

## Geosciences 508: Fundamentals of Academic Research

Fall 2012

University of Montana

2 credits

Tuesday 3:10-5; Clapp 348

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**Office Hours:** M 3:10-4 PM, or by appointment

Fundamentals of Academic Research will provide an introduction to academic research methods, including formulation of research questions and hypotheses, design of research approach, literature search, other research tools, written presentation of research plans, oral presentation skills, and research ethics. Students will prepare and present their proposed research in multiple formats.

The course emphasizes active learning (discussions, working with peers, writing, other forms of student participation in and out of class) rather than lectures. Students will develop a research plan and develop several modes of presenting that research plan to others, including grant proposals and talks. The course is directed toward those in the beginning or early stages of their graduate research and will be designed to benefit those with previous research experience.

### Course Outcomes

#### *Knowledge and Comprehension*

- Know how to develop and formulate research questions, objectives, and hypotheses
- Know how to find literature relevant to a problem
- Know how to read a research paper and retain its content for future use.
- Know simple approaches to good writing for research proposals, papers, and theses.
- Know how to communicate your research plans to peers and others, including presentation of research talks and posters
- Know a range of tools and tricks of the research trade, including finding funding, publishing, peer review, and computer-based tools
- Be aware of common ethical issues in research

#### *Synthesis and Evaluation*

- Write several versions of a research proposal, including identifying your questions, objectives, and/or hypotheses, framing your proposed research in the context of the knowledge base you are building on, and identifying your methods
- Prepare and present a research poster
- Prepare and present a research talk
- Participate in peer review of the above products

### Workload:

*Proposals:* A substantial portion of the work in the class will be oriented around grant proposal writing. Students will write proposals directed toward two funding targets: the National Science Foundation Graduate Research Fellowship Program (NSF GRFP) and the Geological Society of America Graduate Student Research Grants. There will be multiple drafts of proposals submitted

for review by both peers and ACW. These exercises are intended to help you formulate and explain your research plans, potentially obtain funding, and prepare for your full thesis proposal.

*Individual meetings with ACW to discuss project:* week of October 11

*Presentations:* Each student will give a ~10-minute presentation on their proposed research to the full Geosciences Department at the end of the semester. These will be preceded by practice presentations during class. Each student will also present a poster.

*Paper readings and discussion:* We will occasionally read and discuss papers and articles. These readings and discussions will be designed to expose you to additional perspectives and advice on graduate research. Readings will be announced in class and posted on the course website.

*Other assignments:* There will occasionally be other small assignments such as précis of research papers.

### **Assessment**

40% Research proposals.

10% Research talk

10% Research poster

20% Other assignments (reviews, website, other small assignments)

20% Class participation: active participation in discussions, including of journal papers; questions and other participation during class activities

Proposals will be assessed using NSF criteria, where the proposal is judged according to the intellectual merit and the broader impacts of the proposed research and is assigned two sets of qualitative ratings: 1) poor, fair, good, very good, excellent, and 2) do not fund, fund if possible, definitely fund.

### **Other notes**

1. *Attendance:* Much of the content of this course is focused on in-class activities and discussions, which is reflected in the weight assigned to class participation. If you miss class, it is your responsibility to find out what you missed, which should involve consulting the course website and your peers.
2. *Course website:* This course will use Moodle (<https://umonline.mrooms3.net/login/index.php>). Please check the course website regularly, especially before class, for announcements, notes, readings, assignments, and schedule updates. Some of the class lecture notes will be posted. For instructions on using Moodle and on obtaining your NetID, which is required to access Moodle, go to: <http://umonline.umt.edu/Moodle%20Tip%20Sheets/tipsheetandvideosstudents.aspx>
3. *Email.* Feel free to communicate with me by email, and note that: 1) I'm likely to read your email fairly soon after I receive it but I may not respond immediately; 2) if you have questions that others are also likely to have, please save them for class; 3) if you need to miss class for any reason, please let me know in advance by email; 4) assignments submitted electronically must be well organized, consolidated into one file, and contain your last name in the file name.
4. *Late policy:* No credit allowed for assignments handed in > 1 week after due date or after answer key posted, whichever comes first.
5. *Academic Integrity:* All students need to be familiar with and abide by the Student Conduct Code and its definitions of academic misconduct. The Code is available for review online at <http://life.umt.edu/vpsa/documents/StudentConductCode1.pdf>.
6. *Equal Access:* The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students (DSS). If you think you may have a disability adversely affecting your academic performance, and you have not already registered with DSS, please contact DSS in Lommasson 154. I will work with you and DSS to provide an appropriate accommodation.

**Course schedule:**

- Class meeting topics are subject to change
- Readings will be announced each week and must be completed before the following class.
- Updates to the syllabus will be announced in class and posted on the course website

**Week 1 (8/28)**

Introduction: Department & course overview, graduation requirements, paper discussion

**Week 2 (9/4): Defining a research project**

Due: Statement of previous research experience (<2 pages)

**Week 3 (9/11): Writing proposals, funding sources****Week 4 (9/18): Proposal review, Literature reviews****Week 5 (9/25): Writing and reviewing****Week 6 (10/2)**

Research tools – searching, referencing (with Barry Brown, Mansfield Library, meet in Buckhous, ML 284)

Due: Proposal #1

**Week 7 (10/9): The publication process, Individual meetings****Week 8 (10/16): Research-related software tools****Week 9 (10/23): Oral presentations****Week 10 (10/30): Multimedia research tools (websites, posters, graphics)**

Due: Proposal #2

**Week 11 (11/6): No class, Election Day****Week 12 (11/13): Poster session****Week 13 (11/20): Research ethics****Week 14 (11/27): Practice talks****Week 15**

Monday, 12/3, 4-5:30 pm: Oral presentations to department (Geosciences colloquium)

Course wrap-up (regular time)

Due: website

**Week 16: Exam week, no class**

Due: Proposal #3

**Required text:**

Turabian, K.L. 2007. *A Manual for Writers of Research Papers, Theses, and Dissertations*. University of Chicago Press. 7<sup>th</sup> ed.

**Other readings:**

American Meteorological Society. 2010. Communicating Science. Draft statement.

Gopen, G.D. and J.A. Swan 1990. The science of scientific writing. *American Scientist* 78:550-558.

Harley, C.D.G., Hixon, M.A. and Levin, L.A., 2004. Scientific writing and publishing-A guide for students. *Bulletin of the Ecological Society of America*(April): 74-78.

Isaak and Hubert 1999. Catalyzing the transition from student to scientist—a model for graduate research training. *BioScience* (April): 321-326.

Kearns, H. and M. Gardiner. 2011. The care and maintenance of your adviser. *Nature* 469: 570.

Kiparsky, M. 2006. How to win a graduate fellowship. *Chronicle of Education*.

Mackay, R.J. Writing readable papers: How to tell a good story. Reprinted from *Bulletin of the North American Benthological Society* 12(3): 381-388; 1995.

Schwartz, M.A., 2008. The importance of stupidity in scientific research. *Journal of Cell Science*, 121: 1771.

**Resources:**

Department of Geosciences Graduate Handbook:

[http://www.cas.umt.edu/geosciences//documents/guidelines/Grad%20Guidelines%202011-2012\\_AY\\_v2.pdf](http://www.cas.umt.edu/geosciences//documents/guidelines/Grad%20Guidelines%202011-2012_AY_v2.pdf)

The Writing Center (free writing tutoring; highly recommended even for those of you who don't think you need it!): <http://www.umt.edu/writingcenter/>

UM website on Responsible & Ethical Conduct of Research:

<http://www.umt.edu/research/complianceinfo/RCR>

Information on grant proposals we'll explicitly incorporate into the class (I will provide a more extensive list of funding options in the future)

NSF GRFP (National Science Foundation Graduate Research Fellowship Program):

<http://www.nsfgrfp.org/>

-Due date: Nov. 19

Geological Society of America Graduate Student Research Grants

<http://www.geosociety.org/grants/gradgrants.htm>

-Due date: early February 2013

Zotero: Firefox extension for managing references: <http://www.zotero.org/>