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| <b>College of Engineering</b><br><b>Department of Civil Engineering</b> |   |  |
| <b>CE 575 Prestressed Concrete Structures</b>                           |   |   |
| <b>Credit and Contact hours</b>   | 3 / 3 (Lectures), 0 (Tutorials), 0 (Laboratory)   |   |
| <b>Required, or Elective</b>  | Required  |   |
| <b>Course Description</b>   | Prestressing of statically indeterminate structures, prestressing losses; prestressed concrete slabs; partially prestressed concrete beams; members with unbonded tendons; coordination between design and construction techniques in prestressing. Relevant code provisions.   |   |
| <b>Prerequisites or Co-requisites</b>                                   | None  |   |
| <b>Course Learning Outcomes</b>   | Students completing this course successfully will be able to:   |   |
|   | <b>Course Learning Outcomes (CLOs)</b>  | <b>Related Student Outcomes (SO)</b>  |
|   | <b>CLO1.</b> Acquire the knowledge of various methods of prestressing. K1   | <b>SO1</b>  |
|   | <b>CLO2.</b> Analyze prestressed and partially prestressed continuous beams and indeterminate structures. S1  | <b>SO2</b>  |
|   | <b>CLO3.</b> Design prestressed and partially prestressed continuous beams and indeterminate. S4  | <b>SO5</b>  |
|   | <b>CLO4.</b> Design prestressed concrete two-way slabs and circular structures in accordance to the code specifications. S4   | <b>SO5</b>  |
|   | <b>CLO5.</b> Design prestressed concrete bridges in accordance to the code specifications using advanced computer programs. S4  | <b>SO5</b>  |
|   | <b>CLO6.</b> Demonstrate a high level of ethical values, autonomy and responsibility in coursework, assignments and projects. V2  | <b>SO7</b>  |
| <b>Student Outcomes related to this Course</b>                          | SO 1 Recognize advanced engineering knowledge, concepts, and techniques to identify, interpret, and analyze complex and real-life engineering problems.<br>SO 2 Provide solutions for complex and real-life engineering problems through critical thinking and the use of modern engineering tools, and identify their impact on social, global, cultural, environmental, safety, and economic factors.<br>SO 5 Design novel advanced Civil Engineering systems and evaluate their performance, sustainability, and effectiveness for engineering practice and their impact in global, economic, environmental, and societal contexts<br>SO 7 Effectively manage, individually or in groups, specialized tasks and activities in coursework, projects, assignments, and research work with a high level of autonomy and responsibility. |   |

| <b>Topics Covered</b>                          | <b>List of Topics</b>   | <b>Related CLOs</b> |
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|  | 1. Principle and Methods of Prestressing  | <b>CLO1</b>         |
|  | 2. Prestressing Materials: Steel and Concrete   | <b>CLO1</b>         |
|  | 3. Ultimate Strength Analysis and Design of Prestressed and Partially Prestressed Concrete Beams  | <b>CLO2, CLO3</b>   |
|  | 4. Shear Design of Prestressed and Partially Prestressed Concrete Beams   | <b>CLO3</b>         |
|  | 5. Deflection Computation and Control in Prestressed Members  | <b>CLO2, CLO3</b>   |
|  | 6. Computation of Prestress Losses  | <b>CLO2, CLO3</b>   |
|  | 7. Continuous Beams and Indeterminate Structures  | <b>CLO2, CLO3</b>   |
|  | 8. Prestressed Concrete Slabs   | <b>CLO4, CLO6</b>   |
|  | 9. Circular Prestressed Concrete Structures   | <b>CLO4, CLO6</b>   |
|  | 10. Prestressed Concrete Bridges  | <b>CLO5, CLO6</b>   |
| <b>Textbook(s) and Other Required Material</b> | <ul style="list-style-type: none"> <li>• Prestressed Concrete Analysis and Design: Fundamentals by Antoine E. Naaman, Techno Press</li> <li>• Code Requirements for Structural Concrete (ACI 318)</li> <li>• Saudi Building Code (SBC 304)</li> <li>• AASHTO</li> <li>• ACI Manuals of Concrete Practice</li> </ul> |                     |
| <b>Grading System</b>                          | Assignments   | 5%                  |
|  | Lecture Attendance  | --                  |
|  | Mid-term exam   | 30 %                |
|  | Seminar   | 5%                  |
|  | Term Project - Design of Prestressed Structure (Bridge/Building)  | 20%                 |
|  | Final Exam  | 40%                 |
| <b>Instructors</b>                             | Prof. Mohammad Iqbal Khan –Office: 2A83, email: <a href="mailto:miqbal@ksu.edu.sa">miqbal@ksu.edu.sa</a>  |                     |
| <b>Date of Review</b>                          | April, 2025   |                     |