GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering (Part Time)
Subject Code: 2970609
SUBJECT NAME: Precast Construction
SEMESTER-VII

Type of course: Professional Elective Course

Prerequisite: Concrete Technology, Design of Structures, Structural Analysis

Rationale: Building with Precast concrete components is as much old as constructing with concrete. Precast concrete construction however now has increased by leaps bounds and has taken industrialized form owing to development of heavy lifting equipment mechanized steel moulds, automated manufacturing systems. Precast concrete construction these days most sought after construction practice by developers as it facilitates construction, factory production presents excellent conditions for their use. However construction techniques lack wider appreciation due to lack of design instruction at undergraduate level and limited exposure of engineer to design concepts, manufacturing erection stages. The inclusion of this subject aims to provide the engineers with understanding & applications of Precast concrete construction.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1.	**INTRODUCTION**: Detailed description of Precast Concrete Construction. Difference between Precast and Other forms of Concrete construction. Advantages of this form of construction. **Need for Prefabrication:** Principles of prefabrication, Comparison with cast-in-situ construction, types of prefabrication, automation in manufacturing of precast elements, Modular Coordination, Standardization, Transportation , Erection **Materials in Precast Structures** – Mix design, Steel reinforcement, Structural steel, welding, inserts and bolts,	8
2	**Structural Concepts of Precast concrete Systems :** Loads, Load path, Limit states, Precast Concrete building systems, Pre-cast frame analysis, Overview of the Structural Ties,	8
3.	**Design of Precast Reinforced Concrete Components:** **Precast Concrete Floors** : Precast concrete flooring options, flooring arrangements, Structural design (flexural capacity, shear capacity, Bearing capacity) **Precast Concrete Beams** – Types of precast beams, Construction methods, loading arrangements, beam behavior, Composite & Non composite reinforced concrete beams **Precast concrete Columns** – Geometry, Strength and General requirements.	23

	Overview of the design requirements **Precast Concrete walls** – Functions, Types of precast concrete walls (infill shear walls), Distribution of horizontal loadings. **Precast Concrete Connections –** Design, Manufacturing & construction considerations, Types of connections, expansion joints in precast construction, provisions for non-structural fastenings	
4.	**Production Technology & application :** Choice of production setup, manufacturing methods, stationary and mobile production, planning of production setup, storage of precast elements, dimensional tolerances, acceleration of concrete hardening. Hoisting Technology - Equipment for hoisting and erection, techniques for erection of different types of members like beams, slabs, wall panels and columns, vacuum lifting pads. Applications - Designing and detailing of precast unit for factory structures, purlins, principal rafters, roof trusses, lattice girders, gable frames, singe span single storied simple frames, single storied buildings, slabs, beams and columns.	6

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**20**	**20**	**20**	**15**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Precast Concrete Structures by KIM S. ELLIOT, Second Edition, CRC Press, Taylor & Francis Group.
2. Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.
3. The Structural Precast Concrete Handbook 2nd Edition, ISBN : 981-04-3609-2, Building and Construction Authority, May 2001.
4. Mokk. L, (1964), Prefabricated Concrete for Industrial and Public Structures, Publishing House of the Hungarian Academy of Sciences, Budapest.

Course Outcome:

Sr. No.	**CO statement**	**Marks % weightage**
CO-1	Identify the Design Principles, Special Characteristics and Rules associated with Precast Concrete Design and Construction.	25%
CO-2	Compare and Contrast the Design philosophy & construction techniques of Precast and Other forms of Construction	20%

CO-3	Describe the Structural System and load path of precast structures	20%
CO-4	Analyse and Design the Precast Structural elements	25%
CO-5	Choose the Production method and equipment for erection of precast elements	10%

List of Experiments:

1. Determine water absorption of Paver blocks of 3 different shapes of 3 different make and size.
2. Cast in house Precast Solid, Hollow Concrete Blocks and test the cast specimens for Water absorption and Compressive Strength.
3. Prepare a detailed report of Field Visit to Precast Manufacturing unit covering various aspects such as Manufacturing process, Curing, Handling, Stacking, In-house inspection and testing etc.
4. Cast of Wall panels and test the panel in flexure.

Major Equipment:

1. Hot Air Oven
2. Digital Weighing balancing of 10kg capacity
3. Compressive Testing Machine
4. Loading frame
5. Flexural Assembly

List of Open Source Software/learning website:

1. https://precast.org/education/classes/webinars/precast-101/
2. https://www.youtube.com/watch?v=Llrr2tdfLEA
3. https://www.youtube.com/watch?v=uiQzx1YFOBs