

Naan Mudhalvan – Polytechnic – Even Semester 2024-25
4th Semester – Course Curriculum

ABOUT THE COURSE

COURSE NAME:	Concrete Construction Work
TOTAL DURATION:	60 HRS
MODE OF DELIVERY	PHYSICAL CLASSROOM TRAINING AT RESPECTIVE COLLEGES
TRAINER TO STUDENT RATIO:	1:60
TOTAL MARKS:	70 (External) + 30 (Internal) (Final Assessment shall be done by TNSDC)

Table 1

OVERALL COURSE OBJECTIVE:	Design and analyse concrete structures using tools and ensure concrete projects meet strength, safety, and durability standards.
LEARNING OUTCOME:	<ol style="list-style-type: none"> 1. Apply practical skills in using industry-standard software tools, including STAAD Pro, M-Calculator, Concrete Mix Design software, and Microsoft Excel. 2. Design and analyse concrete structures, perform concrete mix designs, and ensure the achievement of the required strength and performance standards.

TABLE 2: MODULE WISE COURSE CONTENT AND OUTCOME

Sl. No	Module Name	Module Content	Module Learning Outcome	Duration (Hrs)
1	Concrete Structural Design and Analysis for beams, columns and slab	Introduction to structural design principles for concrete beams, columns, and slabs. Introduction to STAAD Pro for concrete structural analysis, including load calculation, safety factors, and reinforcement detailing.	Apply the fundamental principles of concrete for superstructure and use STAAD Pro software to perform structural analysis, including load calculation and	12

		Design and analyze concrete beams, and columns. Perform structural load analysis and reinforcement detailing using the software.	safety factor evaluation and develop reinforcement detailing using software tools.	
2	Concrete Structural Design and Analysis for foundation and its types	Design and analyze concrete foundation and its types and perform structural load analysis and reinforcement detailing using the software.	Implement the fundamental principles of concrete for substructure and use STAAD Pro software to perform structural analysis, including load calculation and safety factor evaluation and develop reinforcement detailing using software tools.	12
3	Introduction to Concrete Mix Design	Introduction to Principles of concrete mix design (IS, ACI, British Standard) and factors affecting mix design: workability, strength, durability. Perform concrete mix design using Concrete Mix Design for different strength requirements and to calculate the correct proportions for various grades of concrete.	Develop a solid foundation in concrete mix design and empowering them to adopt software tools and application in concrete design	12
4	Quantity Estimation and Cost	Introduction to Estimation of material quantities for concrete	Estimate material quantities required for concrete construction	12

	Analysis of concrete	construction, Cost analysis and optimization using M-Calculator and how budget planning and cost tracking using Excel	projects accurately and perform cost analysis and optimize concrete mix designs using M-Calculator.	
5	Quality Control and Testing of Concrete	Introduction to the methods for testing concrete strength , including slump, cube, and compression tests. Gain proficiency in using software tools such as Excel for tracking test results , for refining mix designs and analyze concrete test data, compare results to industry standards, and adjust mix designs based on real-world data for optimized performance.	Conduct concrete strength tests, analyze the results using software, and use data to adjust and optimize concrete mix designs effectively.	12

TABLE 3: OVERALL COURSE LEARNING OUTCOME ASSESSMENT CRITERIA AND USECASES

Learning Outcome	Assessment Criteria	Performance Criteria	Use Cases
Learn to develop and design concrete super structure building elements using STAAD Pro to ensure structural stability and code compliance.	-Practical Assessment demonstrating proficiency in super structure design with structural calculations using STAAD Pro	- Demonstrates proficiency in design and analyze structural stability and detailed reinforcement plans.	- Analyze and design a reinforced concrete slab and column using STAAD Pro under specified loads.
Learn to develop and design building foundation concrete sub	-Practical Assessment demonstrating proficiency in substructure	- Demonstrates proficiency in design and analyze structural stability and detailed reinforcement plans for	- Analyze and design a building foundation using STAAD

structures using STAAD Pro to ensure structural stability and code compliance	foundation design with structural calculations using STAAD Pro	substructure building elements.	Pro under specified loads.
Learn to design concrete mixes using software tools to meet specified strength, workability, and durability criteria.	Practical Assessment demonstrating Identify material properties required for concrete mix design and use the Concrete Mix Design Calculator to generate mix proportions for specific grades of concrete (e.g., M20, M25).	Produce accurate mix proportions achieving target strength and workability within $\pm 5\%$ tolerance. Demonstrate adaptability to site-specific conditions by adjusting the mix for on-site requirements.	Design concrete for a multi-story building using Concrete Mix Design Calculator and optimize costs using M-Calculator
Learn to Perform quantity estimation and cost analysis for the concrete structures.	Practical Assessment demonstrating proficiency in Accurate quantity and cost estimation using M-Calculator.	- Demonstrate Cost-effective and feasible project plans for concrete works. Optimize costs while maintaining quality by adjusting mix design parameters in M-Calculator.	- Calculate material quantities for a construction project using M-Calculator and prepare a cost breakdown.
Learn to analyze compression test data and refine mix design for better strength performance.	- Monitor concrete quality using software to track test results (like slump or strength tests). Use data to improve concrete quality.	- Conduct record of quality control tests (e.g., slump test, compressive strength test); and analyze results using software tools like Excel or custom applications.	Conduct basic concrete quality tests (slump test, compressive strength test) and record results. Analyze test data using Excel and recommend adjustments to mix design if required.

TABLE 4: LIST OF INDUSTRY USE CASES (20 PROJECTS THAT COMPREHENSIVELY COVER ALL THE LEARNING OUTCOMES)

S.No	Final Project
1	Mix Design for M20 Concrete
2	Cost Comparison of Concrete Mixes
3	Improving Workability in Concrete
4	Design and cost estimate of a Simple Beam
5	Mix Design for a Slab
6	Construction Quality Control Plan
7	Cost Estimation of a Concrete Column
8	Mix Design for Concrete Pavement
9	Concrete Volume Calculation for a Slab
10	Design of Concrete Slab and quantity estimate
11	Monitoring Concrete Strength Development
12	Recording and Analyzing Slump Test Results
13	Cost Comparison of Different Concrete Grades
14	Structural Design of a Flat Slab System
15	Monitoring and Adjusting Concrete Workability
16	Concrete Quantity and Cost Analysis for an Industrial Shed
17	Project concrete test Scheduling and Quality Tracking

TABLE 5: COURSE ASSESSMENT RUBRICS (TOTAL MARKS: 70)

Assessment Criteria	Describe the Criteria of the Below Category Performance	Total Marks	Fair	Good	Excellent
Structural Analysis and Design Using STAAD Pro Ability to perform concrete structural design using relevant tools	Accurate modeling, analysis, and detailing; all safety standards and codes are fully met.	20	10	15	20
Concrete Mix Design Ability to obtain mix proportions by application of tools and optimize for cost, strength, and durability.	Mix design is precise, optimized for cost and performance; software tools are effectively used.	15	7	12	15
Quantity Estimation and Cost Analysis Perform material quantity calculations and derive quality and cost analysis.	Quantity estimates and cost analysis are accurate; solutions are well-reasoned and cost-effective	15	7	12	15
Quality Control and Monitoring Recording and analysis of quality test results and analyze data.	Test results are accurately recorded and analyzed; actionable recommendations provided.	10	4	7	10
Communication and Reporting	Reports are clear, professional, and well-structured; visuals and outputs effectively presented	15	7	12	15