Birla Institute of Technology & Science, Pilani
Hyderabad Campus

ACADEMIC – GRADUATE STUDIES AND RESEARCH DIVISION
BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI-HYDERABAD CAMPUS
SECOND SEMESTER 2021-2022

Course Handout Part II

Date: 15-01-2022

In addition to Part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : CE G613
Course Title : ADVANCED CONCRETE STRUCTURES
Instructor-in-Charge : Bahurudeen A

Description: Materials; high strength concrete, flexure analysis and design; shear and diagonal tension; bond and anchorage; serviceability; torsion; columns; joints; indeterminate beams and frames; yield line analysis; strip method for slabs; composite construction; footing and foundations; concrete building system; concrete tall buildings, detailing in concrete structures

Scope and objective of the Course:

This course delivers an enhanced overview on design of reinforced concrete structures. Methods of deign, salient specifications and design details are discussed in the course. Furthermore, the course provides the design details for flexure, shear, torsion, bond and anchorage. Principles and methods of design for salient reinforced concrete members are discussed in the course.

Course Outcomes:

1. On the completion of the course the learner will be able to apply the salient codal specifications for the design of reinforced concrete members.
2. On completion of the course the learner will be able to analyze different sections used in reinforced concrete construction based on the principles of limit state design
3. On completion of the course the student will be able to design and detail for flexure, shear and torsional reinforcement in various sections of reinforced concrete.
4. On the completion of course the student will be able to interrelate specifications and insight on design procedure of limit state.

Text Book:

T1. Varghese PC., Advanced Reinforced Concrete Design, PHI Publication, 2nd Edition, 2005

Reference Books:

R1. Subramanian, N., Design of Reinforced Concrete Structures, Oxford Publishers, 6th Edition, 2018
R2. Krishna Raju, N., Design of reinforced Concrete Structures, CBS Publishers, 4th Edition, 2016

R3. Bandyopadhyay, J.N., Design of Concrete structures, PHI Publisher, 6th Edition, 2018.
R4. Gambhir, M.L., Design of reinforced Concrete structures, PHI Publisher, 8th Edition, 2017.
R5. Pillai and Menon D., Reinforced Concrete design, McGraw Hill Publisher, 3rd Edition, 2009.

Course Plan:

No. of Lectures	Learning Objectives	Topics to be covered	References	SLO
1-6	Outline the basic methods used for reinforced concrete design	Basics; Introduction to methods of design; Working stress method	1, R3	**(h),(j)**
7-9	List important material parameters for concrete and steel reinforcement.	Materials; Reinforcement; High Strength Concrete	2, R5	**(c)**
10-15	Analyse rectangular and flange sections for flexure	Flexure Analysis and Design: Limit state method; Assumptions and flexural strength	4, R2 4, R3	**(e)**
16-19	Recite the design steps for shear reinforcement in order	Shear and Diagonal Tension: Design shear strength; Detailing of shear reinforcement.	5, R2 7, R3	**(e), (k)**
20-24	Draw the cracking pattern due to torsional shear stress for a rectangular section	Torsion: Analysis for torsion and critical section; Detailing of torsional reinforcement.	6, R2 8, R3	**(a), (k), (e)**
25-26	Calculate short term and long term deflections	Serviceability: Short term and long term properties; Deflection	8, R2 9, R3	**(e), (a)**
27-29	Draw provision of development length in RCC beam	Bond and Anchorage: Design bond stress; development length	7, R2 8, R3	**(a), (k)**
30-33	Classify columns based on reinforcement, loading and slenderness ratio	Columns: Failure mode; Design for longitudinal and tranverse reinforcement; Axially, uniaxially and biaxially loaded columns; Design of slender column	11, R2 12, R3	**(a), (e)**
34	List salient specifications for joints	Design specifications for Joints and composite Construction in RCC;	20, T1 19, R1	**(a), (c)** **(c), (j)**

	Summarize the imperative consideration for composite	Indeterminate Beams and Frames	6, R4	
35	Describe assumptions and rule for yield lines	Yield Line Analysis; Analysis of slab design using yoeld line theory	23, T1 4, R4	**(a), (b)**
36-38	List the types of foundation Specify important design specifications	Footing and Foundations: Design consideration	13, R3	**(c)**
39-40	List desirable consideration for good detailing practices	Concrete Building System; Concrete Tall Buildings; Detailing in Concrete Structures	2, R1 20, R1 15, R5	**(d), (j)** **(j)**
Total: 40				

***Student Learning Outcomes (SLOs):**

SLOs are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.

(a) an ability to apply knowledge of mathematics, science and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Remarks
Mid Semester Test	90 min	30	As per Timetable	Closed Book
Term project	-	15	Continuous	Open Book
Take Home	-	15	Continuous	Open Book

Assignments				
Comprehensive Exam	120 min	40	As per Timetable	Closed book

Chamber Consultation Hour: Wednesday 3:00 -4:00 pm

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Notices: Notices will be displayed on the Notice Board of the Civil Engineering Department and Google class room of the course.

Make-up Policy:

1. Prior permission is mandatory in genuine cases. Applications (preferably email/hardcopy) received 24 hours after (in case of medical emergencies) the test will not be entertained. Applications on informal forums will be ignored.
2. Medical emergencies have to be supported by valid certificates to satisfaction of I/C.

INSTRUCTOR-IN-CHARGE
CE G613