

The Citadel
Department of Chemistry

Procedures and Policies for the Senior Research Thesis Courses (CHEM 419/420)
September 2012

This document provides guidelines for the proper completion of the Senior Research Thesis (Chemistry 419 and 420) courses. In brief, these courses require selecting a chemistry "problem," developing it under the direction of a member of the chemistry faculty, presenting two seminars (one during the fall semester and one in the spring semester of your senior year) on this topic, and finally preparing an undergraduate thesis on the topic and defending it before a faculty committee.

The Senior Thesis is required of all chemistry majors. For the B.A. major, it can be the preparation of a review article on some suitable chemical topic under the direction of a faculty committee. The work to be done will include a literature search (which will be as exhaustive and as current as possible), an annotated bibliography, and a paper in the fashion of a review article consisting of fifteen to twenty pages of *text* in addition to any included tables, diagrams, pictures, etc.

For the B. S. major, an experimental research project is required. This course involves a research project on an approved chemical topic under the direction of a faculty committee. The work to be done will include a literature search on the selected topic and an extensive laboratory investigation. It culminates in a written report in the fashion of a journal article in the appropriate discipline. B.A. Chemistry majors may also choose an experimental project with the permission of the Department Head.

The term "senior paper" is used in these guidelines as a generic term to refer to either the literature or experimental research project as appropriate. The student is further referred to the college catalogs for the descriptions, prerequisites, and expectations of the courses. Additionally, the primary reader is also the research advisor.

1. TOPIC SELECTION

As a portion of the requirements of the junior -level Introduction to Chemical Research course (CHEM 308), each student will attend the several department seminars presented during the spring semester. In general, these seminars will be presentations by the senior chemistry majors on their research topics. However, at least one of these seminars may consist of short presentations by the faculty of the chemistry department on their current research and chemical interests which that faculty member would be able to sponsor for a senior paper. Following these presentations, each student will meet with one or more of the faculty presenters to explore research possibilities; a record of these discussions will be kept on the attached form. For the purpose of the Introduction to Chemical Research course, any properly worked-up topic which reasonably follows from a discussion with a faculty member will satisfy this portion of the Introduction to Chemical Research course requirements. For the purpose of the senior paper, it is expected that all rising seniors will have selected an appropriate thesis or research topic prior the end of the junior year so that some preliminary work and attention can be given to this material during the summer prior to the start of the senior year. The memo form to the Department Head at the end of this document is to be turned in by May 1 of the Junior year.

Should the faculty presentation not be made, the student will make appointments and meet with at least three members of the chemistry faculty to discuss possible research or thesis topics. A record of these discussions will be kept on the attached form; the remainder of the requirements are as outlined in the previous paragraph.

The student will prepare an outline of his/her topic during the Introduction to Chemical Research course. After the discussion with a member of the chemistry faculty who will then serve as the research advisor, a topic will be selected, a bibliography assembled, and a short (two page) research proposal will be prepared. This topic may or may not be that which the student pursues in the completion of the requirements for his senior paper and seminars; it may well be that the

topic becomes less attractive to the student as it becomes better understood! In the event that the student does not continue with the topic, the student will complete the expectations of the Introduction to Chemical Research course but will need to repeat this process with the topic finally selected for the senior paper.

The committee which will be advising the senior paper may have additional requirements and expectations for the literature search and bibliography; if so, the student will be responsible for this additional work as a part of the requirements for the senior paper. It is also expected that the bibliography will be kept current with any new developments that may be published during the student's senior year.

In certain instances, a student may have an opportunity to do a research project at another institution during the summer between the junior and senior years. With the consent of the instructor, the bibliography project for the Chem 308 course can reflect this proposed work. Under certain circumstances, the student may be able use this experience to meet a *portion* of the senior paper requirements. If such a project is available, the student needs to discuss the possibilities and potential restrictions with the department head *before* beginning the project.

2. TOPIC APPROVAL MECHANISM

As indicated above, the student should have selected a topic for the senior paper no later than the end of the spring semester of his junior year. The faculty member who agrees to sponsor this student will serve as the primary advisor. A memo must be given to the Department Head indicating the choice of advisor and a proposed topic as well as information from the mentor indicating their approval of the project by May 1 of the Junior year.

Final approval of the topic for the senior paper, including the setting of the various completion dates, should be made by the department head no later than the fifth day of the fall semester of the student's senior year. At this time, the department head will appoint a secondary advisor; the details of the selection process and the responsibilities of the advisors are outlined below.

3. DEPARTMENTAL REVIEW (See Appendix A)

During the fall and spring semesters of the senior year, the student will present a seminar to the chemistry department on the senior paper. The expectations of the seminar program will be given to students as a part of the Introduction to Chemical Research course as well as early in the fall semester of the senior year. The Faculty Evaluation form of the presentations is included at the end of this document in Appendix A. It is anticipated that the fall seminar will address "what is to be accomplished" and the spring presentation will report "what has been done."

The seminar series is the opportunity that the department provides to its members and friends to tell what we are doing. This opportunity provides a friendly forum for the student to practice the art of a scientific presentation. The questions which are asked during the seminar and the comments written on the evaluation sheets by the faculty members will help to identify those areas of one's chosen topic that are in need of further work and clarification.

Following the second seminar, and before the final submission of the written senior thesis, the student will meet with his advisors and a third faculty member (who will be appointed at that time by the department head) to "defend" his thesis. The Department Head or a representative for the Department Head will also be present. The intent of this meeting is to have a final discussion of the project with the student in a setting less stressful than the public seminar and to ensure that the student has benefited by this degree requirement. Additionally, the other primary readers may attend this session as observers. They will not ask questions or make comments as the purpose is to assist them in making grade recommendations for their advisees.

The primary assignment for grading purposes for CHEM 419 will be the faculty evaluation sheets for the students' seminar. Each member of the faculty in attendance will submit a completed review sheet to the CHEM 419 coordinator. The coordinator will combine all the comments and provide primary advisor with a summary to share with the student.

The original forms and a summary will be placed in the student portfolio. A meeting of the primary readers will be convened and the primary readers will assess student performance and assign final grades.

Because the emphasis of the course shifts during the second semester, additional parameters will be considered when assigning course grade. The primary assignments will be the thesis and the thesis defense (60%). The seminar and research progress will also be considered to a lesser, but significant, extent (40%). The faculty will evaluate the seminar in the same manner described previously and they will forward their comments to the CHEM 420 coordinator. The primary reader will evaluate and recommend the grade for research progress. The primary and secondary reader will independently recommend grades for the thesis and the defense. All grade recommendations will be forwarded to the CHEM 420 coordinator. The final grade will be determined by the primary readers after reviewing all the grade recommendations. The grade recommendations will be reported to the department chair to ensure consistency.

Normally the grade of CN will be made for midterm grades when satisfactory progress is made. However, the primary reader may assign the D or F grades if he/she deems such an assignment appropriate.

4. COMPLETION DATES

The following completion dates will be set by student and his advisors. These dates must be coordinated with the pertinent seminar dates; the indicated dates are for guidance only, actual dates must be established with the assistance of the current academic calendar.

May 1 (junior yr)	(spring semester, junior year) Selection of topic and advisor by student and the completion of the research proposal prior to finals week, Memo to Department Head with approval of research mentor.
Sept (senior yr)	Final approval of topic (this date should be no later than the fifth day of classes, fall semester), Assignment of the primary and secondary advisors, and Setting of the various completion dates
Oct (senior yr)	Bibliography complete except for new material which is published during the year
March (senior yr)	First draft of final paper in hands of primary advisor
April (senior yr)	the "next-to-last" draft perused by BOTH advisors and the third faculty member
April (senior yr)	the defense of the paper is completed and the final revised version read and signed by BOTH advisors and the grade reported to department head (this date must be prior to the start of finals, Anything turned in after this time will be penalized by one letter grade.)

The actual date of the seminar presentation will be set by agreement between the student and the seminar supervisor; the following dates are set by agreement between the student and his advisor; the following lead times are advanced for guidance.

- 5 th day of the fall semester	final proposal form signed by Dept Head
- 4 weeks	detailed outline and bibliography to advisor for perusal
- 2 weeks	abstract and bibliography to advisor for perusal
Friday before:	final draft to advisor for perusal, copies of abstract and bibliography distributed to chemistry faculty and students. This date should be considered as inviolate.

The student will be responsible for ensuring that all deadlines, including the signing of the final paper, are met. Failure to meet the various deadlines will result in a **one letter grade per missed deadline penalty** that will be applied to the semester grade.

5. MECHANICAL ASPECTS

As indicated above, the details and expectations of the seminar program will be given to students as a part of the Chem 308 course as well as early in the fall semester of the senior year.

The senior paper will be prepared in a manner consistent with the guidelines to authors as periodically published in the appropriate professional journal, *ie*, organic papers should conform to the expectations of the *Journal of Organic Chemistry*, etc. Since the BA thesis is intended as a review article, the journal model should be *Chemical Reviews*. The student will obtain, as a required text of both the Chem 308 and the senior research/thesis courses, a copy of the current edition of *The ACS Style Guide*. Publications such as *Form and Style: Theses, Reports, Term Papers* by Campbell and Ballou, *Write Like A Chemist* by Robinson, Stoller, Costanza-Robinson, and Jones, *Scientific Writing and Communication* by Hofmann or *A Manual for Writers of Term Papers, Theses, and Dissertations* by Turabian will be useful guides for additional information and details in preparing the final paper.

The primary advisor to a senior paper will be that faculty member who suggested the topic which the student has chosen to develop. In general, the responsibility of the primary advisor will be to direct and advise the student's research, writing, and seminars. A faculty member may be limited by the department head or by other authority with respect to the number of students he may accept as a primary advisor.

The secondary advisor will be appointed by the department head in such a fashion as to create a relatively even load across the department with respect to faculty responsibility to the thesis and research courses. The primary duty of the secondary advisor will be to serve as a second reader of the final written report but this advisor will be available during the course of the project as a source of additional ideas and suggestions. The primary and secondary advisors will concur in assigning a course grade to the final paper which the student submits for evaluation. Progress grades (midterm and fall semester) will be assigned by the primary advisor based upon his observation and evaluation of the student's progress. Special grading situations will be resolved by the course coordinator.

The Citadel
Department of Chemistry

To: Head, Department of Chemistry

From:

Subject: "For Your Information:" Senior Thesis/Research Project

1. I propose the following subject for my senior thesis/senior research project.

2. The following faculty member has agreed to serve as primary advisor to this work.

Signature of faculty member. _____

3. Student's signature _____

Date _____

This form is to be used by the student to notify the department head of their research intentions towards the completion of the senior paper and should be filed no later than May 1 of the student's junior year.

The Citadel
Department of Chemistry
Final Approval of Senior Paper Topic

To:
From: Head, Department of Chemistry
Subject: Senior Thesis or Senior Research Project

1. The following project selected by you has been approved:

2. The following committee of professors shall direct this project
 - a. _____, Primary Advisor
 - b. _____, Secondary Advisor

3. _____
Date _____ Head, Department of Chemistry

4. The undersigned accept appointment to the committee:
 - a. _____
 - b. _____

5. Deadlines (to be set by student and advisor):
_____ Completed literature search/bibliography
_____ First draft of paper to primary advisor
_____ Next to last draft perused by the committee (may be TBD by a specific date)
_____ Final Draft of paper read and signed by committee (may be TBD by a specific date)

6. Sign and date this form, return it to the head of the chemistry department

Student Signature _____ Date _____

7. Approval complete, copies to all parties:

Head, Department of Chemistry Date _____

This form is used in the fall to finalize the arrangements which have been made towards completing the requirements of the senior paper. The student is to complete number 1, obtain the signature of the primary advisor, and number 5 in consultation with the advisor and turn it into the Department Head no later than the 5th day of the semester.

The Citadel
Department of Chemistry

Record of Student's Meetings with Potential Advisors

This form is to be returned to the chemical literature course instructor prior to the student's beginning the Introduction to Chemical Research bibliography assignment.

Student

Research or Thesis

Signatures of Faculty and topic(s) discussed:

1.

Signature _____ Date

2.

Signature _____ Date

3.

Signature _____ Date

4.

Signature _____ Date

Appendix A

Since CHEM 419/420 will be offered in multiple sections, we need to develop a procedure that will insure consistent grading throughout all sections.

A model similar to what was in place over a decade ago will be used. The basic structure of the thesis committee structure will be retained: primary reader, secondary reader and departmental representative. The departmental representative will be an individual who is normally not on any research committees and will insure that thesis format is consistent across the board. This individual will be present during the thesis defense as an observer should a problem arise later when the grades are determined.

Grading for the course will be determined by a committee. The committee will consist of all primary readers, one of whom will be the coordinator for the course. All primary readers are welcome to be present during each student's thesis defense to insure consistent grade determinations. However, only the primary reader of the student making the defense will be allowed to participate. The others are only present as observers. Once this committee meets and the grades are determined, the research director (primary reader) will be bound by the decision of this committee regarding the grade assignment. In the event that only two primary readers constitute the committee, the departmental representative will be required to serve and automatically be the coordinator. If there is only one primary reader, the student's thesis committee will constitute the committee and the primary reader will automatically be the coordinator.

This committee will also be responsible for the CHEM 419 grades which are based on the seminar as the primary grade source. However, primary readers are free to include a participation grade as well.

Faculty Responsibilities

Primary Reader - This individual will serve as the student's research director; judge the thesis and/or seminar on the merits of the project, determine the level of student participation on the project, serve on the grading committee, be present for all student thesis defenses.

Secondary Reader - This individual will review the thesis for scientific content and style, be present and take part in the thesis defense of that student's defense, be a part of the grading committee if required.

Departmental Representative - This individual will review all student theses for style consistency and serve on the grading committee as necessary.

Seminar Evaluation Form

Presenter: _____

Date: _____

Key: 1-Excellent 2-Above Average 3-Average 4-Below Average 5-Not Proficient

I. Scientific Presentation (35-50%)

Grade _____

- | | | | | | |
|---|---|---|---|---|---|
| A. Student demonstrated the subject's relevance in the introduction and provided an outline of the talk. | 1 | 2 | 3 | 4 | 5 |
| B. Student provided a background of related work in their field suitable to bring the non expert "up to speed". | 1 | 2 | 3 | 4 | 5 |
| C. Student clearly presented their proposed work and how it fits into the current work in the field. | 1 | 2 | 3 | 4 | 5 |
| D. Student discussed the chemistry at an acceptable level for a senior chemistry major. | 1 | 2 | 3 | 4 | 5 |

II. Question/Answer (5-15%)

Grade _____

- | | | | | | |
|--|---|---|---|---|---|
| A. Student listened to each question and provided a thoughtful answer. | 1 | 2 | 3 | 4 | 5 |
| B. Student answered questions at a level suitable for a senior chemistry major without too much assistance from their advisor. | 1 | 2 | 3 | 4 | 5 |

III. Mechanics (35-50%)

Grade _____

- | | | | | | |
|---|---|---|---|---|---|
| A. The abstract is of a suitable format and reflects the material presented in the seminar. | 1 | 2 | 3 | 4 | 5 |
| B. Visual aids are of professional quality, organized, clear, and free of mistakes. | 1 | 2 | 3 | 4 | 5 |
| C. Student speaks clearly and sufficiently loud, also at an appropriate pace. | 1 | 2 | 3 | 4 | 5 |
| D. Presentation is professional, student displays no distracting mannerisms. | 1 | 2 | 3 | 4 | 5 |
| E. Presentation is in the appropriate time range. | 1 | 2 | 3 | 4 | 5 |

IV. COMMENTS:

Note: Weighting of the scores within the given ranges above is up to the evaluator. Grades of D or F will be reserved for extremely unprofessional (including extremely short) presentations or failing to give the presentation.

OVERALL GRADE RECOMMENDED _____

LATE ABSTRACT PENALTY _____