Information on the Ph.D. Preliminary Exam

The Ph.D. Preliminary Exam is held within the scope of the CE600 course and is organized by the Ph.D. Qualifying Committee. Ph.D. students take the exam in the first semester of the Ph.D. program. Students who pass the exam get a P grade. Those who fail the exam get a U grade and are allowed to retake the exam in the second semester. Students who fail the exam twice will be dismissed from the Ph.D. program.

The exam is held during the weeks 11–14 in the semester and consists of two parts: "I: Mathematics" and "II: Mechanics and Special Topics in Civil Engineering," in the areas listed below, regardless of the courses that have been taken by the students during their undergraduate/graduate education. Topics covered in each area are also listed.

Students answer 10 out of 13 questions, each 10 points, and those who score 60 points pass the exam. Those who miss the exam are not given a make-up exam for any reason (including a medical report) and deemed to fail the exam.

Part I: Mathematics (a total of 6 questions, 2 in each area)

- Mathematics for Engineers

  Matrices, systems of linear equations, linear transformations, change of basis, eigenvalue problems, quadratic forms and diagonalization. Vector calculus, line, surface, and volume integrals. Gradient, divergence, curl. Green, Gauss and Stokes theorems.

- Uncertainty and Data Analysis

  Descriptive statistics, histograms, central tendency, dispersion and correlation measures. Basic probability concepts, random variables, probability density and mass function. Regression analysis.

- Numerical Methods for Engineers

  Numerical solution of linear and nonlinear systems of equations. Interpolating polynomials. Numerical differentiation and integration. Numerical solution of ordinary differential equations.

Part II: Mechanics and Special Topics in Civil Engineering (a total of 7 questions, 1 in each area)

- Engineering Mechanics

  Rigid body mechanics. Equivalent force systems: Concepts of moment, couple, resultant. Equilibrium: Free-body diagram; equations of equilibrium. Properties of surfaces: Area moment and centroid; moments and product of inertia; principal directions.

- Mechanics of Materials

  Simple stress and strain. Equilibrium, compatibility and constitutive relations. State of stress and state of strain with emphasis on 2-D problems. Bending and shear stresses. Deflection of beams. Torsion of circular shafts. Combined stresses. Buckling of columns.

- Construction Management

  Effective and nominal interest, compound interest, methods of comparison of alternatives by using present worth, annual equivalent and rate of return techniques, depreciation and replacement analysis, economic life problems, cost-benefit analysis, break-even analysis, payback period. Construction planning and scheduling.

- Construction Materials

  Mechanical properties of materials. Elastic, plastic and viscoelastic material behavior.

- Fluid Mechanics

  Hydrostatics and application of integral equations: conservation of mass, momentum and energy.

- Transportation Engineering

  Road-vehicle performance, stopping and passing sight distance, horizontal and vertical curves, earthwork, traffic stream flow variables and modeling, signalized intersections.

- Soil Mechanics

  Basic characteristics of soils, classification and compaction of soils. Principle of effective stress. Permeability and flow of water (seepage) in soils. Shear strength of soils. Lateral earth pressure theories. Consolidation theory.