



University of Guelph
College of Biological Science
Department of Molecular and Cellular Biology

COURSE OUTLINE

Microbial Cell Biology (MICR*4520)
Fall 2016

Course Goal

This course explores the structure-function relationships of macromolecular complexes and elements of cellular ultrastructure that are involved in fundamental microbial processes. Cellular components and processes will be examined from the perspectives of the requirements for microbial survival in different environments, their integration into cell division and the bacterial cell cycle, as well as their exploitation as targets for antibiotics and other therapeutic approaches. 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.

Course Coordinator and Lecturers

Professor Dr. Cezar Khursigara, Office SCIE 3248, ckhursig@uoguelph.ca,
ext. 58091. Office hours: by appointment

Course Schedule

Lectures 1:00 -2:20 Tuesdays & Thursday, SCIE 3317

Learning Outcomes

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

- Understand the impact of macromolecular complexes and cellular ultrastructure in relation to essential microbial processes, antimicrobial resistance and pathogenicity
- Appreciate the diversity and complexity of microbial cellular structures and the structure-function relationships that promote cell growth and viability
- Understand the application and limitations of contemporary experimental approaches and evaluate the quality of experimental design, data analysis and conclusions presented in current literature
- Develop critical thinking skills by analyzing data in the current literature and synthesize major implications of findings
- Expand scientific writing skills to promote and develop effective communication

Course Resources

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

Course Structure

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

Tentative Lecture Schedule

Classes	Date(s)	Lecture Topic
1	September 8	Introduction to microbial cell biology
2	September 13	Issues in antibiotic resistance and drug discovery <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
3-4	September 15 & 20	Nucleoid structure <ul style="list-style-type: none"> • bacterial nucleoid architecture & chromosome organization • DNA topology • gyrase inhibitors
5-4	September 22 & 27	Bacterial cell cycle <ul style="list-style-type: none"> • DNA dynamics • regulation and coordination of replication • chromosome segregation and nucleoid exclusion • sporulation
7-8	September 29 & October 4	Cell Division <ul style="list-style-type: none"> • cell polarity and defining the mid-cell • FtsZ and the Z-ring • the divisome • atypical systems
9	October 6	MIDTERM 1 (in class)
10	October 11	No class - Fall study break day
11	October 13	Cytoskeletal Filaments and Subcellular Localization <ul style="list-style-type: none"> • cell shape determination • chromosome/plasmid partitioning • proteins clusters, microcompartments and organelles

Classes	Date(s)	Lecture Topic
12-13	October 18 & 20	The basis for the Gram-stain reaction; structures and functions of bacterial cell envelopes <ul style="list-style-type: none"> • Gram-positive bacteria • Gram-negative bacteria • mycobacteria • Archaea
14-15	October 25 & 27	Cell Wall Growth and Remodelling <ul style="list-style-type: none"> • review of bacterial cell envelope structures • peptidoglycan assembly • penicillin-binding proteins and resistance
16-17	November 1 & 3	Microbial Cell Envelope I <ul style="list-style-type: none"> • gram-negative envelope • outer membrane assembly • lipopolysaccharides, OMPs and transporters
18-19	November 8 & 10	Microbial Cell Envelope II <ul style="list-style-type: none"> • gram-positive envelope • surface proteins • teichoic acids
20	November 15	MIDTERM II (in class)
21-23	November 17 & 22	Synthesis and assembly of proteins <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
24-25	November 24 & 29	Protein secretion systems <ul style="list-style-type: none"> • overview of the different systems • relationships to other cellular structures & processes
26	December 1	class rescheduled from Oct 11 class cancelled - study time!
FINAL EXAM	December 10	Time and Location TBD

Methods and Description of 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.*

Important Dates

September 8 (Thursday): first lecture in MICR*4520, 1:00pm in SSC 3317

October 6 (Thursday): midterm examination, 1:00pm in SSC 3317

November 15 (Tuesday): midterm examination, 1:00pm in SSC 3317

December 10 (Saturday): final exam, time and location TBD

Course and University Policies

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, student ID#, and e-mail contact, and be prepared to provide supporting documentation. See the undergraduate calendar for information on regulations and procedures for Academic Consideration:

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

Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Centre for Students with Disabilities as soon as possible.

For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: <http://www.csd.uoguelph.ca/csd/>

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:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

E-mail Communication

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

Drop Date

The last date to drop one-semester Fall 2015 courses, without academic penalty, is Friday November 6. For regulations and procedures for Dropping Courses, see the Undergraduate Calendar:

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

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.

Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded in any electronic media without the permission of the presenter, whether the instructor, a classmate or guest lecturer.

Grading

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

General Campus Resources

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

Make an appointment with a program counsellor in your degree program.

<http://www.bsc.uoguelph.ca/index.shtml> or

<https://www.uoguelph.ca/uaic/programcounsellors>

If you are struggling to succeed academically:

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/>

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.uoguelph.ca/~ksomers/>

If you have a documented disability or think you may have a disability:

The Centre for Students with Disabilities (CSD) can provide services and support for students with a documented learning or physical disability. They can also provide information about how to be tested for a learning disability. For more information, including how to register with the centre please see: <https://www.uoguelph.ca/csd/>