

BIO K235: Microbiology, Spring 2015
Three Rivers Community College, Norwich, CT
Instructor: Sarah B. Selke, Ph.D.
Office Hours (C214): Mondays 1:30 – 3pm, Tuesdays 1 – 2:30pm
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Required Text:

Todar's Online Textbook of Bacteriology, online at <http://www.textbookofbacteriology.net>
Additional readings will be posted on Blackboard.

Optional Text:

Prescott's Microbiology, 9th edition, Willey, Sherwood, and Woolverton, McGraw Hill

Required Lab Materials:

disposable gloves (non-latex), full length lab coat with long sleeves and cuffs (ex. Landau – style number 3178), coat hanger, safety goggles

Course Prerequisites:

BIO 121 and CHE 111 or CHE 121, all courses passed with a “C” grade or better; or permission of the instructor. BIO 122 is recommended.

Course Description:

This course covers a comprehensive study of microorganisms. Topics covered will include the basic characteristics, morphology, physiology, growth, reproduction, and genetics of bacteria, as well as a brief taxonomical survey of the following microbial life forms Archaea, Eubacteria (including cyanobacteria, mycoplasmas, rickettsia and chlamydia), Fungi, Protists and Viruses. Emphasis will be on species that affect humans.

Laboratory activities will include various techniques of staining, culturing, and isolating bacteria. The morphology and metabolic processes of select microbial groups will be studied. Students will learn to apply various modern biological techniques that are used for controlling the growth of microbes, and to identify unknowns.

This course is four credits, and meets for three hours of lecture and three hours of lab each week.

This course is a web-enhanced course, which means that some course materials are posted online in our Blackboard Learn course shell. Blackboard can be accessed through <http://my.commnet.edu/>. There are two course shells associated with this class, one for lab and one for lecture. **All online course information is in the lecture shell.**

General Course Objectives:

To aid the student in developing an understanding of life processes of microorganisms

To aid the student in developing an understanding of the effect, both positive and adverse, that microorganisms have on our daily lives

To provide a useful body of knowledge for students studying all areas of biology, environmental science, food science, nutrition, nursing, dental hygiene & medical technology

Attendance Policy:

Attendance at all class sessions is required. If a class is missed due to circumstances beyond your control, please be sure to notify your instructor and make the necessary arrangements **with a classmate** for obtaining the notes. **You will be responsible** for the material.

Electronic devices (cell phones, pagers etc.) will be put in “Silent Mode” or turned off while class is in session.

Grading Overview:

Your grade is based on the 1000-point scale*

Assignments = 150 points*

Online quizzes = 100 points

Unit tests = 375 points

Lab Practicals = 200 points

Final Exam = 175 points

No individual extra assignments will be given.

***If I assign fewer than 150 points of assignments, your final grade will be calculated based on the total number of points assigned.**

- **Tests & Final**

There are three unit tests worth 125 points for a total of 375 points. A #2 pencil is required for each exam. This item will not be supplied in class.

The final exam is worth 175 points. **The final exam is cumulative.** The final exam is scheduled for Monday, December 21st. **The final exam must be taken to pass this course.**

3 units tests = 375 points (125 points each)

1 final @ 175 points = 175 points

Total = 550 points

- **Lab Practical Exams (200 points)**

There are two lab practical exams. Each lab practical will consist of a written section and a hands-on section in lab. Additional information about the lab practical exams will be given in lab.

2 lab practical exams x 100 points each = 200 points

- **Assignments (150 points, approximately)**

There will be several assignments worth 30-40 points each. The Pre-Test is the first assignment. The remaining assignments will be assigned over the course of the semester.

- **Reading quizzes (100 points)**

Quizzes cover the reading that is due the day of the quiz. Quizzes are completed on Blackboard and are due before the start of class.

Make-up exams:

Make-up exams may be granted on an individual basis following a conference with the instructor. It is up to the instructor’s discretion to determine if a make-up exam will be granted. All make-up tests must be completed within one week of the original exam date. Please be aware that the format of any makeup exam is at the discretion of the instructor. The format could be the same, oral, essay or other, depending on the circumstances. It will not be the same exam taken by the rest of the students in the class.

Make-up quizzes:

There are no make-ups for quizzes.

Make-up labs:

There are no make-ups for lab activities that use live microorganisms.

There are no make-ups for the two Lab Practical exams.

How to calculate your grade:

To determine your grade, I suggest creating 2 columns of scores. The first is the number of points each assignment is worth; the second is the points you earned on that assignment. To determine your grade, add up each column and divide **your points** by the **total points**.

A partial example:

Points assignment is worth	Points I earned
20 (quiz)	18
125 (test)	110
Total points = 145	Your points = 128

$128/145 = 0.88 = 88\% = B+$

Final Grade:

- | | |
|----------------|----------------|
| 93.5-100.0 = A | 77.5-79.4 = C+ |
| 89.5-93.4 = A- | 73.5-77.4 = C |
| 87.5-89.4 = B+ | 69.5-73.4 = C- |
| 83.5-87.4 = B | 63.5-69.4 = D+ |
| 79.5-83.4 = B- | 59.5-63.4 = D |
| | 00.0-59.4 = F |

College Withdrawal Policy:

The last day to withdraw is **December 14th, 2015**. Students who do not withdraw but stop attending class **will receive a grade of "F" for the final grade. Verbal withdrawals cannot be accepted.**

Accommodations for Disabilities:

If you need assistance or modification of class procedure owing to any type of disability, please let me know so that arrangements for accommodation can be made. In order to receive accommodations, you must register with Chris Scarborough, learning specialist at 860-215-9289 or a counselor in the Student Services Development Center.

Academic Misconduct:

Academic dishonesty and plagiarism will not be tolerated. Plagiarism, cheating, or any form of academic dishonesty is **prohibited**. Plagiarism includes any instance of copying words or ideas from another person (ie. another student, author of a book, internet resource etc.) without properly acknowledging the source. Students guilty of academic dishonesty directly or indirectly will receive a **zero** for an exercise or exam and may receive an **F** for the course in addition to other possible disciplinary sanctions that maybe imposed through the regular institutional procedures.

Blackboard Learn & your TRCC email address:

Your Blackboard Learn courses are automatically connected to your college-provided email account. For more information about this email account, visit the college home page and click the "New student email" button. This email account is the only official electronic means that the college will communicate course and non-emergency information to you. Make sure that you check it weekly at a minimum. Another option is to set up to forward your email from the college address to your preferred address. **Important class information is frequently communicated through the Blackboard Learn email function.**

myCommNet Alert:

myCommNet Alert is a system that sends text messages and emails to anyone signed up in the event of a campus emergency. Additionally, TRCC sends messages when the college is delayed or closed due to weather. All students are encouraged to sign up for myCommNet Alert. A tutorial is available on the Educational Technology and Distance Learning Students page of the web site.

http://www.trcc.comnet.edu/div_it/educationaltechnology/Tutorials/myCommNetAlert/MIR3.html

Digication:

As a student you will maintain an online learning portfolio using a college-designed template in Digication. Through this electronic tool you will have the opportunity to monitor your own growth in college-wide learning. It may even help you determine a major that is best suited to you. You will be able to keep and maintain your learning portfolio after graduation. A Three Rivers General Education Assessment Team will select and review random works to improve the college experience for all. If your work is selected and reviewed for assessment purposes, it will remain anonymous and private. Digication provides a "place" where you will connect your learning from the classroom, college, and life in general. Sometimes when you review all of the work you have done and think about it, you end up learning something different and perhaps unexpected. Please review your course outlines to determine what assignments to upload into the TRCC Digication template and please post your own choices, as well. Have fun in learning!

Policies described in this syllabus may change. Any policy change will be described in writing and distributed in class and electronically. Policy changes are not applied retroactively.

Specific Course Objectives:

After completion of this course, the student will be able to

1. develop critical thinking skills and learn to develop sound scientific conclusions by the analysis of scientific data.
2. demonstrate knowledge of the scientific method through examples.
3. understand the scope of microbiology as it relates to other fields of science.
4. list and explain the characteristics of life shared by all living organisms.
5. demonstrate an understanding of the general characteristics of various microbial life forms especially bacteria.
6. demonstrate knowledge of the characteristics used in the classification of microorganisms.
7. develop an understanding of microscopes, microscopy, and the microbial world.
8. explain in detail the differences between prokaryotic and eukaryotic cells.
9. identify the major morphological characteristic of bacteria cells.
10. name the various structures of a bacteria cell and describe their functions.
11. list and describe in detail the energy requirements, electron or hydrogen requirements, and carbon requirements for the growth and cultivation of bacteria.
12. describe in detail all of the nutrient requirements for the growth and cultivation of bacteria and discuss the different nutritional types of bacteria.
13. list and explain the physical conditions required for the growth and cultivation of bacteria.
14. understand and demonstrate the procedures for cultivating microorganisms and the problems associated with cultivation.
15. demonstrate knowledge of the various reproductive processes of bacterial cells, and explain in detail the phases of growth in bacterial cells.
16. list the different categories of culture media and describe the use of each type of media in the cultivation of bacteria.
17. describe and demonstrate several pure culture techniques.
18. give the principal properties of enzymes and summarize their chemical make-up.
19. describe how enzymes function and list factors that affect enzymatic activity.

20. name the major classes of enzymes and describe their action.
21. demonstrate knowledge of the photosynthetic process including photophosphorylation, the Calvin-Benson cycle, and the chemiosmotic theory.
22. explain the differences in the photosynthetic process in algae, cyanobacteria, and bacteria.
23. demonstrate knowledge of chemical energy and the respiratory process in bacteria, including the Embden-Meyerhof, Pentose Phosphate, and the Entner-Doudoroff pathways of glucose catabolism, the Krebs' cycle and the electron transport system.
24. demonstrate knowledge of anaerobic metabolism in bacterial cells and describe various fermentation pathways used by different species of bacteria.
25. develop an understanding of the biosynthesis of proteins in bacteria.
26. describe DNA and RNA and explain their role in bacterial genetics.
27. describe various forms of modification in the genetic make-up of bacterial cells.
28. define mutation, list the various types of mutations and describe their effects on bacterial cells.
29. demonstrate knowledge of the taxonomy of bacteria.
30. explain the characteristics and the taxonomy of fungi, algae, protozoans, and viruses.
31. define and/or explain in detail the terms of microbial control.
32. describe the processes involved in controlling the growth and activities of microorganisms by antimicrobial agents.
33. outline the action and limitations of chemical and physical agents used in the control of microbes.
34. list the major classes of chemical agents used to control microbes, give specific examples of the classes of chemicals, and describe the mode of action of specific chemical agents, as well the limitations of their use.
35. differentiate between synthetic drugs and antibiotics as chemotherapeutic agents used to treat infections. Name the biological source of specific antibiotics, the spectra of organisms that they affects, and the mode of action.
36. demonstrate knowledge of nosocomial infections and describe their sources.
37. list the most common nosocomial infections and the most frequently isolated organism(s) that cause(s) that infection
38. explain the types of patients that have the greatest risk for developing nosocomial infections and why they are at such high risk
39. describe infection control and prevention in the clinical environment.

40. demonstrate knowledge of the normal flora in various anatomical areas of the human body and describe host-microbe interactions.
41. discuss in detail Koch's postulates in relationship to diseases.
42. list the portals of entry of microbes into the human body and explain in detail how microbes breach the portals.
43. list and discuss the invasive methods of bacteria and other microbes.
44. explain how microbes produce diseases.
45. list and explain the stages of infection and illness.
46. list and describe in detail the methods of non-specific resistance to diseases and infections (innate immunity).
47. describe the major features of acquired or adaptive immunity.
48. explain in detail the role of T-lymphocytes and B-lymphocytes in acquired immunity.
49. list the major classes of immunoglobulins (antibodies) and describe their role in immunity.
50. list the different types of humoral antibodies and explain their function.
51. describe the major events that occur during the primary and secondary immune responses.
52. describe the different types of immunity (i.e. naturally acquired passive immunity, naturally acquired active immunity, artificially acquired active immunity, artificially acquired passive immunity).
53. demonstrate knowledge of diseases caused by microorganisms (bacteria, fungi, viruses, and protozoans) by portal of entry, and how these infectious agents damage the body.
54. discuss how infectious diseases of the human body are treated and/or prevented.
55. develop an understanding of the importance of soil, water, food, medical, and industrial microbiology.

Specific Laboratory Objectives:

After completion of this laboratory component of this course, the student will be able to

1. list and describe the proper use of all safety equipment and devices used in this microbiology lab, as well as follow all safety precautions while working in the microbiology laboratory.
2. list and describe the use of various types of microscopes as they relate to the study of microbiology.
3. name all of the parts of a bright field compound light microscope and describe the function of each part.
4. demonstrate proper technique for using the microscope in a microbiology laboratory.
5. demonstrate the ability to use the microscope as a vital instrument for gathering data by direct observation.
6. describe and identify various microbial life forms by studying the unique morphological differences via direct observation using a microscope.
7. demonstrate the ability to perform and correctly interpret the results of the following laboratory procedures: isolation techniques, transformation of *E. coli*, DNA restriction analysis, microbial metabolic tests, and microbial sensitivity tests.
8. name the major classes of staining procedures, give examples of specific stains within each class, and describe the purpose of each specific staining procedure.
9. demonstrate the ability to carry out various staining procedures and correctly interpret the results
10. demonstrate the ability to use learned laboratory skills and critical thinking skills to identify unknown bacterial samples.

BIO 235 Microbiology
 Professor Sarah Selke
 Fall 2015

Lecture Topics	Assigned Reading
Introduction to Microbiology	supplemental reading, posted on Blackboard (BB)
Eukaryotic microbes (Protists and Fungi)	supplemental reading, posted on Blackboard (BB)
Prokaryotic cell structure	online textbook
Prokaryotic growth	online textbook
Control of microbial growth	online textbook
Microbial metabolism	online textbook
Genetics	supplemental reading, posted on Blackboard (BB)
Diversity of Prokaryotes	online textbook
Viruses	supplemental reading, posted on Blackboard (BB)
Microbe-Host Interactions	online textbook
Human Microbiome	online textbook
Mechanisms of Bacterial Pathogenicity	online textbook
Bacterial Pathogens of Humans	online textbook
Viral Pathogens of Humans	supplemental reading, posted on Blackboard (BB)

Note: Additional course content is delivered in Lab Lecture and assessed via written Lab Practical Exam.

Test Dates:

Monday, October 5th, covers lectures 8/31 – 9/28

Monday, November 9th, covers lectures 9/30 – 11/2

Monday, December 7th, covers lectures 11/4 – 12/3

Final Exam (cumulative):

Monday, December 21st

Quiz dates:

Quizzes cover the reading that is due the day of the quiz. Quizzes are completed online and are due before the start of class. All due dates are Mondays.

September 14

September 21

September 28

October 19

October 26

November 2

November 16

November 23

November 30

December 14

BIO 235 Microbiology Lab Schedule* (A211)
Professor Sarah Selke, Fall 2015

Date	Topic
W 9/2	Orientation: Laboratory Safety & Procedures I Lecture: Microscopes & Microscopy Pre-test
W 9/9	Care and Use of the Microscope
W 9/16	Microscopic Observation & Identification of Various Microbial Groups
W 9/23	Microscopic Observation & Identification Con't
W 9/30	Isolation Techniques ** Microscopic Observation & Identification Con't
W 10/7	Bacterial Transformation**
W 10/14	LAB PRACTICAL 1 DNA Analysis preparation
W 10/21	DNA Analysis
W 10/28	Cultural Characteristics Simple & Gram Staining Techniques
W 11/4	Gram Staining Con't
W 11/11	Gram Staining Con't
W 11/18	Acid-fast, Capsule & Endospore Staining
W 11/25	NO LAB
W 12/2	Microbial Metabolic Tests**
W 12/9	Microbial Sensitivity Tests**
W 12/16	LAB PRACTICAL 2

* This schedule is tentative and subject to change. Any and all changes will be announced in class.

Some additional lab activities will be assigned; date TBA.

** Requires students to return to lab in 24 hours to observe the results of the experiment.