College of Engineering

Department of Civil Engineering

CE 565 Theory of Plates and Shells

Credit and Contact hours	3 / 3 (Lectures), 0 (Tutorials), 0 (Laboratory)
Required, or Elective	Elective
Course Description	Stresses and deformations in a plate element. Theory of thin elastic plates. Classical solution of rectangular and circular plates. Numerical techniques of Rayleigh-Ritz. Large deflection theory of plates. Stresses and deformations in a shell element. Membrane and bending theories of thin shells.
Prerequisites or Co-requisites	None
Course Learning Outcomes	Students completing this course successfully will be able to:

Course Learning Outcomes (CLOs)	Related Student Outcomes (SO)
CLO1. Recognize the behavior of plates and concepts of shells under different types of loading and boundary conditions; formulate equilibrium equations. K1	**SO1**
CLO2. Recognize large deflection theory, buckling of plates, membrane, and bending theories for circular cylindrical, conical, and spherical shells. K1	**SO1**
CLO3. Apply energy and approximate numerical techniques to plates and shells. S1	**SO2**
CLO4. Idealize problems involving plates and shells under different types of loading and boundary conditions, using approximate numerical techniques; e.g. Rayleigh-Ritz method to obtain solutions to various plate problems. S1	**SO2**
CLO5. Solve problems involving cylindrical and spherical dome structures. S1	**SO2**
CLO6. Use appropriate numerical techniques for static and stability analysis of plates. S1	**SO2**
CLO7. Apply available finite element software to model and analyze real plate and shell structure, interpret and present analysis results clearly. S1	**SO2**
CLO8. Demonstrate professional engineering and ethical values in assigned projects and assignments, with high academic integrity. V1	**SO6**

Student Outcomes related to this Course

SO 1 Recognize advanced engineering knowledge, concepts, and techniques to identify, interpret, and analyze complex and real-life engineering problems.

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.

SO 6 Demonstrate scientific integrity, ethical responsibility, and academic values in scientific publications, research projects, and thesis work.

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<tr><td>Topics Covered</td><td>
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<tr><th>List of Topics</th><th>Related CLOs</th></tr>
<tr><td>1. Fundamentals of small-deflection plate bending theory</td><td>CLO1, CLO2, CLO3</td></tr>
<tr><td>2. Bending of rectangular plates</td><td>CLO2</td></tr>
<tr><td>3. Bending of circular plates</td><td>CLO2, CLO3</td></tr>
<tr><td>4. Bending of plates of various shapes</td><td>CLO1, CLO3, CLO4</td></tr>
<tr><td>5. Approximate numerical techniques</td><td>CLO3</td></tr>
<tr><td>6. Large-deflection theory of thin plates-Buckling of plates</td><td>CLO2, CLO6</td></tr>
<tr><td>7. Vibration of plates</td><td>CLO2, CLO3, CLO5</td></tr>
<tr><td>8. Membrane and bending theories of thin shells.</td><td>CLO2</td></tr>
<tr><td>9. A workshop on related topics</td><td>CLO7, CLO8</td></tr>
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<tr><td>Textbook(s) and Other Required Material</td><td>• Eduard Ventsel and Theodor Krauthammer, “Thin Plates and Shells - Theory, Analysis, and Applications”, Marcel Dekker, Inc. 2001.</td></tr>
<tr><td>Grading System</td><td>Written assignments 15%
Lecture Attendance —
Written midterm exam 35%
Project submission 10%
Final exam 40%</td></tr>
<tr><td>Instructors</td><td>Prof. Yassir M. Abbas; Office 2A65 Email: yabbas@ksu.edu.sa</td></tr>
<tr><td>Date of Review</td><td>March 2025</td></tr>
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