



MICR*4520 Microbial Cell Biology

Fall 2018
Section(s): C01

Department of Molecular and Cellular Biology
Credit Weight: 0.50
Version 1.00 - August 24, 2018

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 cell division and the bacterial cell cycle, as well as their exploitation as targets for antibiotics and other therapeutic approaches.

Pre-Requisite(s): BIOC*3560, MBG*3080

1.2 Timetable

Lectures 1:00 -2:20 Tuesdays & Thursday, SSC 1304

1.3 Final Exam

Exam time and location is subject to change. Please see WebAdvisor for the latest information.

2 Instructional Support

2.1 Instructor(s)

Dr. Cezar Khursigara
Email: ckhursig@uoguelph.ca
Telephone: +1-519-824-4120 x58091
Office: SCI 4458
Office Hours: By appointment

3 Learning Resources

3.1 Note

There is no assigned textbook for this course. Instead, 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 Courouselink:

<https://courselink.uoguelph.ca/shared/login/login.html>

4 Learning Outcomes

The depth of understanding in this course will be equivalent to an advanced course in the fourth 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. Understand the impact of macromolecular complexes and cellular ultrastructure in relation to essential microbial processes, antimicrobial resistance and pathogenicity
 2. Appreciate the diversity and complexity of microbial cellular structures and the structure-function relationships that promote cell growth and viability
 3. Understand the application and limitations of contemporary experimental approaches and evaluate the quality of experimental design, data analysis and conclusions presented in current literature
 4. Develop critical thinking skills by analyzing data in the current literature and synthesize major implications of findings
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5 Teaching and Learning Activities

5.1 Tentative Lecture Schedule

**Lectures will mainly comprise presentations by the instructor. However students will be encouraged to discuss (in class) relevant current scientific literature.

Classes	Date(s)	Lecture Topic
1	September 6	Introduction to microbial cell biology Issues in antibiotic resistance and drug discovery
2	September 11	<ul style="list-style-type: none">• history of antibiotic development• conventional antibiotic targets• classical and new approaches in drug discovery• alternative approaches for combatting infections Nucleoid structure
3-4	September 13 & 18	<ul style="list-style-type: none">• bacterial nucleoid architecture & chromosome organization• DNA topology

- gyrase inhibitors

Bacterial cell cycle

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| 5-4 | September 20 & 25 | <ul style="list-style-type: none"> • DNA dynamics • regulation and coordination of replication • chromosome segregation and nucleoid exclusion • sporulation |
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Cell Division

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| 7-8 | September 27 & October 2 | <ul style="list-style-type: none"> • cell polarity and defining the mid-cell • FtsZ and the Z-ring • the divisome • atypical systems |
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9	October 4	MIDTERM 1 (in class)
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10	October 9	No class - Fall study break day
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Cytoskeletal Filaments and Subcellular Localization

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| 11 | October 11 | <ul style="list-style-type: none"> • cell shape determination • chromosome/plasmid partitioning • proteins clusters, microcompartments and organelles |
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The basis for the Gram-stain reaction; structures and functions of bacterial cell envelopes

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| 12-13 | October 16 & 18 | <ul style="list-style-type: none"> • Gram-positive bacteria • Gram-negative bacteria • mycobacteria • Archaea |
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Cell Wall Growth and Remodelling

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| 14-15 | October 23 & 25 | <ul style="list-style-type: none"> • review of bacterial cell envelope structures • peptidoglycan assembly • penicillin-binding proteins and resistance |
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16-17	October 30 & November 1	Microbial Cell Envelope I
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- gram-negative envelope
- outer membrane assembly
- lipopolysaccharides, OMPs and transporters

Microbial Cell Envelope II

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| 18-19 | November 6 & 8 | <ul style="list-style-type: none"> • gram-positive envelope • surface proteins • teichoic acids |
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| 20 | November 13 | MIDTERM II (in class) |
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Synthesis and assembly of proteins

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| 21-23 | November 15 & 20 | <ul style="list-style-type: none"> • ribosome function and antibiotic mechanisms • insertion of membrane proteins • the BAM machine • disulfide bond formation • lipoprotein assembly • sortase enzymes |
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Protein secretion systems

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| 24-25 | November 22 & 27 | <ul style="list-style-type: none"> • overview of the different systems • relationships to other cellular structures & processes |
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| FINAL EXAM | December 11 | 8:30am to 10:30am, Location TBD |
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5.2 Important Dates

September 6 (Thursday): first lecture in MICR*4520, 1:00pm in SSC 1304

October 4 (Thursday): midterm examination, 1:00pm in SSC 1304

November 13 (Tuesday): midterm examination, 1:00pm in SSC 1304

December 11 (Tuesday): final exam, 8:30am to 10:30am; Location TBD

6 Assessments

6.1 Assessments

Grading for this course will comprise the following three components:

Midterm Exam I*: **30%** of final Grade

Midterm Exam II*: **30%** of final Grade

Final Examination: **40%** of final grade

Please ensure you are present for the midterm exam as there will be **NO opportunity available to take the exam at an alternate time. If the midterm is missed, academic consideration will only be given providing the appropriate documentation is presented (a note from a physician or academic councillor). In this event, the marks from the midterm will be transferred to the final exam.*

7 Course Statements

7.1 Grading

If you are absent from classes during the semester, you will be expected to make up missed lecture material on your own.

8 Department of Molecular and Cellular Biology Statements

8.1 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](#)

8.2 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.
- 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: [Chemistry & Physics Help](#) and [Math & Stats Help](#)

8.3 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.
 - [Student Health Services](#) is located on campus and is available to provide medical attention.
 - 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](#).
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9 University Statements

9.1 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.

9.2 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 regulations and procedures for [Academic Consideration](#) are detailed in the Undergraduate Calendar.

9.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for [Dropping Courses](#) are available in the Undergraduate Calendar.

9.4 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.

9.5 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 book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: www.uoguelph.ca/sas

9.6 Academic Misconduct

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 discourages misconduct. 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.

The [Academic Misconduct Policy](#) is detailed in the Undergraduate Calendar.

9.7 Recording of Materials

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

9.8 Resources

The [Academic Calendars](#) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.
