GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: CONCRETE TECHNOLOGY
(COURSE CODE: 3350602)

Diploma Programme in which this course is offered	Semesterinwhich offered
Civil Engineering/ Transportation Engineering	5th Semester

1. RATIONALE

Cement mortar and concrete are the most widely used construction materials. It is difficult to use another material for construction which is as versatile as concrete. It is the material of choice where strength, impermeablity, durability, performance, fire resistance and abrasion resistance are required.

Concrete is generally a site-made material unlike other materials of construction and as such can vary to a great extent in its quality, properties and performance owing to use of natural materials except cement. The knowledge of concrete and its properties in the plastic condition and in hardened condition are highly important in order to make Civil Engineering Structure safe and serviceable.

2. COMPETENCY(Programme Outcomes (POs) According to NBA terminology)

The course content should be taught and implemented with the aim to develop with different types of skills so that students are able to acquire following competencies:

1. Comprehend Engineering Properties / characteristics of Concrete with respect to Construction and Engineering Applications
2. Determine various properties & parameters of concrete
3. Evaluate Engineering Properties / characteristics of concrete for their suitability for Engineering Structures

3. TEACHINGAND EXAMINATION SCHEME

Teaching Scheme (InHours)			TotalCredits (L+T+P)	Examination Scheme				
				Theory Marks		PracticalMarks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
03	00	02	05	70	30	20	30	**150**

Legends:L- Lecture;**T-** Tutorial/TeacherGuidedStudentActivity;**P -** Practical; **C –**Credit;**ESE**-End SemesterExamination;**PA**-ProgressiveAssessment

4. COURSE DETAILS

Unit	Major LearningOutcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topicsand Sub-topics
UNIT-I **MATERIALS FOR CONCRETE**	1. Understand and Evaluate Cement and Its Physical Properties 2. Understand and Evaluate Aggregates and Its Physical Properties 3. Understand importance of Quality for Water in Concrete	**1.1 Importanceofcementinpreparation Of concrete , Chemical compound of Ordinary Portland cement ,** Bo**ugue's compounds and its functions** **1.2 Types and Gradesofcementandits uses** **1.3 Physicalproperties- 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** **2.1 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 Value & Abrasion Value , Flakiness & Elongation Index, its importance & their related Test as per Indian Standards** **3.1 Requirementsofqualityfor waterin concrete.**
UNIT-II **FRESH CONCRETE**	1. Understand & Evaluate Properties of Fresh Concrete	1.1 Fresh concrete and its properties - Workability , harshness, Segregation and bleeding 1.2 Factors affecting workability 1.3 Methods of measurement of workability – Slump Test & Compaction Factor Test 1.4 Relation between workability and strength of concrete 1.5Methods of mixing of concrete – Hand & Machine Mixing and its Transportation and Placing 1.6 Methods of compaction of concrete and its suitability 1.7 Factors affecting compaction 1.8 Curing and its importance , its methods and suitability 1.9 Effect of curing on development of strength of concrete

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
UNIT-III **ADMIXURES**	1. Explain various types of Admixtures and its utility	1.1 Admixturesanditsbenefits , Typesof Admixtures - AcceleratorandRetarder Plasticizer and Super Plasticizer Waterproofing and Air entraining admixture 1 . 2 Utility of Admixtures
UNIT-IV **HARDENED CONCRETE**	1. Understand & Evaluate Properties of Hardened Concrete 2. Understand Non Destructive Test of Concrete	1.1 Hardened Concrete and its Properties – Compressive Strength ,Tensile Strength , Bond Strength ,Flexure StrengthDurability , impermeability 1.2 Factors affecting Compressive Strength 1.3 Creep of Concrete & its effect , factors affecting Creep 1.4 IS Test Procedure to find Compressive & Tensile Strength of Concrete , Acceptance Criteria , Mean Strength & Standard Deviation 1.5 Durability of Concrete & factors affecting it 1.6 Economy of Concrete & factors affecting it 2.1 Methods of Non Destructive Test of Concrete – Rebound Hammer Test , Ultrasonic Pulse Velocity Test 2.2 Importance of NDT
UNIT-V **CONCRETE MIX DESIGN**	1. Design Concrete Mix as per IS method	1.1 Factorsaffectingqualityofconcrete, Advantages of Quality Control. 1.2 ConcreteMix Designandits importance. 1.3 NominalMix andDesignMix. 1.4 Factorsaffectingconcretemix design. 1.5 Differentmethodsof Mix Designand Its suitability. 1.6 I.S.methodtodesigna ConcreteMix Asper IS 10262-2009. 1.7 Example of Mix design as per I.S. method

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
UNIT - VI **SPECIAL CONCRETE & CONCRETING TECHNIQUES**	1. Explain Various types of Special concrete and its use.	1.1 Light weight concrete 1.2 Plum concrete 1.3 Fibre reinforced concrete 1.4 Polymer concrete 1.5 High density concrete 1.6 No fines concrete 1.7 Ferro cement 1.8 Fly Ash concrete 1.9 Pumped Concrete 1.10 Ready mix concrete
UNIT -VII **PREVENTION &REPAIRTECHNIQUES FOR CRACKS**	1. Explain Various types of cracks in concrete structures and its causes. 2. Explain methods to prevent and repair the cracks.	1.1 Deteriorationofconcrete and Corrosion ofreinforcement 1.2 Types of deteriorations and its effects 1.3 Prevention of concrete deterioration 1.4 Effect of corrosion of reinforcement in concrete and remedial 1.5Types,causesandremediesof concrete cracks before hardening 2.1.Types,causesandremediesof Concrete cracks after hardening 2.2 Prevention of cracks 2.3 Materials for repair of cracks 2.4 Methods used for repair of cracked Concrete
UNIT-VIII **MODERNTREND ANDRESEARCH DEVLOPMENTIN CONCRETE TECHNOLOGY**	1. Explain about latest Developments in the field of concrete.	1.1 Familiarizestudentswithlatest researchanddevelopmentinthefield ofconcretetechnology 1.2 List the journals available in the library ,its publishers, Editors and place of publications. 1.3 Name the various authorities in the Field of concrete technology and Theirfieldofspecialization. 1.4 Prepare synopsis of at least one research paper on concrete during the course from various journals

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS(THEORY)

Unit	Unit Title	Teaching Hours	Distribution ofTheory Marks			
			R Level	U Level	A Level	Total Marks
I	**MATERIALS FORCONCRETE**	08	3	8	3	14
II	**FRESH CONCRETE**	08	2	2	8	12
III	**ADMIXURES**	03	2	1	2	05
IV	**HARDENED CONCRETE**	08	2	2	8	12
V	**CONCRETEMIX DESIGN**	05	1	2	6	09
VI	**SPECIAL CONCRETE &CONCRETING TECHNIQUES**	04	1	2	4	07
VII	**PREVENTION&REPAIRTECHNIQUES FOR CRACKS**	04	1	2	4	07
VIII	**MODERNTREND ANDRESEARCH DEVLOPMENT IN CONCRETE TECHNOLOGY**	02	1	1	2	04
Total		42	13	20	37	70

Legends: R = Remember , U = Understand , A= Apply and above Level (Bloom's revised taxonomy)
Note :This specification table shall be treated as only general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

6. SUGGESTED LIST OF EXERCISES/PRACTICAL

Thepractical/exercisesshouldbeproperlydesignedand implemented withan attemptto develop different types of skills(**Course outcomes in psychomotor and effective domain**) so that students are able to acquire thecompetency. Followingis thelist of experimentsforguidance.

S. No.	UnitNo.	Practical/Exercise	Approx. Hrs. Required
1.	I	Soundness of Cement	**02**
2.	I	Grading of Fine and Coarse Aggregate	**02**
3.	I	Flakiness and Elongation Index	**02**
4.	I	Aggregate Crushing Value Test	**02**
5.	I	Aggregate Impact Value Test	**02**
6.	I	Aggregate Abrasion Value Test	**02**
7.	II	Measurement of Workability (Slump, Compaction Factor Test)	**02**
8.	IV	Effect of W/C ratio on Compressive Strength of Concrete	**04**
9.	IV	Split Cylinder Test	**02**
10.	IV	Pull Out Test to determine Bond Strength	**02**
11.	IV	Demonstration of Non-destructive Tests of Concrete	**02**
12.	IV	Project :- Concrete Mix Design as per I. S. Method	**04**
13.		TOTALHOURS	**28**

FIELD VISIT: Arrange field visit to cement factory and Ready Mix concrete plant and prepare a report which should be a part of term work

7. SUGGESTED LISTOFSTUDENT ACTIVITIES

1. **Collect Few Samples & find out different Properties of concrete from nearby site**
2. **Undertake Site visit related to construction site and prepare the report**
3. **Visit to concrete Testing Laboratory for awareness related to other concrete Testing Equipment, concrete Testing Report**

8. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

1. **Show Video Clips of ConcreteTesting, interact with students by asking questions**
2. **Show Picture Clips through Power Point regarding Testing of Concrete and its Commercial report**
3. **Video program on concrete tests – NITTTR - Bhopal**

9. SUGGESTED LEARNING RESOURCES

A. List of Books:

No.	TITLE	AUTHOR	PUBLISHER
1	ConcreteTechnology	M.S.Shetty	S.Chand&co.Ltd
2	ConcreteTechnology	M.L.Gambhir	TataMcGrawHillLtd.
3	PropertiesofConcrete	A.M.Neville	Pitman
4	ConcreteTechnology	Dr.K.T.Krishnaswami	Dhanpatrai&sons
5	ConcreteTechnology	R.S.Vashney	Oxford&IBH Publishingco,Bombay

B. LIST OF RECOMMENDED I.S. PUBLICATIONS:

I.S.269	SpecificationsforO.P.C.
IS.12269	SpecificationsforO.P.C.53Grade
I.S.383	Specificationsfor coarse andfineaggregates
I.S.516	Methodsoftestsforstrengthofconcrete
I.S.2386Part ItoVIII	Methodsoftestsforaggregateforconcrete
I.S.456	CodeofpracticeforplainandR.C.C.
I.S.2340	Methodsforsamplingof aggregatesfor concrete
Sp23	Handbookfor concreteMix Design
I.S.4031	MethodsofphysicaltestsonHydrauliccement
I.S.13311	Methods of non destructive testing of concrete
I.S.1199	Methodsofsamplingandanalysisofconcrete
I.S.10262- 2009	Recommendedguidelinesforconcretemix design

C. List of Major Equipment/Materials

1. Ennore sand of 3 grades 2. Cube Moulds of size 7.07cm 3.Mortar Mixer
4. Compression Testing m/c 5. Le-chatliermould 6. Water bath 7. I.S sieve sets
8. Moulds for Aggregate Crushing and Impact Test 9. Impact test Apparatus
10.Thickness and Length gauge 11. Cube Moulds of size 15cms 12.Slump cone
13. Compaction factor Apparatus 14. Schmidt Rebound Hammer 15. Table Vibrator.

D List of Software/Learning Websites

1. www.issnge.org
2. www.springer.com
3. www.britannica.com
4. www.trb.org
5. www.nptel.ac.in

10. COURSE CURRICULUMDEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

1. **PROF. B G RAJGOR,H.O.D, APP. MECH. , BBIT, V VNAGAR**
2. **PROF. B G BHANKHAR , H.O.D , APP. MECH., GP , AHMEDABAD**
3. **PROF. K K PATEL , H.O.D , APP. MECH. , GP , RAJKOT**
4. **PROF. C H BHATT , LAM , DR. S & S S GANDHI ENGG. COLLEGE , SURAT**
5. **PROF. BHRUGULI H GANDHI , LAM , GGP , AHMEDABAD**

Coordinator and Faculty Members from NITTTR Bhopal

1. **DR.K K PATHAK, PROFESSOR CIVIL, NITTTR, BHOPAL**
2. **DR.M C PALIWAL, PROFESSOR, CIVIL,NITTTR, BHOPAL**