

Guidelines for Geology Capstone Project

The purpose of the geology capstone experience (GLY 491/492) at Marshall is to give students experience doing research or project-related work. Geology majors may fulfill the capstone requirement one of three ways:

1. Senior thesis
2. Internship
3. Field camp

This document presents specific guidelines for completion of the capstone requirement in all three of the above areas. The guidelines are provided with the expectation that students will take the necessary time and care to plan, execute, and present the results from their project. **Failure by students to adhere to these guidelines may delay completion of their capstone requirement and even their date of graduation.** The guidelines are broken into the following categories:

I. General

II. Senior Thesis

III. Internship

IV. Field Camp

I. General

- Students should complete their capstone project in the semester prior to the term in which they will graduate. For example, if a student plans to graduate in December 2009 at the completion of the fall 2009 semester, the capstone should be completed by the end of the spring 2009 semester.
- Students may satisfy the capstone requirements by registering for 2, 3 or 4 credit hours (students pursuing the Engineering Geology area of emphasis are required to complete either a 4-hour internship or 4-hour senior thesis for the capstone).
- For the senior thesis or internship option, approximately 30 hours of work—time spent in the field or lab, data analysis, writing of report, etc., is expected per credit hour.

- The work products required for the capstone will depend on the option that students select. Table 1 summarizes these requirements.

Table 1 -- Summary of Capstone Options for B.A. / B.S. in Geology

Project type	Proposal	Report₁	Presentation₁	Basis for Grade
Senior thesis	Required; to be approved in semester prior to project	Required; to be approved at least 7 days prior to presentation. ₃	Required ₅	Report, 70% Presentation, 30%
Internship	Not required ₂	Required; to be approved at least 7 days prior to presentation. ₄	Required ₆	Report, 30% Presentation, 20% Employer input, 50%
Field camp	Not required ₂	Not required	Required ₇	Assigned by sponsoring institution

Footnotes to Table 1

1: Capstone reports will be kept on file in department; capstone grades for oral and written reports along with faculty comments will be kept in each student's file and may be used by faculty when asked to comment about the student's oral and written communication skills by graduate schools and/or potential employers.

2: Formal proposal not required, but student must receive prior approval from the coordinating professor and the department chair for an internship and the department chair in the case of field camp.

3: Minimum of 12 double-spaced pages of text, plus tables, figures, references, etc. Report should include rigorous presentation, analysis, and interpretation of data.

4: Minimum of 8 double-spaced pages of text, plus tables, figures, references, etc. Report should include general description of duties during internship and rigorous presentation, analysis, and interpretation of data from at least one example project.

5: Oral presentation with visual aids (e.g., Powerpoint), 30- to 40-minutes in length. The presentation should summarize content of written report.

6: Oral presentation with visual aids (e.g., Powerpoint), 25- to 30-minutes in length. The presentation should focus on rigorous presentation, analysis, and interpretation of data from at least one example project.

7: Oral presentation with visual aids (e.g., Powerpoint), 25- to 30-minutes in length. The presentation should focus on itinerary of field camp, major exercises, and a summary of the geology setting(s).

II. Senior Thesis

Proposal

- Geology students doing a senior thesis for their capstone are required to prepare a written proposal for review by the geology faculty. Proposals must be structured according to the outline provided in Appendix A.
- A proposal must be submitted and approved in the semester prior to the one in which the work will be executed. For example, if a student plans to graduate in December of 2009, he/she should submit and receive approval for their proposal by December 2008 and complete the capstone during the spring semester of 2009.
- The geology faculty may require that the student revise the proposal prior to its approval. The proposal must be approved by the faculty before a project may be initiated.

Report

- Following completion of the research project, a written report (as well as an electronic copy) of the senior thesis must be submitted and approved by the geology faculty.
- The report must be structured according to the outline provided in Appendix B. It must be a minimum of 12 double-spaced pages of text, plus tables, figures, references, etc., and should include rigorous presentation, analysis, and interpretation of data.
- The report must be submitted a minimum of 7 days prior to the oral presentation. Following the oral presentation the student must make any required revisions to the written report and resubmit the revised version to their thesis advisor. A final grade for the senior thesis will not be given until the written report has been revised to the satisfaction of the student's thesis advisor.

Presentation

- Once the written report has been submitted, the student should consult with his/her advisor about scheduling a time and date for the presentation. The date of the presentation should be no less than 7 days from submittal of the report and no later than the last day of classes for the same semester in which the report is submitted.

- Presentations should be 30-to 40-minutes in length and must adhere to the guidelines given in Appendix C.
- Part of the presentation grade will be based on the student's ability to competently respond to questions from the audience.

Grading

- The grade for the senior thesis will be based on the quality of the written report (70%) and the subsequent oral presentation (30%).

II. Internship

Approval of Internship for Capstone Credit

- A proposal is not required for an internship; however, students must declare their intent to fulfill the capstone requirement with an internship and receive approval from both the coordinating professor and the department chair.
- The coordinating professor is designated according to the type of internship:
 - Dr. El-Shazley: igneous/metamorphic petrology, geochemistry
 - Dr. Martino: coal, oil, or natural gas; sedimentology, stratigraphy
 - Dr. Niemann: engineering or environmental geology; hydrogeology
 - Dr. Sanderson: structural geology; computer methods; hydrogeology
- Approval ideally should be obtained prior to beginning the internship or within a reasonable time frame after beginning the internship. Approval to use an internship for capstone credit will generally not be given after an internship has been completed.

Report

- Following completion of the internship, a written report (as well as an electronic copy) must be submitted and approved by the geology faculty.
- The report must be structured according to the outline provided in Appendix B. It must be a minimum of 8 double-spaced pages of text, plus tables, figures, references, etc., and should include a general description of duties during the internship and rigorous presentation, analysis, and interpretation of data from at least one example project.
- The report must be submitted a minimum of 7 days prior to the oral presentation. Following the oral presentation the student must make any

required revisions to the written report and resubmit the revised version to their thesis advisor. A final grade for the senior thesis will not be given until the written report has been revised to the satisfaction of the student's thesis advisor.

Presentation

- Once the written report has been submitted, the student should consult with his/her advisor about scheduling a time and date for the presentation, at least 7 days from submittal of the report.
- Presentations should be 25-to 30-minutes in length and must adhere to the guidelines given in Appendix C.
- Evaluation of the presentation will include the student's ability to competently respond to questions from the audience.

Grading

- The grade for the internship will be based on input from the student's supervisor at the coordinating company or agency (50%), quality of the written report (30%), and the subsequent oral presentation (20%).

III. Field Camp

- Students should be aware that each year the geology department offers a competitive partial scholarship for a Marshall student to attend a geology field camp.

Approval of Field Camp for Capstone Credit

- A proposal is not required to attend field camp; however, students must declare in advance of the field camp their intent to fulfill the capstone requirement with attendance at a field camp. Prior approval by the department chair is required.
- To be eligible for capstone credit, a field camp must be at least 6 weeks in duration and affiliated with an accredited academic institution.
- Capstone credit will be given only for successful completion of a field camp, including a passing grade from the sponsoring institution.

Presentation

- Presentations on the field camp experience should be 25-to 30-minutes in length and must adhere to the guidelines given in Appendix C.
- Although the presentation is not part of the capstone grade, it will be scored and critiqued by the geology faculty. Presentation grades and faculty scoresheets will be kept on file for each student for future reference regarding oral communication skills.

Grading

- The grade for field camp is assigned by the institution sponsoring the field camp.

Appendix A Requirements for Senior Thesis Proposal

A good project begins with a good proposal. The proposal to do a senior thesis in geology is a planning document prepared for the benefit of both the student and faculty.

This requirement is intended to promote consistency and quality projects that can be performed by students in the most efficient manner possible.

It is anticipated that a proposal prepared according to the following guidelines will require approximately 750 words, equivalent to four double-spaced typed pages (12-point Times Roman font with 1-inch margins).

- Title page
- Abstract
- Introduction
- Methods/Procedures
- Schedule
- Budget
- References

Title page

- The title for your project should be specific and descriptive of what you are trying to accomplish. For example, a title like “*Proposal to study the Marshall Formation*” is not nearly as informative as “*A proposal to interpret depositional conditions of the Marshall Formation based on macrofossil assemblages in eastern Kentucky.*”
- The title page of your proposal must include signature lines for all geology faculty to indicate that they have read and approved the proposal:

Signature _____

Date _____

Dr. Smith has read and approved this project proposal

Abstract

- Should be a one-page summary (maximum of three paragraphs) of the project and its elements. It should include a brief statement of the problem, the approach you will follow in solving it, and possibly the expected outcomes and benefits of the project. Avoid using acronyms, abbreviations, or strange terminology in the abstract.

Introduction

- This section should state the significance of your project and provide background information.
- Summarize previous work related to your topic. This may include published work in a technical journal or unpublished work such as that done by your advisor or another student during a previous capstone. (If you don't know of any related work to discuss, chances are you haven't done your homework and aren't ready to write your proposal!). Use standard scientific format to cite previous work, e.g., "*Jones (1998) described brachiopods from the Marshall Formation,*" or "*Brachiopods are numerous in exposures of the Marshall Formation (Jones, 1998).*"
- What will you attempt to accomplish with your project? Being as specific as possible in describing your goals may save you hours of work later on!
- Will your project offer something completely new or a different angle on something that has already been done on the same topic? Be specific as to what your project will contribute to knowledge in the subject area.
- Are your goals tangible or measurable such that you will know when they have been accomplished? (Note: the end of the semester or your graduation date does not constitute a valid reason for terminating your study if the goals remain unfulfilled!).
- Is there a reasonable possibility that your primary goals may not be achieved because of a problem with equipment or methodology or other factors? If so, acknowledge this and state a backup plan.

Methods / Procedures

- What procedures or methods will you be employing in collecting and analyzing your data? Cite any standard methods, e.g., "*The fossil communities described by Smith (1982) will be the basis for identifying the macrofossil assemblages from the Marshall Formation.*"
- Will you be using lab and/or field equipment or software to accomplish your goals? If so, what is it—make, model/version number? Does the department own it and is it currently working, or do you have access to it somewhere else? Have you confirmed with your advisor that he/she will be available to help you during the time period you are planning to use the equipment/software?

Schedule

- How much time will your project require? A 2-credit hour capstone should involve an average of 4 hours per week for the duration of a 15-week semester, a total of 60 hours. Will you be doing most of the work in chunks, such as full days during the summer, or four hours each week? If you find that your project will require significantly more than 60 hours, consider registering for additional credit hours or scaling back your project in consultation with your advisor.
- Give an approximate schedule for when you will be doing your work including time frame for data collection, data analysis and a tentative date for submitting your written report and doing your oral presentation.

Budget

- Will your project require funds for any part of it, outside services, travel expenses, supplies, etc? If so, list these here and the anticipated amount(s). Note that funds may be available from the department of geology provided you give advance notice of your needs.

References

- Use standard scientific format in listing the references used in preparing your proposal. Examples are given below. If you don't know of any references to cite, chances are you haven't done your homework and aren't ready to write your proposal!

El-Shazly, A. K. and Coleman, R. G., 1990. Metamorphism in the Oman Mountains in relation to the ophiolite emplacement. In Robertson, A. H. F., Searle, M. P. and Ries, A. (eds.), *The Geology and Tectonics of the Oman Region*. Geol Soc London Special Pub, 49, p. 475-495.

El-Shazly, A. K.; Coleman, R. G. and Liou, J. G., 1990. Eclogites and blueschists from NE Oman: Petrology and P-T evolution. *J Petrology*, 31: 629-666.

Appendix B Requirements for Capstone Reports

Before writing your report, obtain and read one or two professionally written articles. This will give you insight into the topic and help you grasp how a technical paper is put together. Your advisor should be able to assist in locating these articles.

The report for the senior thesis should be a minimum of 12 double-spaced pages (12-point Times Roman font, 1-inch margins) not including figures, tables, maps, appendices and a list of references. The report for the internship should be a minimum of 8 double spaced pages.

Pages should be numbered and all figures, tables, maps, sources, and appendices must be referenced in the text. Refer to figures and tables in their appropriate places. For example: “..... the plagioclases are normally zoned (Fig. 3)”, or “Figure 2 shows that the plagioclases are normally zoned from An₆₅ to An₃₀”, or “Table 1 lists the chemical compositions of pyroxenes”. Do not use footnotes.

Define all acronyms or abbreviations after their first occurrence in the text or use a separate page if necessary for this purpose.

Capstone reports must include the following headings:

- Title page
- Abstract
- Introduction
- Methods/Procedures
- Results
- Interpretation/Discussion
- Conclusions
- Acknowledgements
- References

Title

- Title page of your report must include signature lines for all geology faculty members to indicate that they have read and approved the report.

Signature _____ Date _____

Dr. Smith has read and approved this project proposal

Abstract

- Should be a one-page summary (maximum of three paragraphs) of the project and its elements. It should include a brief statement of the problem, the approach you followed to solve it, the results that you obtained, and your conclusions. Avoid using acronyms, abbreviations, or strange terminology in the abstract.

Introduction

- A brief history of the area of research, its significance, and how your project contributes to it. Some of this can be recycled from the text of your proposal.

Methods/Procedures

- Document how you collected and analyzed your data including laboratory, field, lab, statistical, and/or computer methods. Be sure to reference standard methods where appropriate (e.g., “standard penetration tests were performed according to the American Society for Testing of Materials [ASTM] Method D-1586.”).

Results

- Describe what you found in objective terms. This should be factual and clearly separate from your interpretation/discussion in the following section. Avoid long written descriptions of your results by taking advantage of summary tables, graphs, maps, etc., all of which should be referenced in the text.

Interpretation/Discussion

- Tell the reader what your results mean. Can the results be interpreted in more than one way? Is the quality of the data an issue? (This may have been out of your control due to field conditions, etc). If so, explain how it limits your ability to make interpretations. Were there certain aspects of your research plan that you could not follow or were forced to modify (e.g., number of samples)? Explain.

Conclusions

- Summarize what you found and what it means, how it adds to the topic that you addressed, and what might be done next to further this area of research. Be careful not to overstate the significance of your study; even for professional researchers, limitations in time, funds and other factors commonly constrain the types of conclusions that can be made from a single study.

Acknowledgements

- Acknowledge all sources of financial support, those who have extensively reviewed your manuscript, or those who have given you data/ ideas.

References

- Use standard format as detailed above in Appendix A.

Report Approval

- Faculty members will review your report and likely request minor or major revisions, some of which may affect your oral presentation.
- When all of geology faculty members have signed the final, corrected copy of your report, submit the original to the geology secretary, who will then make you a copy for your use. Also submit an electronic copy of all text, figures, tables, etc.

Other useful advice for writing geological reports can be found in the following on-line resources:

http://www.nwrc.gov/lib/lib_sta.htm: An excellent extensive guide to writing geological articles. Originally designed for USGS type reports, but is quite applicable to other types of papers and manuscripts. Excellent guide for the proper use of stratigraphic, paleontological, mineralogical, petrological, ... etc. terms.

<http://filebox.vt.edu/eng/mech/writing/>: An excellent site with some tips, exercises (in grammar, spelling, vocabulary, punctuation, ... etc.) as well as sample papers.

<http://users.von.uc.edu/brackerw/ScientificWriting.htm>: Contains an excellent powerpoint presentation on scientific writing. Has several other resources as well.

<http://www.earthresearch.com/>: Useful website with several tips on writing, and many other useful resources.

Appendix C

Requirements for Oral Presentation

Once the written report has been submitted, talk to your advisor about scheduling a time and date for the oral presentation, no sooner than 7 days following submittal of the report. Remember that it is sometimes difficult to find a time and date that works for everyone, especially late in the semester, thus do not delay.

Students presenting the results of their senior thesis should plan for a 30- to 40-minute talk; presentations on internships and field camp should be 25 to 30 minutes in length. Students should anticipate and be prepared for questions from the faculty and other members of the audience. The ability to respond competently to these questions is an important aspect of the presentation.

Evaluation of presentations will be based primarily on the quality of their technical content, but the following considerations also will be factored into the grade:

- organization;
- persuasiveness;
- quality of slides/visual aids;
- effective use of time;
- competent response to questions.

Students should recognize that effective presentations are not simply recitations of a written report. Respect your audience by being prepared, or risk the consequences. Some good general advice for speakers:

- The most important factor in preparing a good presentation is rehearsal! Multiple rehearsals of a talk are normally required--even by professionals--before the “real” thing, in order to master content, timing, etc. (Make sure your advisor sits in on one of your rehearsals so he/she can provide input). It is usually obvious when speakers have not rehearsed their talks.
- Presentations should be supplemented with visual aids; this is most easily done using *Powerpoint* or overhead transparencies. An informative and entertaining talk normally provides a mix of text, pictures, tables, graphs, etc. Do not try and fit too much information on individual slides.
- A good rule of thumb is one idea per slide and one slide per minute of talk.
- Being nervous before a talk is normal, even for experienced presenters. Try not to be overly concerned. A talk does not have to be perfect to be effective.

- Never read verbatim from slides; make eye-contact with your audience and treat the talk as a “conversation.
- If you don’t know the answer to a question, admit that you don’t know or are not sure; don’t try and bluff the audience. The audience usually will respect a speaker who goes this route. An educated guess may be appropriate, but be sure to state that’s what it is.
- An example scoresheet used to judge student presentations at an AAPG meeting is shown below.

**Eastern Section AAPG
Oral Presentation Judging Form**

Session:		Date, Time:	
Speaker:		Title:	
Maximum Score		Score	
Notes		PRESENTATION Criteria	
	3		Elapsed Time: Full score if not more than 10% short or one minute over
	2		Opening: Pertinent, interesting or trite
	5		Diction: Enunciation, volume, inflection
	6		Stage Manner and Enthusiasm: Tense or relaxed; addresses audience or lectern; both bored?
	3		Word Choice and Grammar: Appropriate and correct usage; clear and free of excessive jargon
	12		Visual Aids: Legibility and clarity, overcrowded (lettering, photography)
	6		Coverage: Are text points adequately illustrated?
	3		Ending: Strong ending or just ran down; were main points summarized and stressed?
Subtotal:	40		
Notes		CONTENT Criteria	
	5		Substantiation: a) Does paper contain data which support a scientific conclusion?
	5		Substantiation: b) Does the speaker arrive at a scientific conclusion? (yes – high score; no – low score)
	15		Originality: a) Is paper a real contribution, presenting new concepts or new interpretations of new or old data? A new frontier geographically or scientifically?
	5		Originality: b) Is the subject matter timely or is the speaker boring the audience with old, worn, thoroughly understood concepts?
	10		Pertinence: a) Are data, text, illustrations all relevant to topic or title?
	10		Pertinence: b) Will you remember the scientific aspects of this paper? Do you think this paper will create a lasting impression?
	10		Usefulness and Significance: Does paper have broad application to the geologist?
Subtotal:	60		
Maximum total score	100		
Judge:		Signature:	