



# MICR\*3240 Microbial Physiology and Genetics

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

In this course students examine the genetic and physiological responses of microorganisms to their diverse and changing environments. Topics covered include gene regulation, bacterial quorum sensing and bacterial phage immunity.

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

**Restrictions:** MBG\*3080, MICR\*3260

### 1.2 Timetable

Lectures Mon, Weds, Fri 9.30 am to 10.20am at ROZH102

### 1.3 Final Exam

8th Dec 8.30 am to 10.30 am. Check webadvisor for venue.

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## 2 Instructional Support

Meetings with the instructor can be scheduled by email.

### 2.1 Instructional Support Team

**Instructor:** Stephen Seah  
**Email:** sseah@uoguelph.ca  
**Telephone:** +1-519-824-4120 x56750  
**Office:** SSC 4250

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## 3 Learning Resources

### 3.1 Required Resources

**Microbiology – An Evolving Science by J.L. Slonczewski & J.W. Foster. (2020) 5th Edition (Textbook)**

**Journal articles (Article)**

Journal articles are available online through CourseLink.

**Lecture slides and explanations (Other)**

Lecture slides are provided in CourseLink under the content tab. Students are expected to supplement the slides with notes taken during lectures and textbook/article readings.

### 3.2 Self-study questions

Self-study questions will be provided in CourseLink. Do form virtual study groups or use Google Docs to share answers and discuss the questions.

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## 4 Learning Outcomes

### 4.1 Course Learning Outcomes

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

**1. By completing this course you will be able to :**

1. describe how microbes respond to their diverse and changing environments.
  2. relate the different levels of biological organization, from molecules to cells to organisms.
  3. predict the functions of genes and the mechanisms of gene regulation from the phenotypes of mutants.
  4. interpret and analyze primary research literature in the areas of Microbial Physiology and Genetics.
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## 5 Teaching and Learning Activities

### 5.1 TOPICS (tentative)

Topic	Reading (Note page numbers of references)

1. Overview of bacterial chromosome, plasmids, transcription and translation	<p><b>Slonczewski:</b> Sections 7.2 and 7.4, 9.1 and Chp 8</p>
2. Selection and Utilization of Carbon/Energy Supplies	<p><b>Slonczewski:</b> Section 10.1</p> <p><b>Goerke, B. and Stuelke, J.</b> (2008) Carbon catabolite repression in bacteria: many ways to make the most out of nutrients. <i>Nat Rev Microbiol</i> <b>6</b>: 613–624. (pages 613-617 focus on <i>E. coli</i> only)</p>
3. Selection and Utilization of Nitrogen Supplies	<p><b>Slonczewski:</b> Sections 15.4, 15.5</p> <p><b>van Heeswijk WC, Westerhoff HV, Boogerd FC.</b> (2013) Nitrogen Assimilation in <i>Escherichia coli</i>: Putting Molecular Data into a Systems Perspective. <i>Microbiol Mol Biol Rev.</i> <b>77</b>:628-639 (This is a very detailed review and you need not learn anything not covered in class)</p>
4. Motility and Chemotaxis	<p><b>Slonczewski:</b> Sections 3.6 &amp; 10.6</p> <p><b>Wadhams, G.H. and Armitage, J.P.</b> (2004) Making sense of it all: bacterial chemotaxis. <i>Nat Rev Mol Cell Biol</i> <b>5</b>: 1024-1037. (Focus only on <i>E. coli</i>).</p>
5. Quorum Sensing	<p><b>Slonczewski:</b> Section 10.4</p> <p><b>Ng, W.-L. and Bassler, B.L.</b> (2009) Bacterial quorum-sensing network architectures. <i>Annu Rev Genet</i> <b>43</b>: 197–203.</p>
6. Stress Tolerance	<p><b>Slonczewski:</b> Sections 5.2, 5.3</p> <p><b>Wood, J.M.</b> (2007) Bacterial osmosensing transporters in <i>Methods in Enzymology</i> <b>428</b>, pp77-107.</p>

	<b>Krulwich et al.</b> (2011) Molecular aspects of bacterial pH sensing and homeostasis. <i>Nat Rev Microbiol.</i> <b>9</b> : 330–343.
7. <i>Transposons</i>	<b>Slonczewski</b> : Sections 9.4
8. <i>Bacteriophage genetics</i>	<b>Slonczewski</b> : Sections 6.4, 9.3, 11.1  <b>Hinton D.M.</b> (2010) Transcriptional control in the pre-replicative phase of T4 development. <i>Virology J.</i> <b>28</b> :289.  <b>Oppenheim AB, Kobiler O, Stavans J, Court DL, Adhya S.</b> (2005) Switches in bacteriophage lambda development. <i>Annu Rev Genet.</i> <b>39</b> :409-429.
9. <i>Phage immunity</i>	<b>Slonczewski</b> : <b>Section 6.4</b>  <b>Westra E.R., Swarts D.C., Staals R.H., Jore M.M., Brouns, S.J. and van der Oost, J.</b> (2012) The CRISPRs, they are a-changin': how prokaryotes generate adaptive immunity. <i>Annu Rev Genet.</i> <b>46</b> :311-339 (Focus on general phage immunity and type II CRISPR system).

## 6 Assessments

### 6.1 Marking Schemes & Distributions

Assessment	Weight (%)	Dates	Addresses Learning Outcome
Assignment on chromosome, plasmids, transcription	4	Sept 20 by 11.59pm	1-2

and translation			
Online Quizzes	15	Best 3 of 4 quizzes.  Sept 23, Oct 5, Oct 26 and Nov 25	1-3
Midterm Exams	25	Mid-term exam 1 lecture time Oct 8  Mid-term exam 2 lecture time Nov 3	1-3
Research article analysis	21	Select article by 21 <sup>st</sup> Sept  Literature Analysis Report 1 due 13 <sup>th</sup> Oct  Literature Analysis Report 2 due 8 <sup>th</sup> Nov  Literature Analysis Report 3 due 22 <sup>nd</sup> Nov	1-4
Final Exam	35	8th Dec 8.30am to 10.30am  Cumulative. Check webadvisor for venue	1-4

## 6.2 Assessment details

### Assignment on chromosome, plasmids, transcription and translation

This problem set is available in courselink and it covers basic genetics theory. This is an independent assignment i.e. you are to work on the assignment alone. Upload your worksheet in the designated courselink dropbox when completed. Late submissions will be assigned grades of zero unless extenuating circumstances are adequately documented within one week of the submission date.

### **Online Quizzes**

There will be 4 quizzes (equal weighting) based on the lecture topics and are to be taken online via courselink. Each quiz will cover lecture material starting from the date of the preceding quiz. Every student will have 45 min to complete the quiz anytime between 12 am to 11.59 pm on the quiz date. The best 3 out of 4 quiz marks will be used towards 15% of the final mark. There will be no make up quizzes.

### **Midterm Examination**

Two midterm exams are scheduled during lecture time (12.5 % weight for each exam). Midterm exams will be based on lecture topics. If the midterm is missed, academic consideration will only be given for medical or compassionate reasons with documentation. These extenuating circumstances must be adequately documented within one week of the missed mid-term exam. If you missed the exams for valid reasons, marks from the midterm exams will be transferred to the final exam.

### **Research article analysis**

The Research Literature analysis will develop your ability to search, read, understand, analyze and interpret the primary **research literature on bacterial physiology and genetics**. Working in groups of 2 or 3 students, you will select one research article **from the list provided in courselink** for in-depth analysis. Indicate your partner(s) name in the online Google docs document in courselink under the content and "Literature Analysis assignment" tab **by Sept 15**; students without partners after this date will be randomly assigned to groups. Send an email to Dr Seah (sseah@uoguelph.ca) with your choice of article to review by **21<sup>st</sup> Sept** . Note that each article can be reviewed by only by a maximum of about 4 groups, so **the**

**groups that obtained approval first from Dr Seah will be given priority i.e. other groups will have to choose another article to review .**

Reports are to be deposited in the appropriate folders in the dropbox on courselink.

Late submissions of reports will be assigned grades of zero unless extenuating circumstances are adequately documented within one week of the submission dates.

Details about the literature analysis assignment are available in the courselink content page.

### **Turnitin in the assignments/reports**

In this course, your instructor will be using Turnitin, integrated with the CourseLink Dropbox tool, to detect possible plagiarism, unauthorized collaboration or copying as part of the ongoing efforts to maintain academic integrity at the University of Guelph. All submitted assignments/reports will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Usage Policy posted on the Turnitin.com site. A major benefit of using Turnitin is that students will be able to educate and empower themselves in preventing academic misconduct. In this course, you may screen your own assignments through Turnitin as many times as you wish before the due date. You will be able to see and print reports that show you exactly where you have properly and improperly referenced the outside sources and materials in your assignment.

### **Final Exam**

Check webadvisor for the dates and venue for the Final examination . It is compulsory and will be comprehensive, i.e. the exam will cover all lecture topics.

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

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

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