



2 Fort Road, South Portland, Maine 04106

Semester: Spring 2022

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Title: Microbiology with Laboratory

Course Number: BIOL 250

Credit Hours: 5

Total Contact Hours: 105

Section: 21 and 31

Course Syllabus

Course Description

This course is designed to provide the student with an introduction to the principles and techniques of microbiology. Consideration will be given to microbial structure, growth, physiology, and the reaction of microorganisms to their physical and chemical environments. The laboratory will emphasize the development of proper laboratory technique and the identification of microorganisms.

Prerequisites: BIOL-100 or BIOL-124 or BIOL-132.

Course Objectives

Upon successful completion of this course, the student should be able to:

1. Describe the structure of bacteria and other microorganisms,
2. Conduct quantitative and qualitative tests on microorganisms,
3. Interpret and evaluate the results of these tests,
4. Understand the cellular functions that promote growth and reproduction of microorganisms, and
5. Employ the proper laboratory techniques for the study of microorganisms.

Topical Outline of Instruction

1. The Evolution of Microorganisms
2. Microscopy
----- EXAM ONE -----
3. Bacterial Cell Structure
4. Archaeal Cell Structure
----- EXAM TWO -----
5. Eukaryotic Cell Structure and Function
6. Viruses and Other Acellular Infectious Agents
----- EXAM THREE -----
7. Microbial Growth
8. Control of Microorganisms in the Environment
9. Antimicrobial Chemotherapy
----- EXAM FOUR -----
10. Introduction to Metabolism
11. Catabolism: Energy Release and Conservation
----- EXAM FIVE -----
13. Bacterial Genome Replication and Expression
14. Regulation of Gene Expression, and Mechanisms of Genetic Variation
15. Recombinant DNA Technology
----- EXAM SIX -----
----- FINAL EXAM -----

Learning outcomes for science courses at SMCC:

SMCC students recognize the methodology and content of science and its relevance. SMCC students:

1. apply scientific methodology to the study of the natural world.
 2. participate in hands-on and interactive lab activities.
 3. demonstrate the ability to make scientifically-informed decisions.
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Course Requirements

The course is organized into modules that will correspond to chapters in the textbook and lab exercises from your lab manual. There are one or two 75-minute class periods each week, as well as one or two 2-hour laboratory sessions each week. Attendance and participation in lab is required.

Student Evaluation and Grading

There are seven equally weighted **exams** given during the semester over the material in the textbook and in the lab exercises. The first six exams will primarily test the material discussed in lectures and in chapters from your textbook, although you can expect some questions from laboratory exercises (particularly where there is overlap between lecture and lab). The last exam is a Final Exam that will cover everything in the semester. The exams will account for 70% of the semester grade, thus each one is worth 10% of the semester grade.

You must **attend** laboratory sessions each week and take the **lab quizzes**. The average score on the lab quizzes will account for 10% of the semester grade. You will keep a **laboratory notebook** that will be worth another 10% of the semester grade. Finally, you will be given a two unknown bacteria to identify in an independent **lab project**. You will write a report on your identification of these organisms that will account for the other 10% of the semester grade.

Attendance is required for laboratory sessions (unless the health screening has suggested you stay home). Points will be deducted from your lab notebook score if you miss a lab session. Your first absence will deduct no points, but point deductions for subsequent absences will escalate. For example, a second absence is a deduction of 5 points, a third absence 10 points, a fourth absence 15 points, and any further absences will result in a deduction of 20 points per absence. If you are more than 15 minutes late for a lab session, it is considered an absence.

You will have an opportunity to do **extra credit work** by participating in an online study group. **Discussion forums** are organized by textbook chapter and exam. If you write 8 questions (not yet asked by another student) and answer 8 questions asked by other students (ones not yet answered fully), for a total of 16 messages for a particular forum, then you will receive 10 points that will be averaged into your laboratory quiz average. That's equivalent to one perfect quiz score! You are not required to contribute to the discussion forums, but it is a relatively easy way to raise your quiz average and to study for the exams.

To calculate your semester grade at any time, you can use this formula. Since the score for the lab project won't be given until the last week, divide the result by 90 for an accurate grade estimate during the semester.

$$\text{Semester Average} = [(\text{average of exam scores}) \times 0.7] + (\text{average of quiz scores and discussions}) + (\text{average of lab notebook scores}) + [(\text{score for lab project paper, ID of two bacterial species}) \times 0.1]$$

Letter grades are assigned following the policy in the SMCC handbook:

93 & higher	A	80-82	B-	67-69	D+
90-92	A-	77-79	C+	63-66	D
87-89	B+	73-76	C	below 63	F
83-86	B	70-72	C-		

Scores for your exams, quizzes and lab notebook assessments can be found under Grades in Brightspace. There will also be an estimate of your semester grade based on all of your work up to that point.

Attendance Policy

You must complete exams during the time period that the exam is available. The days that an exam is available are listed in the schedule online, posted on the course home page, and will be announced in class.

Attendance at lectures and labs **every week** is expected. Inform your instructor if you will not be attending class and lab for a week but will return. If you are inactive for one week without explanation, you will be reported as no longer attending the class.

Make up exams will be given only in cases of extraordinary circumstances, either due to documented illness (with a note from your physician) or death of a family member. Interfering work schedules, car problems, relationship issues, migraines, and day care difficulties are not a valid excuse for missing exams. Exams are available online for seven days, so you should be able to take them even under trying circumstances.

The Exams Are "Open Book" Tests

You may use notes, textbooks or web searches to find answers. However, these will be timed exams, and you will have approximately one minute per question.

You will not do well if you have not read the chapters and listened to lectures. The vocabulary and concepts must be familiar to you, so that you can quickly understand what is being asked in these questions. You will do well if you read chapters more than once and study the figures, so that you are able to answer most questions without looking for the answer. Some of the questions may involve a small detail from the chapter, and you will have a good idea of where to find the answer for a detailed question only if you've studied the chapter well.

You may NOT ask another person the answer to the questions during an exam. Another person may not take your exam for you or with you. If you are discovered taking exams or quizzes with another person, you will be dismissed from the course and given an "F".

Find the Right Time and Place to Take Your Exams

Make sure you have several hours without interruption to take an online test. You may begin the test anytime, but once you start the test, the clock is ticking and you cannot take a break. You can log out, but the timer is still counting down on that test.

You will not have another chance to take the test, even if animals or children need your attention. You must find a time and place where you will not be interrupted. Do not take an exam if you are on call at work.

Make certain that you are using a computer that has a reliable connection to the internet. Do not use a wireless connection that is inconsistent. Choose the time you take the test wisely. For example, you will not be given a chance to take the test again should you choose to take it during an ice storm and your home loses power. Do not wait until the last evening to take a test if there are forecasts of bad weather. Take tests early during the week if you sometimes have migraine headaches, seizures or other personal issues that arise unexpectedly.

How To Do Well On The Exams

Listen to the lectures, take notes, and review the lecture slides. Ask the instructor questions during class or after class. Read the textbook more than once. Take notes from the book. Participate in a study group, including the online discussion forums. **You will not have time to look up all the answers.**

You will be able to return to questions during the test, although one question at a time will appear on your computer screen. It is possible to go between any two questions with a single click. Have a blank sheet of paper to take notes as you do the online test. You might want to write down the question number of any questions that are difficult for you so that you can return to the question if you have time.

Bookmark the pages in your textbook where there are tables or summaries so you can find them easily during the test. You may want to copy the tables and figures that are critical, and tape these to the wall where you are taking the test so you don't have to look them up.

Some questions will require you to fill in the blank for a word in a sentence or to give the name of an organism or structure. **Correct spelling is required**, so double check the word if you are unsure of the spelling. The correct answer will require **one word for one blank space**. If there are two blank spaces, then it is a name that has two words. If you think that the correct answer is two words and there is one space, then check on your answer and see if there is a better answer that is one word. Do not type two words into one blank space.

Keeping a laboratory notebook

You will be given specific instructions on how to keep a good laboratory notebook. Keep your notebook up to date! Your notebook will be examined from time to time to assign scores. You must have a notebook that will not allow pages to be removed; a spiral notebook or 3-ring binder is not allowed, a bound notebook is required.

Writing a report on the independent lab project: identification of two unknown bacteria

Halfway through the semester, you will begin a project that will take several weeks of independent work, normally during our laboratory sessions. You'll be given instruction on how to carry out identification using a dichotomous key (using a process of elimination) and you will have learned about the assays already. This semester, we will carry out the project with email requests and answers. There will be a rubric that describes how to write up your independent research in a format resembling a professional journal article.

You must write the entire report in your own words and sentences. Points are deducted if you have copied sentences or paragraphs from another student or from a source on the internet.

This report is due on Monday of the last week of classes. This deadline is a firm deadline. The report will not be accepted after that day.

How To Contact Your Professor

The quickest way to contact your instructor and get a response is by sending an e-mail through campus e-mail. My e-mail address is **dpmoore@smccme.edu**.

If you would like to meet in person, we can arrange an appointment or you can talk with me during office hours. My office is Room 127, Marine Science Center on the South Portland Campus. You can call me at (207) 741-5966, but e-mail is usually a faster way to get a response.

My office hours will be Tuesday, 11 to noon, and Friday, 10 AM to noon.

Teacher Evaluation

If you have a question or a suggestion about the course format in general or an exam question in particular, please feel free to contact me directly. I do want to hear how the course could be improved.

Students should complete evaluations for each course attended at SMCC. Evaluations are submitted online and can be accessed through the student portal. Students can access the course evaluations beginning one week before the end of classes. The deadline for submission of evaluations occurs Monday at 5 PM following the last day of class. You should receive an email to your student email account when course evaluations are available.

Textbooks and Supplies

Prescott's Microbiology Willey, Sandman and Wood
McGraw-Hill 11th edition, 2019 ISBN : 9781264073375

Connect Online Access for Microbiology ISBN: 9781264075515

Microbiology: Laboratory Theory and Application Leboffe and Pierce
Morton Publishing 4th edition, 2015 ISBN : 9781617312502

Composition notebook, or laboratory notebook

Laboratory coat (a coat will be made available to you, but you may wish to purchase and bring a new one for yourself; our coats are wrinkled and stained)

Policies for all courses at Southern Maine Community College:

1. ADA (Americans with Disabilities Act):

Southern Maine Community College is an equal opportunity/affirmative action institution and employer. For more information, please call (207) 741-5798. If you have a disabling condition and wish to request accommodations in order to have reasonable access to the programs and services offered by SMCC, you must register with the Disability Services Coordinator, Sandra Lynham, who can be reached at 741-5923. Further information about services for students with disabilities and the accommodation process is available upon request at this number. Course policies about online testing are modified to suit each individual's accommodations.

2. SMCC Pay-for-Print Policy:

Each semester students receive a \$20 printing credit. The balance resets at the end of the semester and any remaining credits are removed. The College's pay-for-print system monitors printing on all printers (including those in general access labs, library printers, Tutoring Services, Campus Center Lounge and technology labs). Be sure to log OUT of the system when you've finished your printing, to prevent unauthorized access to your account. Students can check the number of pages they have printed by using the Printing Balance tool available on SMCC computers (located in the lower right corner of the screen, near the clock). Departments with work study students who need to print documents for the department should contact the Help Desk at 741-5696 to have a special account set up. To find ways to reduce your printing charges, please go to the IT Help tab on My SMCC. If you have questions about the pay-for-printing policy or your printing charges, please contact the Help Desk at 741-5696 or send an e-mail to helpdesk@smccme.edu.

Refunds Print jobs are eligible for a refund in the event of mechanical or electronic error on the part of the printer, print server, or software used to submit the job. Jobs are not eligible for a refund in cases where the job was not set up correctly, was submitted multiple times, or the student is not satisfied with the result. To request a refund, please bring the offending print to the IT Department in the basement of the Ross Technology Center. Refunds will be granted in the form of a credit to the student's account.

3. Add/Drop Policy:

Students who drop a course during the one-week "add/drop" period in the fall and spring semesters and the first three days of summer sessions receive a 100% refund of the tuition and associated fees for that course. Please note any course that meets for less than the traditional semester length, i.e., 15 weeks, has a pro-rated add/drop period. There is no refund for non-attendance.

4. Withdrawal:

A student may withdraw from a course only during the semester in which s/he is registered for that course. The withdrawal period is the second through twelfth week of the Fall and Spring semesters and the second through ninth week of twelve-week Summer courses. This period is pro-rated for shorter-length courses, usually 75 percent of course meeting times; please check with the Registration Office. To withdraw from a course, a student must complete and submit the appropriate course withdrawal form, available at the Registration Office. This process must be completed either in person or by using SMCC e-mail accounts.

5. Plagiarism:

If an instructor suspects that a student has knowingly committed a violation defined in the Maine Community College System Policy on Student Grade Appeals and Academic Misconduct, the instructor has the authority to review the alleged misconduct and determine the grade that the student should receive for the assignment and the course. The instructor may assign a failing grade for the assignment or course and may require the student to complete additional work for the course. The instructor may consult with the department chair and/or the College's chief academic officer prior to making such decisions. If a student seeks to challenge an instructor's determination, the student should submit a grade appeal. Grade appeal forms are available in the Advising Office on the South Portland Campus or in the administrative offices in the Learning Commons on the Midcoast Campus. An instructor may also refer the matter to the College's disciplinary officer for review under the procedures of the MCCS Student Code of Conduct.

6. The Learning Commons:

The library, tutoring and writing centers, and reference/research assistance (typically located on the second floor of South Portland's Campus Center and in the Midcoast's LL Bean Learning Commons and Health Science Center) will be fully available online during the fall 2021 semester. Here you can find free academic support through individually scheduled and drop in, online tutoring. You can also find information literacy/research librarians, and professional academic strategy/planning mentoring online. The physical space of the Learning Commons will be available at this time, and they can also work with you to set up zoom classrooms for small group study. Services are offered by appointment or as drop-in assistance.

To access services: visit My Learning in My Maine Guide, or select the "tutoring needed" button if it appears inside your Brightspace course.

Whether on Site or online, students have consistently reported that the Learning Commons is a friendly, risk-free, and helpful place to seek academic support. It has also been shown that those who make use of the Learning Commons do better in a course than those who do not. We strongly encourage you to take advantage of this valuable and enjoyable resource.

7. COVID contingency plan:

While the syllabus represents current plans, there may be changes during the semester in response to the on-going Covid-19 pandemic. Depending on the progression of the virus, it is possible that the College may have to suspend face-to-face instruction for part of the semester. If we must stop face to face instruction anytime during the semester, your instructor will contact you via your SMCC email or the Brightspace course homepage to discuss next steps for the course.

<u>Week</u>	<u>Dates</u>	<u>Chapter</u>	<u>Lab Exercises</u>
1	Jan 19	Chapter 1: Intro to Microbiology Chapter 2: Microscopy and staining	Use of microscope (Exercise 3-1 in your lab manual),
2	Jan 24 Jan 26	Chapter 2: Microscopy and staining	Aseptic transfer and pipetting skills (1-3) Simple staining (3-5), Streak plating (1-4) Colony morphology (2-2)
3	Jan 31 Feb 2	Exam One Chapter 3: Bacterial cell structure	Gram staining (3-7), Handwashing (see Module),
4	Feb 7 Feb 9	Chapter 4: Archaeal cell structure Chapter 5: Eukaryotic cell structure	Endospore staining (3-10), Standard plate count (6-1)
5	Feb 14 Feb 16	Exam Two Chapter 5: Eukaryotic cell structure	Soil microbial count (8-11), Effect of temperature (2-9), Anaerobic growth using 3 methods (2-6, 2-7, & 2-8), Effect of osmotic pressure (2-11)
6	Feb 21 Feb 23	Chapter 5: Eukaryotic cell structure Chapter 6: Viruses and other acellular infectious agents	Differential media: Phenol red assays (5-3) Selective/differential media: MSA (4-4), EMB (4-6), MacConkey (4-5), Blood agar (5-25) Begin project: ID of bacterial unknowns (5-31)
7	Feb 28 Mar 2	Chapter 6: Viruses and acellular agents Exam Three	IMVIC: Citrate (5-9), SIM (5-20), MR-VP (5-4) Project: identification of bacterial unknowns
8	Mar 7 Mar 9	Chapter 7: Microbial growth Chapter 8: Control of microorganisms in the environment	Enzyme assays: Amylase (5-13), Urease (5-18), Gelatinase (5-17) Enzyme assays: Catalase (5-6), Oxidase (5-7), Nitrate reductase (5-8) Project: identification of bacterial unknowns
9	Mar 21 Mar 23	Chapter 9: Antimicrobial chemotherapy	Antimicrobial susceptibility assay (7-3) Project: identification of bacterial unknowns
10	Mar 28 Mar 30	Exam Four Chapter 10: Introduction to metabolism	Thermal death time & decimal reduction value (6-6) Sanitary analysis of water and MPN (see Module) Project: identification of bacterial unknowns
11	Apr 4 Apr 6	Chapter 11: Catabolism	Project: identification of bacterial unknowns Slide agglutination to differentiate Staph species (11-4) Enzyme linked immunosorbent assay, ELISA (11-6)
12	Apr 11 Apr 13	Chapter 11: Catabolism Chapter 17: Recombinant DNA technology	Project: identification of bacterial unknowns Restriction enzymes and agarose gel electrophoresis (AGE) of DNA (10-2)
13	Apr 18 Apr 20	Exam Five Chapter 13: Bacterial genome replication and replication	Project: identification of bacterial unknowns Polymerase chain reaction, PCR (10-4) DNA sequencing and alignment with BLAST (module)
14	Apr 25 Apr 27	Chapter 13: Bacterial genome replication and replication	Project: identification of bacterial unknowns Transformation of bacteria (10-3)
15	May 2 May 4	Chapter 14: Regulation of cellular processes (small part of the chapter) Exam Six	Project: identification of bacterial unknowns Plaque assay to determine viral titer (6-5)
16	May 9 - May 11	Review all of the chapters Final Exam	Hand in report for the lab project on Monday; this is a firm deadline.