

Advanced Analysis of Solids and Structures (ME532)

(Spring 2022, MON/WED 9:00~10:15, Classroom N7-2202)

Instructor: Phill-Seung Lee

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Introduction

The objective of this course is to provide the unified understanding of both solid and structural mechanics. First, the course teaches the fundamental concepts of solid mechanics (deformation, strain, stress, strength, elasticity and plasticity) and the governing equations. Then, a reduction procedure leads the concepts of structural mechanics (tensioning, bending, shearing and twisting) and governing equations for structural members are obtained. Through the lectures, various solution procedures (displacement and stress methods, principle of virtual work, energy methods and direct stiffness method) are introduced to assess the response of solids and structures. Finally, the course deals with further topics on the nonlinear analysis, collapse and structural stability.

Schedule

Week	Contents	Week	Contents
1	Vectors, matrices and tensors	9	Stretching, bending, twisting
2	Deformation and strain	10	Principle of virtual work
3	Deformation and strain	11	Energy methods
4	Momentum balance and stress	12	Direct stiffness method
5	Strength	13	Plasticity
6	Elasticity	14	Incremental nonlinear analysis
7	Solution procedures	15	Collapse analysis
8	Mid-term exam	16	Stability of structures

References: Mechanics and Durability of Solids (FJ Ulm, O Coussy), Finite Element Procedures (KJ Bathe), Inelastic Analysis of Structures (M Jirásek, ZP Bažant), Inelastic Analysis of Solids and Structures (M Kojić, KJ Bathe)

Grade: Homework (20%) + Midterm exam (30%) + Final exam (50%)