GUIDELINES

PhD Qualifying Exam

TAMU Ocean Engineering Department

Updated: May 2, 2023

Overview

The PhD qualifying exam is intended to test fundamental student ***knowledge of basic undergraduate engineering subjects in Ocean Engineering***. The students are tested over the course of three successive days in the following three subject areas:

I. Applied Mathematics (2 hours)
II. Fluid Mechanics (2 hours)
III. Solid Mechanics (2 hours) – Choose one of the following
    1. Mechanics of Solids and Structures
    2. Dynamics

Each segment of the exam is supplied by a member of the Ocean Engineering Faculty, and it may be closed book, open book, or something else depending upon the particular examiner's preference. Each exam will be administered face to face in a room to be determined on each campus.

Exam Timetable

- The written exam is given once annually before the start of the fall semester.
- Students will be notified of their scores within two weeks of completion of the exam.
- Students who have made scores of 75 or higher on all portions of the exam will be deemed to have passed the qualifying exam.
- Students who have made below 75 on any portion of the exam may, depending on the view of the examining committee, have the opportunity to take an oral exam as a means of passing that portion of the exam, or take a remedial course on that subject.
- Any student who wishes to retake any portion of the written exam will be required to retake the portion of the exam they failed before the beginning of the spring semester.
- ***Any student initiating the qualifying exam in the fall that has not passed all portions of the exam in this second opportunity will be subject to disenrollment from the university.***

Exam **Topics**

Exam#1: Engineering Mathematics

The engineering mathematics portion of the test will examine the student's knowledge of engineering mathematics which is typically a course following the standard calculus and differential equations sequence, as well as a elementary statistics. A good reference book might be Kreyszig's *Advanced Engineering Mathematics*, although there are many similar texts. The topics might include calculus (differential, integral and vector/several variables) and differential equations (ordinary and partial) and applied linear algebra (systems of equations).

References

1. Advanced Engineering Mathematics by E. Kreyszig
2. Elementary Differential Equations and Boundary Value Problems by W.E. Boyce and R.C. DiPrima
3. Foundations of Applied Mathematics by M.D. Greenberg
4. Probability and Statistics for Engineers and Scientists by A J. Hayer
5. Probability, Statistics and Decision for Civil Engineers by J. Benjamin and C.A. Cornell

Exam#2: Fluid Mechanics

Coverage in fluid mechanics will include information covered in the undergraduate engineering curricula. The exam will include the following subjects from undergraduate courses related to the fluid mechanics:

1. Control volume analysis
2. Fluid kinematics, descriptions, and materials derivatives
3. Differential analysis
4. Dimensional analysis
5. Potential flow techniques and analysis
6. Boundary layer flow
7. Exact solutions to Navier-Stokes equations
8. Linear water wave mechanics and dispersion

References

1. Munson et al., Fundamentals of Fluid Mechanics, Wiley.
2. R.W. Fox et al., Introduction to Fluid Mechanics, Wiley.
3. F.M. White Fluid Mechanics, McGraw Hill.
4. F.M. White Viscous Fluid Flow, McGraw Hill.
5. R.G. Dean and R.A. Dalrymple, Water Wave Mechanics for Engineers and Scientists. World Sci.
6. L. H. Holthuijsen, Waves in Oceanic and Coastal Waters, Cambridge University Press

Exam#3: Mechanics of Solids and Structures or Structural Dynamics

Option 1: Mechanics of Solids

Structure and Strength of Materials tests fundamental knowledge in basic structural analysis, including:

1. Uniaxial bars
2. Torsion bars
3. Euler-Bernoulli beam theory
4. Buckling,
5. Stress and failure analysis using Mohr's circle,
6. Bars subjected to combined stresses,
7. Pressure vessels

References

1. Introduction to the Mechanics of Solids: Bars and Beams by D.H. Allen
2. Introduction to Aerospace Structural Analysis by D.H. Allen and W.E. Haisler
3. Mechanics of Elastic Structures by J.T. Oden and E.A. Ripperger

Option#2: Structural Dynamics

The Structural Dynamics exam will test the student's knowledge of basic and applied dynamics and vibrations. The exam will consider topics such as:

1. kinematics and dynamics (particles and rigid bodies including translational and rotational degrees of freedom)
2. Oscillatory motion of a single degree of freedom and multiple degree of freedom systems
3. transient and steady state vibrations
4. magnification curves of directly forced, base excited and rotating unbalanced systems

References

1. Engineering Mechanics: Dynamics by W.F. Riley and L. D. Sturgis
2. Theory of Vibration with Applications by W.T. Thompson
3. Engineering Mechanics: Dynamics by G. Gray, F. Costanzo and M. Plesha