MICR*3280 Microbial Cell Biology

Fall 2021
Section(s): C01

Department of Molecular and Cellular Biology
Credit Weight: 0.50
Version 1.00 - September 04, 2021

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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 1:00 pm - 2:20 pm Tuesdays & Thursday offered in MCKN 121 (after September 28) and online (via Zoom), or as recommended by UG admin or WDG Public Health.

1.4 Final Exam

******Please note that the exam date, time, and mode of offering is subject to change.***

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2 Instructional Support

2.1 Instructional Support Team

Instructor: Cezar Khursigara
Email: ckhursig@uoguelph.ca
Telephone: +1-519-824-4120 x58091
Office: SSC 4458
Office Hours: Office hours will be by appointment.

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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:

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    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 will mainly comprise discussion and presentations led by the instructor. However, students will be e

Lecture Topics

1. Introduction to microbial cell biology, antibiotics, resistance and drug discovery
    a. General overview of bacterial cell structures
    b. Comparison of Gram-positive, Gram-negative and mycobacterial cells
    c. History of antibiotic development and conventional antibiotic targets
    d. Classical and new approaches in drug discovery and alternative approaches for combatting infections

1. DNA, replication, nucleoid structure and acquisition of genetic diversity

a. DNA structure and dynamics
b. DNA replication – coordination and regulation
c. DNA topology and gyrase inhibitors
d. Bacterial nucleoid architecture, plasmids and chromosome organization

1. Bacterial cell cycle and cell division
    a. Chromosome segregation, nucleoid exclusion and cell polarity
    b. The bacterial divisome and elongasome
    c. Atypical systems of cell division
    d. Sporulation

1. Cytoskeletal filaments and subcellular localization
    a. Cell shape determination
    b. Chromosome and plasmid partitioning
    c. Protein clusters, microcompartments and bacterial organelles

1. RNA, transcription and transcriptional inhibitors
    a. Bacterial transcription cycle and RNA polymerase
    b. Regulatory RNAs in bacteria
    c. RNA modification, processing and decay
    d. Transcriptional inhibitors

1. Protein synthesis, assembly and secretion
    a. Protein structure, translation and the ribosome
    b. Antibiotics that target translation and resistance
    c. Protein export, membrane insertion and secretion
    d. Disulfide bond formation and sortases

1. Bacterial peptidoglycan the cell wall
    a. Peptidoglycan synthesis and assembly
    b. Cell wall dynamics and remodeling
    c. Penicillin binding proteins, β-lactam antibiotics and resistance

1. The Cell Membrane and Transport

    a. Gram-negative cell envelope

    b. Gram-positive cell envelope

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6 Assessments

6.1 Marking Schemes & Distributions

Grading for this course will comprise the following three components (NOTE - assessments for this course are subject to change. Final assessment schedule will be presented in the final

version of the Course Outline):

Quizzes (2 in total, each worth 10%): 20% of final grade

Quizzes will consist of multiple choice and short answer questions and will be based on lecture topics and will be held during lecture time.

Midterm Exams (2 in total, each worth 25%): 50% of final grade

Midterm exams will consist of multiple choice, short and long answer questions and will be based on lecture topics and will be held during lecture time.

Final Examination: 30% of final grade

The Final examination will be comprehensive, i.e. the exam will cover all lecture topics, readings and independent assignment. The final exam will be schedule during the exam period. Format to be determined.

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

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 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (https://news.uoguelph.ca/2019-novel-coronavirus-information/) and circulated by email.

8.10 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).

8.11 Covid-19 Safety Protocols

For information on current safety protocols, follow these links:

- https://news.uoguelph.ca/return-to-campuses/how-u-of-g-is-preparing-for-your-safe-return/
- https://news.uoguelph.ca/return-to-campuses/spaces/#ClassroomSpaces

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.
