

**Summer 2019  
BIO C17H3Y  
MICROBIOLOGY : THE BACTERIAL CELL**

## **GENERAL INFORMATION**

### **Instructor:**

Professor. Shelley Brunt

Office: S563A

416-208-2794

[brunt@utsc.utoronto.ca](mailto:brunt@utsc.utoronto.ca)

**The main learning objective of this course** is to provide you the background in basic and clinical microbiology, emphasizing eubacteria and introducing archaeobacteria, viruses and other acellular microorganisms. Emphasis will be placed on characteristics of the above that result in a number of these microorganisms being beneficial and others excellent pathogenic agents of numerous hosts.

**This is a lecture course with a laboratory component.** Some material in the laboratory will address material that is best presented in a lab setting and will not be addressed in detail in lecture. However, much of the lab and lecture material is interrelated. **The material may not necessarily fall in the same week but during lecture I will highlight related laboratory material. In addition to learning about microorganisms** in the laboratory **component you will be acquiring laboratory skills that are useful in the job market** as you will be learning how to cultivate and identify bacteria. These are valuable techniques for jobs requiring microbiology background such as environmental sampling, food industry, biopharmaceuticals, cosmetic industry, government testing labs, blood services labs to name a few.

### **Major learning outcomes:**

- Understand the role of microorganisms as nutrient cyclers and how these organisms interact with host organisms-both beneficial and determinate interactions
- Use correct terminology/scientific names in scientific writing
- Understand and apply the role of cell wall components, structural components and effector molecules in pathogenicity of bacteria
- Understand the basic components of viruses and compare and contrast the main structure of bacteriophages with those of animal viruses
- Understand the types of horizontal gene transfer and genetic exchange in microorganisms
- Apply basic microbiological techniques to the growth of bacterial cultures
- Evaluate scientific data from experimentation and understand the limitations of data collection and produce logical hypotheses based on experimentation
- Evaluate the role of genetic exchange in the evolution of antimicrobial resistance
- Compare and contrast the nature of bacterial and archaeobacterial cell walls
- Evaluate the role of bacterial cell structure, virulence factors and pathogenicity factors in host immune responses to pathogens

- Compare and contrast the DNA, RNA and protein structure of prokaryotes and eukaryotes

## Communication

**The best way to reach me is to drop by and see me** (if my door is open I am available, if it is closed it usually means I am not there, but try knocking) . I prefer to meet with you in person to answer your questions. This is why I have an **open door policy** . **Alternatively come by during my formal office hours.**

**I encourage you to ask questions about the course material (lecture or lab), in class, in my office or when I am visiting the labs. Please feel free to discuss other issues related to assisting you in your education.** If you wish to see me at a specific time outside of office hours then it is best to email me the request for an appointment. I will respond within the day.

I will answer emails when I am on campus. I am on campus generally Monday through Friday. If you send me emails on the weekend, you may not get a response until the following Monday. **Please use U of T account for email ( I will not answer emails from non-U OF T accounts ) and please indicate the course in the subject heading as I teach 4 courses in the summer.**

- General announcements and any material needed for the course will be posted on Quercus

## Office hours

Tuesday 10 am to 11 am and 2:15 to 3 pm

Wed 11 to noon

Thursday 1 to 2 pm

## AccessAbility statement:

*"Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible. AccessAbility Services staff (located in Rm SW302, Science Wing) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations 416-287-7560 or email [ability@utsc.utoronto.ca](mailto:ability@utsc.utoronto.ca). The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course."*

## Academic integrity/plagiarism

*The University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences.*

*Potential offences in papers and assignments include using someone else's ideas or words without appropriate acknowledgement, submitting your own work in more than one*

course without the permission of the instructor, making up sources or facts, obtaining or providing unauthorized assistance on any assignment.

On tests and exams cheating includes using or possessing unauthorized aids, looking at someone else's answers during an exam or test, misrepresenting your identity, or falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes."

<http://academicintegrity.utoronto.ca/>

(<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

(source [http://www.uts.utoronto.ca/~vpdean/academic\\_integrity.html](http://www.uts.utoronto.ca/~vpdean/academic_integrity.html) )

### **In papers and assignments:**

- Using someone else's ideas or words without appropriate acknowledgement.
- Submitting your own work in more than one course without the permission of the instructor.
- Making up sources or facts.
- Obtaining or providing unauthorized assistance on any assignment.

### **On tests and exams:**

- Using or possessing unauthorized aids
- Looking at someone else's answers during an exam or test.
- Misrepresenting your identity.

### **In academic work:**

- Falsifying institutional documents or grades.
- Falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

Submitted work may be requested to be submitted turnitin

- *"Normally, students will be required to submit their course essays to Turnitin.com for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site".*

**Intellectual Property (CTSI)** - <http://teaching.utoronto.ca/teaching-support/course-design/developing-a-syllabus/> - *"Recording or photographing any aspect of a university course - lecture, tutorial, seminar, lab, studio, practice session, field trip etc.*

– without prior approval of all involved and with written approval from the instructor is not permitted. For further information on University policies, please refer to the following links for details

- If you wish to opt out of turnitin, you must do it in writing to Professor. Brunt and provide an electronic copy of your lab report as well as copies of all rough work and referenced material.

**Intellectual Property (CTSI)** - <http://teaching.utoronto.ca/teaching-support/course-design/developing-a-syllabus/> - “Recording or photographing any aspect of a university course - lecture, tutorial, seminar, lab, studio, practice session, field trip etc. – without prior approval of all involved and with written approval from the instructor is not permitted. For further information on University policies, please refer to the following links for details

## Mark breakdown:

### LECTURE(58%) :

**Mid-term exam**      **Tuesday June 25, in class**      **22%**

➤ You must contact me within 48 Hours of missing the midterm and provide me with the UTSC medical certificate filled in by your doctor to be able to write midterm Illness Verification Form – should be submitted additionally to Jennifer Campbell in the Biological Sciences administrative office

<http://www.utsc.utoronto.ca/ctl/sites/utsc.utoronto.ca.ctl/files/resource-files/Verification-of-Illness-or-Injury-form-Jan-22-2013.pdf>

**Final exam: covers** material from midterm on. One hour is for the laboratory exam see below ( 3 hr)

During exam period TBA      **32%**

- All lecture exams are multiple choice format

**Participation in lecture** through one-minute writes/case studies/reflective practice (if you wish to opt out you may. Please inform me by the fourth week of classes and the 4% will be moved to the final lecture exam

(minimum of 80% of assignments completed for full credit)      **4%**

**Optional assignment:** in the news mini powerpoint about a microbiology related topic. Pick in social media, print or news report, and find one primary source paper related to the topic and write a one page, double spaced summary and include references at the end (not included in the page restriction.      **2%**

**If you participate in this assignment your final is reduced to 30%.**

**Due date: July 4 at midnight**

**LABORATORY: (42%): ( attendance is mandatory, you need a medical certificate to be excused see below for further details)**

**Final exam** During exam period (written with the lecture exam, short answer/calculations, short essay, **lab exam is cumulative**) **14%**

**Lab reports and assignments** **18%**

**Lab performance** (includes lab log book(5.5%) and performance/presentations /relective practice when appropriate and requested by your TA (4.5%)).

This is not an automatic grade. You must come prepared for lab and participate **10%**

The laboratory component of this course is worth 42% according to the following outline.

	<b>Topic</b>	<b>Format</b>	<b>% of final grade</b>	<b>Due Date</b>
<b>Assignment # 1</b>	Identification of an Unknown Bacteria	<ul style="list-style-type: none"> <li>• 2 Slides - Gram &amp; Endospore Stain</li> <li>• Data Sheet</li> </ul>	5%	<b>Week #3 May 28/19 In class</b>
<b>Assignment #2</b>	Generation time of <i>Escherichia coli</i>	<ul style="list-style-type: none"> <li>• Introductory paragraph</li> <li>• Semi-log graphs</li> <li>• Concluding paragraph</li> </ul>	3%	<b>Week #7 July 2/19 in lab</b>
<b>Assignment #3</b>	Transfer of Genetic Material	Mini Formal Lab report on bacterial transformation	4%	<b>Week #8 On-line Thurs July 11/19 by 11:59 pm</b>
<b>Assignment #4</b>	Effect of antiseptics on bacterial growth	Formal Lab Report:	6%	<b>Week #11 July30 by 11:59 pm</b>
<b>Performance</b>	Lab Notebook	Weekly Summaries: intro, flowcharts, results,discussion, critical thinking	5.5%	<b>Weekly Check</b>
<b>Performance</b>	In – Lab participation	<ul style="list-style-type: none"> <li>• Overall performance</li> <li>• Reflective practices</li> </ul>	4.5%	

		• Mini-presentations		
<b>Lab Exam</b>	Labs #1-11	Short answer format	14%	<b>Final Exam Period</b>

**Lab section:** Double check your **room and the course timetable. Quercus will be updated with student lists after class enrolment has ended. Learn the name of your teaching assistant. Lab related questions will be answered in Dr. Brunt's office hours as well.**

**Text:** Custom text book: **BIOC17 Microbiology** from Pearson custom Library for the biological Sciences Combination of two different textbooks, reducing the cost of the text book. This book can also serve as a resource for BIOD26 and BIOD17. A copy should be on reserve in the library

**Midterms and final exams are based on material presented in lecture.** While I take material from multiple sources **this text book most closely reflects the material and the level of coverage that I give topics.** My goal with the custom text book is for you to get the background needed for lecture and lab at the lowest price possible so I chose relevant chapters from two different Person text books Brock: Biology of Microorganisms and Bauman: Microbiology with diseases by body system

**Lab Manual:** Posted on Quercus

**Web-sites:**

An excellent web-site for all Biology courses is PubMed at [www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov) use Search function to get recent research papers on virtually any Biology topic and to search free textbooks

Online text book of Microbiology: <http://www.textbookofbacteriology.net>  
 Canadian Society of Microbiologists: <http://www.csm-scm.org>  
 American Society for Microbiology: <https://www.asm.org>

**Grading:**

Several **different types of evaluations** are used in the calculation of your grade in this course. These include: two lecture exams (Midterm and Final: multiple choice format), one final lab exam (short answer/ short essay format) given in the final exam period with the lecture exam, lab practical (e.g. slides to be handed in and graded), lab reports as well as lab preparation and performance based on in- class -exercises and lecture participation through one-minute writes/case studies.

**What you need to know for lecture exams:** In Microbiology, there is an emphasis on factual knowledge including the names of important organisms discussed in lecture. Your lecture notes and posted lecture aids are your most important guide to what you need to know. The lecture exam questions will be taken from **the material covered in class**, whether on the **lecture aids**, covered on the board and in any way discussed in class. Although there is no requirement to do so, I do provide a lecture aid prior to each lecture. These lecture aids have significant information because I take the lecture material from multiple sources, including reviews and primary sources and not just your text book. Your textbook will provide the basic resource for material in the course. I provide the lecture aids prior to class to allow you to supplement the notes, listen and process the material covered. I emphasize certain material in lecture, it is important you come to lecture to get a feel for what the important information is (all material in each slide is not equal). I also expect you to supplement the lecture notes with the additional detail I provide in lecture. **In addition there are in class small assignments worth 4% of your grade. (see mark distribution above)**

**The lecture aids may be modified in class and you are responsible for any added material.** If I cover additional material on the board or via an discussion in lecture it will be your responsibility to take notes. You are responsible for all the material in the lecture and the lecture aids, unless specifically advised otherwise in class

## **Take home message**

To get the most out of the course,

- (i) come to class and attend laboratories (which are required see laboratory outline)
- (ii) ask questions
- (iii) go over your lecture and lab notes as soon as possible after each class and
- (iv) if possible, set up a study group with one or two other students in the class (e.g. your lab partners), with whom to discuss these. Studies have shown that the sooner you review your notes, the longer you retain the information ("positive reinforcement").

-

## **Laboratory component ( see manual for specifics)**

**Attendance in labs is mandatory. To be excused from a lab requires a medical certificate.**

You must attend all labs for this course!

You are allowed a maximum of 2 excused absences (ie. you must provide a Self-Declaration of Student Illness form or Verification of Student Illness form to both Professor Shelley Brunt and Jennifer Campbell (Dept. of Biology Course Coordinator).

Consequences for missing laboratories: 3 or more absences from the lab (regardless of the reason) will result in a loss of all marks associated with lab, resulting in failure of the course.

- An unexcused absence will lead to the loss of grades related to in class work/performance(1% of performance) and 1% of lab book grade for that laboratory.
- **If you have two unexcused absences you forfeit participation/performance grade of 3% and note book grade and all grades associated with the missed laboratory**

If you have to miss a lab please contact Professor Shelley Brunt prior to the lab to discuss your options.

Lab assignments will not be accepted late. Late assignments as a result of excused absences are

only accepted up to 5 days past the original deadline based on the medical documentation, otherwise a mark of zero will be assigned.

### **Microscopes : see lab manual for further details**

- You will be assigned to a specific microscope.
- The TAs will instruct you as to how these microscopes are to be handled and cleaned.
- At the end of each lab, the TAs will check that you have removed any oil from the lenses and have put the microscope away correctly.
- **If this is not done properly marks will be deducted from your grade. WHY because the residual oil can severely damage the microscope**

**The lecture outline is below.** Many of the Topics listed below are given over more than one lecture period.

**Check related readings/key words on the front page of each lecture aid.**

#### **TOPIC NUMBER**

#### **LECTURE TOPIC AND READING ASSIGNMENTS**

##### **Topic 1**

Course Outline  
The Development of Concepts in Microbiology

##### **Topic 2**

Microbial Diversity, metabolism  
Evolution of cells  
The "Endosymbiont Hypothesis"

##### **Topic 3**

Overview of Acellular Agents:  
Viruses, Prions, Plasmids and  
Transposons

##### **Topic 4**

Comparison of Selected Features of  
Prokaryotic and Eukaryotic Cells



- Topic 5** Bacterial Cell Walls and Cell Envelopes (Gram positive and Gram negative highlighted:  
(I) Peptidoglycan (Murein) Synthesis  
(II) Teichoic Acids  
(III) Medical Importance of Gram Positive Cell Walls  
(IV) Gram Negative Outer Membrane  
(V) Lipoproteins and Lipopolysaccharides  
(VI) The Endotoxic (Inflammatory / Innate) Responses  
(VII) Adaptive (Specific) Immune Responses
- Topic 6** Pili , Fimbriae and flagella and role in pathogenesis
- Topic 7** Capsules and Biofilms and role in pathogenesis
- Topic 8** Endospores and other developmental pathways