

SYLLABUS**CHM 4972 - RI: HONORS THESIS IN CHEMISTRY
Florida Atlantic University
Department of Chemistry & Biochemistry**

Semester Year

CREDIT HOURS: 2**COURSE:**

Location and time: To be arranged with the course instructor.

INSTRUCTOR:

Any full-time faculty member with research experience in the Department of Chemistry & Biochemistry may assume responsibility for guiding a CHM 4972 RI research project.

COURSE WEB-SITEThe Blackboard site for this course, where students can obtain course information, can be reached using the address <http://blackboard.fau.edu>. Your user name is the same as your FAUNET ID (go to <http://accounts.fau.edu> for information).

It is the student's responsibility to read the entire syllabus and understand the contents herein. This syllabus forms the rules and regulations by which the student must abide. In addition, it is the student's responsibility to monitor, read and understand all emails, announcements and course documents that are posted on the course Blackboard site. Any corrections or additions to the syllabus will be posted at the course Blackboard site and are understood to be part of the syllabus.

PREREQUISITEStudents must have completed 2 semesters of Honors Direct Independent studies (CHM ~~4972~~⁴⁹⁰⁵) with a minimum grade of B+ and have maintained overall major (Chemistry) GPA of 3.3 (B+).**COURSE DESCRIPTION**

This RI course is intended to provide the opportunity for in-depth, independent, undergraduate research. This includes all aspects of the research process: development of a research question, and the methods and/or experimental procedures to study that question, how to conduct scientific experiments, data analysis and interpretation, including scientific technical writing. Students will gain experience communicating the results of their research project in the form of an undergraduate thesis.

NOTE OF HONORS DISTINCTION:

CHM 4972 Honors Thesis in Chemistry is a course that is only offered to students in the Honors in Chemistry Program. Students admitted to this course will develop close relationship with faculty members through involvement in the independent research project. Students will be exposed to a real-life scientific research problems, taught to solve complex problems by applying interdisciplinary approaches, and will have hands-on access to research-grade equipment and application-based laboratory experiences. Through this high quality educational experience these students may appear as co-authors of publications in scientific journals and/or presentations at professional meetings. The writing component of the Honors Thesis course involves refinement of writing, graphic and oral presentation skills, and systematic work with regular deadline and ongoing feedback from the instructor. These students will receive more personalized letters of recommendation from their faculty mentors, giving them an advantage when applying to graduate and professional school or applying for jobs after graduation.

NOTE OF RESEARCH INTENSIVE (RI) COURSE DISTINCTION:This course contains an assignment or multiple assignments designed to help students conduct research and inquiry at an intensive level. If this class is selected to participate in the university-wide assessment program, students will be asked to complete a consent form and submit electronically some of their research assignments for review. Visit the Office of Undergraduate Research and Inquiry (OURI) for additional opportunities and information at <http://www.fau.edu/ouri>.**COURSE OBJECTIVES**

The main objective of this RI course is to train students to conduct research in a chemistry laboratory and produce an honors thesis. Through understanding of scientific method, students will be able to develop hypotheses,

design experiments, and critically analyze results to create a scientific report. Over the duration of the thesis work, students will be expected to apply a range of research techniques, demonstrate the ability to organize and document laboratory procedures and to refine report writing and oral presentations skills for the general scientific audience. Upon completion of this RI course, students are expected to have a good understanding of the safe laboratory practices, gain experience in critical analysis of their research to determine if it appropriately tested their hypothesis, and gain analytical and communication skills that are necessary skills for successful continuation of their education in a graduate program and/or for a highly competitive STEM job market.

STUDENT LEARNING OUTCOMES (SLO)

SLO 1: Knowledge.

Students will demonstrate ability to complete an independent research project, including writing and defending a thesis at the end of the course.

SLO 2: Formulate Questions.

Students will formulate or identify research questions and evaluate the literature to integrate basic principles and knowledge of chemistry and their application.

SLO 3: Plan of Action.

Students will develop and implement an experimental approach to address research and inquiry questions or scholarly problems. Students' plan of action will be evaluated both in the written assignment and in the oral presentation.

SLO 4: Critical Thinking.

Students will apply critical thinking skills to evaluate information regarding their own work and the work of others. Specifically, critical review of chemistry methods applied will be assessed both during oral presentations and in evaluating written reports.

SLO 5: Ethical Conduct.

Students will identify and follow significant ethic issues while conducting research and inquiry.

SLO 6: Communication.

Students will convey their research and inquiry in both oral and written formats.

INTEGRATION OF SLO's AND ASSIGNMENTS

<i>SLOs</i>	<i>Assignment requirements and assessments</i>
<i>1. Knowledge</i>	Students will master research methodologies sufficient to produce <u>an original work</u> , where "original" is defined as not being a straightforward repetition of previous work with no changes. Thesis work is expected to make a recognizable and novel contribution to the body of knowledge in the field while developing the scholarship skills required of effective and productive scientists. Students' Thesis will be evaluated for both effort (project ownership, persistence, group engagement, group citizenship, commitment) and scholarship (successfully integrates the thesis problem into the context of prior knowledge, including: research aims that are specific and complete; experimental approaches that are well justified; results that are analyzed thoroughly and interpreted soundly, as well as described clearly and effectively, depicted accurately with appropriate figures, and presented in a logical format with journal-quality; a referenced literature which is appropriate, accurate, and comprehensive).
<i>2. Formulate Questions</i>	Students will formulate a fundamental research question that will be addressed in their thesis project. Also, students should conduct background research to determine what work has been done to address this question and confirm that research is unique. The ability to identify a key critical question applicable to the selected field of study will be assessed.
<i>3. Plan of Action</i>	Students will develop and implement a statement of intent outlining the significance of the project, literature review, state hypothesis, specify the experimental design that will be implemented, potential difficulties and limitations of the proposed methods, and alternative approaches. The timeline of the proposed studies will be evaluated by the student's thesis committee.
<i>4. Critical Thinking</i>	Students will apply critical thinking skills to evaluate information including their own work and the work of others. Specifically, critical review of chemistry methods

	applied, ability to recognize and explain experiments efficiently, report data and make most relevant conclusions out of experimental results will be assessed both during oral presentations and in evaluating written reports. The assessment questions type will be: e.g. What fundamental chemical principles are demonstrated by the results? Are these results consistent with previously reported experiments? What other experiments can be conducted to either prove or disprove this analysis? What sort of explanation can be offered for this result?
5. <i>Ethical Conduct</i>	Students will conduct science in an “ethical” manner, safety issues in conducting science, and regulatory aspects of conducting research will be discussed on a regular basis with the research advisor. The proper literature citation and plagiarism will be assessed for each written research progress reports and final thesis document. Responsible conduct of research (RCR) learning course completion certificate that can be earned through the CITI on-line training, current Environmental Health and Safety training records, and the evaluation of the research project approval guidelines will be required at the beginning of the course. Students will be encouraged to attend FAU OURI workshops on topics related responsible conduct of research.
6. <i>Communication</i>	Students will convey their research and inquiry in both oral and written formats. As part of graded requirements, students will be required to write a statement of intent to pursue the honors project, progress reports, and a final thesis document including introduction, experimental design, results, discussion, conclusion, and literature cited sections. These reports are expected to demonstrate proficiency in technical writing and ability to present all relevant information. Students will also be assessed for the quality of oral communication skills during the thesis defense presentation. Content and its organization, clarity, delivery and quality of the power points will be part of the grading rubric.

COURSE TEXTBOOKS

There is no assigned textbook for this course. Background information will be largely derived from reviews and the primary scientific literature.

COURSE SCHEDULE:

Week 1: Research question identified and literature search

Week 2: Statement of Intent that includes Thesis Abstract written by student and signed by two Faculty Advisors has to be submitted to the Honors Director in Chemistry for approval

Week 3-8: Research, data analysis, and thesis writing

Week 9: The first Thesis draft should be submitted to Faculty Advisors

Week 10-11: Thesis writing

Week 12: Final thesis is due for faculty review (3 weeks in advance of graduation date)

Week 14: Preparation for the oral defense

Week 15-16: Thesis defense (presentation during Department seminar series)

COURSE REQUIREMENTS:

The thesis need not be limited to description of research during the semester, but may also include research from previous 2 semesters of Honors Direct Independent studies (CHM 4905). Length of senior thesis must be at least 15 pages (double-spaced). This page limit includes figures and their legends, but not the Literature Cited. The font type must be 11 point Arial. All margins of the paper must be one inch wide.

An honors thesis must contain the following sections:

I. Introduction

The introduction should include a description of the scientific background of the project and the significance of the project.

II. Experimental Design

This section should describe the experiments performed in sufficient detail to allow others to repeat the original experiments and reproduce the results.

III. Results

This section should state the rationale for each experiment and its design. The outcome of the experiments should be explicitly described.

IV. Discussion

This section should focus on the meaning and the broader context of the experimental results.

It should include analysis of whether the experiments supported or disproved the working model and hypothesis.

V. Conclusions and Opportunities for Future Research

This section should provide a brief description of where the research has led.

VI. Literature Cited

When referring to the work of others, it is important to cite their research with a suitable reference. A document of this size will typically cite 20-50 references in ACS style.

Students will present their findings at the FAU's Annual Undergraduate Research Symposium to further master presentation skills.

ASSESSMENT AND GRADING SCALE

The course grade will be based on both research and oral presentation components. Research component will reflect the priorities and expectations of the supervising Faculty Member (200 points). The oral presentation component will be based on the quality of the thesis defense presentation and will be given by a Thesis Committee, consisting of two Faculty Advisors (100 points). The grade will be calculated as a percentage of the total points earned (300).

The "A" range is 90-100%, "A-" range is 85-89% "B+" range 80-84%, "B" range 75-79%. A minimum grade of B+ is required for honors credit.

INCOMPLETE GRADE

Incompletes will not be given unless a) a student is passing the course and b) a student encounters severe and unexpected problems and was not able to complete some portion of the work assigned to all students as a regular part of the course. Incompletes are given only by arrangement with the instructor. Students are expected to make up incompletes as soon as reasonably possible. Incompletes are not given because a student is doing poorly in the course.

CLASSROOM ETIQUETTE POLICY

In order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular telephones and pagers, are to be disabled in class sessions.

CLASSROOM ATTENDANCE POLICY

Students are expected to meet with the Faculty Advisor at least once per week to satisfy all academic objectives as outlined by the Advisor.

Although this is a 2 credit hour course, a minimum of 10 hours per week of work will be required. In general, students should strive to commit to large blocks of time in the lab (>3 hours) to increase productivity.

DISABILITY POLICY STATEMENT

Students with disabilities: In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS)—in Boca Raton, SU 133 (561-297-3880); in Davie, LA 131 (954-236-1222); or in Jupiter, SR 111F (561-799-8585)

CODE OF ACADEMIC INTEGRITY POLICY STATEMENT

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty, including plagiarism, is considered a serious breach of these ethical standards, because it interferes with the University mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the University community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see the Code of Academic Integrity in the University Regulations:

http://www.fau.edu/regulations/chapter4/4.001_Code_of_Academic_Integrity.pdf