MICR*3330 World of Viruses

Fall 2023
Section(s): C01

Department of Molecular and Cellular Biology
Credit Weight: 0.50
Version 2.00 - December 18, 2023

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1 Course Details

1.1 Calendar Description

Viruses infecting many organisms will be covered in the context of their global impact on disease and history, beneficial uses of viruses, and their role in advances of molecular theory. A fundamental virology background will be achieved by understanding the diversity of viruses, their replication strategies and their interactions with the host in disease. The relevance of viruses in society will be highlighted by discussion of historical accounts and contemporary news articles.

Pre-Requisites: MCB*2050

1.2 Course Description

This course is intended for a broad audience from diverse academic programs on campus. Viruses are important in that they are pathogens causing diseases in human, animals, and plants. Numerous viruses have played fundamentally important roles in the advancement of molecular biology, cell biology, immunology among others. The ultimate goal is to provide our students with a broad foundation in virology through exposure to, and appreciation of, the various types of viruses, their chemical nature, morphology, architecture, genome structure, strategies of genome replication and expression. We also discuss the transmission, epidemiology and impact of viral diseases on human health, agriculture, the ecosystem, and society. We will discuss a wide range of diverse viruses that cause diseases in humans, livestock animals, and plant crops. You will also have opportunities to critically evaluate contemporary and historical events, such as multiple pandemics caused by viruses (e.g. AIDS, smallpox, Spanish flu, Ebola, SARS, MERS, and yes, COVID-19), emerging viruses, as well as dire economic losses due to viral infections in plant crops and livestock animals. Moreover, we will cover topics such as intervention strategies against viral diseases as well as some of the beneficial applications of basic knowledge gained from studying viruses. These include the eradication of viral diseases through global vaccination, as well as the use of viruses as vectors in vaccines, gene therapy, cancer treatment and biotechnology. We will accomplish these objectives through detailed discussion on select families of viruses that are important pathogens or that have been used as model systems for scientific discoveries,

including many Nobel-winning research.

Virology is unique in that it is a relatively new and still fast evolving discipline that encompasses a wide range of topics and viral groups that differ greatly in multiple aspects, such as the nature of their genomes, structural design of virions, strategies for genome replication and expression, as well as how they interact with their host. Consequently, many students may find it challenging to grasp some of the terminologies, concepts and processes related to viral replication and infection. To help you gain foothold in the initial stage of studying virology, we will offer several tutorial sessions to recap some of the key concepts that are unique to select viral families that many students struggle with. Since the first offering in 2021, the feedbacks we have received from students on these tutorial sessions have been very positive. Therefore, you are encouraged to attend as many tutorial sessions as you can. Because these tutorials are not an official component of the course, some students will be unable to attend some of the tutorials due to conflict in their schedules, we will make video recordings of these tutorial sessions available on Stream.

MICR*3330 is a prerequisite for two advanced virology courses: Molecular Virology (MICR*4330) and Medical Virology (MICR*4430). MICR*4330 (Molecular Virology) is offered in the winter semester and will provide more in-depth discussions of select topics with emphasis on the molecular biology, cell biology and virus-host interactions as well as key methods that are used to study viruses.

1.3 Timetable

Lectures: Tuesdays and Thursdays from 10:00 to 11:20 AM in MacNaughton 113. Lectures will be in person.

Tutorials: Each tutorial session will be one hour in length, and will be offered via Zoom every third week. Specific time arrangement for tutorials will be scheduled in the first two weeks of the semester. You will also be reminded through announcement via email or on CourseLink over the semester, so stay tuned.

1.4 Final Exam

Format: The final exam is cumulative and will cover all materials discussed in the course. However, emphasis will be on the lecture materials discussed after the midterm. It will include multiple choice questions, definition of virology terms and acronyms commonly used in virology, short answer questions as well as a long essay-type question that would test on the synthesis and in-depth understanding of course materials learned throughout the semester.

Time: December 14, 8:30 - 10:30 AM

Location: The location for the final exam will be made available later in the semester by the Registrar's office. Check WebAdvisor for such information in the latter part of the semester.

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2 Instructional Support

2.1 Instructional Support Team

Instructor: Baozhong Meng
Email: worldofviruses@uoguelph.ca
Telephone: +1-519-824-4120 x53876
Office: SCI 4255
Office Hours: Thursdays 4:00 – 5:00 pm.

You are strongly encouraged to take advantage of the office hours to ask any questions you may have or to share any thoughts, ideas and experiences you may have pertaining to virology and your journey as an undergraduate student at the University of Guelph. I also welcome, with open arms, those who may encounter difficulties in learning virology or the general course work and would like to reach me out for advice.

Please refrain from asking questions through emails unless this is the only option for you. While I will do my best in providing answers to questions submitted via email, you may experience delays in receiving my responses. As per the university policy in promoting barriers between work and personal wellbeing, I may not answer emails in the evenings, on weekends or during statutory holidays. To avoid delays in getting answers to your questions, please make an effort to attend the office hours for your questions. Of course, you are most welcome to talk with me right after lectures if you have questions.

2.2 TA

Catherine Fust: cfust@uoguelph.ca

Patrick Lameront: plameron@uoguelph.ca

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3 Learning Resources

3.1 Required Resources

Fundamentals of Molecular Virology (Textbook)
Fundamentals of Molecular Virology, 2nd edition by Nicholas H. Acheson (John Wiley and Sons, Inc. 2011).

Note: Among the several textbooks that are currently available, this textbook is the better choice for a third year level course. However, while a majority of lectures will be based on the different chapters of this text, numerous lectures will be assembled from information gathered from other sources. For these latter lectures, key references related to the lecture material will be listed on the last slide of each lecture and made available in the References

section on CourseLink. In order to gain a deeper and more comprehensive understanding of the materials discussed during lectures so as to excel in the course, it is necessary to carefully read the related materials (mostly book chapters and review papers, occasionally primary research publications).

Courselink (Website)
https://courselink.uoguelph.ca
The Course Website contains important information and materials related to this course as well as announcements pertaining to various components and activities of the course. CourseLink can be accessed by using your central login ID and password.

3.2 Additional Resources

Understanding Viruses (Textbook)
Understanding Viruses by Teri Shors (Jones and Bartlett Learning 2013).

Principles of Virology by J. Flint et al. (Textbook)
This is another highly useful text in virology. Five editions are currently available, with the most recent edition (the 5th edition) published in 2020. The most recent edition is published in two volumes, with the first focusing on fundamental aspects of virology, while the second dealing with pathogenesis, epidemiology and vaccines.

Fields Virology (Textbook)
Fields Virology, David M. Knipe and Peter M. Howley (Lippincott Williams Wilkins). Its 7th edition, the latest version, comprises four volumes as follows:

Volume 1: Emerging viruses.

Volume 2: DNA viruses.

Volume 3: RNA viruses.

Volume 4: Fundamentals.

3.3 Note

Two of the additional references (Principles of Virology and Fields Virology) are at much more advanced levels and are better suited for the more advanced virology courses, graduate studies and virology research. Both texts may be a bit too difficult for the majority of students at the third year level. However, it will be a useful reference not only for this course but, more importantly, for advanced virology courses, graduate studies in virology and related fields, and virology research. So, if you have a burning interest in virology, it would be a good idea to purchase a copy of the most recent edition as a reference and for future use.

It is critical that you be judicial of the vast amount of information that is available on the internet. With the democratization of the internet, anyone can post information. As such, the information you will find on the internet may not be reliable or complete. Even Wikipedia can be wrong or contains inaccurate or partially correct information. As one of my favourite

sayings, the quality of the information available on the internet can only be as good as the level of understanding of the person who provides such information.

On the other hand, some websites such as the ICTV database (http://www.ICTVonline.org, the official site on virus taxonomy) and the All Virology on the WWW site (http://www.virology.net), and public health agencies such as CDC and PHAC are expected to be more trustworthy.

3.3 Virology Research Programs on Campus

Ray Lu	MCB (CBS)	Herpesvirus transcription, virus-host interactions.
Sarah Wootton	Pathobiology (OVC)	Viral vectors; retroviruses; vaccines
Leonard Susta	Pathobiology (OVC)	Avian viruses (surveillance, genomics, diagnostics, molecular biology)
Baozhong Meng	MCB (CBS)	Plant viruses (molecular biology, virus-host interactions, genomics, evolution biology and diagnostics)

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4 Learning Outcomes

4.1 Course Learning Outcomes

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

1. Have acquired a broad and general understanding of the importance of viruses as a subject of scientific inquiry and as causal agents of major infectious diseases in humans,

livestock animals and agricultural crops.
2. Have developed a basic appreciation of the morphology, structure, chemical composition, biological properties as well as the classification and nomenclature of diverse viruses.
3. Having developed an understanding of the diversity of viruses, their genome structure and expression strategies.
4. Have learnt some of the intervention strategies for the mitigation and control of major viral diseases in humans, livestocks and plant crops.
5. Have developed an appreciation for the relevance of viruses to history, and their impact on society.
6. Refine interpersonal skills and collaboration via group discussion and in-class presentation in the form of breakout rooms in Zoom calls.
7. Refine critical thinking and discernment of the vast amount of information available on the internet and social media.
8. Acquire skills in literature search, critically evaluate the published literature, data analysis and writing skills.

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5 Teaching and Learning Activities

5.1 Schedule of Lectures (tentative, subject to change)

Lecture 01: Introduction and course organization

Lecture 02: Discovery, morphology, chemical composition of viruses

Lecture 03: Classification, taxonomy and nomenclature of viruses

Lecture 04: Virus replication cycle overview, part 1

Lecture 05: Virus replication cycle overview, part 2

Lecture 06: Tobacco mosaic virus and contributions to life science

Lecture 07: *Picornaviridae*: Polio, and Foot and Mouth Disease

Lecture 08: *Flaviviridae*: yellow fever and hepatitis C virus

Lecture 09: *Coronaviridae:* SARS, MERS and COVID-19

Fall break and study break day (no class):

Lecture 10: *Orthomyxoviridae,* Spanish flu, 2009 Swine flu and seasonal influenza

Lecture 11: *Papillomaviridae* and cervical cancer

Lecture 12: *Herpesviridae*: herpes, chickenpox/shingles, mononucleosis, Epstein-Barr virus

Midterm exam: Oct 24 (Tuesday)

Lecture 13: HIV and AIDS

Lecture 14: Pathogenesis and patterns of viral infection

Lecture 15: Antiviral vaccines and new vaccine technologies

Lecture 16: Place holder lecture slot, topic to be decided

Lecture 17: Plant viruses, an overview

Lecture 18: Virus research: grapevine virology and research in the Meng laboratory

Lecture 19: Beneficial uses of viruses: RNA silencing & genetic engineering for viral resistance

Lecture 20: Evolutionary aspects and emerging viruses

Lecture 21: Class discussion: on hot topics such as pandemics, public health and public health policy-making, vaccines and vaccine mandates, the greater impact of pandemics to society

Lecture 22: Recap of lectures, a brief review

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6 Assessments

To achieve a fair assessment of students, evaluation of students will be based on a combination of online quizzes, a midterm exam, a final exam, as well as an essay on self-reflection.

Midterm Exam: The midterm exam will cover lectures and related materials such as key references discussed in the first part of the course. The midterm exam will be a combination of essay style questions requiring the integration of material and short answer questions, plus "Multiple Choice" and “Fill in the Blanks” type of questions.

Final Exam: Final exam will be cumulative but with emphasis on the lecture materials discussed after the midterm. It will be composed of multiple choice questions, definition

questions, short answer questions and a long answer essay type question.

6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Quiz 1	5
Quiz 2	5
Midterm	30
Final	40
Quiz 3	5
Quiz 4	5
Critique	10
Total	100

6.2 Assessment Details

Quiz 1 (5%)
Due: Week 1, Online

The first quiz will test your foundations in molecular biology, cell biology and biochemistry concepts that are essential for students to properly comprehend key concepts used in virology. It is expected that students would have learned these concepts through coursework previously taken. If you find yourself struggling with them, it would be in your best interest to thoroughly review them in order to better understand the course. You are advised to review some of the important chapters of the text you used for the key courses that are foundation materials for this course, such as MBG*2040, MCB*2050, and BIOC*2580.

Quiz 2 (5%)
Date: Week 4, Online

The second quiz will assess your mastery and understanding of the foundation materials in virology, including the chemical composition, morphology, and structural design of virions, as well as taxonomy and nomenclature of viruses.

Midterm (30%)
Date: Tuesday, October 24

The midterm will be administered in class during the regular class time on Tuesday, October 25 starting at 10 AM and ending at 11:20 AM.

Final Exam (40%)
Date: Thu, Dec 14, 8:30 AM - 10:30 AM, TBA
Location: TBA

Format: The final exam will be cumulative, with emphasis on the lecture materials discussed after the midterm. It will be composed of multiple choice questions, short answer questions, as well as a long answer essay type question.

Quiz 3 (5%)
Date: Week 9, Online

Quiz 3 will cover select families of viruses discussed after quiz 2, including RNA viruses, DNA viruses, and retroviruses.

Quiz 4 (5%)
Date: Week 12, Online

This is the last quiz and will cover all remaining lecture materials not covered by quiz 3.

Literature critique (10%)
Date: Fri, Nov 17
This is a short critique of a primary research article related to virology that is published in a reputable peer-reviewed journal. The purpose of this exercise is to familiarize students in reading, evaluating and critically analyzing the published literature related to virology. This will be very beneficial for our students at the third year level in their undergraduate program as it would help with the transition from course-based learning to more independent research during their research project courses or graduate studies upon graduation. Further instructions will be provided on the content and format of the critique.

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7 Course Statements

7.1 Disclaimer

Please note: this is a draft course outline and is subject to change up to the first day of classes, in keeping with the policy described in the University of Guelph Academic Calendar.

7.2 Policies on Absence

Students absent from class are expected to make up for classes missed through discussions with fellow students and independent reading. Any student wishing academic consideration

must obtain supporting documentation as outlined under "Academic Consideration and Appeals" in the University Calendar. Your program counsellor should be consulted regarding the procedures to be followed. If the final exam is missed and the student wishes to request for academic consideration, the student must appeal to the Academic Review Subcommittee as outlined in the current calendar. Academic consideration at this point is **NOT** the responsibility of the instructor. The Registrar's office sets the date and location of the final exam.

7.3 General Courtesy

Professors are people too! Just like everyone else, they also appreciate kindness and respect. Please use proper salutation when you email me, or any instructor you may need to interact with, for that matter. This serves to demonstrate your attitude and understanding for mutual respect and professionalism, which is not only desirable but also key to the success of our students once you enter the real world upon graduation. I may choose NOT to answer emails that lack proper salutation, if I deem it appropriate.

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 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).
