Problem and Community Service-Based Microbiology Capstone Course
MOLB 4010 Spring 2014

Instructors	**E-mail**	**Office**	**Phone**	**Office hours***	**Credit & Schedule**
Rachel Watson	rwatson@uwyo.edu	AG 5010	307-760-2942 (cell)	Monday 2:00 – 3:00 pm AG 5010 7:30 – 8:30 pm Monday (online *Elluminate*) Friday 12:00 – 2:00 pm (in AG 5030) *General open-door policy.	Three semester hours from January 13th through May 9th
John Willford	willford@uwyo.edu	AG 5005	307-766-4249	By appointment	

*Office hours are not designed and do not cater to students desiring a confidential meeting. There is often more than 1 student in our offices or online at once and we talk as a group. We are always available in our offices or online for additional appointments. Please schedule alternative times for confidential meetings.

Course Description:

Using a problem-based student learning model (Merrill, 2002), this course is designed to allow students to conceptualize, propose, perform and present a scientific research study to address a real problem within the community. Students will select one of the community-based problems and further cultivate the relationship with the service organization. They will write a formal scientific research proposal, engage in hands-on laboratory and fieldwork to address the problem, communicate progress / solutions with the community service organization and present their project at a final, culminating poster presentation. Students will be assessed, using rubrics, for accomplishment of curricular and service-based learning objectives.

Content coverage will include principles for writing and maintaining a lab notebook and writing a research proposal. Applied laboratory methods will also be presented and students will formulate hypotheses and engage in hands-on laboratory hypothesis testing. Principles for designing and presenting an effective scientific poster will also be covered. Throughout all phases of instruction, the problem presented by the community partner will be maintained as the central focus.

Merrill, M. D. (2002). First Principles of Instruction. *Educational Research Training and Development*. 50. 43-59.

Course Goals:

The broad learning goals of this course parallel the Microbiology Program Goals. Thus, students completing this course will develop the technical laboratory skills to apply molecular biology techniques to microbial systems. Students will also develop information literacy-access skills as well as the oral and written communication skills necessary to access and evaluate scientific information relevant to contemporary topics/issues in microbiology. In addition to accessing, evaluating, and summarizing available information, students will develop oral and written communication skills necessary to present their findings to both student peers and Microbiology faculty.

Specific Course Learning Objectives:

Upon successfully completing the course, learners will be able to

1) perform a thorough overview of a topic (access and assess literature) without being overwhelmed by the extent of available resources.
2) formulate / propose hypotheses.
3) propose experimental tests of hypotheses.
4) apply appropriate experimental methods to test hypotheses.
5) make and interpret observations / data and relate them to hypotheses.
6) present, write and converse using the vocabulary of the field (communicate effectively with those in the field).
7) communicate important microbiological principles with individuals outside of the microbiology discipline (within the community service organization).
8) relate (recognize the relevance of) microbiology concepts to the unique problem of the community service organization.
9) write a scientific research proposal, notebook and abstract.
10) understand when and how to reference source material and recognize this process as an important part of communicating with other scholars.
11) write, converse and present clearly and thoroughly about micriological principles / findings.
12) relate (recognize the relevance of) microbiological concepts to other disciplines and to society.
13) understand the social ramificactions (social perceptions), applications and implications of scientific actions / studies.
14) value scientific knowledge as a tool to enact change (be aware of the limits to this and responsibility inherent with this).

Textbooks and required material:

Writing Successful Science Proposals by Andrew J. Friedland and Carol L. Folt, 2009, Second Edition, Yale University Press.
Writing the Laboratory Notebook by Howard M. Kanare, 1985, American Chemical Society.
How to Present at Meetings by George M. Hall and Neville Robinson, 2012, Third Edition, Wiley-Blackwell.

Submitted Assessments

The Research Proposal:

This proposal provides a thorough description of the proposed problem and community service-based research project. The proposal should clearly communicate the problem and its significance. Relevant literature and preliminary data should be reviewed. A conceptual framework will be presented and all methods and approaches justified. Objectives, hypotheses and specific aims will be clearly enunciated as will the research plan (design, methods and expected results). A timeline will be provided along with an appropriate reference list. Proposals will be limited to 8-10 pages double-spaced. An in-depth description of this assignment and a grading rubric can be found at the end of this syllabus. **The Research Proposal will be worth 150 points toward your final grade.**

The Laboratory Notebook:

A laboratory notebook will be kept as a record of all work done in the lab / field and as a means to document interactions with the community service organizations. An in-depth description of this assignment and a grading rubric can be found at the end of this syllabus. **The lab notebook will be worth 100 points toward your final grade.**

Discussions with Service Organizations:
Meetings with the community service partners will occur at the beginning of the semester, at mid-semester and finally once the project has been completed. A representative from the community service organization will be asked to complete a rubric on which she/he assesses the groups' ability to communicate relevant potential solutions to the problem in a professional way. The rubric provided to the community service representative can be found at the end of this syllabus. **Discussions with community service organizations will be worth 50 points toward your final grade.**

Poster Presentation:
The research project will be presented in the form of a poster. The assignment description can be found at the end of this syllabus. Rubric scoring of the posters will be done by the instructor as well as a team of four external raters: current or retired faculty members and/or university laboratory staff or outside professionals within the community. The scoring rubric can be found at the end of this syllabus. **The Poster Presentation will be worth 200 points toward your final grade.**

Grades:
The Capstone grade is based on a maximum of 500 points. Points are divided as follows:

The Research Proposal	150 pts
The Laboratory Notebook	100 pts
Discussions with Community Organizations	50 pts
Poster Presentation	200 pts
Total	**500 pts**

The following percentages (point distributions) outline the breakdown of grades.

80-100%	(400 – 500 pts)	S (Satisfactory)
<60-80%	(0 – 399 pts)	U (Unsatisfactory)

After semester end grades have been submitted to the registrar, a grade may only be changed if there is a clerical error made. It is not possible to submit extra work after the end of the semester in order to raise a grade.

Academic Dishonesty:
Representing the work of others as your own constitutes academic dishonesty and is strictly forbidden in this course. The official University definition of academic dishonesty is: *An act is academically dishonest when it is an act attempted or performed which misrepresents one's involvement in an academic task in any way, or permits another student to misrepresent the latter's involvement in an academic task by assisting in the misrepresentation.* Further information and some specific examples of academic dishonesty can be found at: http://uwadmnweb.uwyo.edu/legal/Uniregs/ur802.htm. All sources (whether printed or verbal) used in assignments and projects, including those located on the WEB, need to be correctly cited. If you use 5 or more words from a source just as they are used in the source, you need to put those words in quotation marks and cite the source. It is better to not use quotes, but rather paraphrase and cite the source. If necessary, we will use electronic means to detect plagiarism. Students involved in any form of academic dishonesty can as a minimum, receive an automatic "F" in this course.

Non- Discrimination Statement:
A campus environment characterized by diversity, free inquiry, free expression has always been a top priority of the University of Wyoming. Civil discourse is an essential aspect of the search for and transmission of knowledge. Words and actions that promote and encourage self-worth, respect and dignity are consistent with the university's mission. Conversely, words or actions that reflect prejudice, stereotypes

and discrimination are antithetical to the mission of the university and will not be tolerated. Specifically, racist and other discriminatory or harassing conduct based on gender, color, disability, sexual orientation, religious preference, national origin, ancestry or age impair and disrupt legitimate university functions. Every effort, within the context and protection of the First Amendment rights, will be expended to eliminate such conduct from the campus community. Teaching students to live productively in a multicultural/multiethnic society is a process that must take place within a constructive and harmonious environment. It is the obligation of the faculty, staff, students and the administration of the University of Wyoming to provide this environment.

It is the policy of the University to accommodate students with disabilities, pursuant to federal and state law. Any student who needs accommodation because of a disability should inform the instructor at the beginning of the course. Students with disabilities who seek accommodations must contact Student Educational Opportunity Services, Knight Hall room 330, at 766-6189.

Tentative schedule:

Week # (Date)	Topics covered	Reading Assignment	Assignment Due
1 (Jan. 13-19) *Instructional Phase: Activation*	Process: Conceptual overview of problem-based learning; focus-group discussion of prior lab experience; introduction to online microbiology informational feeds / journals and initial discussion with service organization Content: **Lab Notebook:** Writing in and maintaining the lab notebook, The lab notebook front matter **Proposal:** Writing the statement of problem and significance	Kanare, The Reasons for Notekeeping and the Hardware (pp. 1 – 26 and 53 - 63) Friedland and Folt, Chapter 1, 3 and 4 (pp. 1 – 14 and 26 – 48)	First meeting with the service organization must be scheduled and Knowledge Survey must be entered into Canvas by the end of the week.
2 (Jan. 20-26) *Instructional Phase: Activation and Demonstration*	Process: Finding recipes, making media and buffers in the lab Content: **Lab Notebook:** The Body of the Notebook **Proposal:** Introduction (relevant literature), Objectives, hypotheses and specific aims, references	Kanare, The Notebook body and examples of Notebook Entries (pp. 63 – 79 skim pp. 81 – 101) Friedland and Folt, Chapter 7, 8 and 12, (pp. 78 – 105 and 134 – 140)	Lab notebook should be purchased, prepared and ready for review in class. A draft of the statement of problem significance (one for each community problem) will be due in class.
3 (Jan. 27-Feb. 2) *Instructional Phase: Activation and Demonstration*	Process: Laboratory culture stock preparation: streaking plates, inoculating broth and making and utilizing frozen stocks. Content: **Proposal:** Introduction (conceptual or empirical model, justification of approach / methods), the Research Plan	Friedland and Folt, Chapter 9 and 10 (pp. 106 – 128)	A draft of objectives, hypotheses and specific aims will be due in class as well as the relevant literature section of the introduction. This should be accompanied by an ever-waxing list of references. Lab notebook entries from introductory material will be reviewed in class.

4 (Feb. 3 – 9) *Instructional Phase: Activation and Demonstration*	Process: Laboratory decontamination principles and a review of the plate count for enumeration. Content: **Proposal:** Title, Project Summary /Abstract and Timeline	Friedland and Folt, Chapter 5, 6 and 11 (pp. 49 – 77 and 127 – 133)	A full draft of the proposal will be due by the end of the weekend.
5 (Feb. 10-16) *Instructional Phase: Demonstration and Application*	Process: Group assessment of proposals, Basic bacteriological identification or project-specific tasks / skills in the laboratory Content: **Proposal:** Revising and rethinking	Friedland and Folt, Chapter 15 (pp. 156 – 161)	Any needed proposal revisions are due by the end of the weekend. Lab notebook entries from project-specific tasks will be reviewed in class.
6 through 11 (Feb. 17 – Apr. 6) *Instructional Phase: Application*	Process: Laboratory experimentation, hypothesis testing, lab manual maintenance	Selected pertinent literature as suggested by the laboratory instructor	At least one meeting must be scheduled with the service organization by midterm. Lab manual should be continually maintained and will be collected for feedback at midterm.
12 (Apr. 7-13) *Instructional Phase: Integration*	Process: Complete laboratory tests, fully clean lab space Content: Presenting findings as a poster	Hall and Robinson, Forward and Chapter 1 (pp. xv-7)	The laboratory manual is due by the end of the weekend.
13 (Apr. 14-20) *Instructional Phase: Integration*	Process: Poster presentation preparation Content: Presenting findings as a poster	Matthews handout (*The Scientific Poster: Guidelines for Effective Visual Communication*) Hall and Robinson, Chapter 5 (pp. 35-40)	A draft of the final poster will be due by the end of the weekend.
14 (Apr. 21-27) *Instructional Phase: Integration*	Process: Poster presentation revision Content: Subversive Science / a critical discussion of positivism, Creating inclusionary environments in science that welcome diversity	Selected readings from the writings of Francis Bacon, Josephine Donovan, Donna Haraway, Patricia Erwick and Sandra Harding	Posters must be finalized and ready to print by the end of the weekend.
15 (Apr. 28 – May 4) *Instructional Phase: Integration*	Process: Poster presentation printing / preparation, focus group discussion of the capstone experience Content: Poster presentation delivery Using the capstone experience to help in finding your career Guest lecture: Environmental Justice (TBA)	Hall and Robinson, Chapters 7 and 10 (pp. 51-55 and 67-73)	Posters will be presented during the week of Final Exams along with the General Microbiology Posters. Knowledge Survey must be entered into Canvas by the end of the week.