MICR*3330 World of Viruses

Fall 2018
Section(s): C01

Department of Molecular and Cellular Biology
Credit Weight: 0.50
Version 1.00 - August 30, 2018

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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-Requisite(s): MCB*2050

1.2 Course Description

This course is designed to appeal to a more generalized audience from a wide range of programs based on its broad treatment of viruses, providing students with a conceptual understanding of the nature and lifestyle of diverse viruses, mechanisms of viral replication and infection, their interaction with their hosts and subversion of the host's immune response as well as their impact, both contemporary and historical, on society. This course will provide students in specialized programs with an understanding of the basic principles of virology. The objective of this course is to provide students with a basic understanding and appreciation of viruses, their chemical composition, physical structure, replication, transmission and their impact on human health, agriculture, the ecosystem, and society. Students will have the opportunities to critically evaluate contemporary and historical events, such as virus pandemics (e.g. AIDS, small pox, influenza and Ebola), emerging viruses, crop and livestock animal losses due to virus infections, vaccines and viral control and intervention strategies. Students enrolled in the course will also learn about human intervention against viral diseases and beneficial applications of fundamental knowledge of virology, such as in global eradication of certain viral diseases using vaccines, and the potential use of viruses as vectors in gene therapy and biotechnology. MICR*3330 is a prerequisite for two advanced courses in virology: Molecular Virology (MICR*4330) and Medical Virology (MICR*4430).

This course is intended to expose students to the breadth of virology as a discipline and how viruses are relevant in society and throughout history. Greater emphasis will be given to the panoply of viral replication strategies through discussion of viruses from select families of viruses that are most important either to the scientific advancement or to human health and agriculture. Higher level courses (MICR*4330 Molecular Virology or MICR*4430 Medical Virology) available on campus will provide more focused and in-depth discussion at the

molecular and cellular level.

1.3 Timetable

Tuesdays and Thursdays 10:00 to 11:20 AM

MACN (MacNaughton) Room 113

1.4 Final Exam

Exam time and location is subject to change. Please see WebAdvisor for the latest information.

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2 Instructional Support

2.1 Instructor(s)

Baozhong Meng
Email: bmeng@uoguelph.ca
Telephone: +1-519-824-4120 x53876
Office: SC1 4255
Office Hours: Fridays 3:30 – 5:00 pm

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3 Learning Resources

3.1 Required Resource(s)

Courselink (Website)
https://courselink.uoguelph.ca
The Course Website will contain important information and materials related to this course. It will be accessible to you through Courselink on the University of Guelph home page with your login ID and password as would be required for the central login.

I would like to remind you that you be critical of the information available on the various Websites, even Wikipedia can be wrong. The ICTV database at http://www.ICTVonline.org (the official site for virus taxonomy) and the All Virology on the WWW site at http://www.virology.net is also fairly comprehensive with many additional links.

3.2 Recommended Resource(s)

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

3.3 Additional Resource(s)

Principles of Virology (Textbook)
Principles of Virology 3rd edition by S. J. Flint et al. (American Society for Virology Press)

Fields Virology (Textbook)

Fields Virology, 6th edition by David M. Knipe and Peter M. Howley (Lippincott Williams Wilkins)

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

3.4 Note

Please note that the latter two references are at a much more advanced level and are better suited for the more advanced virology courses. These textbooks are on 2 hour reserve in the library.

3.4 Virology Research Programs on Campus

Name of Faculty	Affiliation	Research Interest
Peter Krell	MCB (CBS)	Baculovirus transcription/replication
Ray Lu	MCB (CBS)	Herpesvirus/host transcription
Eva Nagy	Pathobiology (OVC)	Adenovirus-based vaccines/genomics
Sarah Wootton	Pathobiology (OVC)	Retrovirus and cancer
Baozhong Meng	MCB (CBS)	Plant viruses (molecular biology, phylogenetics, virus-host interactions, genomics, evolution biology and diagnostics)

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4 Learning Outcomes

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5 Teaching and Learning Activities

5.1 Course Content_tentative

1. Historical perspective and impact on societies (1)
    - Egyptian stela with polio afflicted sovereign (1500 BC)
    - Ramses V mummy with evidence of pox lesions (1157 BC)
    - Homer’s the Illiad with reference to a rabid Hector (700 BC)
    - Influenza pandemic, 1918, and now

    - Earliest use of viruses as biological weapons (smallpox in Americas)
    - Impact of viruses on the outcomes of World War I and II

- Yellow fever virus and the Panama Canal, discovery of vector transmission

1. Earliest identification of viruses as distinct microbes and development of virology as a discipline (2)

- Some “viruses” found to be filterable (hence “filterable virus”)
- Derivation of the term “virus” and towards a basic definition of a virus
- Jenner and vaccination
- Attenuation and killed vaccines (rabies virus and poliovirus)
- The sources and diversity of viruses, taxonomy (ICTV)

1. Fundamentals of virus structure and replication (10)

- Nature and diversity of viral genomes
- Diversity yet conservation in virus structure and symmetry
- Basic virus replication cycle (e.g. DNA viruses and RNA viruses)
  - Attachment
  - Entry
  - Uncoating
  - Biosynthetic phase (mRNA, protein, genome replication)
  - Assembly - morphogenesis
  - Release and maturation
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- Strategies used by viruses to maximize the coding capacity of limited genomes
- Diversity of strategies for certain phases of the replication cycle.

4. Introduction to viral pathogenesis, prevention and control of viral diseases (2)

- Cell and host specificity of viruses
- Cellular defences to viral infections (e.g. Toll-like receptors, apoptosis)
- Virus movement in infected hosts (cell to cell and systemic movement, plant viruses)
- Utilization of cellular structures and factors in viral trafficking and replicatio
- Virus transmission and spread
- Epidemiology, zoonoses
- Human interventions in viral diseases (e.g. immunization, antiviral drugs, diagnosis, surveillance, quarantine, plant resistance)
- RNA silencing and genetic engineering for plant virus suppression

5. Beneficial uses of viruses (1)

- Vaccination strategies
- Viruses as recombinant vaccines and gene delivery vectors (Pseudoviruses) (a wolf in sheep's clothing)
- Viruses in biotechnology
- Viruses as biological agents for pest control
- Bacterial viruses in treatment of bacterial diseases in animals
- Plant viruses as tools for protein expression and functional genomics

6. Social relevance of virology (contemporary issues, news media) (2)

- Global eradication of viral diseases (smallpox, polio, measles)
- AIDS and HIV
- Ebola outbreaks
- Tainted blood (HIV and HepC)
- Papillomaviruses and vaccination against cervical cancers
- Avian flu H5N1, the 2009/2010 "pandemic" and potential for a pandemic, unwarranted paranoia or just caution?
- West Nile and SARS viruses
- Viruses and cancer
- Virology, the Canadian perspective [e.g. Powassan virus; Ocean phages (Curtis Suttle); sequencing SARS genome (MA Marra, BC, Science 2003); ICTV committees (Carstens/Krell/Sanfacon/Suttle)]
- Viruses in the news, contemporary stories and relevance (i.e. as it happens).

7. Contributions of virology to major advances in biology (1)

- Chemistry, the basis of living systems (TMV dissociation/re-association)
- Bacteriophage DNA is genetic material (^{35}S protein and ^{32}P DNA experiments)
- RNA as genetic material (TMV reconstitution experiments)
- Polyadenylation of mRNA transcripts (polyomavirus)
- 5' capping of mRNA transcripts (reovirus)
- Splicing in eukaryotic systems (adenovirus)
- Nuclear localization signals in proteins (SV40 T antigen)
- First complete genome sequenced (phi X 174, 1977-1978)
- First "mammalian source" genome sequenced (SV40, 1978 VB Reddy Science)
- Post-transcriptional gene silencing (RNA silencing) and suppression of RNA silencing

8. A discussion on the origin and evolution of viruses

9. Guest lectures on virology research on campus

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6 Assessments

Evaluation of students enrolled in this course will be based on a combination of three components: a midterm exam, a term paper assignment, and a final exam. The midterm exam will cover lectures and assigned materials presented before the midterm, and the final exam will

cover the entire course, with greater emphasis on the materials covered after the midterm. The exams will be a combination of essay style questions requiring integration of material and short answer questions, plus "multiple choice" and “Fill in the blanks” questions.

6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Midterm	25
Assignment	25
Final Exam	50
Total	100

6.2 Assessment Details

Midterm (25%)
Date: TBA, In Class

Assignment (25%)
Date: November 16th by 5:00 pm
Please see Guidelines and example term paper document (available on course website on CourseLink) for specific instructions and requirements.

Final Exam (50%)
Date: December 4th - 11:30am-1:30pm (The specific date and time for the final exam will need to be confirmed)
**Confirm with Registrar’s office for exam schedule and location

6.3 Calculation of Final Grade

Your final grade will be calculated based on your mark for the assignment, plus one of the following two options, whichever produces the higher contribution toward your final grade: 1) both the midterm and final exam marks OR, 2) only your final exam mark. In other words, if you do much better on the final exam, or you could not write the midterm exam for medical or other legitimate reasons, the final exam will count for 75% of the overall grade.

6.4 Assignment

To promoter critical thinking, data analysis and interpretation, communication skills, and team work spirit, students are required to complete a term paper assignment as part of the course requirements. Students are encouraged to follow various news media for reports involving viruses, e.g. emerging viruses, pandemics, vaccine trials, agricultural problems, and to bring these topics to the attention of the class for more in-depth discussion. In the course of following these topics as well as other topics brought up during lectures, groups of students (3-4 students per group) are required to “ask a question”, either on their own or through consultation with the instructor, and write a report which “answers the question” (5-6 pages in length and no more than 6 pages, double spaced, Cambria, font size 12, one inch borders all round) which includes analysis of **at least two and no more than three ORIGINAL** research papers published in PEER REVIEWED scientific journals in the virology field. Important: you are not allowed to use REVIEW articles for the essay. Should you use review papers for your essay, you will receive a failing mark for the essay component. Specific guidelines on the theme, formatting as well as time line of the report will be provided later on. Specific guidelins and requirements for the format and content of the assignment will be provided later on.

It is important to note that you must submit an electronic copy via email as well as a hard copy of your term paper bearing signature of each student of your group by the submission deadline. The penalty for late submissions will be 10% per day (24 hours) after the submission deadline.

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7 Course Statements

7.1 Plagiarism

Plagiarism is cheating and a serous offense and will not be tolerated at the University of Guelph. It will be dealt with seriously according to University of Guelph regulations and policies.

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 counselor should be consulted regarding the procedures to be followed. If the final exam is missed and the student requests 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 and they also appreciate kindness and deserve respect as everyone else does. Please use proper salutation when you compose an email letter to me, or to any instructor you may interact with for that matter. This serves to demonstrate your appreciation and understanding for mutual respect and professionalism, which is not only desirable but also key to success in the real world upon graduation from the academic environment.

Be courteous to others in the classroom and to teammates of your group for the term paper. Be on time for lectures, as late arrivals will cause unnecessary distraction to students in class. Refrain from conversation during lecture time unless you are asked to do so during class discussions. Should you need to leave early, you must inform the instructor before class begins and find a seat that is close to an exit.

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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.uoguelph.ca/~ksomers/

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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 regulations and procedures for Academic Consideration are detailed in the Undergraduate Calendar.

9.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for Dropping Courses are available in the Undergraduate Calendar.

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.

More information: www.uoguelph.ca/sas

9.6 Academic Misconduct

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 discourages misconduct. 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.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar.

9.7 Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate 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 which apply to undergraduate, graduate and diploma programs.
