

Department of Mechanical Engineering

Preliminary Exam Preparation

It is strongly recommended to review old written exams to complement preparation for the oral examination. Consider written examination practice as your first step toward proficient oral examination. This gives you the opportunity to critically think through problems at your own pace. During the oral examination, you do not have this luxury. You must practice the oral examination with your peers and discussions with faculty to learn how to reason through problems, think on your feet, and self-assess your ideas in front of a group of faculty. This takes considerable practice prior to the oral examination to reduce anxiety and improve your skills so you can focus on the technical questions. Consult your faculty mentor or peers who have passed the examination for additional advice.

The following list provides a description of the topics that will be evaluated orally. The list of topics for each of the courses can be found online within the FAMU-FSU Mechanical Engineering website. Please consult each syllabi and the textbooks used for these classes for preparation of your area of examination. *Questions from these courses will be fundamental in nature and therefore beyond course examinations and homework examples.*

Dynamics & Controls

EML 3013C – Dynamic Systems I
EML 3014C—Dynamic Systems II
EML 4316 —Advanced Design and Analysis of Control Systems
Advanced Dynamics

Fluid Mechanics & Heat Transfer

EML 3002 – ME Tools
EML 3015C – Thermal Fluids I
EML 3016C—Thermal Fluids II

Solid Mechanics & Materials Science

EML 3011C Mechanics and Materials I
EML 3012C Mechanics and Materials II
EML 3234 – Material Science and Engineering

The following mathematics topics are not directly required for the preliminary exam, but recommended to support fluency in the above topics in fluids, heat transfer, dynamics, controls, mechanics, and materials.

Mathematics

Linear Algebra

- Vectors, matrices, projections
- Lines, curves, and planes, tangential planes, normal vectors
- Eigenvalues and eigenvectors
- Diagonalization and principal axes
- Quadratic forms and symmetric matrices

Ordinary Differential Equations

- First order equations; separation of variables and linear equations
- Homogeneous linear constant coefficient equations
- Solution methods for linear constant coefficient equations
- Eigenvalue problems
- Reduction to first order systems

NOTE: In addition to the topics listed above, students taking the Ph.D. preliminary exam are expected to have a good command of Calculus and basic knowledge of partial differential equations.