

# CHEM 6914 – Original Research Proposal – Spring 2011 Syllabus

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## Overview

Written research proposals are the primary instruments that scientists use to other people (agencies or employers) to fund our work. Writing a proposal is a complex process that connects insight and creativity (new ideas) with established theory (literature precedent). In this course, the student prepares a written scientific proposal for evaluation by their Advisory Committee.

## Student Learning Objectives

Upon successful completion of this course, the student will be able to:

- Design an original, novel research study in chemistry.
- Identify, within the literature, the theoretical basis for a new research study and sound precedent supporting its experimental plan.
- Construct and write a research proposal that frames the proposed study, its theoretical basis, and its supporting precedent in a scholarly context establishing both intellectual merits and potential broader impacts.
- Orally present and defend a research proposal.

## What Does “Original” Mean?

The topic of your proposal (the main scientific idea that you are putting forth), needs to be something that you came up with on your own. Your idea should not be:

- Already present the literature (journal articles, reviews, patents, or conference proceedings), or
- Derived from your Research Director’s proposals, or
- In a specific area under investigation in your research group or in your advisor’s collaborations.

You should consult with your Advisory Committee members (not just your Research Director) if you think your proposal idea might be “too close” to work already underway in their own research group.

Connections. Your idea needs to be supported through “logical connections” to the existing literature. Your ability to make these “connections” is among the most important aspects of your proposal that your professors will judge. Proposing something “extremely novel” or a topic that is well outside the range of your knowledge can be unwise because you might not be able to make these “connections.”

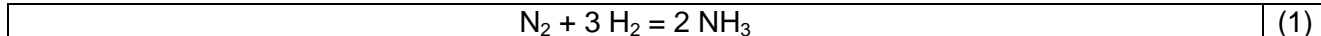
Although the main idea must be *your* idea, you are allowed to discuss it with professors, postdocs, and other students with regard to identifying and exploring the key issues. Just please don’t get yourself in a situation where someone else is trying to “feed” you ideas. Also remember that a new idea can be (and almost always is) a new combination of existing ideas.

## The Proposal Model

The structure and size of documents prepared for CHEM 6914 are based on a combination of National Science Foundation (NSF) and Petroleum Research Fund (PRF) models. We use some of NSF’s terminology, such as “Project Summary,” “Intellectual Merit,” and “Broader Impacts,” but we use a word limit (instead of a page limit) that is similar to the PRF DNI type proposals. Students who are interested in academic careers will be interested to read the NSF Grant Proposal Guide (a very long document), but for this course knowledge of the GPG is not required.

## Document Formatting Requirements

- **Cover Sheet.** Each document submitted must be accompanied by a fully completed Cover Sheet. Ask your Advisory Committee members whether they prefer paper or electronic documents.
- **Main Font:** 11 point Arial (this font) or 12 point Times New Roman. Please don't use other fonts unless you need them to create figures or to insert symbols or Greek characters into the text.
- **Line Spacing:** Double-space your documents.
- **Margins:** One-inch margins (2.5 cm). Note: the default margins for Word 2003 are not one inch. Page numbers (see below) may be below the bottom margin.
- **Page and Word Limits:** There are no document page limits. Instead there are limits on the number of words (500 for the Project Summary and 2500 for the Full Proposal). Word counts include figure captions but not references. Word 2007 gives the word count in the status bar (lower left).
- **Page Numbering.** Pages must be numbered at the bottom center. Please do not use text footers.
- **ChemDraw.** Please use "ACS 1996" default settings and do not reduce schemes past 50%.
- **References.** References should be formatted in the style for *Journal of the American Chemical Society*. Citations in the text should be indicated with subscripted numerals. These settings can be established as bibliography defaults within Thomson EndNote software. You are required to use EndNote or similar reference-database software for your Full Proposal.
- **Equations.** To make an equation with the equation-number on the right margin, use a Table. The wide left-hand column holds the centered equation. The narrow right column is made just large enough to hold the equation number. The second example shows how it will look without borders.



## Databases and Library Resources

### Newman Library

- General library home page: <http://www.lib.vt.edu>
- Electronic journals list: <http://www.lib.vt.edu/find/ejournals>
- Science Reference Librarian: Ed Lener, [lener@vt.edu](mailto:lener@vt.edu)
- Databases (SciFinder, Beilstein, etc.): <http://www.lib.vt.edu/dsp/index.php?subject=52>
- EndNote Download: <https://www.ita.vt.edu/Apps/WebObjects/NetSoftware>

### Recommended Books

- The ACS Style Guide (American Chemical Society)
- The Craft of Scientific Writing (Michael Alley, Springer).

## Grading

Grading Scale. This course is graded on an A-F basis as shown in the accompanying tables. The last column in the second table shows how grades will be assigned if the course is taken pass-fail. CHEM doctoral students must use the A-F grading option.

Document	%	90–100	A	P
Project Summary	20	80–89	B	P
Full Proposal	50	70–79	C	P
Oral Exam	30	60–69	D	F
<b>Total</b>	100	Below 60	F	F

### Automatic Point Deductions

The following table shows deductions that will be taken from your total if certain criteria are not met. Note that for the purposes of evaluation, a “no response” from an Advisory Committee member is interpreted as “not approved.” It is possible to receive more than one deduction.

Criterion	Points
Deduction <u>per day</u> (a minimum of 3 days will be charged) for failing to meet a deadline	–1
Deduction for <u>each</u> formatting requirement that is not followed	–2
Project Summary is not fully approved on the first attempt	–10

### Project Summary

A Project Summary that is turned in on time, follows all the formatting requirements, and approved by all members of your Advisory Committee will be awarded the full 20 points. Advisory Committee members do not assign a “Score” to the Project Summary. They either approve it, or they don't.

### Full Proposal

Advisory Committee members will read your Full Proposal and assign it a Total Score based on the 100-point scale shown in the table at the top right corner of this page. The scores assigned by your Advisory Committee members will be averaged and normalized to a maximum of 50 points. (Thus, if your professors awarded your proposal three grades of 90 and two grades of 80, your average would be 86, which corresponds to 43 points toward your total possible of 100 in this course).

### Virginia Tech Graduate Honor Code

Students must be familiar with and abide by the Graduate Honor Code which governs all their academic work at Virginia Tech. Plagiarism is an especially important (and potentially problematic) issue in CHEM 5914 and CHEM 6914. Care must be taken to discuss material published in the chemical literature in your own words. If sentences (or parts of sentences) are used verbatim, they should appear in quotations and cited. However, even a simple rewording of a published phrase (even if properly referenced) is inappropriate. The Graduate School has a document dealing with the issue of plagiarism which can be accessed at: <http://ghs.grads.vt.edu/student/avoiding.html>.

## Course Schedule

Project Summary. The Project Summary is to be submitted to your Advisory Committee (on paper, or electronically, as they prefer) by the end (5 PM on Friday) of the first week of the semester.

Response. Faculty members are allowed 2 weeks to respond to your Project Summary. Thus their responses are due at the end of the third week of the semester.

Revised Project Summary. In the event that one or more of your committee members asks you to revise your Project Summary, the revised Summary must be submitted *only to those specific members requesting the revision* by the end of the fourth week of the semester.

Response. Faculty members who are evaluating a revised Project Summary are allowed one week to respond. Thus their responses are due at the end of the fifth week.

Full Proposal. The Full Proposal is to be submitted to your Advisory Committee (on paper, or electronically, as they prefer) by the end of the seventh week of the semester (not counting the week of Spring Break).

Response. Faculty members are allowed 3 weeks to respond to your Full Proposal. Thus their responses are due by the end of the tenth week of the semester (not counting spring break).

Oral Exam. You may schedule your oral exam as soon as responses to your Full Proposal have been received from at least four members of your Advisory Committee. The Oral Exam must be completed on or before the Last Day of Classes.

Response. Faculty members are asked to use the Departmental ORP Oral Exam Result form to evaluate your oral exam. This should be completed on the same day as your exam and returned promptly to the Graduate Staff Coordinator (Angie Miller). Students should make sure this actually happens by bringing the form to their own exams.

## Uncommon but Unpleasant Problems

Project Summary Rejected. If one or more of your Advisory Committee members rejects your Project Summary, then you cannot proceed with the Full Proposal. Coming up with a research idea is hard, but that's the task before you. You do not automatically get to "try again." Your Research Director and the Graduate Program Director should meet with the professor(s) who rejected your Project Summary to discuss the situation and determine a fair course of action.

Faculty Members Do Not Respond. This is a problem that is largely beyond the student's control, but you should let the CHEM 6914 instructor know if you are not able to communicate with a member of your Committee.

## Recommended Document Content

### Project Summary

Specific Aims. The Project Summary should start with a short, introductory paragraph that explains, in clear language, the main idea of your proposal and its primary significance. This paragraph should conclude with your Specific Aims (1-3 *concisely* phrased key objectives presented in a bulleted list, as statements – not as questions).

Scientific Merit. The second (main) section of your Project Summary (two to three paragraphs) should be entitled “Scientific Merit.” This section should describe the general research approach that you would follow to reach your Specific Aims. Perhaps you need to describe briefly how a molecule will be made, or how a polymer surface will be coated with an inorganic substance. This section also describes the “logical connections” that your Full Proposal will establish between the published literature and your research approach. Finally, the Scientific Merit section should explain why your proposed research is interesting scientifically. Technological applications or societal benefits do not necessarily make research scientifically interesting. Instead, describe the insight that will be gained.

Broader Impacts. The final (short) paragraph of your project summary should be entitled “Broader Impacts.” This is where you summarize any practical applications or long-term technological impact that might result from your proposed research. One of the big pitfalls here is overselling your idea.

### Full Proposal

Background. The first ca. 500 words of your proposal should outline the literature background. The purpose of this background is to identify a gap – something missing – in the background, which your proposed research will address. In other words, the Background section convinces your reader that the research you are proposing really needs to be done.

Specific Aims. The next 500 words should summarize how the proposed research would build on the established (literature) work, and it should list the objectives of the proposed research. You can copy your Specific Aims section from your Project Summary and perhaps expand it a little.

Research Plan. The rest of the document should present an organized plan for the proposed research. Normally research projects are divided into sub-projects that support a central idea. Each of these sub-projects should be justified in terms of intellectual merit and connected back to one of your Specific Aims. Note that you do not need fine experimental details (such as using a 100-mL flask, or heating a reaction for three hours) because those details are subject to variation. On the other hand, critical parameters should be described, for example the use of supercritical CO<sub>2</sub> as the solvent for a particular reaction that cannot be accomplished any other way.

References. You must construct your reference list using Thomson EndNote or similar bibliographic database software.

### Suggestion

Write From an Outline. Writing a complex scientific document is much easier if you build a detailed outline and work from it.

## CHEM 6914 Original Research Proposal – COVER SHEET – p. 1 of 2

Student's Name	
Proposal Title	
Date Submitted	
Response Deadline	

**Check the correct box. (In MS Word double-click on box and change "default value")**

<input type="checkbox"/>	<b>Project Summary.</b> Submit to Advisory Committee. Response needed in two weeks.
<input type="checkbox"/>	<b>Full Proposal.</b> Submit to Advisory Committee. Response needed in three weeks.

**List your ENTIRE Advisory Committee here:**

Function	Name	Department	Email
Chair			
Co-Chair (if you have one)			
Member			
Member			
Member			
Member			

**Be sure to include *both* cover sheet pages ... this one and the next one.**

**Honor Pledge.** Turning in any document for CHEM 6914 constitutes a pledge to conform to the policies and procedures of the Virginia Tech Graduate Honor System.

## CHEM 6914 Original Research Proposal – COVER SHEET – p. 2 of 2

### Faculty Instructions

**Syllabus:** <http://www.chem.vt.edu/grad/course-syllabi/chem-6914-current-syllabus-PDF.pdf>

Evaluations are entered electronically at <http://www.gpd.chem.vt.edu>. VT login is required. Click on “Approval Tasks” in the left navigation pane. This is a new system. Contact Paul Deck (pdeck@vt.edu, 231-3493) with questions or problems. The advantage of this system is that the students will be able to log into the site and immediately see which approvals have been entered, rather than relying on Prof. Deck to relay that information to them.

Feedback. You should provide constructive feedback to the student (on the document, or on separate sheets), to help them address conceptual errors, improve their writing skill, and prepare for the next step in the process. Feedback should be conveyed *directly to the student*. When you have entered your evaluation, the student will likely contact you to retrieve his or her marked document and your comments. Alternatively you can put the document / comments in the student’s mailbox or send it by campus mail (mail code 0212).

Expectations for Scholarship. Students were advised that faculty members will expect a “main proposal idea” that is reasonably inventive and that is not in a *specific* area of research currently or recently underway their research group (including collaborations), or embodied in their proposals. Students were also advised that “logical connections” between proposed ideas and published precedent are central to successful proposals. While the Project Summary might not illustrate those connections in detail, there should be evidence that the student grasps the scientific issues that the proposal raises and has ideas to address them.

Project Summary. The Summary is limited to 500 words and must include a brief introduction with bulleted Specific Aims as well as sections titled “Scientific Merit” and “Broader Impacts.” Please approve the Summary if *“the main idea is sufficiently sound and novel for continuation to a proposal, and the student seems aware of the main issues and how to address them.”*

You may request a revision of the Project Summary, but please use this option **only** if you really need more information from the student to determine whether the idea is workable.

Full Proposal. The Proposal is limited to 2500 words, including Background, Specific Aims, and Research Plan sections. References and cover pages do not count toward the limit. There is no “First Draft.” Please read the Full Proposal as a Final Draft and assign it a score based on a 100-point scale (>90 = A, >80 = B, >70 = C, >60 = D, <60 = F). There is no provision within this system to require revisions to the proposal. If you believe there are serious issues that the student needs to address before his or her oral exam, then you should include those in your feedback directly to the student.

Grading. CHEM 6914 is now a graded course (A through F). The Project Summary is worth 20 points if accepted on the first try by all of the student’s committee members. Otherwise it is assigned 10 points. The Project Description (full proposal) is assigned 50 points, and the oral exam is assigned 30 points.