Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Institute of Technology
Semester-1

Subject: Advanced Concrete Design – METSE11502

Type of course: Major Core

Prerequisite: Elementary design of concrete structures and Concrete Technology

Rationale: Reinforced cement concrete is a popular construction material extensively utilized in the field. The continuous advancement of infrastructure development has led to a surge in the construction of specialized structures worldwide, including bunkers, silos, flat slabs, grid floors, shear walls, corbels, deep beams, and water retaining structures. The course on Advanced Concrete Design is specifically designed for aspiring structural engineering students, providing them with comprehensive knowledge and practical skills to analyze and design these unique structures in accordance with the Indian Standard code of practice.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
4	0	2	5	60	30	10	20	30	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Design and Analysis of Slender Columns** Students will perform a step-by-step design of slender columns, considering material properties, load-bearing capacity, and buckling effects. They will use relevant design codes (e.g., IS 456) to determine appropriate reinforcement and check for stability and serviceability. The final design, including reinforcement detailing, will be submitted on the GMIU Web Portal.	10
2	**Design of Deep Beams and Corbels** Students will analyze and design a deep beam and corbel for a given	10

	loading scenario using relevant design guidelines. They will calculate shear, bending, and deflection and check for compliance with serviceability criteria. The design process will include detailing for shear reinforcement, anchorage, and bearing. The students will submit their designs and justifications on the GMIU Web Portal.	
3	**Design of Bunkers and Silos** Students will design a bunker and silo for agricultural or industrial use, considering material flow properties, wall pressure distribution, and structural integrity. They will calculate the required reinforcement and check for stability and serviceability under different loading scenarios. The design documents and analysis will be submitted on the GMIU Web Portal.	10
Total		**30**

Course Content:

Sr. No	Course content	Hrs	% Weightage
1	Design philosophy, Loads and load combinations, Material Characteristics, Serviceability criteria: Deflection and crack width.	10	15
2	Design of slender columns, Design of Deep Beam and Corbel	10	20
3	Design of Slab Proportioning, analysis and design of flat slab by direct design method and detailing Analysis and design of Grid floors by Rankine Grashoff Method, classical equivalent plate theory and IS:456 method.	12	20
4	Design of Footing Design of rafts, Strip footing and pile cap. Design of Intz type shaft supported water tank	17	30
5	Design of Bunker and Silos Design of Shear Walls, Compression Field Theory for Shear Design, Design against Torsion	11	15
	Total	**60**	**100**

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	NA	NA	NA	NA	NA	NA

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.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Carry out load calculation, analysis, design and detailing of Slender Column, Corbel, Deep beams, flat slabs, water tanks, bunker and silos, Shear Walls as per relevant IS code of practice.,
CO2	Analysis and design of raft foundation, strip footing and pile caps,
CO3	Ensure serviceability criteria for reinforced concrete structural elements.

List of Practical

Tutorial work shall consist of solution of at least five problems from each topic out of which at least half of problems shall be checked by use of standard software.

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of the tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

[1] Advanced Design of Concrete Structures – Krishana Raju N., Tata Mc-Graw Hill, Delhi.
[2] Reinforced Concrete Design – Sinha S. N., Tata Mc-Graw Hill, Delhi.
[3] Reinforced concrete, Vol - I and II – Shah H. J., Charotar Pub., Anand
[4] Reinforced Concrete Design, Pillai S. U. and MenonD., Tata McGraw-Hill, 3rd Ed, 1999.
[5] IS Codes: IS:456, IS:875, IS:1893, IS:4326, IS:13920, IS: 3370, IS: 4995 (I & II), SP:16, SP:34.