MICR*4330 Molecular Virology

W22

Winter 2022
Section(s): C01

Department of Molecular and Cellular Biology
Credit Weight: 0.50
Version 1.00 - January 07, 2022

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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

The overarching objective of this course is to provide students with a deeper understanding and appreciation of viruses and virus-host interactions at the molecular and cellular level. This fourth-year level course will emphasize on student-oriented active learning and skill development in scientific inquiry and communication through participation in presentations (both oral and written) and a peer-review process. Building upon the World of Viruses (MICR*3330) in the previous semester, this advanced course focuses on select topics concerning the molecular biology of virology, virus-host interactions, evolution biology, metagenomics, phylogenetics, as well as experimental systems and methods commonly used in virology research. The laboratory component will provide students the opportunities for hands-on learning of some of the most essential experimental systems and methods commonly used in virology research.

1.3 Timetable

Lectures:

Mondays and Wednesdays 12:30 - 13:20 pm, MacKinnon (MCKN) Rm 259 (via Zoom in the

first two weeks until Jan 24)

Labs:

Section 101: Thursday 2:30 – 5:20 pm, SSC Rm 4101

Section 102: Friday 2:30 – 5:20, SSC Rm 4101

Section 103: Friday 2:30 – 5:20, SSC Rm 4109

1.4 Final Exam

Time: April 12, 8:30-10:30

Location: TBA

Final exam is cumulative and covers all lectures, guest lectures and students' in-class presentations, and lab components

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2 Instructional Support

2.1 Instructional Support Team

Instructor:	Baozhong Meng Dr.
Email:	bmeng@uoguelph.ca
Telephone:	519-824-4120 Ext 53876
Office:	SSC 4205
Office Hours:	Wednesdays 4:00 – 5:00 pm
Lab Co-ordinator:	Mehdi Shabanian
Email:	shabania@uoguelph.ca
Telephone:	+1-519-8244120 Ext 53264
Office:	SSC 4602
Office Hours:	No regular officer hours. Mehdi will be in the lab during the regular lab hours to answer some of the questions students may have. Inquiries and request for appointments are to be made via email.

2.2 Teaching Assistants

Teaching Assistant (GTA): Patrick Lameront
Email: plameron@uoguelph.ca
Office: SSC 4602

Teaching Assistant (GTA): Catherine Fust
Email: cfust@uoguelph.ca
Office: SSC 4602

Teaching Assistant (GTA): Dipendra Karki
Email: dkarki@uoguelph.ca
Office: SSC 4602

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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. Lecture materials will be derived from a wide range of sources including chapters in textbooks, review articles and primary research papers. *Principles of Virology* (4th edition by Flint et al., 2015, ASM Press) and *Fields Virology* (6^{th} edition by Knipe and Howley, Wolters Kluwer/Lippincott Williams and Wilkins, 2013) are two of the most useful general references in virology and will be available on reserve in the library. In addition, materials pertaining to lectures, labs, the term paper project, assigned reading materials, as well as announcements will be made available on 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). Deeper understanding and appreciation of the various strategies viruses use to express and replicate their genomes.

   2). An appreciation of the intricate interactions between a virus and its host at the molecular and cellular levels.

3). Experimental approaches and methodologies that are commonly used in virology research.

4). Host defense mechanisms against viruses and viral infections

5). Evolution biology, phylogenetics, metagenomics and high-throughput sequencing for the discovery of novel viruses.

6). Enhanced skills in active learning, teamwork, scientific inquiry through critical reading, analysis, and synthesis of literature.

7). Scientific communication skills through group mini-review project, in-class presentation, and peer review

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5 Teaching and Learning Activities

5.1 Lecture

Topics: **SCHEDULE OF LECTURES (Tentative, subject to change)**

Weeks	Dates	Lectures/Activities	Other
One	January 10	Introduction and course organization	
	January 12	Experimental systems and methods-I	
Two	January 17	Experimental systems and methods-II	
	January 19	Potato virus X as a model system for RNA virus research	
Three	January 24	Strategies of transcription and genome replication in RNA viruses	

	January 26		
Four	January 31	Strategies of transcription in DNA viruses, retroviruses, and para-retroviruses	
	Feb 2		
Five	Feb 7	Strategies of translation and post-translational modifications	
	Feb 9		
Six	Feb 14	Guest lecture-viral vectors (S. Wotton/S. Thomas)	Deadline to submit paper outline
	Feb 16	Guest lecture-NDV (Dr. Leonard Susta)	
Reading week, no classes			
Seven	Feb 28	**Midterm exam (in class)**	
	March 2	Guest lecture-RNA-seq, transcriptomics (Y Song)	
Eight	March 7	Strategies of genome replication in DNA viruses	
	March 9	RNA silencing & viral suppressors of silencing	
Nine	March 14		Deadline to submit draft paper
	March 16	Origin and evolution of viruses	
Students group in-class presentations			

5.2 Seminar

Ten	March 21	Student groups 1-3	
	March 23	Student groups 4-6	
Eleven	March 28	Student groups 7-9	
	March 30	Student groups 10-12	
Twelve	April 4	Student groups 13-15	
	April 6	Review of lectures / Q&A session	

Other topics of interest for future lectures:

-Viral replication complex: biogenesis, structure and composition

-Construction of infectious viral clones and uses in molecular virology

-The arms race between viral pathogens and their hosts

-Closteroviridae: an economically important viral family of the second largest genomes

-Grapevine virology and Research in the Meng Lab

Topics: **GROUP RESEARCH PROJECT (MINI-REVIEW, PEER REVIEW AND IN-CLASS PRESENTATIONS)**

Mini-Review by Student Groups:

To promote student-oriented and active learning and to enhance skills in scientific inquiry, information gathering and data analysis, as well as communication skills, students will form groups to complete a mini-review and in-class presentation project. To familiarize students with the process of scientific publishing and to provide the opportunity for refinement of the mini-review, draft manuscripts will undergo a similar peer-review as for

scientific publications by other students in class. Reviewers are expected to provide constructive comments and suggested changes that would not only significantly improve the scientific merit but also the editorial quality of the manuscripts. Student authors ought to take full advantage of the feedbacks provided by peers who are assigned to review your paper and revise your draft manuscript by incorporating all comments and suggested changes as you judge appropriate. These activities will be invaluable, as they would help prepare you acquire skills that are essential for you to become not only a successful researcher but also an effective communicator in science. For detailed instructions on the term paper project, the peer-review process and its submission, please refer Guidelines for Mini-Review that is available on CourseLink.

In-class Group Presentations:

This will take place toward last weeks of the semester. Each of the student groups will give a short PowerPoint presentation to the class where they will give a critique on one of the primary research papers chosen for the mini-review. Your presentation will be marked by other students in class as well as by members of the teaching team.

5.3 Lab

Topics: **LABORATORY EXERCISES:**

The lab activities offered this semester are the result of a recent restructuring of the lab component based on feedbacks from students in the past several years. These newly minted laboratory exercises include:

1) The inoculation chicken eggs as host for fowl viruses;

2) A multi-week-long project involving the inoculation of an experimental model plant *Nicotiana benthamiana* with a GFP-tagged infectious clone of potato virus X (PVX). PVX is a single-stranded, positive sense RNA virus of the family *Alphaflexiviridae* (order *Tymovirales*) and one of the best studied model systems RNA viruses. Studies using PVX made significant contributions on the molecular biology, cell biology, virus-host

interactions, RNA silencing and viral suppression of RNA silencing, as well as biotechnology using PVX-based vectors.

Together, these experimental systems and methods will give students exposure to some of the most commonly used methods in virology research and diagnostics, both the traditional infectivity-based methods and the modern molecular methods. These methods reflect the importance of viruses as pathogens in different eukaryotic organisms, including livestock animals and food crops. Importantly, these experimental systems and methods will be readily applicable to human viruses because the animal viruses to be included in the labs are closely related to some of the highly pathogenic human viruses. Further details on these lab activities will be provided during the lab sessions.

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6 Assessments

6.1 Marking Schemes & Distributions

Components of Assessment	Weighting	Due date for submission
Term paper: 25 at 5 pm (Final)	20%	March 14, at 5 pm (draft submission); March
In-class presentation	7.5%	
Peer review:	2.5%	March 21, at 5 pm
Laboratory:	25%	
Midterm exam:	15%	February 28 (in class)
Final exam (TBA):	30%	April 12

Total:	**100%**

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7 Course Statements

7.1 COURSE POLICIES

ATTENDANCE REQUIREMENT:

Due to the requirement for students' participations during in-class presentations and lab exercises, students are required to attend all lectures and labs. Under special circumstances, for example, severe illness, if a student has to miss a class due to legitimate reasons, you must inform the instructor for the lecture to be missed or the lab coordinator for the particular lab to be missed at least one day prior to the lecture or the lab. Given the complexity and the high-cost nature of laboratory activities, we will be unable to schedule for make-up labs. Any students who miss a lab session without permission will receive a grade of zero for the particular lab you will miss.

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)

8.5 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.

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 make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

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, 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.

9.10 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).

9.11 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.
