

Ph.D. Preliminary Examination Rubric

FAMU-FSU College of Engineering

Department of Mechanical & Aerospace Engineering

Purpose

This document serves as a guide for PhD students preparing for the preliminary examination and for faculty evaluating readiness for advancement to doctoral candidacy.

The preliminary examination evaluates whether the student has developed the intellectual foundation necessary to conduct independent doctoral research.

The exam aims to evaluate:

- Mastery of fundamental concepts in the student's research area.
- Understanding of the state-of-the-art literature.
- Ability to interpret, organize, and critically evaluate the existing literature, identifying key contributions, limitations, and gaps.
- Ability to formulate PhD-level research questions, develop testable hypotheses, and articulate a coherent strategy for investigating them.
- Ability to articulate the intellectual merit and broader impacts of proposed research.

The preliminary examination is designed to assess a student's readiness for independent research. The research topic used in the examination may align with the student's dissertation research, but the primary objective is to evaluate intellectual preparation rather than the completion of a specific research project.

Timing and Eligibility

Students are expected to complete the preliminary examination after completing the majority of their core graduate coursework and typically before the end of their third year in the PhD program.

Minimum eligibility requirements include:

- Completion of core graduate coursework required by the department.
- A minimum graduate GPA consistent with departmental PhD program requirements.
- Approval from the student's PhD advisor.

Role of the Advisor

The PhD advisor may assist the student in identifying an appropriate research area and providing general guidance in preparation for the examination. However, the preliminary examination is intended to evaluate the student's independent intellectual development.

The PhD student is responsible for:

- Conducting the literature review
- Formulating research questions and hypotheses
- Developing the proposed research plan
- Preparing the written and oral components of the examination

The advisor does not serve as a voting member of the preliminary examination committee, but is permitted to ask questions during the oral examination.

Examination Components

- **White Paper (1–2 pages)**

The white paper is intended to: 1) provide a concise description of the research topic and proposed direction for the preliminary examination and 2) check the PhD's progress in core graduate courses. The audience is the examination committee and 3) ensure alignment between the student and committee prior to development of the full proposal.

The white paper shall include:

- A list of completed core graduate courses and other relevant graduate courses
- Graduate GPA in these courses
- Research topic and scope
- Identification of key literature and the general research directions

Additional page(s) for references are encouraged.

- The committee should provide general comments and/or concerns within one week of receiving the white paper.
- If no comments are provided from the committee, it should be assumed that the white paper has no major concerns regarding scope or direction.

- **Written Preliminary Examination Proposal**

The written document should not exceed **10 pages of technical text** (excluding references and appendices).

The proposal should be written for a technically educated audience within Mechanical and Aerospace Engineering.

Recommended structure:

- Summary / abstract
- Introduction and literature review (approximately 50–60%)
- Research questions and hypotheses (concise paragraph(s))
- Proposed methodology and anticipated outcomes (approximately 30–40%)
- Broader impacts (approximately 10%)

The proposal should demonstrate the student’s ability to synthesize prior literature, identify open questions, and develop a logical research strategy. The proposed work may represent a thought exercise and does not necessarily need to correspond exactly to the student’s final dissertation topic.

The committee should provide written feedback within two weeks after receiving the document. If no comments are provided from the committee, it should be assumed that the white paper has no major concerns regarding scope or direction.

• **Oral Presentation and Examination**

The oral examination consists of:

- A presentation of approximately **30 minutes**
- Followed by questions from the committee

The presentation should summarize:

- The state of the art
- The research gap
- The proposed research questions and hypotheses
- The proposed methodology and anticipated outcomes

Questions from the committee may include:

- Fundamental concepts from core graduate coursework
- Concepts from undergraduate mechanical and aerospace engineering curricula
- Prior research discussed in the proposal
- Methodological or analytical approaches presented in the proposal

Students may use presentation slides during the examination, but should be prepared to answer questions without reliance on additional reference materials.

Students entering the program from non-MAE backgrounds should expect questions related to foundational Mechanical and Aerospace Engineering undergraduate topics relevant to their research area. The department may provide a recommended list of core topics derived from the MAE graduate curriculum to guide student preparation.

- **Committee Deliberation**

Following the oral examination, the committee will deliberate and provide written feedback to the student and advisor.

Committee Composition

- The *preliminary examination* committee shall consist of a minimum of three Mechanical & Aerospace Engineering faculty members who have expertise in the core research area. These three members exclude the PhD advisor.
- In cases where highly specialized topics make it difficult to assemble subject-matter experts, the committee should include faculty capable of evaluating the student's understanding of fundamental engineering concepts and research methodology.
- For reference and in accordance with university policies, *doctoral committees* must consist of at least four of the following members: 1) Chair (advisor), 2) In-area member 3) Out-of-area member, and 4) University Representative.
- Given the differences between the *preliminary examination committee* and the *doctoral committee*, continuity in committee membership is strongly encouraged. A minimum of two members (PhD advisor and in-area member) is recommended.

Evaluation Criteria and Weighting

Criterion	Weight
1. Mastery of Fundamental Concepts	50%
2. Literature Review and State-of-the-Art Understanding	25%
3. Research Questions, Intellectual Merit, and Broader Impact	25%

Mastery of fundamental concepts is primarily evaluated through responses during the oral examination, though evidence of conceptual understanding may also appear in the written proposal.

Detailed Rubric

1. Mastery of Fundamental Concepts (50%)

Expectations

- Demonstrates strong understanding of fundamental engineering concepts relevant to the research area.
- Connects theoretical foundations to engineering applications.
- Responds accurately and rigorously to technical questions during the oral examination.

Performance Levels

- **Exemplary:** Demonstrates deep and integrated understanding; synthesizes theory and application independently.
- **Satisfactory:** Demonstrates solid understanding with minor gaps.
- **Needs Improvement:** Noticeable conceptual gaps.
- **Unsatisfactory:** Lacks essential knowledge required for doctoral research.

2. Literature and State-of-the-Art (25%)

Expectations

- Identifies seminal work and major developments in the field.
- Demonstrates the ability to interpret, organize, and critically evaluate the literature.
- Identifies limitations, uncertainties, and gaps in existing work.
- Clearly articulates opportunities for advancing knowledge.

3. Research Questions, Intellectual Merit, and Broader Impact (25%)

Expectations

- Formulates clear research questions and testable hypotheses.
- Provides logical reasoning supporting feasibility and significance.
- Explains why the research problem is important relative to other engineering challenges.
- Identifies potential impacts on engineering, industry, education, or society.

Scoring and Outcomes

Each committee member evaluates the candidate independently using the rubric above.

Typical interpretation:

- **Pass:** Majority of evaluations are *Satisfactory* or *Exemplary*.
- **Conditional Pass:** Minor deficiencies identified that must be addressed before the prospectus stage.
- **Fail:** Significant deficiencies in fundamental knowledge or research readiness.

Departmental graduate policies govern whether a re-examination is permitted.

Administrative Responsibilities

- The Graduate Coordinator is responsible for tracking examination scheduling and documentation.
- The committee chair (not advisor) is responsible for compiling written feedback and communicating the final outcome to the student.
- Examination results are documented according to departmental and university policies.