

CHE 496
Undergraduate Research in Chemistry/Biochemistry
(updated 9/1/2010)

Office Hours

Please schedule appointments *via* email.

Drop Date

The drop date for undergraduate research is the same as any other course.

Prerequisites

The prerequisite for CHE 496 is CHE 410, chemical safety, as well as senior standing. Before beginning this course, the student must read the undergraduate research guidelines on the department website (<http://www.usm.edu/chem/undergradresguidelines.htm>).

Credit Hours

CHE 496 may be taken for 1-3 hours credit and may be repeated once. At least three hours are required to count as the departmental capstone course. Although not required, students are encouraged to take two semesters of CHE 496.

Course Overview

CHE 496 counts as the capstone course of the undergraduate curriculum in the Department of Chemistry and Biochemistry. This is because research ties together the theory from the classroom and the techniques learned in the teaching labs. The experience of undergraduate research will benefit not only students planning on a research career, but also students planning any career in the sciences, both basic and health-related.

University requirements for a capstone course include writing of at least 5000 words and at least two graded oral presentations of which one must be public. The writing requirement is met in this course by a combination of the laboratory notebook, any reports in writing required by the advisor (e.g. weekly or monthly progress reports), and the final report. The notebook does not count toward the 5000 word minimum. The public oral presentation requirement can be met in a number of venues such as the departmental undergraduate symposium, senior honors symposium, the Mississippi Academy of Sciences, etc. The writing requirement and oral presentation requirement satisfies the GEC student learning outcomes 1a and 1b for general course requirements. Students taking two semesters of CHE 496 must provide an interim report at the end of the first semester and a full report at the end of the second semester.

Students are strongly encouraged to utilize the USM Speaking Center and the USM Writing Center for assistance. Both are located in Cook Library.

Course Objectives

At the end of the course you will be able to

- Read a scientific journal article in chemistry or biochemistry
- Plan new experiments, carry them out safely, and interpret the data obtained

- Keep a complete and understandable laboratory notebook
- Develop and focus on one topic in speaking and writing assignments and present ideas in an organized, logical, and coherent form
- Standard English grammar, punctuation, spelling, and usage

Required Text (s) and Readings

- Your research advisor will assign specific background reading and journal articles.
- Undergraduate research guidelines on the department website
- Instructions for authors of the journal your advisor selects for your final report format

Class Procedures and Requirements

- **Laboratory research**
- **Safety awareness-** *Students should familiarize themselves with the safety features of the laboratory and wear appropriate clothing and safety equipment, particularly eye protection, when in the laboratory. Students should also be aware of the toxicity of any chemicals they work with.*
- **Work ethic-** *Students should plan to work at least 10 hrs/week in the laboratory and to make efficient use of their time.*
- **Group meeting-** *Students are expected to participate in meetings of their research group and to be familiar with the pertinent scientific literature as directed by their research advisor.*
- **Laboratory skills-** *Students will learn to plan and carry out their own experiments, and interpret the data acquired.*
- **Notebook-** *Students will keep a dated record in a bound notebook of all laboratory experiments including protocols, calculations, results, and conclusions.*
- **Oral presentations**
- *Students must make at least two graded oral presentations of their research (one must be public). Documentation of the public presentations should be included in the final report. This documentation can be the flyer announcing the end-of-the-semester undergraduate symposium, a copy of the abstract page from a scientific meeting, etc. It must clearly indicate that you gave an oral presentation and were not just listed as a coauthor.*
- **Final Report (Thesis)**
- *The thesis should detail the research conducted by the student and will be judged by the soundness of the research procedure followed, and the thoroughness and clarity of thought evident in analyzing and critically evaluating the project results. It should be written in the style of a major scientific journal in the area. Examples of such journals might be the Journal of Physical Chemistry, the Journal of Organic Chemistry, the Journal of Biological Chemistry, etc. The thesis will normally be a minimum of 20 double-spaced pages long. The page minimum includes abstract and references but not cover page or figures. The thesis should also include a bibliography of not less than 10 primary literature references which are both current and complete, including titles.*

Professionalism

Students taking CHE 496 are expected to maintain a professional attitude, and contribute to a safe and collegial research environment. The chemistry and biochemistry research laboratories have numerous potential dangers, and the research student needs to recognize possible hazards and be familiar with safety equipment and procedures. Likewise, research is naturally about the discovery of new things, some of which will have potential commercial applications. It is critically important, therefore, that research students properly design and carry out their experiments, document their findings carefully, and report them clearly in oral and written reports.

Evaluation Criteria

Grades will be assessed based on the following categories. It is the responsibility of the student to discuss with their research advisor the weightings that he/she will apply to each of the categories. The student must discuss what is expected in each category with their research advisor.

- Laboratory Skills
- Work Ethic
- Safety Awareness
- Group Participation
- Notebook
- Final Report
- Oral Presentations (one must be public)
- Experimental Design
- Data Interpretation

Appendices

Three appendices are attached to this syllabus. They are rubrics which faculty use to evaluate research, writing and speaking. You should read them carefully.

Academic Honesty (from the USM Undergraduate Bulletin):

“When cheating is discovered, the faculty member may give the student an F on the work involved or in the course. If further disciplinary action is deemed appropriate, the student should be reported to the Dean of Students. In addition to being a violation of academic honesty, cheating violates the Code of Student Conduct and may be grounds for probation, suspension, and/or expulsion. Students on disciplinary suspension may not enroll in any courses offered by The University of Southern Mississippi.”

A research course offers a different dimension of academic honesty. Students must avoid misconduct such as plagiarism of research articles and reports by other students, falsification or fabrication of research results, etc. A good sampling of research ethics materials is available at the website of Dr. Samuel Bruton at <http://ocean.otr.usm.edu/~w305717/RE&S/home.html>.

ADA Syllabus Statement

If a student has a disability that qualifies under the American with Disabilities Act (ADA) and requires accommodations, he/she should contact the Office for Disability Accommodations (ODA) for information on appropriate policies and procedures. Disabilities covered by ADA may include learning, psychiatric, physical disabilities, or chronic health disorders. Students can contact ODA if they are not certain whether a medical condition/disability qualifies.

Address:

The University of Southern Mississippi
Office for Disability Accommodations
118 College Drive # 8586
Hattiesburg, MS 39406-0001

Voice Telephone: (601) 266-5024 or (228) 214-3232 Fax: (601) 266-6035

Individuals with hearing impairments can contact ODA using the *Mississippi Relay Service* at 1-800-582-2233 (TTY) or email Suzy Hebert at Suzanne.Hebert@usm.edu.

Departmental Statement on Pregnancy and Safety in the Chemistry Laboratory

“The safety of all experiments is carefully considered, but all effects of all reagents used are not currently known. Therefore, if you are pregnant or considering becoming pregnant during this semester, we suggest you consider consulting your physician regarding remaining in this lab. If your doctor recommends in writing that you not be enrolled in this lab, you will be allowed to complete the laboratory requirement at a later semester.”

Senior Honors

Completion of CHE 496H satisfies the research and thesis requirements for senior honors in the Honors College, assuming that the final report is formatted to conform to Honors College guidelines. The comprehensive exam requirement is handled separately, although the examination committee will normally review the thesis prior to the exam.

	Unacceptable	Poor	Satisfactory	Excellent
Notebook	No notebook	Illegible	Records procedure and data in reproducible manner.	Records procedure, data, observations, and conclusions in reproducible manner. Dates each page.
Work Ethic	No attendance	In lab less than 10 hrs/week	In lab at least 10 hrs/week.	In lab at least 10 hrs/week. Works hard and makes efficient use of time
Final Report	No report	Short report with little detail.	Report accurately describes the goals of the work, provides background of the work and includes relevant data, analysis and conclusions.	Report accurately describes the goals of the work, provides background of the work and includes relevant data and analysis. The report goes beyond simple conclusions and provides sophisticated interpretation and proposals of future work.
Presentations	No presentations	Only presentations at group meetings.	Public presentation at dept undergrad symposium	Presentations at dept symposium and at scientific meetings
Safety	Endangers self or others	Ignores safety protocols.	Follows reasonable safety protocols.	Follows reasonable safety protocols. Makes sure all laboratory safety equipment is functioning properly.
Group meeting attendance	No attendance	Attends, but is unprepared and does not participate.	Attends and participates.	Attends and participates enthusiastically.
Creativity/Initiative/Literature	No effort at creativity or literature reading. Requires constant supervision.	Does only what is told to do in the lab. Shows little understanding of project.	Is familiar with literature supplied by advisor. Works diligently in lab.	Actively seeks pertinent literature, plans new experiments, and offers interpretation of data. Works enthusiastically in lab.

QEP Oral Communication Rubric

Student Name: _____

Student ID: _____ Date: _____

Course #: _____ Section #: _____

Presentation Title/Topic: _____

Criteria	1 – Unacceptable	2 – Minimally Acceptable	3 - Proficient	4 - Advanced	Score
Content	Central idea/purpose is not stated; content is erroneous or irrelevant; support for assertions is largely absent.	Central idea/purpose is stated; content is accurate but not always relevant; support is offered but inadequate for some assertions.	Central idea/purpose is clearly stated; content is accurate and relevant; credible support is provided for each assertion.	Central idea/purpose is vividly stated; content is accurate, thorough, and directly on point; strong support is provided for each assertion.	Score: ____
Organization (Intro, Body, Conclusion)	Little or no structure present. Presentation is confusing to the audience; no logical sequence of ideas; frequently off topic.	Identifiable structure is present but inconsistently executed; may contain several statements out of place and occasionally deviate from topic.	Identifiable structure is present and consistently executed with few statements out of place.	Identifiable structure is presented in a purposeful, interesting, and effective sequence and remains focused.	Score: ____
Language	Grammar, pronunciation, and/or word choice are severely deficient.	Isolated errors in grammar, pronunciation, and/or word choice reduce clarity and credibility.	Presentation is free of serious errors in grammar, pronunciation, and/or word usage.	Presentation is free of errors in grammar and pronunciation; word choice aids clarity and vividness.	Score: ____
Adaptation to Audience and Context	Content and/or style are frequently inappropriate to the audience and/or context. Presentation falls well outside set time parameters.	Content and/or style are occasionally inappropriate to the audience and/or context. Presentation falls slightly outside set time parameters.	Content and/or style are consistently appropriate to the audience, and/or context. Presentation meets set time parameters.	Content and/or style are consistently appropriate and targeted to audience and context. Presentation makes full, effective use of time and stays within time parameters.	Score: ____
Vocal Delivery	Vocal delivery is too soft to hear, too fast to understand and/or long, unintended silences and speech disruptions (repetitions; filled pauses, e.g., "um") frequently distract audience	Vocal delivery is audible. Rate, volume, or speech disruptions only occasionally distract from audience comprehension.	Vocal delivery is clear and distinct. Rate, volume, and tone facilitate audience comprehension.	Vocal delivery is varied and dynamic. Speech rate, volume, and tone enhance listener interest and understanding.	Score: ____
Nonverbal Delivery	Eye contact, posture, attire, gestures, movement, and/or facial expressions are inappropriate and significantly distracting.	Eye contact, posture, attire, gestures, movement, and facial expressions neither enhance nor hinder effectiveness significantly.	Some but not all of the following apply: Eye contact, posture, attire, gestures, movement or facial expressions enhance the presentation.	Most or all of the following apply: Eye contact, posture, attire, gestures, movement or facial expressions enhance the presentation.	Score: ____

QEP Oral Communication Rubric
Other OPTIONAL Presentation Criteria

Audio-Visual Aids	<input type="checkbox"/> Contain errors in grammar and/or spelling <input type="checkbox"/> Illegible or hard to see <input type="checkbox"/> Content, format or use is inappropriate and distracts from meaning or credibility.	<input type="checkbox"/> Error free <input type="checkbox"/> Legible and displayed so that most or all of the audience can see <input type="checkbox"/> Does little or nothing to enhance the presentation.	<input type="checkbox"/> Error free <input type="checkbox"/> Legible and displayed so that entire audience can see <input type="checkbox"/> Used appropriately (e.g., displayed so all can see only when being discussed) <input type="checkbox"/> Some but not all of the aids makes a positive contribution to the presentation (e.g. increase attention or enhance understanding).	<input type="checkbox"/> Error free <input type="checkbox"/> Legible and displayed so that entire audience can see <input type="checkbox"/> Used appropriately (e.g., displayed so all can see only when being discussed) <input type="checkbox"/> All of the aids make a positive contribution to the presentation (e.g. increase attention or enhance understanding).	Score: ____
PowerPoint Presentation	<input type="checkbox"/> Presentation reflects no logical sequence. <input type="checkbox"/> Inappropriate number of slides for information presented. <input type="checkbox"/> Very distracting transitions and effects are used. <input type="checkbox"/> No backgrounds were chosen to go on the slide.	<input type="checkbox"/> Presentation reflects some logical sequence. <input type="checkbox"/> Inappropriate number of slides for information presented. <input type="checkbox"/> Somewhat distracting transitions and effects are used. <input type="checkbox"/> Backgrounds clash with font color and styles.	<input type="checkbox"/> Presentation mostly reflects logical sequence. <input type="checkbox"/> Includes appropriate number of slides <input type="checkbox"/> Transitions and effects rarely distract from information presented. <input type="checkbox"/> Use of fonts, colors, and styles is appropriate.	<input type="checkbox"/> Presentation always reflects logical sequence. <input type="checkbox"/> Includes appropriate number of slides with outstanding graphics. <input type="checkbox"/> Transitions and effects are used appropriately without distraction from information presented. <input type="checkbox"/> Excellent use of font, color, and style.	Score: ____
Question and Answer Period	Speaker gives erroneous, inadequate, incomprehensible, or distracting answers to questions.	Speaker gives answers to questions that are partly but not fully acceptable (i.e., accurate, complete, comprehensible, cogent).	Speaker gives accurate and appropriate answers.	Speaker consistently gives accurate, cogent, dynamic, and appropriate answers that enhance credibility.	Score: ____
Instructor-added criterion	(indicants provided by instructor)	(indicants provided by instructor)	(indicants provided by instructor)	(indicants provided by instructor)	Score: ____

QEP Written Communication Rubric
Circle Draft Type: Preliminary or Final

Student Name: _____

Student ID: _____ **Date:** _____

Course #: _____ **Section #:** _____

Paper Title/Topic: _____

Criteria	1 – Unacceptable	2 – Minimally Acceptable	3 - Proficient	4 - Advanced	Score
Content	Central idea/purpose is not stated; content is erroneous or irrelevant; support for assertions is largely absent.	Central idea/purpose is stated; content is accurate but not always relevant; support is offered but inadequate for some assertions.	Central idea/purpose is clearly stated; content is accurate and relevant; credible support is provided for each assertion.	Central idea/purpose is vividly stated; content is accurate, thorough, and directly on point; strong support is provided for each assertion.	Score: ____
Organization (Intro, Body, Conclusion)	Little or no structure present. Paper is frequently confusing to the reader because of lack of organization.	Identifiable structure is present but inconsistently executed; may contain several statements out of place and occasionally deviate from the topic.	Identifiable structure is present and consistently executed with few statements out of place.	Identifiable structure is presented in a purposeful, interesting, and effective sequence and remains focused.	Score: ____
Language	Grammar, punctuation, spelling, and usage are severely deficient.	Isolated errors in grammar, punctuation, spelling, and/or usage reduce clarity and credibility.	Free of serious errors in grammar, punctuation, spelling, and usage.	Free of errors in grammar, punctuation, spelling, and usage. Word choice aids clarity, vividness, and credibility.	Score: ____
Adaptation to Audience and Context	Content and/or style are frequently inappropriate to the author, audience and/or context.	Content and/or style are occasionally inappropriate to the author, audience and/or context.	Content and/or style are consistently appropriate to the author, audience, and/or context.	Content and/or style are consistently appropriate and are targeted to the author, audience, and/or context.	Score: ____
Adaptation to Assignment Requirements	Paper does not adhere to important aspects of the assignment.	Paper adheres to all but a single guideline or constraint.	Paper adheres to all aspects of the assignment.	Paper meets or exceeds all aspects of the assignment.	Score: ____
Use of Research and Documentation of Sources (if applicable)	Needed research is absent or material is used but not cited.	Adequate research is included and sources are cited, but there are errors in formatting several of the citations.	Research is incorporated well and sources are cited accurately with one or two minor errors.	Research is thorough and incorporated well. All sources are cited accurately.	Score: ____