Biology 415: Advanced Microbiology
Spring 2016
Class Syllabus

Course and Instructor Information
Lecture: T Th 12:00 - 12:50, TNR 460
Lab: F 10:00 - 12:50, TNR 451
Final Exam: Thursday, May 18, 12:30 pm – 2:30 pm

Instructor: Dr. Matt Rogge
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Office hours: T, Th 10:00 – 10:50
Other times by appointment

Course Description This course will build upon ideas introduced in general microbiology classes by using microbiological techniques to study and identify unknown organisms and the use of molecular genetic techniques to study and manipulate microbes. Lecture material will provide the theory and background to the laboratory exercises done each week. The students will collect data from laboratory exercises and incorporate their methods and results into a research report that follows the format of research manuscript.

What you should acquire from this class

Students will understand that…

- The identification of microbes incorporates the use of many biochemical and genetic characteristics.
- Simple molecular techniques allow for scientists to construct recombinant DNA and modify the genetic makeup of bacteria.
- The process of science includes success and failure, and the ability to troubleshoot and diagnose errors will lead to better success.
- The ability to clearly and concisely communicate the results of research is important to the process of science.

Learning outcomes

Knowledge:

Students will…

- Recognize how biochemical and genetic tests are used to identify unknown organisms.
- Understand how DNA sequencing can be used to identify microbes.
- Describe useful components of plasmid cloning and expression vectors.
- Learn the theory of PCR, how PCR primers are designed, and how to add desirable sequences to PCR products using primer modifications.
- Develop written communication skills by writing experimental results in manuscript form.

Skills:

Students will…

- Develop the ability to store and maintain microbial cultures.
- Determine the appropriate tests to use for the identification of an unknown organism.
- Use genetic techniques to study and modify microbes.
- Clearly and concisely communicate research results.
- Use computer programs for bioinformatics analysis.

Dispositions:

Students will…

- Appreciate the diversity of biochemical and genetic characteristics of microbes, and how those characteristics are used to separate microbes into taxonomic groups.
- Experience the simplicity of molecular techniques commonly used to modify genetic information.
- Experience the process of science, including successes and failures, and how to ensure correct analysis of the data.
- Recognize the importance of scientific writing and reading.

Required materials

A black permanent marker is required for lab

Optional Text – this course is writing intensive, and this book can help you become a better scientific writer. *I recommend you buy this book if you do not already own a copy.*

- Hofmann, A. H. Writing in the Biological Sciences: A Comprehensive Resource for Scientific Communication, Second Edition. Oxford University Press, New York, New York.
- Available in the bookstore or online.

Attendance

Students are expected to attend all lecture and lab sessions to ensure exposure to all material covered in class. It will be difficult to makeup missed labs or lab assignments due to the availability of cultures, media, and reagents that may not be available after the regularly scheduled labs. Assume that if you miss a lab, you will not have the opportunity to make up the exercise. If you do miss a lab, however, do ask if it is possible to make up the lab.

Open labs

The lab is usually open when there are not any scheduled labs. For safety reasons, students will not be allowed to use the lab without an instructor or another student present in the area.

Microbiological safety

We will be working with live organisms that have the potential to be infectious to humans. Careless or sloppy work endangers other students and is unacceptable in a microbiology lab. *Students that consistently use improper technique will receive point deductions*.

Grading

Your grade will be determined by dividing the sum of the points received by the total points possible. Grades will not be curved.

Every other week, you will be required to turn in a draft of your materials/methods, results, and interpretations of the *previous two weeks'* work. That is, on Friday of week 3, you will submit a draft of the information you worked on in weeks 1 and 2. In week 5, you will turn in a draft of the work you did in weeks 3 and 4, and so on. Each draft report is worth 10 points. The schedule for submission of these reports is in the tentative course schedule. These reports will be reviewed by the instructor, and comments/suggestions will be returned to the students in a timely manner. *When writing the full research reports, those reports should reflect the comments/suggestions made in the draft reports.*

Draft Report Points: 60 (24%)

At the conclusion of each ongoing experiment, you will submit a research report that details your activities, findings, and conclusions of your experiment. A full report will be submitted for each lab project (see schedule). Each report is worth 50 points.

Research Report Points: 100 (40%)

Each time a draft report is due, you will receive a draft report from a classmate that you will **peer review**. That is, you will read that student's draft report and edit it, including suggestions for improvement. Each peer review is worth 5 points.
Peer Review Points: 30 (12%)

The final portion of your grade will be determined by your involvement in class discussions and involvement in lab activities. The points equate to about 3.75 points per week. **YOU WILL NOT RECEIVE PARTICIPATION POINTS FOR SIMPLY BEING PRESENT.** Participation includes discussing methods/results/interpretations, asking questions about material you did not understand, relating the information to either real-world examples or in-class exercises, and being active in the laboratory sessions.
Class Participation Points: 60 (24%)

TOTAL CLASS POINTS: 250

Grades will be calculated by dividing the total points received by the total points possible and multiplied by 100. The following scale will be used to assign a final grade.

93 to 100%	A	80 to 82%	B-	67 to 69%	D+
90 to 92%	A-	77 to 79%	C+	60 to 66%	D
87 to 89%	B+	73 to 76%	C	<60%	F
83 to 86%	B	70 to 72%	C-		

Grades are assigned based on how well you perform on the described exercises. I do not "give" grades because you need it to get into med school, grad school, or stay in your current program of study. If you want an A in the course, you will need to exhibit excellence in every aspect of the course. Average performance will result in an average grade (usually B- or C+). Achieving the *minimum* expectations is ***not*** exhibiting excellence; it is being average and will result in an average grade.

Future Letters of Recommendation and References
In the future, you may need a former professor to write a letter of recommendation or be a reference for your employment application, application for graduate school, awards and scholarships, or other future endeavors. If you decide that you want to ask me to be a reference for you, you need to consider what you have provided for me to write or talk about. Were you an average, above-average, or excellent student? Were you engaged in class and excited about the material? Am I familiar with you outside of class and your goals for your life and career? Have you separated yourself from other students I have had in terms of interest, motivation, or academic success? What am I going to be able to say about you to convince someone else that you are better than other applicants? Furthermore, have you exhibited any negative characteristics that I might mention in my letter? The information I give reflects my honesty, and I will not give false or misleading information, because that may affect my ability to vouch for future students. Serving as a reference in no way guarantees that the reference will be a *positive* one. You need to consider these things for *any* person you hope to be a reference, not just me.

If you do ask me to be a reference or write a letter, I require the request to be in writing and an in-person meeting scheduled to discuss the position(s) for which you are applying. Before I give a recommendation, I require a current CV and/or transcript, copies of or links to forms I need to fill out, and all necessary contact information (names, addresses, phone numbers) required for me to submit the recommendation. Finally, I require these materials be delivered a minimum of **two weeks**' before a recommendation is due. If any of these criteria are not met, I will not have time, nor will I be well enough informed to write a letter.

Graduate credit
Students taking the course for graduate credit will be assigned additional work and should discuss this work with the instructor as soon as possible.

Expectations
You are responsible for attending lecture in order to ensure exposure to all the material covered. You are responsible for asking questions for clarification of topics that you do not fully understand. I am more than willing and happy to meet with you outside of class to further explain any topics. You can stop by during office hours or call/email/see me after class to set up an appointment outside of office hours. If there is any way I can assist you in this class, do not hesitate to ask, and I will do my best to help. If you feel that you are falling behind in the class and not understanding the material as it is being presented, GET HELP IMMEDIATELY! Do not risk falling so far behind that catching back up is impossible.

UWSP values a safe, honest, respectful, and inviting learning environment. In order to ensure that each student has the opportunity to succeed, we have developed a set of expectations for all students and instructors. This set of expectations is known as the *Rights and Responsibilities* document, and it is intended to help establish a positive living and learning environment at UWSP. Visit here for more information:
http://www.uwsp.edu/stuaffairs/Pages/rightsandresponsibilities.aspx

Academic integrity is central to the mission of higher education in general and UWSP in particular. Academic dishonesty (cheating, plagiarism, etc.) is taken very seriously. **Don't do it!** The minimum penalty for a violation of academic integrity is a failure (zero) for the assignment. For more information, see the UWSP "Student Academic Standards and Disciplinary Procedures" section of the *Rights and Responsibilities* document, Chapter 14, which can be accessed here:
http://www.uwsp.edu/stuaffairs/Documents/RightsRespons/SRR-2010/rightsChap14.pdf

Access for all Students
The Americans with Disabilities Act (ADA) is a federal law requiring educational institutions to provide reasonable accommodations for students with disabilities. For more information about UWSP's policies, visit:
http://www.uwsp.edu/stuaffairs/Documents/RightsRespons/ADA/rightsADAPolicyInfo.pdf

If you have a disability and require classroom and/or exam accommodations, please register with the Disability and Assistive Technology Center and then contact me **AT THE BEGINNING OF THE COURSE**. I am happy to help in any way that I can, but you need to be registered. For more information, please visit the Disability and Assistive Technology Center, located on the 6th floor of the Learning Resource Center (the Library). You can also find more information here: http://www4.uwsp.edu/special/disability/

Use of electronics during class
Please turn off/mute/set to vibrate any electronic devices that could interrupt class (lab or lecture) before class begins. If it is a personal emergency, feel free to excuse yourself from the class and communicate outside of the classroom. I do not allow the use of electronics to record my lectures (visual or audio) without prior approval. If I find that lectures or labs are being inappropriately recorded, your final grade will be dropped one full letter.

TENTATIVE SCHEDULE

Week	Date	Project	Assignments Due	Topic(s)
1	Jan 24 Jan 26 Jan 27	Gene Cloning and Conjugation		Syllabus/Introduction; Introduction to cloning Vector analysis; Computer programs; Start cultures Plasmid preps and DNA quantification
2	Jan 31 Feb 2 Feb 3			PCR and primer design; Primer design programs Using primer design programs **NO LAB – Outside class exercise**
3	Feb 7 Feb 9 Feb 10		Draft Report 1 Weeks 1 & 2	PCR theory; Preparing a PCR Set up PCR PCR gel electrophoresis
4	Feb 14 Feb 16 Feb 17			Discuss purification and quantification of DNA Purify PCR Quantify PCR; Discuss restriction enzymes and protocols
5	Feb 21 Feb 23 Feb 24		Draft Report 2 Weeks 3 & 4	Restriction digestion set up (PCR and plasmid) Inactivate digests; Discuss ligation Purify digests, quantify, and perform ligation reactions
6	Feb 28 Mar 2 Mar 3			Discuss *E. coli* strains and transformation Transformation protocol *E. coli* transformation and plating
7	Mar 7 Mar 9 Mar 10		Draft Report 3 Weeks 5 & 6	How to analyze and interpret culture results Set up colony PCR; start cultures Purify plasmids; Colony PCR and plasmid electrophoresis
8	Mar 14 Mar 16 Mar 17			Cryopreservation Start cultures for cryopreservation Cryopreserve cultures; Discuss conjugation protocol
9	Mar 21-24			**Spring Break – No Class**
10	Mar 28 Mar 30 Mar 31		Draft Report 4 Weeks 7 & 8	Finalize conjugation protocol; start SM10 and *E. ictaluri* cultures Mix cultures, filter, and plate Resuspend conjugation, dilute, and plate
11	Apr 4 Apr 6 Apr 7			Analyze conjugation results and discuss analysis Set up colony PCR and start cultures Colony PCR electrophoresis; Plasmid preps; Cryopreserve
12	Apr 11 Apr 13 Apr 14	Unknown ID	Research Report 1	Project Introduction; Sampling General Techniques Refresher Choose colony of interest; Staining, motility, and other tests
13	Apr 18 Apr 20 Apr 21			Streak fresh cultures Start broth culture Cryopreserve; Genomic DNA purification
14	Apr 25 Apr 27 Apr 28		Draft Report 5 Weeks 12 & 13	Quantify gDNA; discuss 16S PCR Set up 16S PCR PCR electrophoresis; PCR purification
15	May 2 May 4 May 5			Using biochemical analyses and identification systems Inoculate biochem media and Biolog Biochem and Biolog Interpretations
16	May 9 May 11 May 12		Draft Report 6 Weeks 14 & 15	Discuss final analyses Repeat biochems or perform additional tests Interpret final tests
17	**May 18**		**Research Report 2**	**FINAL EXAM, Thursday May 18, 12:30 pm – 2:30 pm**