**BCH 408 SENIOR THESIS II IN THE BIOCHEMISTRY AND MOLECULAR BIOLOGY MAJOR**

*(continuation of BCH 407)*

**Coordinator:** Hanna Damke (775) 784-1830 (office), HMS165B, damke@unr.edu; office hours by appointment

**BCH 408 - Senior Thesis II (4 units):** Continuation of independent research project initiated in BCH 407. Culminating in a written thesis and poster presentation of the research experience.

**Required Prerequisites:** BCH400, completion of CO 1 – 8, senior standing

**Course Description:**
Original directed research in biochemistry and molecular biology culminating in a written thesis and a poster symposium; This course is required for all students in the Biochemistry and Molecular Biology major; an appropriate independent research project may be developed in biochemistry, molecular biology, chemistry, biology, chemical engineering, materials science, physics, environmental chemistry, and other related fields in the molecular biosciences.

The senior thesis gives students the unique opportunity to participate in undergraduate research. Students spend two semesters in a research laboratory working under the supervision of a faculty mentor. They perform independent research projects related to their investigator's research focus. The senior thesis program allows students to explore their aptitude for research within a more extended and individualized framework than that generally afforded by laboratory courses.

A senior thesis provides the students with the opportunity to draw upon everything they have learned during their college undergraduate experience and make a significant contribution to life science. A major student learning outcome of this program is to ensure that all students demonstrate the ability to communicate their research results effectively in written and oral form to diverse audiences. As such, the program culminates with a public poster session where students discuss their research findings with faculty, students and representatives from local molecular bioscience companies.

**Time Commitment:** Students are required to dedicate a *minimum* of 12 hours of experimental work per week (~ 3 hours per week per credit) to research. Individual research advisors may have higher expectations for the amount of time a student needs to dedicate to an undergraduate research project. Student and advisor expectations should be discussed prior to enrolling in this course.

This course satisfies the following core objective:

**Core Objective 14:** Application, Students will be able to demonstrate their knowledge and skills developed in previous Core and major classes by completing a project or structured experience of practical significance.
Student Learning Outcomes and Core Objectives:

- Students will apply their cumulative theoretical and practical knowledge related to biochemistry and molecular biology to engage in ongoing research programs.
- Students will design a research project that includes a testable hypothesis and appropriate experimental objectives by completing a project or structured experience of practical significance.
- Students will be able to demonstrate an ability to work independently under the supervision of a faculty member in a research environment.
- Students will demonstrate the ability to effectively communicate their research findings in written and oral form.
- Students will be able to integrate quantitative reasoning (builds on CO2) and critical analysis and use of Information (CO3) to formulate and carry out a research project. Students will be able to synthesize information and techniques from previous coursework across disciplines, specifically in Science, Technology and Society (CO9) to identify and use the basic materials and resources needed to carry out a research project.
- Core Objective 14 (Application): Students will be able to communicate the results of their senior thesis research in writing following the standards of scholarly articles in sciences (building on CO1).
- General Objective: Students will be able to articulate and follow ethical principles in a scientific context, including professional standards of laboratory practice, the communication of literature research without plagiarism, the crediting of collaborators and standards for co-authorship.

Student Research Responsibilities:

- Each student must work a minimum of 12 hrs/week in the laboratory or the amount of time agreed upon with the research advisor mentor. To prevent any misunderstandings at the end of the semester the student needs to keep a time sheet of the hours worked each week.
- The student must set up a weekly schedule and fill out a contract as to the days and times the student will be working in their lab. This needs to be completed in the first week of the semester.
- The student must notify the mentor if unable to work in the lab on a particular day (due to illness or accident).
- The mentor may assign papers related to the research project for the student to read as homework. The student must read them promptly and make every attempt to understand them.
- All laboratory safety regulations and common courtesy rules must be followed at all times.
- A good work ethic is to be maintained throughout the senior thesis.
- The student needs to communicate often with members of the lab, specifically the mentor and/or supervisor. Senior thesis costs the mentor supplies and time and taken away from other important projects necessary to keep the lab funded by national agencies. Be an asset to the lab, not a liability.

Grading:

40% percent of the grade will be assigned by the mentor’s final evaluation on the student's overall performance. At the end of this course the student will turn in a completed version of the senior thesis that includes the work conducted over two semesters. 50 % of the grade are based on the final written thesis and will be assigned by the mentor following the rubric provided. The remaining 10 % are based on the quality of the oral and poster presentations and will be assigned by the course coordinator. The final grade will be determined based on the quality/quantity of the research performed, the time commitment in the laboratory (attendance), laboratory safety, and completion of and quality of the senior thesis. Students are required to turn in the final copy of their senior thesis no later than the beginning of finals week (preparation day). Final
copies of the senior thesis need to be submitted to the research advisor and the course coordinator. It is critical that students start working on their final report well before the due date to allow for corrections and rewriting. Draft copies of the senior thesis need to be given to the mentor for review and correction prior to the final submission. The timeline for handing in drafts of thesis papers will be determined in consultation with the course coordinator.

**Senior Thesis Timeline (BCH407 and BCH408):**

Students are expected to find a laboratory to conduct their independent research project before or by the beginning of their senior year. Assistance with placement will be provided by the course coordinator. It is the student's responsibility to contact the laboratory of interest.

*Before or by the end of 1st week of the semester:*
- Discuss and outline research topic with advisor
- Sign contract including a brief project description and work schedule

*Prior to starting research in the laboratory*
- Complete laboratory safety training (provided by UNR EH&S)

*Ongoing throughout two semesters:*
- Background reading on research topic
- Independent research and training in the lab (12 hours/week)
- Participation in group meeting presentation(s)
- Preparation and practice of short talks (laymen audience) and 10 min scientific presentations;
- Mentoring of two freshmen students during a lab shadowing experience; this includes the review of a scientific paper written by the freshmen
- Building a reference library (for example: Endnote; Mendeley)
- Search and annotation of scientific literature
- Instructions on writing of scientific papers

**Week 10 of first semester**
- Rough draft of preliminary senior thesis

**Week 15 of first semester/Finals week**
- Final draft of preliminary senior thesis

**Week 10 of second semester**
- Rough draft of complete senior thesis

**Week 15 of second semester/Finals week**
- Final draft of complete senior thesis
- Clean up lab space/check out of lab
- Poster preparation and presentation (poster symposium)

**Senior Thesis:** All students are required to turn in a completed version of a written senior thesis at the end of two semesters of independent studies in a research laboratory. The thesis is due no later than the last day of finals (with draft versions due earlier). The senior thesis must be approved by the student mentor and submitted to both the course coordinator and the mentor. The written thesis should be a minimum of 10 pages (single spaced, 12 pt font) and needs to follow the standards of scholarly articles in science.
**Safety:** All group, departmental, and university safety and environmental policies must be followed. Students are to complete safety training pertinent to their research project provided by the UNR Environmental Health and Safety Department prior to beginning work in the laboratory.

**Academic Standards:** Academic dishonesty will not be tolerated in any form. This includes inadvertent as well as deliberate misrepresentation of one’s own work. Plagiarism is a serious offense and will be treated with the most severe sanctions permitted under university policy. Refer to the policies in the General Catalog on student conduct, academic standards, and academic dishonesty. Any student caught cheating in any way will be referred to the UNR Office of Student Conduct. Penalties include, but are not limited to, course failure and dismissal from the University. If there is any uncertainty about what might or might not be regarded as plagiarism, please discuss this with the course coordinator or faculty mentor before submitting any portion of the senior thesis. The most common form of plagiarism involves the copying of sections or statements directly from the literature or from the mentor’s grant proposals without proper citation. Even if citations are included, it is not appropriate to construct a discussion section by appending direct information from others.

**Academic Success Services:** Student fees cover usage of the Tutoring Center ([www.unr.edu/tutoring](http://www.unr.edu/tutoring)), the Math Center ([www.unr.edu/math-center](http://www.unr.edu/math-center)) and the University Writing Center ([http://www.unr.edu/writing-center](http://www.unr.edu/writing-center)).

**Students with Disabilities:** The Biochemistry Departments is committed to equal opportunity in education for all students, including those with documented physical disabilities or documented learning disabilities. University policy states that it is the responsibility of students with documented disabilities to contact instructors during the first week of each semester to discuss appropriate accommodations to ensure equity in grading, classroom/laboratory experiences and outside assignments. The instructor will meet with the student and staff members of the Student Services Center to formulate a written plan for appropriate accommodations, if required.

**Audio and Video Recording:** Surreptitious or covert videotaping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. The class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may have been given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded.