

Prospectus guide for AMSC

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The prospectus for your preliminary exam is limited in length and is meant to demonstrate your mastery of the background related to your research. It is important to be concise and clear in this written presentation. These guidelines are intended to help you get started with your prospectus and point you to additional resources. Often the candidacy exam is one of the first significant writing projects of graduate school, so it can be a daunting task. However, written communication will be an important component to your success as a researcher. Therefore, it is best to leave yourself plenty of time and to be diligent in your approach to this task.

Your best resource for writing your prospectus and preparing for your exam will be your advisor. He or she will be able to help you with selecting topics and references as well as with the content and style of your work. These guidelines are intended to give you a suggested structure and point you to various resources that you might find useful for this or other writing tasks.

For the preliminary prospectus, the departmental guidelines are located in the candidacy examination proposal (on the AMSC website). These state that your prospectus should be about 6 pages and should include

- Primary Material: 1-2 research articles that will be covered in the exam.
- Secondary Material: 5-10 articles related to the primary material. Also note that the guidelines specify that one should *"briefly discuss the nature of these relationships."*
- Course Material: List of relevant courses

1 Suggested Outline

The following is one suggestion for how the prospectus could be structured.

1. Introduction: In my opinion, the introduction is the most important part of any research article, project paper, prospectus etc. This should be your opportunity to tell the broad story of the research area of your primary material. What is the problem these papers are trying to solve? Are you working with a model? What is used for? Why is it important? It's often necessary to have equations in the introduction, but there should only be a few and they should describe the primary problem or class of problems. Since introductions tell a story, they should have a beginning, middle, and an end. The end is the the problem(s) that you will be discussing.
2. Main topic: The methodology, model, or topic of your primary material. Here you can be more detailed about background of the field and the information contained in your primary references.

3. Secondary topic 1: Often your secondary material breaks down into categories. Perhaps you will have a section that deals with numerical issues that arise in the problems of the primary material. Maybe the section covers the relevant theory. Maybe one of your secondary categories will be applications of the primary material. Don't forget that the requirements state that these categories should be too connected to the material. Be explicit about this!
4. Secondary topic 2: This section is where you'll review your remaining sources. In general, don't be afraid to use subheadings to further categorize your material. Once again, connect this to your primary topic.
5. Future plans: Often it's a good idea to *briefly* discuss what your research plan is moving forward. This can be written in first person and/or written as a description of the open questions and problems in this field (restricted to the ones you will be addressing). This could be as short as a paragraph. I'd recommend that it not be longer than half a page.
6. Courses: List of your courses categorized by the requirements they fulfill.
7. Bibliography: It's a good idea to add subheadings to your references so that your primary sources and secondary sources are clearly defined.

2 General advice

Audience. One of the most important considerations in writing any document is to consider who the reader will be. For this work, your audience is the AMSC graduate committee. The committee is comprised of professors from many disciplines so they are (probably) not referees for the journal that your research material was written in. Therefore, this work should be for a general math audience. There is a tendency to assume that your audience knows everything your advisor does and to jump to the technical details too quickly. This is especially noticeable in the introduction. Think about yourself as a reader – reading something you already know orients you and helps you draw connections to new material you might not know.

Style. Keep in mind that different disciplines have different standards for writing. Mathematical writing can seem quite different from the style you learned in your undergraduate freshmen English course. There are also many myths related to scientific writing, i.e. don't use "We", always use the passive voice, never use the passive voice etc. A good rule of thumb is to say things in the clearest possible way – avoid using ten words when just two do. There are different standards of style across subdisciplines even within applied math, so there are no hard-and-fast rules. The best advice is to read other articles. Since you'll be reading reference material to write your prospectus, try to read those references and other papers in that field with an eye towards how they are written. What journals would you likely submit your research to? Read papers in those journals while thinking about these questions. In addition, many journals have style guides which provide some assistance.

Reading. Good writing discipline is helped by a good reading practice. In the style section, we discussed reading other work in the field to help guide your style choices. An important part of the prospectus and subsequent exam is demonstrating your mastery of the key ideas of your references. You must distill these key ideas into a small amount of space. You will (and have already) read a lot of papers in graduate school. One good reading practice is to take notes which extract the main

ideas. Some people find it helpful to structure their notes. I am partial to the following note-taking template: (*credit*: Kevin Carlberg)

- Summary
- Problem
- Past work shortcoming
- Main idea
- Good ideas/tricks
- Criticisms
- Relation to my work
- Broadly interesting
- Questions

With notes about your references organized, it may be easier to construct categories and draw connections between them. Reading other prospectuses can also help. There are examples on the AMSC website and other graduate students might be willing to share there prospectus if you ask nicely :)

Revision: A huge part of writing any document is the revision process. This can be a time-consuming process, so be sure to leave yourself plenty of time. There are many, many strategies for revising your work. Revision refers to correcting broad, big picture ideas like structure and organization as well as smaller problems like style and grammar. One revision technique I especially like is *glossing*. This technique is a way of summarizing your work at every level. (For example, what does this paragraph say? What is this paragraph's function?) I find this extremely helpful for organizing and structuring. For more information on glossing, see <http://writing2.richmond.edu/writing/web/glossing.html>. This link from University of Richmond's writer's web has many resources you may find helpful.

3 Writing resources

There are many other writing resources available to you. Here are a few.

- Graduate School Writing Center
<http://www.gradschool.umd.edu/graduate-school-writing-center>
This is a writing center exclusively to help you (graduate students) with your writing needs. They are always adding new programs to help students. Currently they offer:
 - Writing consultations – help from another graduate student with your writing. They can help with everything in the writing process including brainstorming techniques and general advice to help with writing. They can also point you to other great writing resources. I urge you to take advantage of this assistance and the prospectus is a short enough piece of writing to be able to cover a lot of material in the session.

- Writing workshops – offered through out the semester. Past topics include how to write a literature review and revision & editing. The literature review workshop will be especially helpful for the task of writing your prospectus.
- Weekly write-ins – Sign up to sit in a room for three hours and write free from distraction. Bring a writing project and the writing center will provide a structure for your writing time and help you with setting your goals for that time. These are highly recommended. Weekly write-ins are also open to postdocs and professors.

Their website has more detailed information on the services they offer, information for how to sign up for the workshops and consultations, as well as links to other web resources.

- English Editing for International Graduate Students

<http://www.gradschool.umd.edu/graduate-school-writing-center/english-editing-international-graduate-students>

The graduate school offers free editing services for international graduate students. Unfortunately this services requires submissions to be typeset Word, but some students may find this resource helpful.

- Your fellow graduate students

Many of your fellow students are happy to read your work (especially a prospectus– it's only 6 pages). Buy them a cup of coffee!

- Web resources

- **LaTeX resources.** There are many websites which offer introductions and tutorials in LaTeX. Other graduate students probably have their favorites. I like <https://en.wikibooks.org/wiki/LaTeX>. Often, your best bet for specific latex questions is googling.
- **Scientific writing.** Celia Elliot's webpage <http://physics.illinois.edu/people/profile.asp?cmelliot> has links to some of her guides on scientific writing. In particular, I recommend Guidelines for Scientific and Technical Publishing http://people.physics.illinois.edu/Celia/Publishing_CMElliott.pdf.



Applied Mathematics & Statistics, and Scientific Computation Program

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Candidacy Examination Proposal Instructions

The candidacy examination is an oral examination that serves as a test of the detailed preparation of a student in the area of specialization and seeks to discover if he or she has a deep enough understanding to carry out research in that area. The objective of the candidacy examination is to show the student's mastery of tools and techniques at a research level. The examination is usually taken before a student embarks on serious dissertation research.

The candidacy examination proposal consists of two parts: (1) a Prospectus that sets the scope of the exam, and (2) an examination committee that has read and agrees to abide by the prospectus. The proposal must be approved by the AMSC Graduate Committee before the exam takes place.

- 1. Examination Prospectus:** The examination prospectus is prepared by the student under the supervision of the student's advisor. The Prospectus should be written in a **scholarly style with proper citations**. The expected length of the Prospectus is **five to six pages, excluding references**. It should discuss the following topics:

a) Primary Material: The focus of the exam will be a presentation by the student of material in one or more research articles. These articles should be directly and closely related to the student's expected area of research, **but not** on the student's own research. The candidacy prospectus should: a) explain briefly what mathematical problems the area of research [of the material to be presented] aims to solve; b) state clearly what mathematical challenges are present and what mathematical/statistical/computational theories, tools and techniques are used to overcome these challenges; and c) discuss the scientific status or value of the contributions made in these articles. The student's understanding of the contribution and possibly the incompleteness of the research in the primary references will typically be included in both the prospectus and the candidacy examination.

b) Proposed Research: Pose research questions that you envision to address. Explain why they are challenging. Suggest how you will try to overcome these challenges. The committee does not expect the prospectus to describe the solution to these research questions, but only to suggest a possible approach. However, if you have performed any **preliminary work or have initial results pertinent to the prospectus**, you are encouraged to discuss it here under the alternate topic header "Current and Proposed Research".

c) Course Material: The prospectus should identify at least six courses the student has taken that covered topics relevant to the mathematics or the science of the primary or secondary material. It should also briefly discuss the nature of these relationships. At least two of these courses should have primarily mathematical content and two should be in the area of application of the student.

The student should **prove excellence** in understanding, presentation and discussion of the Primary Material. The Proposed Research section gives students an opportunity to **map out a credible plan** towards the dissertation prospectus and thesis. The Course Material section should **demonstrate** the student has developed an **appropriate background** to tackle the proposed research program. The Proposed Research and Course Material should be limited to no more than 25% of the prospectus.



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Candidacy Examination Proposal Instructions

References (not included in the 5–6-page limit above): Highlight Primary Material in references. Include additional references as needed. Include ***your publications*** if and only if relevant to the prospectus. All references should be cited in the document.

The entire prospectus should not exceed six to seven pages in standard format, including references.

- 2. Examination Committee:** The examination committee is approved by the AMSC Graduate Committee upon recommendation of the student's advisor. The examination committee must consist of three faculty--at least two AMSC-affiliated Faculty members, including the student's advisor; at least one faculty with primary appointment in the Mathematics department; and one faculty with primary appointment outside the Mathematics department but from the application area related to the prospectus. The examination committee may have an optional fourth member drawn from the Graduate Faculty. Each member of the examination committee should read and agree to the prospectus and sign the form on the reverse side.