></p>                                   | <p>5.1 Factors affecting quality of concrete, Advantages of Quality control<br/>5.2 Concrete Mix Design and its importance<br/>5.3 Nominal Mix and Design Mix<br/>5.4 Factors affecting concrete mix design<br/>5.5 Different methods of Mix Design and its suitability<br/>5.6 I .S. method to design a concrete mix as per IS 10262-2009.<br/>5.7 Example of Mix design as per I .S method</p>  | <p>5a Design Concrete Mix as per IS method.</p>   | <p>10</p> | <p>06</p> |
| <p><b>UNIT – 6<br/>SPECIAL<br/>CONCRETE &amp;<br/>CONCRETING<br/>TECHNIQUES</b></p>  | <p>6.1 Light weight concrete<br/>6.2 Plum concrete<br/>6.3 Fibre reinforced concrete<br/>6.4 Polymer concrete<br/>6.5 High density concrete<br/>6.6 No fines concrete<br/>6.7 Ferro cement<br/>6.8 Fly ash concrete<br/>6.9 Pumped Concrete<br/>6.10 Ready mix concrete</p>   | <p>6a Explain various types of special concrete and their use</p>   | <p>05</p> | <p>04</p> |
| <p><b>UNIT – 7<br/>PREVENTION &amp;<br/>REPAIR<br/>TECHNIQUES<br/>FOR CRACKS</b></p> | <p>7.1 Deterioration of concrete and<br/>7.2 Corrosion of reinforcement<br/>7.3 Types of deteriorations and its effects<br/>7.4 Prevention of concrete deterioration<br/>7.5 Effect of corrosion of reinforcement in concrete and remedial<br/>7.6 Types, causes and remedies of concrete cracks before hardening<br/>7.7 Types, causes and remedies of concrete cracks after hardening<br/>7.8 Prevention of cracks<br/>7.9 Materials for repair of cracks<br/>7.10 Methods used for repair of cracked</p> | <p>7a Explain various types of cracks in concrete structures and their causes.<br/>7b Explain methods to prevent and repair the cracks.</p> | <p>10</p> | <p>06</p> |
|  |   | <p>Total</p>  | <p>60</p> | <p>45</p> |

| List of Practicals |      |   |
|--------------------|------|---|
| No.                | Unit | Name of Practical   |
| 1                  | I    | Compressive strength test of cement   |
| 2                  | I    | Test the cement for soundness.  |
| 3                  | I    | Grading of Fine and Coarse Aggregate.   |
| 4                  | I    | Determine Flakiness Index of aggregates.  |
| 5                  | I    | Determine Elongation Index of aggregates.   |
| 6                  | I    | Determine Crushing Value for Aggregates.  |
| 7                  | I    | Determine Impact Value for Aggregates.  |
| 8                  | II   | Measurement of Workability of fresh concrete( Slump Test , Compaction Factor Test ) |
| 9                  | IV   | Compressive strength test of Concrete.  |
| 10                 | IV   | Demonstrate Non-destructive Test on Concrete.                                       |
| 11                 | V    | Design concrete Mix as per IS Method.   |

| List of Instruments / Equipments / Trainer Board |  |
|--|--|
| 1  | Oven                                       |
| 2  | Sieve Shaker                               |
| 3  | Slump Cone                                 |
| 4  | Mortar Mixer                               |
| 5  | Table Vibrator                             |
| 6  | Weighing Scales                            |
| 7  | Rebound Hammer                             |
| 8  | Le-Chatellier Apparatus                    |
| 9  | Compaction Factor Apparatus                |
| 10   | Compression Testing Machine                |
| 11   | Different types of Concrete Moulds         |
| 12   | Laboratory Concrete Mixer ( Motorized )    |
| 13   | IS sieves for Fine & Coarse aggregates     |
| 14   | Length and Thickness Gauges for Aggregates |

| List of Text Books |  |              |                       |
|--------------------|--|--------------|-----------------------|
| No                 | Title of Books                           | Authors      | Publication           |
| 1                  | Concrete Technology: Theory and Practice | M. S. Shetty | S. Chand & Co. Ltd    |
| 2                  | Concrete Technology                      | M.L.Gambhir  | Tata McGraw Hill Ltd. |

| List of Reference Books |                          |                 |                                       |
|-------------------------|--------------------------|-----------------|---------------------------------------|
| No                      | Title of Reference Books | Authors         | Publication                           |
| 1                       | Concrete Technology      | P. Kumar maheta | McGraw Hill                           |
| 2                       | Concrete Technology      | A R Santhakumar | Oxford university press-<br>new Delhi |

| Link of Learning Web Resource |  |
|-------------------------------|--|
| 1                             | <a href="http://www.indianconcreteinstitute.org">www.indianconcreteinstitute.org</a> |
| 2                             | <a href="http://www.sciencedirect.com">www.sciencedirect.com</a>                     |
| 3                             | <a href="http://www.researchgate.net">www.researchgate.net</a>                       |
| 4                             | <a href="http://www.nptel.ac.in">www.nptel.ac.in</a>                                 |