

Thesis Handbook for Master of Science – Earth System Science

This handbook serves as a comprehensive guide for graduate students pursuing a research thesis as part of their Master of Science – Earth System Science (MSc ESS) program requirements at Athabasca University (AU). It also provides valuable information for faculty and staff involved in the thesis process. While this handbook offers essential guidance, it is important to note that AU policies and regulations take precedence over any information presented herein.

For authoritative guidelines on master's studies, students should consult the Faculty of Graduate Studies (FGS) website, specifically the **Master's Study Regulations** in the Graduate Handbook. These regulations form the foundation for the thesis process and should be followed closely.

In cases where ambiguity arises regarding the interpretation of information provided in this handbook, students are strongly encouraged to seek clarification from either the MSc ESS program advisors or the graduate program director.

Overview

The master's thesis consists of five (5) three-credit courses. These courses allow students to apply knowledge and skills they have gained in their academic courses to produce a substantial piece of scholarly work. The produced thesis must represent the results of the student's independent research working with a supervisory committee. The proposed topic for the thesis should be defined in a mini-proposal that includes a brief statement outlining the research question, the proposed method of treatment, and the arrangement made for faculty supervision. The mini-proposal must be approved by the supervisor and program director before registering in these courses. The thesis involves two milestones for evaluation: a thesis proposal examination at the end of the first course, ESSC 675, and a final thesis examination that takes place after

completing the research work at the end of the last course, ESSC 679. Each of these examinations includes an oral defence in addition to the written report, both of which are assessed by an examination committee.

Step 1: Selection of research topic and supervisor

Research work formally begins after the student has completed their core and elective courses. However, the student is encouraged to begin the process of identifying a research **focus area**, a research topic, and a prospective supervisor when they enter the program. A research topic can come from the student's workplace or personal interest, interactions with the Faculty of Science and Technology faculty members, and/or the **research topics list**. The student should use the MSc ESS Thesis Mini-Proposal Template (see Appendix A) to write a mini-proposal for the project, which may be based on the research topic identified in ENSC 680.

The student should then submit this mini-proposal to their prospective supervisor. If no prospective supervisor has been identified, they should submit it to the MSc ESS program director. The prospective supervisor reviews the student's mini-proposal and agrees (or does not agree) to act as the supervisor. If the prospective supervisor agrees to act as the student's supervisor and approves the mini-proposal, the supervisor forwards the mini-proposal and agreement to supervise to **fst_grad_success@athabascau.ca**. Once the prospective supervisor receives the approval from the program director, then the student can register for ESSC 675.

If the prospective supervisor does not agree to act as the supervisor, the student must either modify the mini-proposal in accordance with the prospective supervisor's recommendations for resubmission (if the supervisor agrees to accept the mini-proposal again), submit the mini-proposal to another potential supervisor, or write a new mini-proposal.

If the student cannot find a prospective supervisor, they should submit the mini-proposal to the program director. The program director will review the mini-proposal and will assist the student in finding a supervisor.

Notes:

1. The effort expended in writing the mini-proposal (e.g., through the literature review, interactions with the program director, and the

presentation of the mini-proposal to prospective supervisors) is not a factor that impacts the acceptance or rejection of the mini-proposal.

2. The mini-proposal (and each step in the thesis process) is the individual student's responsibility, and the onus is on the student to demonstrate that the proposed investigation is worthy of being deemed thesis research.
3. After the supervisor approves the mini-proposal, its content, such as methods, tasks, or goals, is still changeable. Anything in the mini-proposal can be changed if both the supervisor and the student mutually agree during the period of the thesis research.

Upon finding a supervisor, the student should fill out the **Master's Thesis Supervisor Approval form**  and obtain signatures from the supervisor, program director, and FGS dean.

To obtain the required credits for the thesis, the graduate student must complete all of the following 3-credit courses: ESSC 675, ESSC 676, ESSC 677, ESSC 678, and ESSC 679. These are not conventional courses; however, they are treated that way for administrative purposes.

If the student fails in any of the above courses, the student must switch from the thesis route to the project route by submitting a new mini-proposal and contacting the program director to identify a new supervisor.

Step 2: Proposal writing and formation of supervisory committee (ESSC 675)

ESSC 675 Thesis I (Proposal Writing) is the first phase of the thesis work. This three-credit course focuses on defining research questions, making hypotheses, identifying research methodologies, and assessing the suitability and applicability of these methodologies to the research problem. It also involves literature review and ethics/access approval if data collection is used in the research.

The thesis is carried out under the supervision of a supervisory committee and should be completed by the end of the student's program. So, during this course, the student and the supervisor should work together to form the supervisory committee. Please visit the **Graduate Handbook** for details about the roles and responsibilities of the student, supervisor, and supervisory committee.

The supervisor should fill out the **Master's Thesis Supervisory Committee Approval form**  and obtain approvals and signatures from the committee

members, program director, and FGS dean.

If the research project involves human or animal participants, or human biological remains, the student may need to request specific approval from the AU Research Ethics Board. For the policies, procedures, and guidelines for obtaining ethics approval, please refer to the university's **Ethics** resources.

By the end of ESSC 675, the student should have developed their thesis proposal, which will need to be assessed by the supervisory committee. The guidelines for the thesis proposal are in Appendix B, and a template for the thesis proposal is in Appendix C.

The assessment of the thesis proposal is done through formal adjudication of the proposal and an oral examination that involves the supervisory committee. Please refer to the **Graduate Handbook** for more details.

The assessment of the written proposal may result in one of four **outcomes**: Pass; Pass, Subject to Minor Revisions; Pass, Subject to Major Revisions; or Fail. The assessment of the oral presentation may result in one of the three **outcomes**: Pass, Fail, or Adjournment.

Once the proposal and the oral examination are adjudicated, the supervisor needs to complete the **Master's Thesis Proposal and Oral Examination Report**.

Common problems with thesis proposals

There have been a number of problems with previous thesis proposals that have occurred so frequently that it is worth identifying them explicitly. Some of these are major problems that will typically require major revisions to your proposal, while others are less serious but make your reviewers' tasks difficult.

The following are the most common serious problems seen in previous thesis proposals:

- *Failure to identify and clearly state a specific problem that you are addressing.*

You must make it clear to the committee what you are intending to do.

Even if you are planning on doing work that is more generally focused (such as developing a taxonomy or a framework) rather than, for example, solving a specific implementation problem, you must clearly identify what it is you intend to do. A good guideline is that you should be able to specify what it is you are trying to do in a single sentence, perhaps with a couple of sentences of clarification afterward.

- *Failure to clearly describe the methodology you will use to complete your work.*

While, at the time you are writing your proposal, you will be unable to provide complete details on how you will solve your problem, you must be able to describe the techniques you plan on using and explain why they are appropriate for what you are trying to do. You should also discuss whether and how you would alter the proposed techniques for use in your work.

- *Failure to properly organize your proposal.*

If you do not organize your proposal in a logical fashion, it is extremely difficult for the reviewing members of the supervisory committee to tell that you have a good understanding of the area and are therefore prepared to begin your proposed work. Most importantly, your thesis proposal itself, and each section within it, must have good flow. This means that each statement must logically follow the one preceding it. You must always present complete trains of thought. There should be no leaps of faith required to understand what you are writing about. This reflects the process of scientific reasoning. Ideas should carefully follow from one step to the next as in a mathematical proof.

It is also a good practice to look at each paragraph in each section individually and ask yourself, "Does this paragraph correspond to the title of this section?" If your answer is "No," then you need to consider removing or refocusing that paragraph. A common example of this occurs when related work is discussed in a different section. (This is often easily identified by the presence of many citations in the paragraph in question.)

- *Failure to make comparisons between related work.*

It is insufficient to simply enumerate work related to your proposed thesis. You must logically organize and discuss the related work so it is clear to the reader how the various previous research efforts relate to each other and, especially, how they relate to what you are proposing.

- *Failure to remember that the supervisory committee is, by its constitution, a multidisciplinary committee.*

You must write your proposal accordingly. You are not writing to an expert audience within your specific chosen area of study. Consequently, you must always define all acronyms and explain terms before you use them. You may assume only a general, undergraduate level of knowledge and must, in your thesis proposal, explain everything beyond that. Always follow the adage, "Know your audience!"

The following are some common, less serious, problems often seen in thesis proposals:

- *Grammatical and spelling errors.*

The prevalence of such errors speaks negatively to your concern for detail and your industriousness. These are characteristics that are fundamental to success in scientific research and higher-level study such as the MSc and PhD degrees. You should remember that negative impressions of your written work will often be reflected later in, for example, reference letters written for you. As a first step, you should always spell-check your thesis proposal. Remember, however, that spell-checkers are not perfect and will fail to detect certain errors. Further, grammatical checkers are notoriously bad in certain situations; technical writing, such as that in a thesis proposal, is one such situation.

The bottom line is that automatic checking must be only a first step. Careful, human proofreading is also needed. If necessary, it might be useful to arrange to have proofreading of the final (submitted) version of your proposal done by a professional editor or at least a highly proficient English speaker. A proposal which has obviously been poorly proofread may be returned for improvement prior to review.

- *Inadequate and/or dated citations.*

Whenever you refer to the work of others (including figures you may have reproduced), to specific systems, and/or to specific claims that you do not explicitly justify within your proposal, you need to provide a citation to the related work. Such citations should always be made on the original reference to the corresponding system or piece of work. There are no exceptions to these two rules.

Further, when selecting citations, you should always pick the best possible reference, where best is judged in terms of direct relevance, quality of the source, and recentness of the citation. Always try to avoid the use of old citations that might have been superseded by more recent work.

- *Incomplete and/or inappropriate references.*

Each reference you provide should be as complete as possible. This means that it should include such elements as page numbers and date of publication. Sometimes getting this information requires a little extra work (especially if you find the paper online), but this information should be included so that it is easy for the reader to locate the reference if they need to. (Note also that this will be even more important for your thesis document itself since a larger audience will likely read it.)

It is also increasingly common to see references to web-based documents, such as technical reports, that are not refereed and are thus of dubious quality and value. Such references should be used extremely sparingly in your proposal and certainly should not be used alone to argue for any key point that your work depends on. Always try to find references from recognized journals, books, and top-tier conferences whenever possible. A proposal that obviously makes little or no attempt to provide complete and consistent bibliographic entries may be returned for improvement prior to review.

Timing of MSc ESS thesis proposals

This handbook states that your thesis proposal must be approved at the end of ESSC 675. However, you should not put off sharing your proposal with your supervisory committee. There are several reasons for this.

First, when you submit a so-called proposal after the bulk of the research work has been done, it is not really a proposal but is, instead, a summary of what you have done. This is not the purpose of the proposal! If you submit at a late stage, you run the risk of having done a good amount of research on a topic that is not acceptable to the supervisory committee. In this case, you might be asked to select an entirely new topic and start all over again. While this is the worst-case scenario, it is not impossible, and it is certainly within the rights of the supervisory committee to reject a proposal entirely. In general, you should prepare the thesis proposal and have it accepted before undertaking most of your MSc thesis work.

Further, early submission of your proposal allows you to receive potentially valuable feedback from the members of the supervisory committee, who commonly make suggestions and pose questions related to your proposed work as well as critically reviewing the proposal. This can include guidance on what specifically needs to be done to successfully complete the research. Often these suggestions are valuable in helping you produce a better MSc thesis more expediently.

Step 3: Research (ESSC 676, 677, and 678)

ESSC 676 Thesis II (Research Stage 1) is the second element of the thesis work. Students can register in this course after they have successfully completed ESSC 675. Upon completion of ESSC 676, one-third of the research should be done. Data collection and/or solution design should be completed by this stage.

Generally, a student taking this course will continue to work with the same supervisor as in ESSC 675.

ESSC 677 Thesis III (Research Stage 2) is the third element of the thesis work. Students should register in ESSC 677 when their thesis work is well underway, and they have passed ESSC 676. Upon completion of ESSC 677, the student should have completed two-thirds of the research. Data analysis and/or solution implementation should be completed by this stage. Generally, a student taking this course will continue to work with the same supervisor as in ESSC 676.

ESSC 678 Thesis IV (Research Stage 3) is the fourth element of the thesis work. Students should register in this course when their thesis work is well underway, and they have passed ESSC 677. Upon completion of ESSC 678, the student should have completed at least 90% of the research work. Experimental evaluations and results interpretation should be completed by this stage. Generally, a student taking this course will continue to work with the same supervisor as in ESSC 677.

Step 4: Thesis writing, examination, and oral defence (ESSC 679)

ESSC 679 Thesis V (Thesis Writing and Defence) is the final element of the thesis work. Students should register in this course when they have passed ESSC 678 and anticipate completing the thesis work. In the ESSC 679 course contract, students will finish their thesis, take the oral exam, and complete the final thesis revision. Generally, a student taking this course will continue to work with the same supervisor as in ESSC 678.

The aim of ESSC 679 is to produce a final thesis that satisfies the requirements of the program and of the university and to ensure that the student has completed all the requirements for completion of the degree and graduation. The student must produce a thesis that conforms to the university's **format for theses and dissertations**.

While writing the thesis, the student with the help of the supervisor should ensure that all copyright issues have been resolved. Please check Appendix D for information about copyright permissions. For more information about intellectual property, please refer to the **FCS intellectual property guidelines**.

Once the written thesis is ready, the student should submit it to the supervisory committee, who will review the submission and provide their preliminary acceptance. They will indicate that the thesis is ready to be reviewed by the

examination committee and that the student is ready to proceed by submitting the **Preliminary Acceptance of Thesis Prior to Final Examination form**.

Once the supervisory committee provides their preliminary acceptance, the supervisor should work with FGS to set up the examination committee and arrange for the final thesis examination. For more details about the final thesis examination, please refer to the **Graduate Handbook**.

Important: Once the thesis has been submitted for examination, the student must not make any changes to the thesis unless requested by the examination committee.

For details about the formation of examination committee, thesis oral defence, and thesis submission, please see the **Graduate Handbook**.

Step 5: Final thesis submission

Where applicable, the student is responsible for revising their submitted thesis to satisfy the examination committee's request for changes. If the committee requests changes, a copy of the revised thesis should be submitted to the supervisor for validation of the revisions before the student submits the revised thesis. Please refer to the **Graduate Handbook** for information about the submission of the final thesis. The student will not be recommended for graduation at Academic Council if the revised thesis is not validated.

Step 6: Applying for graduation

Once the program requirements have been met, students must **apply to graduate** through the Office of the Registrar. For questions regarding graduation procedures, please contact the Office of the Registrar.

Appendix A: Template for Thesis Mini-Proposal

Thesis title: _____

Student name: _____

Student ID number: _____

Perspective supervisor(s): _____

- 1.** Problem and research goal: Describe the research problem(s) and objective.
- 2.** Methodology: Outline the main research methodology (qualitative, quantitative, or mixed methods/approaches) you will use.
- 3.** Research rationale: Use this section to explain why the research is significant. Justify why it should be done, using reasons such as novelty or relevance. Identify opportunities and challenges.
- 4.** Timelines: Write a concise paragraph that describes your planned thesis development. This should include details of making hypotheses, obtaining references, making informed comparisons, implementing the solution, collecting data, conducting experimental analysis, etc.
- 5.** Anticipated results and contributions: Describe the likely contributions of your research to other researchers, potential users, and the general Earth system science community.
- 6.** Possible dissemination: Describe possible publications from the research.
- 7.** Hardware, software, and organizational support needed: List what you will need in terms of research environment, sponsors, research ethics approval (if necessary), and tools and materials.
- 8.** List of references: See the section on common problems with thesis proposals for common pitfalls in choosing sources.

Appendix B: Guidelines for Writing the MSc ESS Thesis Proposal

The purpose of having thesis proposals is twofold:

- First, it helps ensure that students are prepared to undertake the work they are proposing.

- Second, it helps ensure that the work being proposed is of appropriate scope and depth for an MSc degree and has value to the community.

The proposal must ensure that these two points are clearly addressed so that the committee can approve the thesis proposal.

The proposal must be a complete, self-contained description of the proposed research work. Any important details omitted will suggest that the student lacks mastery of the area. Having said that, the committee realizes that, at the stage of a thesis proposal, it is not possible for the student to have reviewed all background material (and thus have perfect mastery), nor is it possible to present all the details of the proposed work. The committee will, however, look to see that the student has covered reasonable breadth in their review of the area and that their solution methodology is clear and well thought out. These criteria will give the committee confidence that the student will have mastery by the time the thesis is complete.

Required components

Key components of the thesis proposal include

- an abstract of the proposed work.
- a clearly specified problem statement (where problem is taken in the broadest sense).
- an introduction to the problem and a proposed solution.
- a review of related work describing how it relates to the proposed work (this review is not intended to be exhaustive but rather representative of existing work in the area).
- a statement of how the student proposes to solve the problem, including sufficient methodology to convince the committee that the proposed solution is likely to be successful.
- a description of precisely how the student will evaluate the success of their work.
- a statement of the resources required to complete the work and how they will gain access to them.
- a description of the results they expect to obtain and why these results are of interest to the field.

- a timeline for the completion of the thesis, providing realistic dates for finishing milestone events.
- if appropriate, a statement of how they will manage any sensitive data (i.e., information of a personal nature) that they might have access to or create during the course of their research.
- a brief summary of what they have just proposed.
- a detailed, quality bibliography of work related to the proposed thesis research.

Length and structure

The length of a proposal often varies somewhat depending on the area of the proposed work and the topic itself. In general, a proposal is normally between 10 and 20 letter-size pages, single column, with 1.5 line spacing, 12-point font, and 2.54-centimetre margins. This page count includes figures and references. Be aware, however, that excessively lengthy documents may be sent back unread for revision to provide better focus. An upper bound of close to 20 pages is a good limit in practice.

Appendix C provides a template for the thesis proposal. While the exact structure and organization of a thesis proposal may vary from the following suggested structure, all the material discussed in each item described below should be included somewhere in the proposal and should be presented in a logical order.

Appendix C: Template for Thesis Proposal

➤ **MSc ESS Thesis Proposal Template** 

Appendix D: Copyright Information

Copyright permission is required when you want to include a substantial amount of someone else's work in your MSc thesis.

Copyright permission is required for a chapter or substantial excerpt from a book or journal, material copied from a website, screen captures from a website, charts and tables, images, and audio or video clips.

Copyright permission is NOT required for anything you write or create, short passages or quotes, items in the public domain, links to websites, ideas, and titles. For a more comprehensive description of what copyrighted material is and when permission should be sought, see the Canadian Intellectual Property Office (CIPO) resource **A Guide to Copyright** [↗](#).

Note: Open-access materials, such as items licensed under a **GNU General Public License** [↗](#) or a **Creative Commons License** [↗](#), are usually less restrictive and can often be reproduced for non-commercial purposes, provided you acknowledge the source. Carefully review any such license or agreement attached to the works, as copyright requirements can vary. If in doubt, contact the rights holder of the work.

Expediting copyright permission requests

- For works from published books, journals, online journals, or e-books, submit your permission request to the publisher. Publisher contact information can be found using an online search or a print directory.
- For materials taken from a website, submit your permission request to the website administrator.
- For unpublished works, submit your request to the author.
- For photographs, submit your request to the photographer.
- For artistic works, submit your request to the museum or archive that houses it. You may need to obtain permission from the artist as well.
- For video clips or audio clips: submit your request to the producer or distributor of the work.

If you have difficulty locating a rights holder, contact a Copyright Collective or the **Copyright Board of Canada** [↗](#).

Requesting copyright permission

If available, complete and submit the copyright permission form provided on the publisher's website. Fill out the form as completely as possible; incomplete forms or missing information will delay your request. If you are submitting a copyright permission form online, remember to make and keep a copy for your

files. If no online form is available, use the following copyright permission form as your template:

[Copyright holder name and address]

Dear [Copyright Holder]:

RE: [Author, Complete Title (description of item or excerpt). Place of publication: Publisher, year, pp. #s. ISBN# or URL (if applicable).]

I am a graduate student in the Master of Science – Earth System Science (MSc ESS) program at Athabasca University (AU). On the understanding that you own copyright to the above item, this letter is to request permission to reproduce this material for use in my MSc ESS thesis. The thesis will be reproduced in both paper and electronic format. The electronic version of the thesis will be deposited in the **AU Library Digital Thesis and Project Room** [↗](#) and stored on a server owned and maintained by AU. I am requesting non-exclusive world rights.

Please let me know if you are the copyright holder of this work, and if so, whether there will be a fee for this copyright permission. Should permission be granted, please provide me with your preferred acknowledgment statement.

My deadline for this project is [date]. Thank you for your prompt attention to my request, and I look forward to receiving a response at your earliest convenience.

Sincerely,

[Your name and address]

Pending copyright permission requests

Before you can include the cited material in your thesis, you must receive written consent from the rights holder via fax, mail, or email. Obtaining rights holder permission can be a lengthy process. Ensure that you allow sufficient time to complete your thesis with or without the material you want to reproduce. Following up on your initial request often helps to expedite a response from the rights holder. Keep in mind that many publishing houses may not respond to requests for several weeks.

Note: If you are adapting the rights holder's material in any way, your permission request form must describe how you intend to modify the material.

If you are denied permission to reproduce the requested material, you may want to follow up with the rights holder by requesting further details, elaborating your intended use, or offering to provide a draft for review. If the denial is absolute, you must remove the item from your thesis.

Inserting copyright acknowledgments

All copyright permission statements (credit lines) must appear on the first page where the reproduced material appears in your thesis. If the rights holder has not provided a preferred acknowledgement statement (credit line), then include a complete bibliographic citation, plus the phrase, "Reproduced with permission."

Submitting copyright agreements

All written responses from copyright holders granting permission for the inclusion of their materials in your thesis must be submitted to the MSc ESS administrative assistant along with the final version of your thesis. Ensure that you make and keep copies of all permission agreements for your files.