Mathematics and Statistics Graduate Program
Doctoral Candidacy Requirements

The University of Calgary Doctoral Candidacy Regulations (“the Regulations”) govern the conduct of admission to candidacy at the University of Calgary. This document establishes Program specific requirements associated with the conduct of admission to graduate candidacy under the Regulations.

A. STATEMENT OF PURPOSE

Admission to candidacy in either the Mathematics or Statistics specializations in the Mathematics and Statistics Program signifies that the student can provide clear logical arguments, has a demonstrated understanding of core mathematical or statistical concepts and terminology, has developed relevant computational skills, has demonstrated an ability to provide examples, counterexamples and to produce proofs, building on applications of known results, as well as evidence of the ability to create new results or applications. The student will have synthesized a proposal for research that demonstrates a critical and reflective evaluation of the proposed work in the context of the development and applications of mathematics or statistics. Moreover, the student will give evidence of initial progress towards gaining relevant specialist knowledge and techniques to move the proposed project towards a successful completion, and evidence of developing professional skills related to dissemination and communication of mathematics or statistics, as appropriate.

B. CANDIDACY COMPONENTS

All doctoral students in the Mathematics and Statistics Graduate Program must successfully complete the following components:

1. Course work and examination requirements as stated in the graduate calendar for the specialization
2. Written research proposal
3. Field of Study (FoS) Oral Examination

C. RESEARCH PROPOSAL

A research proposal, produced in consultation with the Supervisor(s) and approved by the Supervisory Committee, must be submitted before the FoS Oral Examination is scheduled. The proposal should document that the proposed research is appropriate for a doctoral dissertation, i.e., of sufficient novelty, interest, scope and level of difficulty, and provide evidence of potential for successful research by the student in the area. It should include an overview of the relevant literature to situate the proposed area of research, and delineate the broad lines of investigation and tools that may be brought to the task. The proposal is written with the awareness that the proposed approaches or methodologies may need to be adapted as the research progresses. The proposal provides a point of departure for questions related to the student's thesis topic in the FoS Oral Examination.

Approved by the Department of Mathematics and Statistics:
Approved by the FGS Policy Committee: November 3, 2017
Effective Date: November 3, 2017
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The proposal should be typed, with 1 inch margins, 12 pt. font (Times New Roman), 1.5 pt. line spacing, and should be 10–15 pages in length, excluding figures, tables and references. A LaTeX template is available on the Graduate Program Website. An optional appendix containing figures, tables and similar material can be included at the end of the proposal and is exempt from the page limit. However, the proposal itself must be self-contained.

The proposal should include the following sections:

- Review of relevant literature: at least 4 pages
- Project description and discussion of applicable techniques: at least 3 pages
- Concrete research plan with objectives and milestones, evidence of progress on the problem, or other support of research capability for the project: at least 3 pages.

The student must submit the first draft of the research proposal to the Supervisory Committee at least 4 months in advance of the expected FoS Oral Examination date; the recommended time frame for submission is approximately 6 months in advance of the examination date. The Proposal Approval Form must be completed by the Supervisory Committee at least 2 months prior to the expected examination date. Each member of the Supervisory Committee must record a recommendation of pass or fail on the Proposal Approval Form, and the proposal will be deemed to be approved by the Supervisory Committee if no more than one fail recommendation is recorded. The student must provide a copy of the approved research proposal to the Graduate Program Administrator, and the student, the members of the Supervisory Committee and the Graduate Program Director must sign the completed Proposal Approval Form before the FoS Oral Examination can be scheduled. The process leading to the completion of the Proposal Approval Form is outlined below.

There is no formal examination of the research proposal, but rather it is a collaborative process where the Supervisory Committee members act as advisors to the student, and provide feedback to the student on drafts of the proposal. The goal is to achieve a consensus that the proposal adequately describes a viable and achievable research project. The process may take place by any appropriate means, including face-to-face meetings, remote meetings, telephone meetings, or email discussions.

If, during this process, a Supervisory Committee member has important recommendations for revisions (which should be provided in writing to the student and copied to the rest of the committee), the student should revise the research proposal and provide the revised proposal to the committee for consideration. No Supervisory Committee member shall take longer than two weeks in reviewing any draft proposal. This process continues until each member of the Supervisory Committee records their final recommendation on the Proposal Approval Form. The supervisor is responsible for ensuring that all Supervisory Committee members have completed the Proposal Approval Form at least 2 months prior.
to the FoS examination date, which in turn must take place within 28 months of the start of the program.

The Supervisory Committee’s approval of the research proposal at this point in no way constrains the larger FoS Oral Examination committee’s decision regarding the student’s ability to successfully carry out the proposed research, or the student’s knowledge of the field.

If more than one Supervisory Committee member recommends a fail on the Proposal Approval Form, the following procedure shall be followed.

*Each member of the Supervisory Committee* writes a brief memo to the Graduate Program Director explaining the reasons for their recommendation and submits it within five working days of the date of submission of the Proposal Approval Form.

*The Graduate Program Director* may uphold the ‘fail’ in the case of a unanimous fail or refer to FGS for a decision in the case of a mixed decision. If the Graduate Program Director upholds the “fail”, after consultation with the Supervisor(s), he or she then writes to the student, summarizing the essential points from the memos, and sends copies to the Supervisor(s) and the Faculty of Graduate Studies.

*The Graduate Program Director* must send the notice of a failed candidacy component to the student within ten working days of the date of submission of the Proposal Approval Form. The Notice and the memos must be kept on the student’s file. If there is an appeal, the Notice and supporting documents must be submitted to FGS (gpoform@ucalgary.ca).

### C.1 APPEAL OF FAILED RESEARCH PROPOSAL

If the outcome of Supervisory Committee’s assessment of the research proposal is a fail, the student has the right to appeal this decision. Students must appeal directly to the Faculty of Graduate Studies following the procedures described in the *Graduate Calendar* under Academic Regulations – section on Appeals – Appeals Against Faculty of Graduate Studies Rulings.

**Re-assessment of research proposal**

Only one re-assessment of a failed research proposal will be permitted. The re-assessment must take place no sooner than two months and no later than six months from the date of the completion of the first Proposal Approval Form. Normally, the composition of the Supervisory Committee will remain the same, and the process outlined for the initial assessment of the research proposal will be followed.

In reporting the results of the second assessment, a recommendation of “fail” requires that, within five working days of the submission of the Proposal Approval Form, Supervisory Committee member must
submit a confidential written report to the Graduate Program Director, copied to the Supervisor, detailing the reasons for their vote.

If the Graduate Program Director upholds the recommendation to fail, the student will be required to withdraw from the Program. The graduate Program must send the Recommendation of Required Withdrawal from Graduate Program for Failure to Maintain Academic Progress and supporting documents to gpoform@ucalgary.ca.

D. FOS ORAL EXAMINATION

The rationale and focus of the FoS Oral Examination is to assess the student’s readiness to continue to the dissertation component of the degree. The examination should focus on the background knowledge of students in their discipline, as well as their preparedness to conduct research of high quality in their particular FoS. The reading list limits the scope of questions in the Oral Examination, and the research proposal serves as a guide for questions related to the student's thesis topic. In the examination, the student should demonstrate to the examiners that they have:

- sufficient background knowledge in the discipline to properly contextualize their proposed research
- sufficient specialized knowledge to undertake the proposed research.

D.1 READING LIST

The reading list should give the student the background in the broad area around the student’s thesis topic that is required for conducting their dissertation research. It covers the material (topics, books, articles, etc.) to be examined, and should include material above and beyond the coursework they have covered. The reading list is independent of the Research Proposal, and serves, along with the Research Proposal, to define the scope of questions in the FoS Oral Examination. Samples of reading lists are available on the Department’s PhD Program website.

The reading list is prepared by the student and student’s Supervisor(s), in collaboration with the Supervisory Committee, using the Reading List Approval Form. The Supervisory Committee is responsible for ensuring that the scope, length and content of the reading list is reasonable and appropriate for the proposed research project and the FoS Oral Examination, using the example reading lists available on the Department’s PhD Program website for guidance. The finalized reading list should be submitted for approval to the Graduate Program Director’s office at least 3 months before the expected date of the FoS Oral Examination.
D.2 SCHEDULING OF FoS ORAL EXAMINATION

The FoS Oral Examination must be taken no later than 28 months from the start of the doctoral Program. Prior to the FoS Oral Examination, students must have completed the Program course work and examination requirements. The FoS Oral Examination can only be scheduled after:

- the research proposal has been approved, and the completed Proposal Approval Form has been filed with the Graduate Program Administrator,
- the student has provided a copy of the approved research proposal to the Graduate Program Administrator (2 months before the intended examination date), and
- the Graduate Program Director has signed the Reading List Approval Form (3 months before the intended examination date).

The examination must be scheduled at least 4 weeks prior to the intended examination date.

When the examination is scheduled, the Graduate Program Administrator provides copies of the following documents to the FoS Oral Examination Committee:

- Notice of FoS Oral Examination form
- Reading List Approval Form
- Approved research proposal

D.3 COMPOSITION OF THE FOS ORAL EXAMINATION COMMITTEE

Normally, the FoS Oral Examination Committee consists of the Supervisory Committee plus two additional members recommended by the Graduate Program Director who shall ensure that no conflict of interest exists between the student or the Supervisor(s) and the additional members of the examination committee. A Postdoctoral fellow whose supervisor is on the Supervisory Committee may not serve on the examination committee. [See the Graduate Studies Conflict of Interest Policy: grad.ucalgary.ca/current/policies-forms/conflict-interest]

The two additional members on the Examining Committee may be internal or external to the Program. A case may be made to include a member from outside the University of Calgary when particular expertise is required or to meet conflict of interest requirements. The Supervisor, and Co-Supervisor if applicable, are voting members. A member of the academic staff appointed by the Graduate Program Director chairs the examination. The Neutral Chair is not a member of the examining committee and is non-voting.
D.4 FORMAT OF FOS ORAL EXAMINATION

The examination should not exceed 2 hours. This does not include the deliberation time of the Examining Committee. The student may elect to give a brief oral presentation (maximum 15 minutes) at the beginning of the exam; this component is included in the 2-hour time frame.

The Oral Examination is comprised of rounds of questions from the Examination Committee to the student. Only members of the Examination Committee are allowed to question the student. All examiners will be given an opportunity to question the student. Normally 2 rounds of questions are sufficient; however, more questions can be accommodated if deemed necessary by the committee members and if time permits.

Questions to the student should be clear and succinct. The student should be given reasonable time to answer. If the student has understood the question and cannot answer, the examiner should pass to another question and not attempt to extract an answer by prolonged interrogation, or by leading the student. The Neutral Chair should guard against any tendency of examiners to interact with each other instead of concentrating on the examination of the student.

The Neutral Chair must stop the examination if one of the examiners needs to leave the room and will reconvene the examination when all examiners are present.

D.5 PROCESS/EVALUATION OF FOS ORAL EXAMINATION

Official Examiners’ Discussion
At the end of the examination, the student is asked to withdraw from the room. Before any discussion of the student's performance, each examiner must identify which recommendation (pass/fail) he/she favours. This is done preferably by secret ballot, and provides the committee with a frame of opinion on which to base a discussion of the student's performance.

Outcomes
Each examiner must record a recommendation of pass or fail on the official Report of Candidacy Oral Examination.

Passing the Oral examination
Every effort should be made to reach a unanimous recommendation. Should the outcome of the final vote include one negative vote, the student will pass.

Failing the Oral examination
Should the outcome include 2 or more negative votes, the committee’s recommendation to the Graduate Program Director will be “fail”.
The Neutral Chair must inform the student of the committee’s recommendation immediately following the vote of the examination committee. The Neutral Chair will submit the final recommendation of pass or fail to the Graduate Program Director within one working day of the completion of the examination.

In case of a fail:

Each examiner writes a brief memo to the Graduate Program Director explaining the reasons for their vote and submit it within five working days from the date of the examination.

The Graduate Program Director may uphold the ‘fail’ in the case of a unanimous fail or refer to FGS for a decision in the case of a mixed vote. If the Graduate Program Director upholds the “fail”, after consultation with the Supervisor(s), he or she then writes to the student, summarizing the essential points from the memos, and sends copies to the Supervisor(s) and the Faculty of Graduate Studies.

The Graduate Program Director must send the notice of a failed candidacy component to the student within ten working days from the date of the examination. The Notice and the post-examination memos must be kept on the student’s file. If there is an appeal, the Notice and supporting documents must be submitted to FGS (gpoform@ucalgary.ca).

D.6 APPEAL OF FAILED FOS ORAL EXAMINATION

If the outcome of the FoS Oral Examination is a fail, the student has the right to appeal this decision. Students must appeal directly to the Faculty of Graduate Studies following the procedures described in the Graduate Calendar under Academic Regulations - section on Appeals – Appeals Against Faculty of Graduate Studies Rulings.

Re-take of Examination

Only one re-take of the FoS Oral Examination will be permitted. The re-take must take place no sooner than two months and no later than six months from the date of the first examination. Normally, the composition of the committee will remain the same, and the process outlined for the initial FoS Oral Examination will be followed.

In reporting the results of the second examination, the committee will be limited to recommending either a pass (i.e., no more than one negative vote), or fail.

A recommendation of "fail" requires that, within five working days:

- Each examiner must submit a confidential written report to the Graduate Program Director, copied to the Supervisor, detailing the reasons for their vote.
- The Neutral Chair must also submit a written report of the examination procedures to the Graduate Program Director.
If the Graduate Program Director upholds the recommendation to fail, the student will be required to withdraw from the Program. The graduate Program must send the Recommendation of Required Withdrawal from Graduate Program for Failure to Maintain Academic Progress and supporting documents to gpoform@ucalgary.ca.

E. TIMELINE

- Program course work and examination requirements completed (prior to FoS Oral Examination)
- Written proposal submitted to Supervisory Committee (recommended 6 months, minimum 4 months in advance of expected FoS Oral Examination date)
- Reading list approved by the Graduate Program Director (at least 3 months prior to scheduling FoS Oral Examination)
- Written research proposal approved (at least 2 months prior to scheduling FoS Oral Examination)

The chart below assumes that the FoS Examination takes place on the last possible date. If it occurs earlier, the time frames and deadlines for completion of program course work and examination requirements, research proposal submission and approval move accordingly. The left-hand ends of the bars are recommended start dates.