

## Mathematical Sciences Masters's Project

### 1. Rationale and Purpose

The master's project was conceived as an integral part of training for a career as a mathematical scientist in government and industry, although its value to students preparing for an academic career is also significant. The master's project is a means of integrating a student's program of diverse study in the mathematical sciences. The purpose of the project is to demonstrate that the candidate can accomplish the tasks expected of a professional mathematical scientist — independent, critical thought about a problem in the mathematical sciences and communication of results both orally and written.

A completed project must demonstrate mathematical skills and general scholarship at a level expected of a professional mathematical scientist. Mathematical skills can be demonstrated by development of new mathematics, critical evaluation of existing mathematics, application of existing mathematics to non-mathematical problems, or development of mathematical models. General scholarship refers to understanding, organizing, and communicating knowledge relevant to a problem in a conventionally acceptable format. Finally, the results of the student's work must be communicated both verbally and in writing.

### 2. Elements of a Project

The successful candidate is required to define, develop, and execute an investigation into a chosen problem area. The motivation, approach and results of the investigation need to be communicated in a clear and logical fashion. Specifically, a typewritten project paper of typically 15-40 double-spaced pages in length (exclusive of technical appendices) should be prepared. The paper must be grammatically correct, logically organized and mathematically sound. In addition, an oral presentation will be given that summarizes the investigation in a clear and considered manner. Both the paper and the oral presentation should be accessible to a mathematical scientist who is not a specialist in the area of the paper.

### 3. Range of Effort

Master's projects should and do vary considerably in scope. As long as the project involves the student in the process of thinking independently and critically about a problem, and as long as the student communicates a summary of his activities orally and in writing, then the requirements of the project are satisfied. Generally, the effort required on the project will be commensurate with the one-credit-hour course, Math Sciences 892. When extensive consultation, data collection, and analysis are necessary, additional credit can be arranged. The grade for MthSc 892 is the formal mechanism by which the Department provides an evaluation of the student's performance at oral and written communication.

Many students do much more than "one hour's worth of work" on their projects, either because of their own initiative or because of demands made by their advisors. The Graduate Affairs Committee feels, however, that for one hour's credit the student should do only one hour's work; concomitantly, the advisor should provide a commensurate level of support. Typical effort on the advisor's part would be 8–10 weekly one-hour meetings with the student during the semester in which the project is completed.

The current structure of the master's program is sufficiently flexible to permit a wide range of efforts and consequent rewards to both student and advisor for master's projects.

Possible types of projects include, but are not limited to:

- critique of one or more existing papers in the literature on some topic;
- design and implementation of a solution algorithm for a specific problem;
- research investigation on a suitable topic; or
- consultation with an industrial, governmental, or academic client on an actual problem.

The first two of these examples would be more typical of a 1-hour project. The latter two might require more extensive effort which can be recognized via registration in special topics courses with commensurate credit. Such special topics courses can be counted toward the interest area courses required in the master's degree curriculum.

#### **4. Timetable**

Work on a 1-hour project should be started early in the semester in which the project is to be completed, in order to allow sufficient time for completing the work, writing the master's paper, and preparing for the oral examination. Ideally, the project topic should be identified in the preceding semester. Of course, more extensive projects would ordinarily be started at an earlier date.

Oral examinations are typically scheduled during the month preceding the week of final examinations. The deadline date is set each semester by the Graduate School. The final version of the paper must be delivered to the members of the candidate's committee at least one week prior to the scheduled oral examination.

#### **5. Responsibilities**

The candidate is responsible for finding an advisor and determining a mutually agreed-upon topic, assembling a committee and completing a plan of study (GS-2) prior to the second year of study, preparing the project, scheduling a date for the oral examination, and delivering a signed copy of the final paper to the department. The candidate's advisor will be helpful in suggesting possible topics, focusing the effort, and providing expert guidance. It must be emphasized, however, that the candidate is ultimately responsible for what is done, how it is done, and how it is presented.

A letter grade for Mathematical Sciences 892 will be given based on both the written and oral presentations. The chairman will determine this grade in consultation with the committee.

#### **6. Some Useful Suggestions**

- Information concerning potential project advisors can be obtained by talking with the faculty, fellow students, the director of graduate studies, and the associate department head.
- Schedule as appropriate a regular meeting time with your advisor (e.g., weekly).
- Be forewarned that Murphy was right: progress is made only on alternate Fridays! That is to say, the earlier the project is initiated, the better.
- Allow time for about three written drafts of the master's paper. It is generally known that writing well is the process of rewriting often. A first draft should be in the hands of the advisor at least three weeks prior to the scheduled oral examination.
- The final paper will typically contain: a complete title page, table of contents, abstract, introduction, body, conclusion, references, and possibly appendices. As a general rule, it is useful to refer in the text to figures and tables by name (e.g., Table 1), and to explain their contents both within the text and by means of legends on the figures/tables themselves.
- The oral presentation should be carefully organized and thought out. One or two "dry runs" are strongly encouraged. You may find the use of prepared transparencies and the overhead projector an especially useful mode of presentation.
- A master's project is usually completed by the end of the second year of study. Note that faculty members may not be available during the summer.