



Jordan University of Science and Technology
Faculty of Engineering
Civil Engineering Department

CE920 Special Topics In Structural Engineering** - JNQF Level: 10

First Semester 2024-2025

Course Catalog

3 Credit Hours. This course will provide an in-depth exploration of innovative applications of Fiber-Reinforced Polymer (FRP) composites in flexural strengthening/repair of beams/slabs, shear strengthening of beams, confinement of columns and other engineering considerations. The course will also introduce the existing bond models that explain phenomenon of bond losing between FRP and concrete, design methodologies for FRP-based repairs in structural concrete and the most practical summary of design guidelines and code formulations. This course presents the nonlinear finite element model for RC members strengthened in flexure with FRP materials.

Teaching Method: On Campus

Text Book

Title	FRP Composites for Reinforced and Prestressed Concrete Structures: A Guide to Fundamentals and Design for Repair and Retrofit (1st ed.)
Author(s)	Balaguru, P., Nanni, A., & Giancaspro
Edition	1st Edition
Short Name	1
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
2	Externally Bonded FRP Reinforcement for RC Structures	fib Bulletin 14, 2001	2nd Edition	
3	Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures	ACI	1st Edition	
4	STRUCTURAL RETROFITTING OF CONCRETE BEAMS USING FRP - Debonding Issues	Yasmeen Taleb Obaidat	1st Edition	

Instructor

Name	Prof. YASMEEN OBEIDAT
Office Location	-
Office Hours	Mon : 08:30 - 10:30 Tue : 10:30 - 11:30 Wed : 08:30 - 10:30 Thu : 10:30 - 11:30
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Class Schedule & Room
Section 3: Lecture Time: Mon, Wed : 10:45 - 12:15 Room: U

Tentative List of Topics Covered		
Weeks	Topic	References
Weeks 1, 2	FRP materials	
Weeks 3, 4	Failure mechanisms of FRP strengthened RC members	
Week 4	3.FRP to concrete bond behaviour	
Weeks 5, 6	Bond strength models	
Weeks 7, 8, 9, 10, 11, 12, 13	Design guidelines and code formulations	
Weeks 14, 15, 16	Chosen nonlinear finite element models	

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	Course Outcome Weight (Out of 100%)	Assessment method
Generalize the types of the FRP materials, strength characteristics and exiting FRP strengthening [1L10K1]	10%	
Understand the types of failure modes and causes of failure in repaired/strengthened concrete structures using FRP. [1L10K1]	10%	
Recognize the mechanisms of degradation of FRP-to-concrete bond mechanisms based on variable bond tests [1L10K1]	10%	
Assess the causes of failure modes in repaired/strengthened concrete structures and suggest suitable techniques for prevention. [1L10K1]	10%	
Describe bond behaviour on the simple empirical models, and shear bond slip models [1L10S2]	20%	
Cover the design of bonded FRP systems for flexural strengthening, shear strengthening, confinement, and other engineering considerations. [1L10S1]	20%	
Present the Finite element model for reinforced concrete structures strengthened with FRP materials. [1L10S3]	20%	

Relationship to Program Student Outcomes (Out of 100%)

PI-1a	PI-2a	PI-2b	PI-2c	PI-2d	PI-3a	PI-4a	PI-4b	PI-5a	PI-6a	PI-6b	PI-7a

Relationship to NQF Outcomes (Out of 100%)

L10K1	L10S1	L10S2	L10S3
40	20	20	20

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