

Course Syllabus

BIOD 171 – Essential Lab Microbiology (4 credits)

Prerequisites: General biology and chemistry (recommended but not required)

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Facilitators: Renee Correll, DPT
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Contact Info: Faculty may be contacted through the Portage messaging system

Course web site address: www.portagelearning.com

Course meeting times: BIOD 171 is offered continuously

Course Description: A systematic examination of the microbial world, emphasizing the properties of bacteria. Topics covered include morphology, physiology, diagnostic techniques and application to various fields with emphasis on pathogenic bacteria.

Course Outcomes: As a result of this course experience a student should be able to:

- Understand the basic building blocks of life
- Understand the difference between prokaryotic and eukaryotic cells
- Understand various cellular components (organelles) and their respective functions
- Understand the biochemical processes of microbial metabolism
- Understand the various sources and strategies for cells to obtain and utilize energy
- Understand the vast role of enzymes within microbial metabolism
- Understand different types of microscopy including bright field, dark field, fluorescence and electron.
- Understand the variety of staining techniques used within microscopy including simple staining, gram staining, acid fast staining, and differential staining.
- Understand microbial growth within a laboratory including selective vs differential techniques
- Understand the control of microbial spread in the laboratory and other public areas
- Understand the strategies for isolating and obtaining a pure microbial culture
- Understand real-world scenarios for practicing safe and accurate microbial cultivation

- Understand the function of normal flora
- Understand the classifications of microbial diseases
- Understand and describe various microbial diseases which affect all systems of the body
- Understand viral composition, types and strategies used for viral replication
- Understand the nature of diseases caused by viral infections, the routes of transmission and treatments available.

Lab Outcomes: As a result of this laboratory experience, students should be able to:

- Practice safe procedures within a laboratory and with all equipment
- Identify various microbes under a microscope and discuss their properties
- Identify various staining techniques used in the laboratory
- Identify various plating techniques used in the laboratory
- Understand various diagnostic tests used in the laboratory

*Each of these BIOD 171 student learning outcomes is measured:

- Directly by:
- (1) module application problems (with instructor feedback)
 - (2) exams
 - (3) lab reports and lab exams
 - (4) comparison of pre-course / final exam results

Indirectly by an end of course student-completed evaluation survey

Course Delivery: This course is asynchronously delivered online and is composed of 40 - 50 hours of reviewed module assignments with instructor feedback, 6 contact hours of secure online module exams, 15 – 20 hours of observation of demonstration labs and maintenance of a lab notebook, and 10 hours of lab exams.

Course Progression: It is the policy for all Portage Learning courses that only one lecture module and the accompanying exam be completed each day. Research on the best practices in learning indicates that time is needed to process material for optimal learning. This means that once an exam has been completed, the next exam will not unlock until the following day. *Note, the above policy does not apply to lab videos and lectures.* Please plan your time accordingly. If you have a legitimate need for an exception to this policy, please contact your instructor.

Required readings, lectures and assignments: Portage courses do not use paper textbooks. Students are required to read the online lesson modules written by the course author which contain the standard information covered in a typical course. Video lectures which supplement each lesson module subject should be viewed as many times as is necessary to fully understand the material.

Module Review Questions: The practice problems within the modules are not quantitatively part of your final grade, but the module work is a pass/fail component of the course and will be reviewed for completeness by the instructor. **Be sure to answer all of the problems, being careful to answer the questions in your own words at all times since this is an important part of adequate preparation for the exams.** After you answer the practice problems, compare your answers to the solutions at the end of the module. If your answers do not match those at the end, attempt to figure out why there is a difference. If you have any questions please contact the instructor via the My Messages tab or call the help line at 1-888-724-3590 x2.

Academic Integrity is a serious matter. In the educational context, any dishonesty violates freedom and trust, which are essential for effective learning. Dishonesty limits a student's ability to reach his or her potential. Portage places a high value on honest independent work. In a distance learning situation, we depend on the student's desire to succeed in the program he or she is entering. It is in a student's own best interests not to cheat on an exam, as this would compromise the student's preparation for future work. It is required of each student to take exams without consulting course materials or study aids including another person, the lesson pages, printed materials, or the Internet. **Students may not copy and paste responses in the answer boxes from any source, including their own notes or drafts in a word processing document, unless explicitly instructed to do so.** To this end, your instructor will be alert to any indications that a student may be violating this principle. It will be necessary to show all your work on exams. When the nature of the course does not require numerical or symbolic determination (perhaps instead just requires recitation of learned descriptions), our experienced staff is able to detect the unauthorized consultation of study aids when answering exam questions. A violation of the academic integrity policy may result in a score of zero on the exam and possible expulsion from the course, at the discretion of the instructor with consultation with an administrative-instructional committee.

Required Computer Accessories: It is recommended that students use a desktop or laptop computer, PC or Mac, when taking the course. Some tablet computers are compatible with the course, but not all features are available for all tablet computers. The latest full version of Firefox is required for the optimal operation of the Portage Learning Management System. In addition, you must have the latest full version of Adobe Flash Player installed as a plug-in in order to view any of the videos on the site. We highly recommend using a high-speed Internet connection to view the video lectures and labs. You may experience significant difficulties viewing the videos using a dial-up connection.

Module & Lab Topics:

- Module 1: This module includes an in-depth overview of the microbial world. An introduction to macromolecules and how small subunits can form large complex molecules is discussed. Content also includes a comparison of prokaryotic and eukaryotic cells. Cellular organelles and their respective functions are then presented.
- Module 2: In this module students learn about various strategies microbes may exploit in order to maintain and sustain life. Content also includes a complete overview of the biochemical processes of microbial metabolism, enzymatic reactions and alternative energy sources utilized to maintain these processes.
- Module 3: In this module the concepts of microscopy are introduced. Included are discussion on the varying types, benefits and disadvantages of each microscope. Accompanying microscopy, various staining techniques are described in order to visualize varying types of microbes.
- Module 4: In this module students will learn multiple techniques scientists use to grow, isolate and identify bacteria. Content includes an assortment of agar plate types, plating strategies and how to obtain a pure culture. This module also includes a discussion on bacterial isolation for real-world applications and safe practice methodologies.
- Module 5: This module covers appropriate usages for personal protective equipment (PPE). Pathogenic microbes are discussed relative to common causative agents. Symptoms, identification and treatment plans are outlined. Diseases covered affect the skin, the eye, the nervous system, and the cardiovascular/lymphatic systems.
- Module 6: This module contains an in-depth discussion on viruses. Content includes the various forms, structures and types of viruses as well as a generalization of the replication cycle. Pathogenic viruses, disease manifestations, symptoms and treatment options are outlined.
- Lab 1: In this lab students learn lab safety, how to maintain a lab notebook as well as identification and function of general lab equipment.

- Lab 2: In this lab students learn how to use a light microscope. General concepts are discussed as well as its respective parts, purpose and function in microbiology.
- Lab 3: In this lab students learn about gram staining. Content also includes discussion about the properties of various microbes introduced throughout the lab video.
- Lab 4: In this lab students learn about the various forms of liquid and solid (agar plate) growth media and how each can be used to safely cultivate a known or unknown microorganism.
- Lab 5: In this lab students learn about antibiotic sensitivity tests (Kirby-Bauer Method). Included is a discussion on antibiotic resistant bacteria and its impact on the options available for disease treatment.
- Lab 6: In this lab students learn how to test for the presence (or absence) of enzymatic activity within a microbe. Tests include oxidase, catalase, coagulase and lipase.
- Lab 7: In this lab students learn about secondary characterization assays (Indole, TSI and API) and how identifying various metabolic properties can aid in the accurate identification of an unknown microbe.
- Lab 8: In this lab students will learn biochemical assays used to further characterize and identify various microbes. Techniques include Western Blotting, ELISA and agglutination tests.
- Lab 9: In this lab students get a practical application of identifying an unknown microbe by running a series of diagnostic tests. Identification of the unknown microbe is based on the recorded observations (lab notebook) made previously throughout the course.

Requirements for Lab:

For the laboratory portion of the course, students will observe an experienced lab instructor. It is the responsibility of the student to view each lab video in its entirety. **Students are required to keep an electronic lab notebook.** This can be submitted by utilizing the notebook icon located at the top of the home page of each lab. It is a graded component of the course and must be submitted prior to the related lab exam. The lab notebook, alone, can be used as a resource to the student while taking their lab exam(s). Please note that the use of outside material (i.e. the internet, textbooks, articles, etc.) is not permitted while taking the lab exams. A recommended lab schedule can be found on the home page of each lab. The student should follow this schedule in order to meet course objectives.

Suggested Timed Course Schedule: (to complete the course within a typical college semester)

All Portage courses are offered asynchronously with no required schedule to better fit the normal routine of adult students, but the schedule below is suggested to allow a student to complete the course within a typical college semester. Despite this suggestion, the students may feel free to complete the course at their desired pace and on a schedule determined by them.

| <u>Time Period</u> | <u>Assignments</u> | <u>Subject Matter</u> |
|---------------------------|--|---|
| Days 1-35 (5 weeks) | Module 1 with Module 1 Exam Lab 1 with Lab 1 Exam Module 2 with Module 2 Exam Module 3 with Module 3 Exam Lab 2 with Lab 2 Exam Lab 3 with Lab 3 Exam | Overview of biochemistry, metabolism and enzymes |
| Days 36-64 (4 weeks) | Module 4 with Module 4 Exam Lab 4 with Lab 4 Exam Lab 5 with Lab 5 Exam | Overview of microscopy, microbial cultivation, isolation strategies and numerous staining techniques |
| Days 65-100 (5 weeks) | Module 5 with Module 5 Exam Lab 6 with Lab 6 Exam Lab 7 with Lab 7 Exam Module 6 with Module 6 Exam Lab 8 with Lab 8 Exam | Overview of common pathogenic microbes, viruses and the numerous medical conditions they elicit. |
| Days 101-108 | Final Exam Final Lab 9 and Lab 9 Exam | Based upon module material Unknown sample based on recorded results in lab notebook |

Grading Rubric:

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|--|------------|
| 6 Module exams = 100 points each x 6 = | 600 points |
| 8 Lab exams = 30 points each x 8 = | 240 points |

| | |
|---------------------------------------|--------------------|
| 9 Lab Notebooks = 5 points each x 9 = | 45 points |
| Final lab exam = 50 points each x1 = | 50 points |
| <u>Final exam = 120 pts.</u> | <u>120 points.</u> |
| Total | 1055 points |

The current course grade and progress is continuously displayed on the student desktop.

Grading Scale:

| | |
|--------------------------------|-----|
| 89.5% - 100% (945 - 1055 pts) | = A |
| 79.5% - 89.49% (839 – 944 pts) | = B |
| 69.5% - 79.49% (734 – 839 pts) | = C |
| 59.5% - 69.49% (628 – 733 pts) | = D |
| <59.49% (<627.72 pts) | = F |

Suggested External References:

If the student desires to consult a reference for additional information, the following textbooks are recommended as providing complete treatment of the course subject matter.

Bruce Alberts, **Essential Cell Biology**, Garland Science

Patrick R. Murray, **Medical Microbiology**, Saunders

William Trattler, **Clinical Microbiology Made Ridiculously Simple**, Medmaster

Learning Support Services:

Each student should be sure to take advantage of and use the following learning support services which are provided to increase student academic performance:

Video lectures which supplement the text material of each course module

Messaging system which provides individual instructor/student interaction

Toll-free phone tutoring help line which is available daily at appointed times (see below)

Tech support which is available by submitting a help ticket

Accommodations for Students with Learning Disabilities:

Students with documented learning disabilities may receive accommodations in the form of an extended time limit on exams, when applicable. In order to receive the accommodations, the student should furnish documentation of the learning disability prior to registration, if possible. Upon receipt of the documentation of a learning disability, Portage staff will provide the student with registration instructions for a variation of the course containing exams with extended time limits. This accommodation does not alter the content of any

assignments/exams, change what the exam is intended to measure or otherwise impact the outcomes of objectives of the course.

Student Help Line:

Portage students have access to our help-line phone service. The phone service is staffed by instructors who will answer questions regarding material in those courses. Please call 1-888-724-3590 and choose option #2 if you would like assistance with your course work. Due to high call volume, we cannot guarantee that your call can be answered immediately so you may be required to leave a voicemail. The help-line instructors will return the voicemails as soon as possible and within one business day. If the hours above do not fit your personal schedule, please leave a message on the help line voicemail requesting an appointment. In the voicemail, please leave several dates and times convenient for a return call. If a help line representative cannot call you at one of your preferred times, you will be contacted to set up a mutually suitable time. Appointment slots are limited and will be granted as instructor time becomes available and at the discretion of the help line instructor. No appointments will be scheduled for Sunday.

Help Line Hours

Mon - Fri: Noon - 9 PM ET

Sat: 9 AM - 11 AM ET

Sun: Closed

Holidays:

During the following holidays, all administrative and instructional functions are suspended, including the grading of exams and issuance of transcripts.

New Year's Day

Easter

Memorial Day

Independence Day

Labor Day

Thanksgiving weekend

Christmas Break

The schedule of holidays for the current calendar year may be found under the Student Services menu at www.portagelearning.com

Code of Conduct: Students are expected to conduct themselves in a way that supports learning and teaching and promotes an atmosphere of civility and respect in their interactions with others. Verbal and written aggression, abuse, or misconduct is prohibited and may be grounds for immediate dismissal from the program.

Grievances: If for any reason a student has a complaint about the course work or the instructor, the student is advised to first consult the instructor, who will be willing to listen and consider your concern. However, if you don't feel you have received a satisfactory reply, you are encouraged to contact the Executive Director of Portage Learning for further consideration of your complaint. The formal grievances process must be initiated via written communication. If desired, please file a written grievance to info@portagelearning.com to initiate the process.

Remediation:

At Portage your instructor, at his/her discretion, may allow a "one-time" only opportunity to re-take an alternate version of **one** exam on which a student has earned a grade lower than 70%. If an exam is retaken, the original exam grade will be erased and the new exam grade will become a permanent part of the course grade. However, before scheduling and attempting this retest, the student must resolve any questions in regard to the material by reviewing both the old exam and the lesson module material. The student is also encouraged to contact the phone help line for assistance. Once ready to attempt the retest of the exam the student must contact his/her instructor to request that the exam be reset for the retest.