DEPARTMENT OF GEOSCIENCES GRADUATE HANDBOOK

Academic Year 2015–2016

ADMISSIONS

We encourage students with majors in geology and complementary disciplines to enter our Geosciences graduate program. We do not require incoming students to have completed an exact equivalent of our undergraduate curriculum in geosciences prior to admission. We do require students to have completed at least one year each of geosciences, calculus, physics, and chemistry prior to admission. However, at the discretion of the Graduate Admissions Committee, course deficiencies may be satisfied during the student's first year. Such students and those with non-geosciences undergraduate degrees will meet with their prospective thesis advisor to design a suitable schedule of remedial coursework. Students receiving a teaching assistantship are required to have sufficient background in geosciences to teach assigned courses effectively.

Applicants are required to submit a standardized form listing completed coursework (Form A) and a personal statement with a clear discussion of research interests that indicates faculty with whom the student wishes to work. See Appendix C for detailed instructions.

Our expectations for admission include the following:

1. GPA of 3.0 or higher in geosciences and related sciences
2. GRE scores in the 70th percentile or higher
3. Strong letters of recommendation
4. Acceptance by a faculty member as a provisional advisee

The Department recognizes the variance in these measures from different colleges, various curricula, and test taking abilities. Thus, strong performance in some areas may outweigh lesser results in others.

FINANCIAL AID AND THESIS RESEARCH FUNDING

Several forms of financial aid are available through the Department. We support some graduate students with teaching assistantships (TAs) made available by the Graduate School. These TAs are generally awarded to incoming students based on merit and, with satisfactory performance, continued for a second year for M.S. students and, occasionally, a third year for Ph.D. students. Research assistantships, off-campus internships, or other awards in lieu of the TA will not change the total number of semesters of the initial award for students (four semesters for M.S. or six semesters for Ph.D.). All remaining semesters of TA support will be forfeited if a student resigns a TA position without first receiving written permission from the Chair to return to the TA position. Other funding opportunities, including occasional one-semester teaching assistantships, are advertised within the Department. Through their grants and contracts, faculty members may also provide research assistantships or research funds to graduate students. The number of research assistantships varies considerably from year to year; the allocation of research funds is the responsibility of the funded faculty member. Graduate support from external fellowships and scholarships is available from a large number of agencies and organizations.

GRADUATE PROGRAM

The requirements for graduate degrees in the UM Department of Geosciences are described below. These requirements are in addition to the basic degree standards for advanced degrees of the University
Of Montana Graduate School, which are available here. Both sets of requirements must be satisfied for fulfillment of the degree program.

**Advising**

Interaction between graduate students and advisors is an integral part of graduate education in the Department of Geosciences. The advisor is responsible for ensuring that the student is aware of and satisfies the requirements for the graduate degree outlined below. The advisor is also responsible for supervising the graduate research, mentoring the student in the field of study, and training the student in the techniques and concepts of the area of research. The student should meet with the advisor at the start of their program to develop a curriculum of study and at the beginning of and throughout each academic year to make sure the curriculum is still appropriate. The student and advisor should also meet regularly to discuss research progress.

Part of the graduate admissions process entails the selection of an advisor; graduate students will not be admitted without a sponsoring faculty advisor. This advisor should have expertise in the candidate’s field of study. Departmental faculty are not obligated to advise any particular graduate candidate; rather, the faculty selects candidates for admission based on scientific interest, capabilities, and funding opportunities. A formal process for terminating the student-advisor relationship exists and is initiated by contacting the Department Chair, but a student must secure a new advisor prior to termination of a previous arrangement or leave the program.

The advisor is responsible for ensuring that the student is aware of the degree requirements.

**Courses**

Graduate students in Geosciences degree programs must register for credits each autumn and spring semester (with exceptions including some distance learning programs or the School of Education where students may be registering primarily in the summer). Full-time student status requires at least 9 credits during the regular session and 4 credits during a summer half-session. Full-time Teaching and Research Assistants must carry at least 9 credits per semester unless a waiver is obtained from the Graduate School. These credits may include GEO 599 (Thesis Research) or GEO 699 (Dissertation Research). Undergraduate credits do not apply to graduate degree requirements unless designated UG in the catalog. Specific course requirements for the M.S. and Ph.D. degrees are given below.

Students must petition for a leave-of-absence if they are not continuously registered. Continuous registration requires completing at least 3 credits per semester. Students who step out of their graduate programs without an approved leave-of-absence for more than two consecutive semester terms will be dropped from their program’s roster and will need to petition the Geosciences Department and the Graduate School for readmission. The petition for readmission will require an evaluation of the student’s progress and plan for completing the degree. Not all students will be readmitted.

**Transfer Credits**

Graduate credits for Geosciences courses may be transferred only from a school that has a graduate program in Geosciences or Geology. After satisfactory performance in graduate courses at the University of Montana and upon recommendation of the student’s graduate advisor and department chair, up to 9 credits may be transferred from another school and applied to a Master’s degree after one semester of residence at the University of Montana. A Ph.D. student may transfer and apply up to 30 credits. Thesis or dissertation credits and credits for courses with grades of C or lower are not transferable. A request for transfer of credits is initiated by petitioning the Chair of the Department.
Grades
A grade point average of 3.0 or better must be maintained throughout the graduate program. Courses with grades of C+ or lower cannot be applied to the requirements for the degree program but are included in the calculation of grade point average. Grades of N (continuing) and CR/NCR (Credit/No Credit) are given for credits in Thesis Research (GEO 599) and Dissertation Research (GEO 699). Many courses numbered GEO 500 or above are graded on a CR/NCR basis. If an instructor offers such a course for a letter grade then it must be taken for a letter grade to apply toward a degree program.

MASTER'S DEGREE
A checklist and timetable of degree requirements for the Master’s degree are provided in Appendix A.

Advising
In addition to an advisor, a Master’s student must choose two additional members of the faculty to constitute the research committee; one faculty member must be from a Department other than Geosciences. This committee is responsible for evaluating the student’s research and for providing supplemental instruction in their respective research specialties to complement the primary training of the student. Members of the committee should be selected by the pertinence of their expertise in the intended course of study. A maximum of one member of the committee may be emeritus faculty of the Geosciences Department. Details of the committee requirements are available from the Graduate School web site, specifically section 6.0 of the Master’s Degree requirements.

Courses
The Master’s degree requires 30 credits of courses designated for graduate credit in the university catalog (those labeled “G” or “UG”) half of which must be at the 500 or 600 level (see section C1.000). However, the committee may require additional coursework beyond the minimum of 30 credits as needed for the students program. Within the total 30 credits, a minimum of 24 credits in formal coursework is required of which 18 must be Geosciences courses. No more than 6 credits of Thesis Research (GEO 599) and no more than 3 credits of Advanced Problems (GEO 597) may be applied toward the total of 30 credits required for the degree. Seminars (GEO 58X) may be taken more than once with the consent of the instructor. A minimum of 21 credits applied toward the degree must be taken on the University of Montana - Missoula campus. A maximum of 8 credits of coursework may be repeated upon approval of the Department chair.

Cognate science courses taken outside the Geosciences Department may be required, depending on the field of study, advisor, or research area. Cognate science courses are generally taken in Math, Physics, Chemistry, Biology or Computer Science. The nature of the cognate coursework will be decided in consultation with the research committee. All Master’s students are also required to take GEO 508, Fundamentals of Academic Research, during their first fall term in residence.

All degree requirements for the Master's degree, including the use of transfer and nondegree credits, must be completed within five years. Courses that fall outside this time limit must be recertified for currency of knowledge.

Thesis
Completion of a Master’s degree also requires submission and approval by the faculty of a thesis research proposal. Each proposal is discussed at a departmental faculty meeting and either approved as
written, approved with changes, or not approved with major changes. To allow time for rewriting and re-
assessment, a committee-approved draft must be turned into the Geosciences office by 3:00PM on the
3rd Monday in April. This “committee draft” must be approved and signed by the entire thesis
committee, before submittal. The draft must be submitted in electronic format (pdf or rtf) along with a
hard copy with original signatures. Missing the deadline can result in dismissal from the program and so
any need for an extension should be requested from the Chair of the department well in advance of the
deadline.

The proposal must include a concise description of the scientific problem to be addressed, a summary of
current research relevant to that problem, the importance of the problem, and a description of the
experimental design or methodology to be used. This content should demonstrate basic scientific
literacy as well as familiarity with the specialty chosen. An acceptable thesis may consist of one or more
papers submitted or ready for submission to peer-reviewed scientific journals or a single longer
document presenting the thesis research. The Master’s thesis must present the results of original
scientific research in the field of specialization in an appropriate scientific style and format. Length and
content requirements are subject to the requirements of the advisor and the committee. However, an
advanced degree in the physical sciences requires a demonstration of competence in scientific method,
as well as familiarity with the current state of knowledge in a specialty.

The completed research and thesis must be defended to the committee and approved by all members. In
case of failure, one repeat examination is permitted. Defense of the written thesis also consists of a
public oral presentation to students, faculty, and other interested members of the public, and an oral
examination conducted by the faculty. The presentation typically includes 40 minutes allotted to the
presentation and several minutes for questions from the audience for a total time limit of 50 minutes.
The final exam follows the public talk. The exam includes the defense of the thesis as well as questions
designed to test competence in the course of study. The exam is conducted by the committee, and
chaired by the advisor, but the exam is open to interested members of the university faculty as well. The
defense should be held during the period of a regular Autumn or Spring semester and must be completed
at least 15 days before graduation. However, the defense can be held during the Summer with the
approval of the research committee if normal semester deadlines cannot be met.
There are three possible outcomes of the exam:

a. Pass with thesis accepted as it stands.
b. Pass with minor revisions required on thesis.
c. Fail or major revision required on thesis.

After a failure, a second defense is allowed after 2 weeks, but not more than 6 weeks, excluding
semester breaks. Only one repeat exam is permitted. A second failure results in the student being
dismissed from the program.

Time Limit
The Graduate School requires that the Master's degree be completed within five years of beginning
coursework at The University of Montana. A leave of absence does not waive these time limits except
when the leave is granted prior to commencing coursework. A leave of absence or delayed admission
requires a "Request for Leave of Absence from the M.S. Program" form from the Graduate School. Such
a leave of absence may be granted for a maximum of one calendar year. The Graduate School, upon
receipt of a written request and with agreement from the Geosciences Department, may grant a 12-
month extension to a leave of absence.
Intellectual Property
The preservation of samples and data collected during thesis research and the publication of research findings is of the highest priority. Therefore, raw data and samples generated as part of research projects supported by faculty grants and/or support from the Department of Geosciences will reside in the Department. The student must develop a plan for the archiving and transferring of data and samples with his/her advisor prior to finishing research and writing the thesis. The advisor has the responsibility to explain to the student any restrictions or dispensations on intellectual property rights of the data/information generated during the student’s research. The advisor and student should consult to determine content, authorship and acknowledgements before papers are submitted for publication.

Application for Graduation
At least one semester before the Master's degree is to be awarded, the student must submit three copies of the Application for Graduation form to the Graduate School and pay a graduation fee. See the Calendar of Deadlines on their website, for the exact dates to file paperwork. The Graduate School will conduct a degree audit and send two copies of this form back to the Geosciences Department (one departmental copy and one student copy) early in the semester of graduation. The faculty advisor and student should note any problems and rectify them at least two weeks prior to the end of the final semester by using a Graduation Amendment Form. If the student fails to meet the original graduation date as requested on the form then the student may request the application be reactivated for the following semester by notifying the Graduate School one semester prior to the revised completion date.

After the defense, the successful candidate must follow the Graduate School rules for the submitting the thesis. Formatting guidelines for the thesis are available at the same site. In addition, the student must complete the following tasks:

1. Prepare one hard copy of the thesis for each research committee member if requested. The copy should be bound according to the requirements of the thesis advisor. Some committee members may prefer only an electronic copy.
2. Where appropriate, the advisor may require a representative collection of samples, specimens, thin sections or other materials, as well as copies of field and laboratory notes, for the departmental collections and for documentation of funded research.
3. Clean up all lab and office space and return any departmental equipment and keys (remember to claim key deposits!).
4. Return any books or other items borrowed from the faculty.
5. Provide forwarding contact information to the department secretary.

DOCTORAL DEGREE
The Department offers two courses of study for the doctoral degree: Ph.D. in Geosciences and Ph.D. in Applied Geosciences. The fundamental requirement for the Ph.D. is demonstration of outstanding scholarship and research ability in a field of Geoscience. Admission to the graduate program does not automatically entail admission to the Doctoral program, which requires satisfaction of an additional set of requirements described below. A checklist and timetable of all Doctoral degree requirements is provided in Appendix B.

Advising
In addition to an advisor, a Ph.D. student must choose four additional faculty members to constitute the
research committee. This committee is responsible for evaluating the student’s research, for providing supplemental instruction in their research specialties to complement the primary training of the student, for administering the comprehensive exam, and for assessing the dissertation. Committee members should therefore be selected by the pertinence of their expertise in the intended course of study. The committee must include at least one member from outside the Department of Geosciences. Not more than one member may be emeritus or research faculty of the Department.

Courses
A minimum of 60 graduate credits beyond the Bachelor's degree is required for the Ph.D. degree at the University of Montana. The committee may require additional coursework beyond the minimum of 60 credits. Up to 30 credits may be transferred from a completed Master’s degree. Candidates entering the Ph.D. program without a Master’s degree may transfer 9 graduate credits from another institution. This limit includes courses taken for the Master’s degree. A maximum of 12 credits of GEO 699, Dissertation Research, and 6 credits of Advanced Problems (GEO 597) may be applied toward the degree. A minimum of 6 graduate credits of coursework must be taken outside of the Geosciences Department. This coursework must comprise a coherent program relevant to the dissertation research and/or professional goals. Courses taken for the Master's degree may be applied toward the 6 credit cognate requirement with the approval of the advisor. Cognate courses are generally in Biology, Math, Physics, Chemistry, or Computer Science. Some courses in Geography or Forestry may be suitable for some fields of study.

The department also offers a Ph.D. in Applied Geoscience, a tailored degree program designed for professional physical scientists. Extensive background in relevant industry or governmental work in geoscience-related disciplines may constitute grounds for the Applied Ph.D. program and reduced or modified formal course requirements and residence requirements. The curriculum is designed under the supervision of an advisor and research committee. A course of study must meet the majority approval of the Department of Geosciences faculty and the Dean of the Graduate School. Dissertation and exam requirements are the same as required for the Ph.D. in Geosciences.

All requirements for the doctorate must be completed within seven years of commencing graduate course work at The University of Montana. Courses that fall outside this time limit must be recertified for currency of knowledge.

Comprehensive Exam and Dissertation Proposal
By the end of fourth semester of study, the student will complete written and oral comprehensive examinations covering the major discipline. Successful completion of the comprehensive examinations is required for a student to be advanced to candidacy in the Doctoral program. See Appendix D for a detailed description of the exam process.

Following successful completion of the Ph.D. examinations, the student will submit a dissertation proposal, approved and signed by their advisor and committee, to the Geosciences faculty for formal discussion and evaluation. The final version of the dissertation proposal must be approved by simple majority vote of the Geosciences faculty prior to formal admission to Ph.D. candidacy. To allow time for rewriting and re-assessment, the committee-approved draft of the dissertation must be turned into the office no later than 3:00PM on the 3rd Monday in April. The draft must be submitted in electronic format (pdf or rtf) along with the original of the signature page. Each dissertation proposal is discussed at a departmental faculty meeting and either approved as written, approved with changes, or not approved with major changes.
Dissertation
Completion of the Ph.D. degree requires submission and defense of a doctoral dissertation. This document may consist of two or more papers submitted or ready for submission to peer-reviewed scientific publications or of a single long document containing original scientific research, although the journal-paper format is strongly encouraged. Length and content requirements are subject to the advisor and the committee. In the case of the journal paper format, additional chapters or appendices including data, detailed methods, or other unifying material may be required. However, an advanced degree in the physical sciences requires a demonstration of competence in scientific method, as well as familiarity with the current state of knowledge in a specialty and a substantive new contribution either to the body of methodology or the body of theory applicable in the field of expertise. All graduates of the program must also demonstrate a thorough understanding of the principles in their specialization, current techniques and methods in that field, a thorough understanding of scientific data and error analysis, and competence in scientific writing.

The oral defense of the dissertation may be scheduled only after the research committee has approved the draft dissertation. A copy of the accepted and corrected committee draft of the dissertation must be placed in the department office at least one week before the defense for inspection by any university faculty member. The defense should be held during the period of a regular Autumn or Spring semester and must be completed at least 15 days before graduation. However, the defense can be held during the Summer with the approval of the research committee if normal semester deadlines cannot be met.

The dissertation defense has two parts; a public oral presentation and the examination conducted by the faculty. The public presentation is open to all students and faculty of the Department and any other interested people.

The final defense before the research committee and members of the university faculty follows the public presentation. The purpose of this defense is to test general comprehension of the dissertation project and related material. Following a period of questioning, the committee will meet in closed session to vote. Possible outcomes are:

a. Unanimous pass without revision.
b. Unanimous pass with minor revisions to the dissertation.
c. Failure of defense that, in most cases, will lead to major revisions of the dissertation. If a failing vote is cast, the candidate must make the changes required by the committee and must defend within 30 days. A second failure is final and the student will be dismissed from the program.

Time Limit
All requirements for the degree must be completed within seven years of commencing graduate coursework at The University of Montana. Candidates are not excused from program time limitations by virtue of a leave of absence except when the leave is granted prior to commencing coursework.

Application for Graduation
At least one semester before the Ph.D. degree is to be awarded, the student must submit three copies of the Application for Graduation form to the Graduate School and pay a graduation fee. See the Calendar of Deadlines on their website for the exact dates to file paperwork. The Graduate School will conduct a degree audit and send two copies of this form back (one departmental copy and one student copy) early in the graduating semester. The department and student should note any problems and rectify them at
least two weeks prior to the end of the final semester by using a Graduation Amendment Form. If the student fails to meet the original graduation date as requested on the form, the student may request the application be reactivated for the following semester by notifying the Graduate School one semester prior to the revised completion date.

After the defense, the successful candidate must follow the Graduate School rules for the submitting the dissertation. In addition, the student must complete the following tasks:

1. Prepare one hard copy of the thesis for each research committee member. The copy should be bound according to the requirements of the thesis advisor. Some committee members may prefer only an electronic copy.
2. Where appropriate, the advisor may require a representative collection of samples, specimens, thin sections or other materials, as well as a copy of all field and laboratory notes, for the departmental collections.
3. Clean up all lab and office space and return any departmental equipment and keys (remember to claim key deposits!).
4. Return any books or other items borrowed from the faculty.
5. Provide forwarding contact information to the department secretary.

Intellectual Property Rights
The preservation and publication of samples and data collected during thesis research is of the highest priority. Therefore, raw data and samples generated as part of research projects supported by faculty grants and/or support from the Department of Geosciences will reside in the Department. The student must develop a plan for the archiving and transferring of data and samples with his/her advisor prior to finishing research and writing the dissertation. The advisor has the responsibility to explain to the student any restrictions or dispensations on intellectual property rights of the data/information generated during the student’s research. The advisor and student should consult to determine content, authorship and acknowledgements before papers are submitted for publication.

APPLICATION OF STANDARDS AND RULES

All graduate students are also subject to the general rules of the Graduate School of The University of Montana. Exceptions to the Department rules may be made with unanimous consent of the faculty of the Department. Exceptions to the University rules are occasionally allowed by petition to the Graduate School. Standards and rules regarding honorable scientific conduct and plagiarism are not negotiable.

PUBLICATIONS AND PROFESSIONAL PRESENTATIONS

The Department of Geosciences strongly encourages graduate students to submit their scientific work for publication in peer-reviewed journals and for presentation at national and regional meetings. Presentation of findings should be undertaken with the supervision of the advisor or members of the committee.

The Department and the Graduate School may help defray the expense of presenting a paper at a professional meeting. Notice of accepted publications, awards, and presentations must be provided to the committee and to the department secretary, and should also be added to a CV, which may also be held by the department secretary.
APPENDIX A: Master’s degree checklist

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<th>Action</th>
<th>Timing</th>
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<tr>
<td>Application to UM geosciences program</td>
<td>3 months before starting term</td>
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<tr>
<td>Acceptance by advisor</td>
<td>2 months before starting term</td>
</tr>
<tr>
<td>Meet with advisor to develop curriculum</td>
<td>1 week before starting term</td>
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<tr>
<td>Meet with committee to review curriculum</td>
<td>At beginning of each semester</td>
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<tr>
<td>Submission of thesis proposal</td>
<td>End of second term</td>
</tr>
<tr>
<td>Submission of thesis draft</td>
<td>4&lt;sup&gt;th&lt;/sup&gt; term (min.) – 8&lt;sup&gt;th&lt;/sup&gt; term (max.)</td>
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<tr>
<td>Completion of 30 graduate credits</td>
<td>4&lt;sup&gt;th&lt;/sup&gt; term (min.)–10&lt;sup&gt;th&lt;/sup&gt; term (max.)</td>
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<tr>
<td>Thesis defense</td>
<td>4&lt;sup&gt;th&lt;/sup&gt; term (min.)–10&lt;sup&gt;th&lt;/sup&gt; term (max.)</td>
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APPENDIX B: Ph.D. checklist

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<th>Action</th>
<th>Timing</th>
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<tr>
<td>Application to UM geosciences program</td>
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<td>1 week before starting term</td>
</tr>
<tr>
<td>Meet with committee to review curriculum</td>
<td>At beginning of each semester</td>
</tr>
<tr>
<td>Comprehensive exam</td>
<td>4&lt;sup&gt;th&lt;/sup&gt; term</td>
</tr>
<tr>
<td>Submission of dissertation draft</td>
<td>6&lt;sup&gt;th&lt;/sup&gt; term (min.) – 12&lt;sup&gt;th&lt;/sup&gt; term (max.)</td>
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<tr>
<td>Completion of 60 graduate credits</td>
<td>6&lt;sup&gt;th&lt;/sup&gt; term (min.)–14&lt;sup&gt;th&lt;/sup&gt; term (max.)</td>
</tr>
<tr>
<td>Dissertation defense</td>
<td>6&lt;sup&gt;th&lt;/sup&gt; term (min.)–14&lt;sup&gt;th&lt;/sup&gt; term (max.)</td>
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APPENDIX C: UM Geosciences Graduate Program Application Instructions

1. Application Procedures & Materials

A. Fall Application deadline:
   Electronic Application via the Graduate School Web Page: Received by January 17 for beginning the following fall semester.

B. Application Instructions:
   • Instructions for applying to the Graduate School are in the Applying for Admission section on the Graduate School web site.
   • To start the application process select “Apply Online” in the left panel of the page. Fill in all the information required. You can save the form and come back to finish items for which you do not have information.
   • The Geosciences Department requires three letters of recommendation. You can have letters sent electronically by the reviewer by selecting that option on the Graduate School web site and supplying the relevant information. Or, you can have the reviewer send hard copies directly to the Department at this address:
     Geosciences Department-Graduate Applications
     The University of Montana
     32 Campus Drive #1296
     Missoula, MT 59812-1296.
     Or e-mailed to (loreene.skeel@mso.umt.edu).
   • Two other items are required by the department:
     o A statement of purpose (~300 words) of your background and goals.
     o Form A (available from the Geosciences Department) or at this web address
     These can be uploaded as one combined document on the Graduate School online application site section entitled “Resume Upload”. Make sure you have all both the statement and Form A combined into one document. These can also be sent in your “additional application materials packet” directly to the Department (above address).

2. Program Requirements for Admission

   • Incoming graduate students with geosciences degrees are required to have a background in math and science that includes a year each of calculus, physics and chemistry at the college level. However, at the discretion of the Graduate Admissions Committee, course deficiencies may be satisfied during the student’s first year. Students with undergraduate degrees in other sciences can construct a remedial course schedule in geosciences pertinent to their research interests.
   • The department requires all graduate applicants to have made prior contact with a prospective advisor or to indicate with whom they want to work.
   • GRE scores with a test date that is within the past five years OR verifiable GRE scores if the test date is older than five years.

3. Assistantship Application and Deadline
   The application deadline for assistantships for Fall semester is January 17. Those wishing to start during the spring semester may apply at any time but should contact the Department Chair before applying and requesting a TA; it is extremely rare that TAs are available for the Spring Semester.

4. International Students
   • See information in the International Admission (http://life.umt.edu/grad/Apply/International Student Admission.php) section on the Graduate School web site.
APPENDIX D: Ph.D. Exam Procedure

Schedule
The advisor works with the student to develop a schedule that will accommodate the exams before the end of the required semester. The following are the main components.

Step 1: Proposal
Preparation of a comprehensive research proposal for the exam committee is the first step of the Ph.D. exams. The student writes the proposal independently of the advisor, although it is acknowledged and expected that the proposal will arise from and reflect substantial intellectual exchange with the advisor leading up to the writing of the proposal. The proposal must include a concise description of the scientific problem to be addressed, a summary of current research relevant to that problem, the importance of the problem, and a description of the experimental design or methodology to be used. This content should demonstrate scientific literacy as well as knowledge of the specialty chosen consistent with the degree objective. The proposal should be limited in length (e.g., 15 pages of text, not including figures and references) to facilitate rapid reading by the exam committee. Once the proposal is complete, the student submits it to the advisor who then distributes it to the committee.

Step 2: Written Exam
Each committee member will read the proposal and generate written questions based on this proposal. There are five people on the committee, so each member will produce questions intended to be worked on for about one day of a five-day exam period. The committee member may include an expected time allotment for each question. The exam is generally completely ‘open book’ and the student will submit his answers electronically. However, the final format is determined by committee consensus approval.

The questions are to be ‘based on the proposal’, but interpretation of this is very loose. For example, the committee members could ask specific questions related to methods, errors, etc., or they could ask general questions related to the student’s research discipline. Committee members can ask many short questions or one longer question, but the questions must be able to be answered within the time given for the exam, i.e., one day per each of the five committee members. Questions can be intended as ‘gating’ (i.e., aimed at determining whether the student “has what it takes to be a PhD level scientist”) or ‘guiding’ (i.e., forcing him/her to consider specific issues so that this research can be successful). If two or more committee members submit questions that are too similar, the advisor will work with those members to adjust or combine the questions.

The advisor will compile the questions and distribute to the student on the agreed schedule. He/she will work on the exam, M-F of the scheduled week and submit answers to the advisor when complete.

Each committee member will receive the entire exam results on the same date. Each committee member will be required to grade only the questions he/she submitted, but should at least look through the entire exam. Committee members are free to pass judgment on any part of the exam but they must grade their own questions. The grading is pass/fail with one of the following outcomes: (1) Pass, (2) Provisional pass, with specified provisions, (3) Fail.

Each committee member will send their grades to the advisor and the advisor will determine whether there is consensus to pass or fail. The student can pass the exam with only one failing vote. If students pass, but there is not a consensus grade among the committee, the advisor will call a committee meeting to discuss the exam. If there are provisions to the pass, the committee will determine what precisely is required of the student before the advisor informs the student of the outcome of the exam.
Once grading and consultation is complete, the student will receive a grade report from the advisor and a determination of whether he/she will be proceeding to the oral exam. If the written exam is not passed the student will have one more opportunity to take and pass the exam. The student must retake the exam with the same committee as soon as reasonably possible, but no more than one semester from the original exam date. If the student does not pass the second attempt of the exam he/she will be dropped from the program after notification of the Graduate School.

**Step 3. Oral Exam (If the written exam is passed).**

The oral exam must take place between 3 and 14 days after the written portion of the exam is passed. The oral exam will take place with all the committee members in attendance (in person or electronically) or some subset approved by the chair of the department if a committee member cannot attend due to health/professional obligations.

The student will make an initial oral presentation of her/his proposal. The committee will be free to interrupt the student at any time with questions. This is a chance ask questions as follow-up to the written exam, or to ask new questions based on the oral presentation and the ensuing discussion. As with the written exam, committee members may exercise considerable leeway in evaluating both the breadth and depth of the student’s knowledge of their discipline.

After the oral exam the committee will dismiss the student and attempt to reach consensus regarding pass/fail or provisional pass. The committee, voting privately, may pass the student with one negative vote. If the student does not pass they will have one more chance to take and pass the exam within one semester from the original exam date. If the student either does not pass the second attempt of the exam or fails to re-take the exam within the specified time, he/she will be dropped from the program after notification of the Graduate School.

The successful completion of the oral exam is the final step in the Ph.D. comprehensive exam process.