

Department of Chemistry & Biochemistry
CESCOS
Upper Division Honors Program Proposal

The mission of the Chemistry Honors Program is to provide an enriched learning experience for high-performing students. The program focuses on the enhancement of research and communication skills required for scientists. Specifically, the program provides opportunities for students to build the strong foundation of quality educational and research experiences in an environment that stresses collaborative and multidisciplinary approaches to problem solving, ethical guidelines, and superior oral and written communication skills. These efforts will give students a positive perspective on working in the interdisciplinary research field and prepare them better for continuation of their education in a graduate program and/or for a highly competitive STEM job market.

1. Entry requirements

- a. Students enter the Chemistry Honors Program in one out of two ways:
 - i. Students who have not completed any upper-level courses are eligible to enter the Chemistry Honors Program if they meet the following criteria:
 1. Overall GPA \Rightarrow 3.5
 - i. Students who have completed chemistry upper-level courses are eligible to enter the Chemistry Honors Program if they meet the following criteria:
 1. Overall GPA \Rightarrow 3.3
 2. Faculty nomination
- b. Students must complete the Chemistry Honors Program Application Form.
 - i. The application must be approved by the Admission Committee, composed of the Honors Program Director and a Chemistry Faculty Member.
- c. At no time will the Honors Program exceed 10% of total undergraduate chemistry majors student enrollment.

2. Program standards

- a. Students admitted to the Honors Program must maintain high academic and ethical standards
- b. Students may be dismissed from the program for any of the following:
 - i. Fail to maintain overall GPA of 3.0 GPA (B)
 - ii. Fail to maintain major GPA of 3.3 (B+)
 - iii. Violation of the Code of Academic Integrity
- c. In the event of withdrawal or dismissal from the program, credits earned in courses will be applied to the traditional Bachelor's Degree in Chemistry, with no penalty.

3. Honors-level enrichment through honors compact that includes the following:
 - a. Honors compacts will be available for a total of at least 3 upper-level chemistry and biochemistry courses (7 credits).
Courses suited for compacts include: Environmental Chemistry (CHM 3080), Quantitative Analysis (CHM 3120), Introduction to Physical Chemistry (CHM 3400), Physical Chemistry 1 (CHM 3410), Physical Chemistry 2 (CHM 3411), Inorganic Chemistry (CHM 3609), Bioanalytical Instrumentation (CHM 4139), Organic Chemistry 3 (CHM 4220), Materials Chemistry (CHM 4714), Directed Independent Study (DIS) (CHM 4905), Biochemistry 1 (BCH 3033), Biochemistry 2 (BCH 3034), and Advanced Biochemistry (BCH 4035).
 - b. All honors compacts will be signed by the student, the Teaching Course Professor and the Honors Program Coordinator.
 - c. The Teaching Course Professor will supervise all honors compacts and determine if the student meets the requirements of the honors compact.
 - d. Each of the honors compacts will have established criteria that should include but is not limited to a written assignment and an oral presentation.
 - e. Honors compact requirements during the first semester will be directed towards review of appropriate scholarly sources in their field of study.
 - f. Honors compact requirements beyond the first semester will require analysis and application of relevant literature.
 - g. Honors compact requirements will include individual and/or group assignments.
 - h. Chemical Literature (CHM 3060) with a supplemental honors component will be a required course for students in the program (1 credit).
4. Capstone experience
 - a. The capstone experience will consist of at least 2 semesters of Honors Direct Independent Studies (DIS) (CHM 4905) (a minimum of 2 credits in total)
 - b. A senior level thesis must be produced by honors students taking DIS courses with honors designation and must register for Honors Thesis in Chemistry (CHM 4972) (2 credits).
 - c. 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.
 - d. Students must obtain a grade of B+ or higher for honors credit.
 - e. The capstone experience will be overseen by two qualified research faculty members.
5. To be eligible for Chemistry Honors at graduation, students must achieve the following:
 - a. Overall GPA ≥ 3.0
 - b. Chemistry GPA ≥ 3.3
 - c. Complete a minimum of 3 (7 credits) upper-level honors compacts.
 - d. Complete the Honors Thesis in Chemistry (CHM 4972) (2 credits) and obtain a grade of B+ or higher.

6. Benefits to students include
 - a. Increased opportunities to develop a high-level of proficiency in skills required for graduate school and careers in science.
 - b. Direct participation in cutting edge research experiences.
 - c. Increased interaction with faculty members of the Department.
 - d. Completion of the undergraduate degree with upper-division honors distinction.

Appendix A

Explanation for Honors Compacts

The Department of Chemistry & Biochemistry proposes a program to enhance upper-division courses to receive honors designation. To receive Honors in Chemistry we believe all students in our honors program should be evaluated similarly and received similar enrichment components to their undergraduate education. Our experiences, and the size of the student population and faculty, prohibit the creation of separate honors section of upper division courses. The Department currently enrolls 350 undergraduate chemistry major students and requires participation in Directed Independent Studies (DIS) courses (CHM 4905) with faculty members and their research groups as part of the curriculum. During the latter courses, faculty members facilitate undergraduate research and inquiry by directly introducing students to scientific work; this is a highly flexible program where students work with a faculty member of their choice in the laboratory, and participate in lab meetings and seminars. Actual student experience in DIS courses varies greatly, depending on the faculty member's area of research and may range from literature analysis, exposure to advance instrumentation or techniques, and hands on laboratory experience in chemistry and biochemistry. Due to the nature of these courses, evaluation of student learning experiences is very limited, and faculty members assign S/U grades. Participation in research intensive experiences is the cornerstone of chemistry education, yet modification of current curricular requirements to introduce a rigid honors program cannot be feasibly implemented in our Department, since it could negatively affect current students with strict graduation plans and also affect faculty projects. Consequently, the overarching goal of this proposal is the implementation of an "honors-by-contract" approach that can be applied to courses offered in the department. Additionally, a key component of this proposal is use of standard rubrics for the evaluation of student learning outcomes, which were designed along with the Office of Undergraduate Research and Inquiry (OURI), to ensure connection between courses in the programs at the Department of Chemistry & Biochemistry.

We will not offer any honors courses/sections and all participating students will complete a uniform honors compact. All honors compact work will be evaluated by the teaching course professor. After the professor determines that a student has satisfactorily completed the honors compact, with a minimum of grade of B+, the student will be awarded honors credit for the course. This approach allows for consistency and maximum participation among our qualified students.

Appendix B
Sample Requirements for Honors Compact

CHM 4905
Honors Compact

In addition to existing course requirements, students completing an honors compact for CHM 4905 are required to satisfactorily complete the following:

1. Attend a minimum of three (3) Department of Chemistry & Biochemistry Seminars and write a summary for each of the meetings attended. The summary should be limited to 2500 characters (including spaces).
2. Submit at least 1 research report of activities for the semester which demonstrates analysis and application of relevant literature in ACS style.
 - a. First semester students can submit a literature review document in lieu of a formal research report.
3. Present research findings at one of the FAU's Undergraduate Research Symposia through a poster presentation and/or hold at least 1 seminar style oral presentation of research activities which will be evaluated for knowledge, clarity, and format. Honors students are expected to carry presentations: in a research group meeting, in Department seminars, university wide symposiums, or at regional/national conferences.
4. Obtain a grade of B+ or higher required for honors credit. We anticipate introduction of two new courses for undergraduate research, CHM 4915 offering letter grade and CHM 4916 offering satisfactory/unsatisfactory grade. Once approved our honors compact DIS course CHM 4905 will be replaced by CHM 4915.

Honors Compact
Chemical Literature CHM 3060

In addition to existing course requirements, students completing honors compact for CHM 3060 (Chemical Literature) must satisfactorily complete the following:

1. Attend a minimum of 2 Department of Chemistry & Biochemistry Seminars and write a summary for each of the meetings attended. Each summary should be limited to 2500 characters (including spaces).
2. Attend Undergraduate Research Symposium and write a summary about 2 poster presentations that attract the student's attention. The summary should be limited to 2500 characters (including spaces).
3. Prepare a brief literature review on important current topic in chemistry research in ACS style as determined by the CHM 3060 instructor.
4. Complete at least 2 student workshops hosted by the Office of Undergraduate Research and Inquiry (OURI), in collaboration with the FAU Library, e.g.: Library Research 101, Literature Review, and How to Write a Manuscript.
5. Obtain a minimum grade of B+ required for honors credit.

Appendix C Assignment Rubric

Student Learning Objective 1: Knowledge. Students will demonstrate content knowledge of basic chemistry principles both in written and oral presentations at the end of the course. Demonstration of higher level competency is expected with seniors and junior level students at the discretion of faculty. It is expected that students registered for Honors are able to hold a seminar style oral presentation as well as write an ACS style article.

Scoring criteria:

Exemplary. Students identify all concepts that are applicable to the selected field of study.

Competent. Students identify most relevant concepts that are applicable to the selected field of study.

Developing. Students reports concepts that are incomplete, with limited vocabulary or not applicable to the discipline.

Student Learning Objective 2: Formulate Questions. Students shall formulate or identify research questions and evaluate the literature to integrate basic principles and knowledge of chemistry and how they apply.

Scoring criteria:

Exemplary. Students identify a key critical question applicable to the selected field of study.

Competent. Students identify a mostly relevant question that is applicable to the selected field of study.

Developing. Students report a question that is incomplete or not applicable to the selected field of study.

Student Learning Objective 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.

Scoring criteria:

Exemplary. Students recognize and explain experiments efficiently.

Competent. Students recognize but do not explain experiments consistently.

Developing. Students recognize and explain experiments in limited styles.

Student Learning Objective 4: Critical Thinking. Students will apply critical thinking skills to evaluate information, 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.

Scoring criteria:

Exemplary. Students report data and make most relevant conclusions out of experimental results.

Competent. Students report data and make some conclusions out of experimental results with a few errors.

Developing. Students fail to report data, make only few conclusions out of experimental results, and work is inaccurate.

Student Learning Objective 5: Ethical Conduct. Students will identify and follow significant ethics while conducting research and inquiry.

Scoring criteria:

Exemplary. Students record and use good laboratory practices and cite all relevant sources in reports.

Competent. Students record and mostly use good laboratory practices and cite all relevant sources in reports.

Developing. Students fail to report all sources or inconsistently exhibit good laboratory behavior.

Student Learning Objective 6: Communication. Students will convey their research and inquiry in both oral and written formats.

Scoring criteria:

Exemplary. Students' articles and presentations are complete and present all relevant information.

Competent. Students' articles and presentations are mostly complete and present most relevant information.

Developing. Students' report and presentations are incomplete.

Appendix D
Department of Chemistry & Biochemistry
Florida Atlantic University
Honors Program Capstone Experience

Objective: Provide upper-division chemistry students an opportunity to apply knowledge obtained across prior chemistry courses and research experiences.

Honors program integration: The capstone experience will be applied by the production of a thesis resulting from at least 2 semesters of CHM 4905. The capstone experience will be completed by students in their senior year.

Research: Faculty advisors will select and direct the research experience at their discretion.

Senior thesis requirements: Students must register for Honors Thesis in Chemistry (CHM 4972). Statement of intent written by a student and signed by two Faculty Advisors will have to be submitted to the Honors Director in Chemistry for approval during the second week of the semester. Students will prepare the first progress report due mid-semester and submit it to the Faculty Advisors for review. At the end of the semester, students will submit a final honors thesis describing their research project for a final Faculty review at least 3 weeks in advance of graduation date. 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.

Senior thesis oral defense: Students will present their senior research project to the Department of Chemistry & Biochemistry.

Student evaluation: Senior thesis oral presentation and written document will be evaluated at an intensive level, using the same rubrics of the honors program compacts.

Faculty advisors: The capstone experience will be supervised by two full-time Chemistry Research Faculty with extensive experience.

Program Budget:**1. BUDGET:**

The Department of Chemistry and Biochemistry was able to secure funding from OURI to support the deployment of the Honors program.

	Year 1	Year 2	Totals	
Graduate research assistant(s)	4,000.00	4,000.00	8,000.00	
Marketing materials	50.00	50.00	100.00	
Total	4,050.00	4,050.00		

APPLICATION FOR UNDERGRADUATE CHEMISTRY
HONORS PROGRAM
FLORIDA ATLANTIC UNIVERSITY

Application package:

Z # _____

LAST NAME _____ FIRST NAME _____ MI _____

FAU EMAIL ADDRESS _____

PHONE _____

Year/Semester in which you seek admission: _____ / _____ GPA: _____

- 2) A copy of your (unofficial) current transcript highlighting all Chemistry major courses.
- 3) A 1-2 page Statement of Purpose which details why you are applying for the Honors Program with emphasis on what are you hoping to accomplish through this program.
- 4) If you have completed upper division chemistry courses, a faculty nomination is required. Include FAU Chemistry Faculty name below and a Statement of Support attached to this application form. Your application will not be considered without support from a faculty member.

I certify that the information given in this application is complete and accurate. Should any of the information I have given change prior to my entry to the program I will immediately notify the Chemistry & Biochemistry Department.

Signature _____

Date _____

<i>Approved by</i>
Department Chair: _____
College Curriculum Chair: _____
College Dean: _____
UUPC Chair: _____
Undergraduate Studies Dean: _____
UFS President: _____
Provost: _____