

Biological Engineering Undergraduate Thesis Opportunity

Thesis Proposal Guidelines, 2021

Upon receiving verbal approval from their faculty research advisor to pursue a thesis, BE juniors may submit a thesis application, to be submitted to and approved by their advisor before the end of Spring semester Junior year.

Once the advisor and student agree on a project, a completed and signed form and brief description of the proposal can be submitted to the BE Academic Office. Students must email the form and proposal to the BE Undergraduate Administrator at besb-thesis@mit.edu (cc'ing their advisor) indicating that the student is committing to complete a senior thesis in Course 20.

Overview

The BE thesis proposal is meant to provide a document outlining the significance and scope of the proposed work. A successful thesis proposal will help you to...

- Consider the significance of your work
- Articulate explicit and specific research questions
- and highlight your contribution to the project.

In sum, the proposal can serve both as a research roadmap and as an outline for your final thesis document.

Guidelines for suggested length and content

The following guidelines are modeled after a Specific Aims page for a grant, in order to give you experience with a relevant form of scientific communication. See the end of this document for additional resources to help you create your proposal successfully.

Individual faculty may make more specific requests as to length and content to be included.

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|---------------------------------------|-----------------------------------|---|
| Overall Length | Maximum 1 page, single-spaced. | |
| COMPONENTS | <i>Recommended minimum length</i> | <i>Guidelines</i> |
| Introduction and Knowledge Gap | 1-2 paragraphs | <ul style="list-style-type: none"> • Establish the importance of the field or problem being addressed. • Introduce any major methods or approaches to be used in the proposed research, and explain their strengths or advantages. • Concisely state the specific questions or problems to be addressed. |
| Research overview | 1-2 paragraphs | <ul style="list-style-type: none"> • Provide a brief overview of how the proposed research will be pursued and what the objectives are. |
| Specific Aims | 2-3 bullet points | <ul style="list-style-type: none"> • Describe the goals of your proposed research in the form of 2-4 Specific Aims, e.g., to develop a new protocol, optimize a computational method, use a dataset to test a hypothesis, or test the effect of an experimental treatment. • Specific Aims should be phrased as a 1-sentence objective or hypothesis (usually in bold or underlined). • Each Specific Aim should include 1-2 sentences, highlighting how the Aim will be accomplished, stating major methods, parameters, and metrics. Make it clear how and which data would be gathered, and how they would be interpreted. • (Optional) Include an estimated timeline of when you expect to be able to complete each Specific Aim. |
| Impact | 1-2 sentences | <ul style="list-style-type: none"> • Conclude by describing the impact and significance should the proposed work succeed. |

Evaluation

Faculty advisors can evaluate the thesis proposal and provide feedback according to the following suggested criteria:

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|---------------------------------|--|
| Scientific understanding | Does the student demonstrate an accurate and thorough understanding of the research field? Is key relevant background included? |
| Significance | Is the importance of the research question established? |
| Scope | Is the scope of the proposed research reasonable, given the time that he student has to accomplish it? |
| Design | Are the Specific Aims concrete and well-defined? Are the chosen approaches appropriate to the research question, and likely to succeed? |

Resources

- **BE Communication Lab:** At any point while drafting your proposal, feel free to meet with a BE Communication Fellow to brainstorm, receive feedback, and revise. Making frequent appointments in advance can help keep you on track, and avoid a last-minute rush.
<http://mitcommlab.mit.edu/be/make-an-appointment/>
- The **BE CommKit website** contains several quick how-to articles with relevant guidelines and recommendations:
 - Writing a successful introduction: <http://mitcommlab.mit.edu/be/commkit/journal-article-introduction/>
 - Writing a short research proposal: <http://mitcommlab.mit.edu/be/commkit/nsf-research-proposal/>