MICR*4330 Molecular Virology

Winter 2021
Section(s): C01

Department of Molecular and Cellular Biology
Credit Weight: 0.50
Version 1.00 - January 12, 2021

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1 Course Details

1.1 Calendar Description

This course will focus on molecular aspects of virus replication cycles and the diverse strategies used for replication of select RNA and DNA viruses. Virus-host interactions including tumour virology and host antiviral responses such as interferon and apoptosis will be discussed. Viral anti host-defence responses as well as recent advances in molecular virology and evolution will be also be covered.

Pre-Requisites: MICR*3330, (MICR*2430 is recommended)

1.2 Course Description

Building upon the introductory course MICR*3330 (World of Viruses), this advanced course will focus on several broad areas that are important to both basic and practical aspects of virology. The overarching goal of this course is to provide students with an advanced level of understanding and appreciation of viruses and virus-host interactions at the molecular and cellular level through an in-depth analysis of select viruses that represent major virus groups. Student-centered learning and skill development are emphasized throughout this course, and independent scientific inquiries and communications are encouraged. Students will learn various strategies used by viruses in genome replication and expression as well as virus-host interactions that are involved in every stage of viral infection. In addition, beneficial uses of viruses as vectors in applications such as protein expression, recombinant vaccines, functional genomics, gene therapy and oncolytics will also be discussed. These objectives will be achieved through lectures, laboratories, student group presentations and term papers, as well as peer reviews. The laboratory component will provide students the opportunity for experiential learning with some of the most essential experimental systems, protocols and methodologies used in virology research.

In this year (W2021), coronaviruses, SARS-COV-1 and -2 in particular, will be one of the major themes of the course.

1.3 Timetable

Lectures:

Mondays and Wednesdays, 12:30 - 1:20 PM.

Labs:

Thursdays and Fridays, 2:30 - 5:20 pm

Midterm (in-class):

Monday Feb. 8, 2021

(covers lecture material up to Wednesday Feb. 3)

1.4 Final Exam

Time: Thur, April 22, 2021; 08:30AM - 10:30AM

Location: online

(covers all lectures, guest lectures and students' presentations, but excluding the lab component)

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2 Instructional Support

2.1 Instructional Support Team

Instructor:	Ray Lu
Email:	rlu@uoguelph.ca
Telephone:	+1-519-824-4120 x56247
Office:	SSC 3443
Office Hours:	By appointments; I will make every effort to accommodate your schedule to meet you online
Lab Co-ordinator:	Amanda van der Vinne
Email:	avander@uoguelph.ca
Telephone:	+1-519-824-4120

Office Hours: Request an appointment by email and a virtual meeting will be arranged.

2.2 Teaching Assistants

Teaching Assistant: Jacob Wilde
Email: jwilde@uoguelph.ca
Office Hours: TBA
Jacob will be primarily involved in the Lab component of this course.

Please do not contact Jacob outside the Office Hours.

Teaching Assistant: Stevan Cucic
Email: scucic@uoguelph.ca
Office Hours: TBA
Stevan will be primarily involved in the Lecture component of this course.

Please do not contact Steven outside the Office Hours.

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3 Learning Resources

3.1 Additional Resources

Information on Textbooks and Resources (Notes)

There is no textbook required for this course though you are encouraged to purchase or have regular access to *Principles of Virology* (5th edition by Flint et al., 2020, ASM Press). If you have the 4th edition Flint, it should close enough to use. Lecture materials will be derived from a wide range of sources including textbooks, review articles and primary research papers. This text and *Fields Virology* (6^{th} edition by Knipe and Howley, Wolters Kluwer/Lippincott Williams and Wilkins, 2013) arguably the most commonly used reference in virology, are available on reserve in the library. In addition, materials pertaining to lectures, labs, assigned reading materials, as well as announcements related to the course will be posted on the course site available on the University website through Courselink.

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4 Learning Outcomes

4.1 Course Learning Outcomes

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

1. 1. Various strategies different viruses use to replicate and express their genomes.
   2. Intricate interactions between a virus and its host at the molecular and cellular level.
   3. Zoonosis, emerging and re-emerging viruses and viral diseases, and applications of phylogenetics, metagenomics and high-throughput sequencing for the discovery of novel viruses.
   4. Experimental approaches and methodologies that are commonly used in virology research.
   5. Enhanced skills in active and student-centered learning, collaboration and teamwork, and scientific inquiry through critical reading of published literature.
   6. Refined skills in scientific communication through group projects and discussions.

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5 Teaching and Learning Activities

5.1 Lecture

Topics: **SCHEDULE OF LECTURES (Tentative)**

SCHEDULE OF LECTURES (Tentative, subject to change)

PART I: A brief review of the world of viruses, the virus replication cycle and common experimental systems and methods used in virology research.

PART II: Discussion on the diverse strategies used by different categories of viruses for genome replication and expression

Transcription and processing of mRNAs

Translation and post-translational modifications

Strategies for genome replication

PART III: Metagenomics, phylogenetics and virus evolution

PART IV: **Applications of viruses**

Transgenic resistance in plant crops, virus-induced gene silencing (VIGS) vectors for functional genomics, viral vectors for recombinant vaccines, gene therapy and oncolytics

PART V: Stages of pathogenesis, viral oncogenesis, and human interventions

Entry, Incubation period and spread within the host, Multiplication, Immune response, Spread of infection in a host population, Outcomes of infection, Patterns of viral infections, Human interventions

PART VI: Molecular and cellular basis of virus-host cell interactions

Cell biology aspects of virus-host interactions

Host defense against viral infections: innate immune responses (small RNA biology, RNA silencing as an ancient defense mechanism against RNA viruses, viral suppressors of RNA silencing)

Host defense against viral infections: innate immune responses (Toll-like receptors, interferons, apoptosis, natural killer cells, etc.)

Viral counter-defense mechanisms (inhibition of apoptosis, mimicry of cellular proteins involved in antigen presentation and recognition, suppression of RNA silencing, etc.)

PART VII: Virology research at Guelph and special topics in virology

5.2 Seminar

Topics: **Written Mini-review OR Oral Presentation**

Students will form groups of three, to write a mini-review of a viral topic, or give a presentation based on primary research. Students are encouraged to pick a topic within the general guidelines provided by Dr. Lu. A mini-review topic can be “Origin of SARS-COV-2, virus evolution and zoonosis”, for instance. The presentation should be based on one or two recent primary research articles with supporting background provided.

This is a key component of learning activities and student assessment of this course. Dr. Lu is available **throughout** this process, to give you guidance and help in gathering research material, organizing and planning your presentation/review and the final presentation/written review. The presentation should be around 30min, while the minireview at 20-25 pages, double-spaced, excluding references and figures. Detailed instructions on the oral presentation and the written research proposal will be given separately on CourseLink.

The written minireview is due at **noon, Friday March 12**, to a designated group Dropbox folder on CourseLink.

Oral presentation groups will be matched with a written review group, to write a 2 -3 page double-spaced peer review of the corresponding proposal. The peer review is due at **noon, Friday March 19**, to a designated Dropbox on CourseLink.

Written proposal groups will write a 2-3 page double-spaced evaluation of the matched oral presentation. The evaluation is due **at 11:59 AM One Day after the presentation**.

Both proposals and presentations should be formatted in Word or PowerPoint and shared with Dr. Lu in Microsoft OneDrive, **from Day 1 when the group start to work on it. It will help Dr. Lu resolve disputes regarding workload distribution if it arises.**

5.3 Lab

Topics: Lab activities are designed to have students explore bacteriophage that have been isolated from soil. Bacteriophage data has been collected by the teaching team and students will identify and analyze the phage through online molecular and bioinformatics tools.

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6 Assessments

6.1 Marking Schemes & Distributions

Distribution Scheme				
Form of Assessment		**Weight of Assessment (% of final)**	**Course Content /Activity**	**Learning Outcome**
Quiz 1		7.5%	Lectures	1-3
Quiz 2		7.5%	Lectures	1-3
Option 1	Oral presentation	25%	Non-lecture	1-6
	Critical review of mini-review	5%	Non-lecture	5-6
	Mini-review	25%	Non-lecture	1-6

Option 2				
	Evaluation of oral presentation	5%	Non-lecture	5-6
Participation in Discussion		5%	Non-lecture	5-6
Lab		25%	Non-lecture	4-6
Final Exam		25%	Non-lecture	1-6

* Please use Microsoft Teams app for all communications and discussions about the group project. This information may be used as a reference when a complaint is filed by a group member.

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7 Course Statements

7.1 COURSE POLICIES

If you miss the midterm, with proper documentation, the weight will be transferred to the final exam.

If one of the group members dropped the course, the remaining two students shall finish the project as usual. If two group members dropped the course, proper accommodation will be given to the remaining student.

Only under exceptional circumstances your oral presentation can be rescheduled. You will need to be granted academic consideration before the rescheduling is allowed.

7.2 Laboratory Attendance

Lab sessions will be held synchronously via Zoom. You are expected to be virtually present to discuss data and assignments with your peers and teaching team.

If you cannot attend for medical/compassionate reasons you must contact the lab coordinator, Amanda van der Vinne.

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. 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

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. 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/

8.4 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)

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 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

9.3 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

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.

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

9.6 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

9.7 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.

9.8 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

9.9 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings and academic schedules. Any such changes will be announced via CourseLink and/or class email. All University-wide decisions will be posted on the COVID-19 website (https://news.uoguelph.ca/2019-novel-coronavirus-information/) and circulated by email.

9.10 Illness

The University will not normally require verification of illness (doctor's notes) for fall 2020 or winter 2021 semester courses. However, requests for Academic Consideration may still require medical documentation as appropriate.
