# Syllabus – Bio 321(W) – Microbiology
# Spring 2016

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| **Instructor**: Jeffrey D. Newman<br>**Room**: Heim 110<br>**Phone**: 570-321-4386<br>**email**: newman@lycoming.edu<br>**office hours**: Mon 3:30-4:30 PM<br>Tues 3:30-4:30 PM | Lecture meets MWF 8:00 – 8:50 AM in Heim G-11<br>Lab meets Tues & Thurs 9:45 - 11:35 or<br>1:00 – 2:50 in Heim 106<br>Course web page: moodle (microorganisms) and<br>GoogleDocs (login: lycomicro, pw: 16srrna1 |

**Catalog Description of Course:** A study of microorganisms. Emphasis is given to the identification and physiology of microorganisms as well as to their role in disease, their economic importance, and industrial applications. *Three hours of lecture and two two-hour laboratory periods per week. Prerequisite:Bio110-111.*

**Text**: Willey, Sherwood, & Woolverton. Prescott, Harley, Klein's, Microbiology, 9th ed. 2014, McGraw Hill

**Course Learning Objectives as related to Biology Dept. Learning Objectives**

1. Exhibit proficiency in Microbiology
2. Perform laboratory techniques as appropriate to Microbiology
3. Understand and use modern biological instrumentation
4. Exhibit ability to work as an individual and in groups
5. Exhibit integrative, problem-solving skills, such as experimental design, quality assurance/quality control in data collection, data manipulation, and data interpretation.
6. Communicate the results of biological investigation effectively in written form.
7. Search the biological literature and/or databases, evaluate the results of the search, access desired research materials, and perform critical analysis of the data therein.
8. Demonstrate responsible conduct in the laboratory, including laboratory safety and ethical research practices.

**Contribution to the Mission of Lycoming College**:

This course provides opportunities for students to "develop communication and critical thinking skills", "increase receptivity to new concepts and perspectives" and "explore … scientific traditions; cultivate an aesthetic sensibility; elicit social responsibility; promote … an appreciation of cultural diversity; and produce leadership for the institutions of society."

**Grades** will be determined based on the following assessments, (W = writing option):

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| 5 exams (lowest dropped) | 4 x 100 pts = 400 pts |
| Clicker quizzes (3 points each) | 100 pts |
| Microbial Genome Analysis Report | 25 pts (100 pts) |
| Unknown Microbe Lab Report | 50 pts (200 pts) |
| Lab Practical | 100 pts |
| Lab Data Results Spreadsheet & Hypothesis | 30 pts |
| Lab Report Critique/Peer Reviews | 0 pts (25 pts) |
| Other homework/problem sets | up to 45 pts |
| Total | 750 pts (1000 pts) |

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| | B+ = 86.7 - 89.9% | C+ = 76.7 – 79.9% | D+ = 66.7 - 69.9% | |
| A = 93.3 – 100% | B = 83.3 – 86.6% | C = 73.3 – 76.6% | D = 63.3 – 66.6% | F= below 60% |
| A- = 90.0 – 93.2% | B- = 80.0 – 83.2% | C- = 70.0 – 73.2% | D- = 60.0 – 63.2% | |

- Exams will be taken in class and will consist of multiple choice, short answer, experimental design, laboratory data interpretation and/or essays.
- Lab practical will assess students' abilities to use the microscope, perform differential stains, perform aseptic technique, streak for single colonies, interpret the results of biochemical tests, perform calculations, and find information in databases.

**Daily "Clicker Quizzes"**

In class this year, beginning in week 2, we will be using "Student Response Systems" or clickers, Each student will register their clicker code number at the beginning of the semester. At the beginning of each class, there will be five clicker questions reviewing the previous class/lab material and the reading assignment for that day.

- A score of 4 or 5 correct earns 3 points
- A score of 2 or 3 correct earns 2 points
- A score of 0 or 1 correct earns 1 point (for attendance)

If a student has an **excused** absence **(with proper documentation)**, or is late for class or does not have their clicker (up to 2 times), a "prep paper" (see below) may be submitted via email within 24 hrs of the class to replace the points for the missed Clicker Quiz.

**Prep Paper Guidelines**:

- Name and class meeting date should be indicated on top of page
- 1 paragraph summarizing key points from previous class
- 1 paragraph summarizing key points from reading assignment
- 0.5 – 1 page single spaced

**Writing Statement**

This is a writing intensive course that satisfies the guidelines specified by the College's Writing Across the Curriculum Committee. As a "W" course, we will spend class/lab time on the process and goals of writing, reviewing and revising formal written work. Note that a draft of the unknown microbe lab report will be submitted, undergo peer review and be returned to you so that you may revise the lab report before submission for a final grade

- For the Microbial Genome Analysis Report, each student will be assigned a genome closely related to their known organism from lab. The student will read the original paper describing the organism and/or its genome, review database materials with information on the organism and its genome, and write a 4-5 page report describing the characteristics of the organism and what was learned from the genome. More specific guidelines will follow.
- The unknown microbe lab report will be in the form of a primary research paper and will describe the analysis and identification of a microbe from creek sediments. A draft will be submitted, reviewed by the instructor and two peers. The feedback will be used to revise the paper prior to submitting for a final grade.

# Tentative Course Schedule

| | Lecture Topics (chapter) | Tuesday Lab | Thursday Lab |
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| Week 1<br>1/11 – 1/15 | Introduction, History (1),<br>Prokaryotic Cell Structure (3,4) | #1 Lab Safety, Aseptic Technique, Inoculation, streak plate technique, select known and unknown organisms. | #1 Collect colony morphology results, photograph. Prepare frozen permanents.<br>#2 Prepare gram stain, prepare and observe wet mount. |
| Week 2<br>1/18 – 1/22 | Microbial Nutrition, Growth<br>Microbial Growth Control (7-8) | #3 Prepare growth media | #2 – Observe, photograph stained slides<br>#4 – Inoculate plates for Temp, $O_2$, NaCl & pH.<br>#5 – R2A for antibiotic |
| Week 3<br>1/25 – 1/29 | Microbial Growth Control - Antibiotics (9) **1/29 Exam 1** | #4 Collect data for Temp, $O_2$, NaCl & pH.<br>#5 – Set up antibiotic plates. | #5 - Antibiotics – Data collection. |
| Week 4<br>2/1 – 2/5 | Energy Metabolism (10-12) | #6 Inoculate carbohydrate and nitrogen metabolism biochemical tests. | #6 Collect carbohydrate & nitrogen metabolism test results |
| Week 5<br>2/8 – 2/12 | Microbial Genetics (13-15) | #7 Inoculate exoenzyme tests, differential and selective medium | #7 collect results from exoenzyme tests, differential and select medium |
| Week 6<br>2/15 – 2/19 | Biotech & Genomics (16-18) | #8 PCR amplification of rRNA gene<br>#9 Analysis of Known Genome | #8 Run gel, quantify PCR products<br>#10 Introduction to Bergey's Manuals<br>#11,12 Inoculate media for Biolog, FAME |
| Week 7<br>2/22 – 2/26 | **2/22 Exam 2**<br>Microbial Phylogeny (19-20) | #11 Inoculate Biolog GenIII plate.<br>#12 Extract fatty acids – run MIDI | **Lab Data Results & Hypothesis Due 2/26**<br>Review MIDI, Biolog results |
| Week 8<br>2/29 – 3/4 | Microbial Diversity (21-24)<br>**Microbial Genome Report Due 3/4** | Discuss lab report, Microbiology literature, the Process of Scientific Publication, | #11 Analyze sequence data to ID unknown, compare to other organisms, construct tree. |
| Week 9<br>3/14 – 3/18 | Microbial Ecology (29-32)<br>**3/18 Exam 3** | Redo tests as needed. Work on lab report | Collect data from repeated tests. Work on lab report |
| Week 10<br>3/21 – 3/25 | Viruses (6, 27) | #12 Phage titering, host specificity | #12 Phage titering, host specificity results |
| Week 11<br>3/28 – 4/1 | The Immune Response (33-34) **Unknown microbe lab report draft due 3/28** | #13 Clinical Micro – API test strips<br>#14 Water/Milk Analysis | #13 Clinical Micro – API test strip results<br>#14 Water/Milk Analysis |
| Week 12<br>4/4 – 4/8 | **Unknown lab report reviews due 4/4**<br>Pathogenicity and Infection (35) **4/8 Exam 4** | #15 Antibody Titer with ELISA | #15 Antibody Titer with ELISA |
| Week 13<br>4/11 – 4/15 | Clinical Microbiology, Epidemiology (36-37) | **Lab Skills Practical** | **Field Trip: Clinical Microbiology Lab** |
| Week 14<br>4/18 – 4/22 | Microbial Diseases (Ch 38-39)<br>**Unknown lab report Final Paper due 4/22** | **Field Trip-Tour of the Bullfrog Brewery** | **Field Trip: Wastewater Microbiology** |