

2005 Final Review (C131)

1 Final Schedule

1.1 Final Exam

The final examination is being held on December 19, Monday, 5:00pm – 8:00pm at Room 534, Davis Hall. The format of the final exam is open book and open notes, but individual work.

1.2 HW14 is due on Monday, Dec. 12

1.3 Final week's office hours:

1. Dec. 12, Monday 10:00 am – 12:00 pm , and 2:00 pm – 5:00 pm;
2. Dec. 14, Wednesday 2:00 pm – 5:00 pm;
3. Dec. 15, Thursday 2:00 pm – 5:00 pm;
4. Dec. 16, Friday 2:00 am – 5:00 pm, and (You can pick up you HW14 on this day).

1.4 Final grade conversion

The overall grade = HW 30 % + Mid-term 30 % + Final Exam 40 %

1. A+: 98 above
2. A : 90–98
3. A-: 85–90;
4. B+: 80–85;
5. B : 75–80;
6. B-: 70–75;
7. C+: 65–70;
8. C : 60–65;
9. C-: 55–60;
10. Below 55 is a failure;

2 Subjects & HWs

2.1 Equilibrium and Stress tensor

Basic Concepts and skills:

(1) Indicical notation and definition of tensor; (2) Cauchy's formula, Cauchy stress tensor, stress transformation, and principal stress; (3) 3D Mohr's circle; (4) Equilibrium equations, and displacement & traction boundary conditions.

HWs to review: I1 – I5; II1 – II8; III1 – III6, V1.

2.2 Strain and constitutive equations

Basic Concepts and skills:

(1) Strain-displacement relations (Geometric equation); (2) Compatibility conditions; (3) Generalized Hooke's law;

HWs to review:

IV1 – IV3, IV5, IV7.

2.3 Planar elasticity

Basic Concepts and skills: (1) Concepts of plane stress & plane strain; (2) Airy stress function, how to solve bi-harmonic equations; (3) 2D elasticity solution in polar-coordinate (e.g. a plate with a hole); (4) Thick cylinder (Lame's solution) and concept of pre-stress.

HW to review: V3 – V6; VI1 – VI6; VIII1, VIII6.

2.4 Beam theories

Basic Concepts and skills: (1) Asymmetric bending – generalized elastic flexural formula; (2) Moment of inertia tensor and the principal axes for moment of inertia; (3) Shear center; (4) composite beam.

HWs to review: IX3, IX4, X1 – X6;

2.5 Beam on elastic foundation

Basic Concepts and skills: Solution for concentrated load (fundamental solution), how to use superposition to find the solution for distributed load;

HWs to review: XI1 and XI2.

2.6 Energy Methods

Basic methods: (1) Virtual work principle: virtual displacement method and virtual force method; (2) Castigaliano's theorems; (3) Minimum potential energy principle; (4) Rayleigh-Ritz method;

HWs to review XI3 – XI6; XII1 – XII6.

2.7 Finite element method

Basic Concepts and skills: (1) how to use Galerkin method to derive FEM weak form based strong form a PDE (integration by parts).

HW to review Computer Project i.e. HW XIII

2.8 Thin Plate theory

Basic Concepts and skills: (1) Kinematic assumptions; (2) Stress - curvature relations, moment-curvature relation; (3) Governing equation, and boundary conditions; (4) Fourier series solution for rectangle plates; (5) The analytical solutions for circular plates.

HWs to review: XIV1, XIV2, XIV3, and XIV4.