



# MICR\*3280 Microbial Cell Biology

Fall 2023

Section(s): C01

Department of Molecular and Cellular Biology

Credit Weight: 0.50

Version 1.00 - September 07, 2023

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## 1 Course Details

### 1.1 Calendar Description

This course explores the structure-function relationships of macromolecular complexes and cellular ultrastructures involved in fundamental microbial processes. The structures of macromolecular machines will be considered from the perspective of the cellular requirements for survival in different environments and will be discussed in the context of their integration into building the basic elements of the microbial cell, as well as their exploitation as targets for antibiotics and other therapeutic approaches.

**Pre-Requisites:** BIOC\*3560, MBG\*2040, MICR\*2420

**Restrictions:** MBG\*3080, MICR\*4520

### 1.2 Course Description

This course explores the structure-function relationships of macromolecular complexes and cellular ultrastructures involved in fundamental microbial processes. The structures of macromolecular machines will be considered from the perspective of the cellular requirements for survival in different environments and will be discussed in the context of their integration into building the basic elements of the microbial cell, as well as their exploitation as targets for antibiotics and other therapeutic approaches.

### 1.3 Timetable

Lectures are pre-recorded and will be posted on Courselink.

Classes 1:00 pm - 2:20 pm Tuesdays & Thursdays are offered in CRSC, 117.

*Please note that lectures will be held each Thursday and that there will be no lectures on Tuesdays, with the following exceptions for review classes – Tuesday, October 3 (Quiz 1 review), Tuesday, October 24 (Midterm review), Tuesday, November 14 (Quiz 2 review).*

*All lecture material should be reviewed before Thursday's discussion classes (see schedule below for details).*

*A schedule of assessments and lectures will be posted in CourseLink.*

## 1.4 Final Exam

All assessments will be online and conducted via CourseLink. We will **NOT** use Respondus monitoring or browser lockdown. Therefore, the assessments (including the final exam) will be in an open-book format.

The final exam will begin at a fixed time (as determined by the registrar) and run for 2 hours. You may not restart an assessment once it has started.

The final exam will open at 8:30 am Tuesday, December 5, and you will have 2 hours (until 10:30 am) to complete it

The final exam is cumulative and will cover material from all lectures

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## 2 Instructional Support

### 2.1 Instructional Support Team

<b>Instructor:</b>	Cezar Khursigara
<b>Email:</b>	ckhursig@uoguelph.ca
<b>Telephone:</b>	+1-519-824-4120 x58091
<b>Office:</b>	SSC 4477
<b>Office Hours:</b>	Office hours will be by appointment.

#### **Teaching Assistant:**

Alicia Plourde

plourdea@uoguelph.ca

## 3 Learning Resources

### 3.1 Required Resources

#### **Slonczewski and Foster Microbiology: an evolving science, 5th edition (Textbook)**

Students are expected to complement class learning with assigned readings from the current scientific literature. A reading list will be assigned for each lecture topic. This course will be run using Courselink: <https://courselink.uoguelph.ca/shared/login/login.html>

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## 4 Learning Outcomes

The depth of understanding in this course will be equivalent to an advanced course in the third year. This course will build on concepts covered in previous molecular and cellular biology, and microbiology courses.

### 4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. By the end of this course, you should be able to:
    1. Compare and contrast the impact of macromolecular complexes and cellular ultrastructure in relation to essential microbial processes and antimicrobial resistance
    2. Categorize the diversity and complexity of microbial cellular structures and the structure- function relationships that promote cell growth and viability
    3. Interpret the application and limitations of contemporary experimental approaches
    4. Evaluate the quality of experimental design, data analysis and conclusions presented in current literature
    5. Conduct a comprehensive exploration of the primary literature to formulate opinions and draw conclusions
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## 5 Teaching and Learning Activities

### 5.1 Lecture

#### Tentative Lecture Schedule

Topics:

**LECTURES:**

**SECTION 1: INTRODUCTION TO MICROBIAL CELL BIOLOGY, ANTIBIOTICS, RESISTANCE AND DRUG DISCOVERY**

Thursday, September 7 – CLASS: Introduction and general overview of the course lecture 1.1

Tuesday, September 12 – NO CLASS

Thursday, September 14 – CLASS: Discussion and general review of lectures 1.2 to 1.5

**Lectures on CourseLink:**

1.2 Microbial Cell Biology

1.3 Antibiotics and Antibiotic Resistance

1.4 The Antibiotic Effect (mini-lecture)

1.5 Observing Microbial Cells

**SECTION 2: DNA, REPLICATION, NUCLEOID STRUCTURE, AND ACQUISITION OF GENETIC DIVERSITY**

Tuesday, September 19 – NO CLASS

Thursday, September 21 – CLASS: Discussion and general review of lectures 2.1 to 2.4

Tuesday, September 26 – NO CLASS

Thursday, September 28 – CLASS: Discussion and general review of lectures 2.5 to 2.8

**Lectures on CourseLink:**

2.1 DNA Review

2.2 DNA Replication I

2.3 DNA Replication II

2.4 Bacterial Growth and DnaA (mini-lecture)

2.5 DNA Topology and Gyrase Inhibitors

2.6 Quinolone Action and Resistance

2.7 Toxicity and Pharmacokinetics of Quinolones (mini-lectures)

2.8 Chromosome Organization and Dynamics

**SECTION 3: BACTERIAL CELL CYCLE AND CELL DIVISION**

Tuesday, October 3 – CLASS: Review for Quiz 1

Thursday, October 5 – CLASS: Discuss and general review of lectures 3.1 to 3.3

Tuesday, October 10 – NO CLASS (Fall study break)

Thursday, October 12 – CLASS: Discuss and general review of lectures 3.4 to 3.7

**Lectures on CourseLink:**

3.1 Cell Cycle

3.2 Bacterial Cell Division I

3.3 Bacterial Cell Division II

3.4 Cell Division Inhibitors (mini-lecture)

3.5 Filamentous Temperature Sensitive Proteins (mini-lecture)

3.6 Atypical Systems of Cell Cycle and Division

3.7 Cell Differentiation (mini-lecture)

**SECTION 4: CYTOSKELETAL FILAMENTS AND SUBCELLULAR LOCALIZATION**

Tuesday, October 17 – NO CLASS

Thursday, October 19 – CLASS: Discuss and general review of lectures 4.1 to 4.3

**Lectures on CourseLink:**

4.1 Cytoskeletal Filaments and Cell Shape

4.2 Cryo-EM and Cellular Microbiology

4.3 Bacterial Microcompartment

**SECTION 5: RNA, TRANSCRIPTION, AND  
TRANSCRIPTIONAL INHIBITORS**

Tuesday, October 24 – CLASS: Review for Midterm Exam

Thursday, October 26 – CLASS: Discuss and general review  
of lectures 5.1 to 5.3

**Lectures on CourseLink:**

5.1 Bacterial Transcription

5.2 Classes of Bacterial RNA (mini-lecture)

5.3 Transcriptional Inhibitors

**SECTION 6: PROTEIN SYNTHESIS, ASSEMBLY, AND  
SECRETION**

Tuesday, October 31 – NO CLASS

Thursday, November 2 – CLASS: Discuss and general review of lectures 6.1 to 6.3

Tuesday, November 7 – NO CLASS

Thursday, November 9 – CLASS: Discuss and general review of lectures 6.4 to 6.5

**Lectures on CourseLink:**

6.1 Bacterial Translation

6.2 Transcription-Translation Coupling (mini-lecture)

6.3 Translational Inhibitors

6.4 Protein Modification, Folding and Degradation

6.5 Protein Secretion

**SECTION 7: BACTERIAL PEPTIDOGLYCAN THE CELL WALL**

Tuesday, November 14 – CLASS: Review for Quiz 2

Thursday, November 16 – CLASS: Discuss and general review of lectures 7.1 to 7.2

**Lectures on CourseLink:**



7.1 Peptidoglycan and Peptidoglycan Synthesis

7.2 Cell Wall Antibiotics

## **SECTION 8: THE CELL MEMBRANE AND TRANSPORT**

Tuesday, November 21 – NO CLASS

Thursday, November 23 – CLASS: Discuss and general review of lectures 8.1 to 8.3

### **Lectures on CourseLink:**

8.1 The Cell Membrane and Transport

8.2 The Gram-Negative Cell Envelope

8.3 The Gram-Positive Cell Envelope

Tuesday, November 28 – NO CLASS

**Thursday, November 30 – CLASS: Review class for final exam**

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## **6 Assessments**

## 6.1 Marking Schemes & Distributions

### **ASSESSMENTS:**

All assessments will be online and conducted via CourseLink. We will **NOT** use Respondus monitoring or browser lockdown. Therefore, the assessments will be in an open-book format.

Assessments will open on a specific date and time (see below for details about each assessment), and the quizzes and the midterm close ~2 days later. You may write the assessment at any point during this time, but once you start, you must finish within the allotted time (30 minutes for quizzes and 1 hour for the midterm). The final exam will begin at a fixed time (as determined by the registrar) and run for 2 hours. You may not restart an assessment once it has started.

If, for any reason, you cannot write an assessment during the assigned period, you must inform the teaching team well in advance of the assessment start date. Failing to do so may lead to a zero for that assessment.

### **QUIZ 1 (15% of final grade):**

- The quiz will open at 9:00 am Wednesday, October 4 and close at 5:00 pm Friday, October 6
- The quiz will cover material from Lectures 1.2 to 2.8
- Once started, you will have 30 minutes to complete the quiz

### **MIDTERM EXAM (30% of final grade):**

- The midterm will open at 9:00 am Wednesday, October 25 and close at 5:00 pm Friday, October 27
- The midterm exam will focus on material from lectures 3.1 to 4.3 but will also include some questions from previous lectures
- Once started, you will have 1 hour to complete the exam

**QUIZ 2 (15% of final grade):**

- The quiz will open at 9:00 am Wednesday, November 15 and close at 5:00 pm Friday, November 17
- The quiz will cover material from Lectures 5.1 to 6.5
- Once started, you will have 30 minutes to complete the quiz

**FINAL EXAM (40% of final grade):**

- The final exam will open at 8:30 am Tuesday December 5, and you will have 2 hours (until 10:30 am) to complete it
  - The final exam is cumulative and will cover material from all lectures
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## 7 Department of Molecular and Cellular Biology Statements

### 7.1 Academic Advisors

If you are concerned about any aspect of your academic program:

- Make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counsellors](#)

### 7.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist.  
<http://www.learningcommons.uoguelph.ca/>
- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can be found at: <http://www.lib.uoguelph.ca/get-assistance/studying/chemistry-physics-help> and <http://www.lib.uoguelph.ca/get-assistance/studying/math-stats-help>

## 7.3 Wellness

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance.  
<https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention. <https://www.uoguelph.ca/studenthealthservices/clinic>
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations.  
<http://www.selfregulationskills.ca/>

## 7.4 Personal information

Personal information is collected under the authority of the University of Guelph Act (1964), and in accordance with Ontario's Freedom of Information and Protection of Privacy Act (FIPPA) <http://www.e-laws.gov.on.ca/index.html>. This information is used by University officials in order to carry out their authorized academic and administrative responsibilities and also to establish a relationship for alumni and development purposes.

For more information regarding the Collection, Use and Disclosure of Personal Information policies please see the Undergraduate Calendar.  
(<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/intro/index.shtml>)

## 7.5 Course Offering Information Disclaimer

Please note that course delivery format (face-to-face vs online) is subject to change up to the first-class day depending on requirements placed on the University and its employees by public health bodies, and local, provincial and federal governments. Any changes to course format prior to the first class will be posted on WebAdvisor/Student Planning as they become available.

# 8 University Statements

## 8.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

## 8.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions

<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

### 8.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

### 8.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

### 8.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a

week ahead of time.

For Guelph students, information can be found on the SAS website  
<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website  
<https://www.ridgetownc.com/services/accessibilityservices.cfm>

## 8.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff, and students-to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct  
<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct  
<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

## 8.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

## 8.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars  
<https://www.uoguelph.ca/academics/calendars>

## **8.9 Illness**

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g.. final exam or major assignment).

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