

University of Guelph, College of Biological Science
Department of Molecular and Cellular Biology

COURSE OUTLINE (tentative Aug 28/2016)

World of Viruses (MICR*3330)

Fall 2016 (Aug 28, 2016)

Richards 2520 (access from both front and back of building)

I. General Information

Course Description (from the UoG Calendar)

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.

Prerequisite: MCB*2050.

Teaching Team

Professor: Dr. Peter Krell SCIE 4252 Extn: 53368 Email: pkrell@uoguelph.ca
Guest Lecturers: Dr Baozhong Meng (plant virology)
(tentative) Dr Jondavid de Jong (virotherapy)

Course Schedule/Important dates

Tuesday/Thursday 10:00 to 11:20 AM (Sept 08 to Dec 01, 2016) in RICH 2520

No Lecture on Tuesday Oct 11 for Study Break. Replaced by Thursday Dec 01 lecture

Tuesday Oct 20 10:00 to 11:50 **Midterm examination** Richards 2520 (i.e. in class)

40th Class day, Friday Nov 04, 2016

Monday, Nov 07 4:30 written hard copy of assignment due

Monday, Dec 05, 8:30 to 10:30 Final examination, place TBA. Check with Registrar first

II. Course Goals

Learning Goals and Rationale:

The objective of this course is to provide students with a fundamental understanding of viruses, their structure, replication, transmission and their impact on health, agriculture and society on a local and global scale. The students will critically evaluate contemporary and historical events, such as virus outbreaks and pandemics (e.g.s. Zika, Dengue, AIDS, influenza, Ebola virus disease), emerging viruses, crop and animal losses due to virus infections, pandemic preparedness, vaccines and viral control agents and strategies. The students will also learn about human intervention in viral diseases and of the application of fundamental knowledge of virology for

example, in global eradication of infectious viral diseases, in cancer treatment and in gene therapy. Based on its broad treatment of viruses, this course is designed to appeal to a more generalized biology audience, though with fundamental knowledge of molecular and cellular biology. It will provide students with both a fundamental and foundational understanding of the nature of viruses, their intracellular replication and interaction with their hosts and subversion of their host's immune response as well as a broader perspective such as their impact, both contemporary and historical, on society. The contributions of virology to our understanding of contemporary molecular biology will also be mentioned. MICR*3330 will provide students in specialized programs such as Microbiology and Molecular Biology and Genetics with an understanding of the basic principles of virology. Greater emphasis will be given to the panoply of viral replication strategies at the cellular/molecular levels. Higher level virology courses available on campus will provide more focus, either in Molecular Virology (MICR*4330) or Medical Virology (MICR*4430) for which MICR*3330 is a prerequisite.

Learning Outcomes (what students should know and communicate if fully engaged in the course)

1. Appreciate and describe the historical context of virus discovery and how the science of virology evolved to an independent and modern discipline with contributions to cell and molecular biology.
2. Appreciate and describe the diversity of viruses based on their morphologies physicochemical characteristics, replication strategies and virus-host interactions.
3. Describe the distinguishing features of viruses and how they differ from each other and from other microbes
4. Learn the basis of virus taxonomy and be able to identify different virus families (and other taxa) and describe the characteristics unique to those families, along with the rules of virus orthography.
5. Describe in detail the replication cycle of select DNA and RNA viruses at the cell and molecular levels.
6. Explain viral pathogenesis and how it is manifested in an infected host organism.
7. Describe with examples, the beneficial uses of viruses (e.g. vaccines, gene therapy and oncolytics).
8. Enlighten their knowledge and understanding of virology by seeking and reading current news reports with a virological context and provide further scientific insight on the nature of the virus(es) involved.
9. Formulate questions for exploration based on lecture material and the popular press. The written assignment will be the start of this process.
10. Critically read the literature and develop interpersonal, communication and time management skills through a group project involving a written assignment.

III. Course Content

Content Overview

As the course name, World of Viruses, implies, this course deals with virology from a wide perspective, not just on the viruses themselves, but also on their broader impact on science and society and in a global context. Thus the course starts with virus discovery (e.g. what are the earliest historical records which could be attributed to viruses and resultant diseases) up to the über modern times (i.e. “as it happens”) like Zika virus diseases. It then expands to the scientific approaches, both past and present, used to advance the understanding of virology as a scientific discipline. The bulk of the course will concentrate on the diversity and classification/taxonomy of viruses, their characteristics and an introduction to the plethora of strategies for their intracellular replication and transmission. The course culminates with the effect of viruses on an individual host (pathogenesis) to populations (epidemics/pandemics) levels and strategies to mitigate their effect at the level of the cell, individual organism and populations. Throughout the course there will be segues as news articles (print/electronic) with a virological context, sometimes on the front page, will no doubt arise (e.g. spread of Ebola virus in Africa, outbreak and modes of transmission of Zika virus in Brasil and its impact on the Rio Olympics). This provides the student with the appreciation that knowledge of virology has societal relevance and affords them the impetus and ability of digging deeper, at least to explore more about what is known about these newsworthy viruses and formulate their own ideas about how to deal with the situation caused by viruses.

Lecture Topics (some of these are covered in only one or two lectures, others like #4 will be covered in several lectures)

1. Virus discovery and impact on society
We will learn of the earliest evidence of viruses in the historical record, nature of some early virus pandemics, and the influence of viruses in history and human advancements.
2. Earliest identification and characterization of viruses as distinct microbes and development of virology as a distinct discipline
We will learn the scientific advances that lead to viruses being identified as entities now known as viruses, their instrumental role in the early days of vaccination strategies, their structural diversity and classification and early recognition of the role of some viruses in cancer.
3. Contributions of virology to major advances in cell and molecular biology
Through the course of their studies, virologists made major contributions to advance concepts of “life”, the nature of genetic material, earliest genomics studies and many important molecular concepts of importance in cell biology and to develop methodologies and instrumentation used in molecular biology laboratories.
4. Fundamentals of virus structure and replication (covered in greater detail)
This is the heart of the course where we will go into detail, much of it molecular, on virus

structure and how viruses interact with cells, replicate, are released and transmitted. The diversity of replication strategies is even broader than the structural diversity of viruses. Consequently we will cover in detail the replication of viruses in select families. Also included will be discussion on theories of virus origin and evolution. Though not viruses, we will also discuss subviral agents like prions, viroids and virusoids.

5. Introduction to Viral Pathogenesis

Viruses are highly specific pathogenic agents and we will discuss the nature of this specificity, the intricate interplay between viral offence and cellular defence mechanisms and the consequence (pathology) of virus infections at the organismal level.

6. Prevention and Control of Viral Diseases

Through the study of viruses and their diseases we can now ameliorate the ability of (at least some) viruses to cause disease and to spread in human and other (plant/animal) populations (epidemiology). We will apply our knowledge of how viruses spread in populations and how individuals can develop control strategies to protect themselves.

7. Beneficial Uses of Viruses

It may seem counterintuitive but some viruses can be used for beneficial means. Viruses can be used in vaccination, gene delivery, foreign protein expression, as biological pest control agents and even in the fight against cancer.

8. Social relevance of virology (contemporary issues, mainstream news) (as it happens)

The relevance of viruses in our daily existence is reinforced each time the mainstream media (print and electronic) report on the importance and impact of viruses in daily life. We often hear stories about advances in global eradication (or at least attempts at it), tainted blood, new vaccination strategies as against cervical cancer, newly emerging epidemics and pandemics of both human and veterinary importance and responses to them and often a bit of Canadiana will show up in a virus news story (viz Toronto mosquitoes positive for West Nile virus, directive to Canadian Women to avoid Zika virus areas if pregnant or planning to be). Such news items will be brought up “as it happens” and will provide a segue to talk about viruses of more immediate importance. These reports will also form the basis of the “Question” you will first formulate in your assignment, and then answer through a review of the literature.

Questions or comments during class especially ones leading to a broader discussion are encouraged. Some questions I might not be able to answer directly or will defer to another time

Assignment:

During the course students will be encouraged to follow the popular news media for reports involving viruses, e.g. pandemics, vaccine trials, agricultural problems due to viruses, and to bring these topics to the attention of the class for a more in depth discussion. Through following these topics as well as others brought up in class, the students should be continue to ask questions of interest on these. Students in groups of three (pick your partners now), will be required to

“formulate a question” to pursue (e.g. why can we not eradicate the flu?). The chosen question will be vetted by the instructor and each group will write a comprehensive answer to the chosen “question” (a maximum 6 pages of text, not including the title page) (double spaced, Times Roman font 12, 2.5 cm borders all round). An appendix with references, figures, tables can be included but does not count to the 6 page limit. The answer will also incorporate the critical analysis of at least one recent (2013 to 2016) primary research journal article (vetted by the instructor) on the virus or topic chosen. The emphasis of this assignment is your ability to formulate your own questions of interest and to pursuing the answer in a scientific way and not simply picking a topic and reporting on it.

The **penalty for late assignments** will be 10% per day (24 hr) late.

IV. Course Resources

Course Website:

The Course web site will be accessible through the Courselink selection on the University Home page. Your login ID and Password are the same as for your Central login. The web site will include important links, a student led Discussion board, announcements and additional material such as copies or links to primary news articles.

The instructor will post copies of Power Point lectures slides to the site. Note that the slides alone are not sufficient for learning the course material. These slides serve only to provide the instructor with a framework for more in depth instruction, and will assist the student only by providing some text material and diagrams which they might otherwise feel the need to write down as part of their notes. Taking notes (beyond what is in the Powerpoint slides) is strongly encouraged, it improves comprehension.

The International Committee on Taxonomy of Viruses (ICTV) is the source for the official taxonomy of viruses. Web site at <http://www.ICTVonline.org>. To access the latest taxonomy update, click on “Taxonomy” in upper left ribbon, then “Current Taxonomy Release”. Use this taxonomy for any communication on viruses. E.g. the latest H1N1 flu pandemic was caused by Influenza virus A (H1NI) in the species *Influenza A virus*, genus *Influenzavirus A*, family *Paramyxoviridae*. Note that the taxa, (i.e. species, genus and family) are all written in italics, but the virus name (the one which causes the infection) is in normal letters.

All Virology on the WWW Web site is also fairly comprehensive with many additional links especially for virus images. at <http://www.virology.net>

The web site <http://viralzone.expasy.org> is a good general source for different virus families and virus schematics.

TWIV, this week in virology (<http://www.microbe.tv/twiv>) provides interesting podcast discussions by active virologists of contemporary virology, one even referred indirectly to the course you are taking.

Be critical of Web Sites, even Wikipedia, though often useful for background, can be wrong and open to manipulation. Some may sound authentic but are often less than objective.

In general, university, government and recognized journal web sites are reliable.

Public Health Agency of Canada: <http://www.phac-aspc.gc.ca/id-mi/index-eng.php>

Centers for Disease Control and Prevention: <http://www.cdc.gov/>

World Health Organization (WHO) <http://www.who.int/en/>

Journal of Virology <http://jvi.asm.org/>

Primary articles of most journals (e.g. from PubMed at <http://www.ncbi.nlm.nih.gov/pubmed>) are freely available through the UoG library

Recommended Textbook:

Fundamentals of Molecular Virology, Second Edition (2011) by Nicholas H Acheson (a Canadian, McGill University, author). This text book is available from the bookstore and is on 2 hour reserve in the library. This textbook is just for reference as much of the lecture material is independent from the text.

Other References:

Human Virology fourth edition (2011) by Leslie Collier et al

Principles of Virology 4th edition (20015) by S Jane Flint et. Al (used in MICR*4330)

Fields Virology 6th edition (2013) by David M Knipe and Peter M Howley,

The Dictionary of Virology Fourth Edition (2009) by Brian WJ Mahy

Virus Taxonomy Ninth Report of the International Committee on Taxonomy of Viruses (2012) by AMQ King et al. In addition to the most recent complete virus taxonomy this book also has summary descriptions of all families and genera.

(online at <http://www.sciencedirect.com/science/book/9780123846846>)

These books are available on line at the library or on 2 hour reserve.

V. Methods of Assessment

Course Evaluation:

Evaluation of students in this course will be based on

1. Midterm Examination (in class time, Thursday, Oct 20): 30%
2. Assignment (due Mon, Nov 07, 4:30 pm): 20%
3. Final Examination (Mon Dec 05, 8:30 to 10:30)*: 50%

*Confirm with Registrar's office for exam schedule and location of final exams.

1. The in-class 30% midterm exam is **optional****. The midterm exam will be on material covered in lectures presented before the midterm exam (lecture days 1 through 11 i.e. through to and including the lecture on Tuesday Oct 18, 2016).
2. The 20% written assignment will be based on first formulating and then, through a literature study, answering a question you would like to answer based on current events in the mainstream media (details below). Students will work in groups of three and are

encouraged to have their report finished and submitted in advance of the deadline (Nov 07, 2016). All students within a group are expected to work as a team and will get the same grade for the assignment.

3. The final 50% exam will be cumulative and on material covered over the entire course (i.e. lecture days 1 through to the last lecture, though with an emphasis, about 80% of the marks, on the latter part of the course).

Both written exams will be a combination of essay style questions, some requiring integration of material, and short answer questions, "fill in the blanks" and "multiple choice" questions.

**If students do better on the final exam than the midterm exam, or do not write the midterm exam, the final exam will count for 80% of the overall grade. Students are nevertheless encouraged to sit and write the midterm exam, in part to gain feedback on their own progress in the course.

Absence and Illness:

Students absent from class are expected to make up for classes missed through discussions with fellow students and independent reading. If a student does not write the midterm exam for any reason their final exam will count for 80% of the final grade. 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 about the procedures to be followed.

No alternate date for the final exam can or will be considered by the instructor.

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. Your program counsellor can advise on what you can do. Academic consideration for the final examination is not the responsibility of the instructor. The Registrar's office sets the date and location of the final exam and deferred exam (if any).

VI. Additional Course InformationVirology Affiliated Research Programs at University of Guelph

Name of Faculty	Affiliation	Research Interest
Dr. Peter Krell	Mol Cell Biol	Baculovirus transcription/replication
Dr. Baozhong Meng	Mol Cell Biol	Plant virus transmission/replication
Dr. Ray Lu	Mol Cell Biol	Herpesvirus/host transcription
Dr. John Dawson	Mol Cell Biol	Use of viruses as expression vectors
Dr. Eva Nagy	Pathobiology	Adenovirus based vaccines/genomics
Dr. Dorothy Bienzle	Pathobiology	Feline leukemia virus
Dr. Sarah Wootton	Pathobiology	Retrovirus and cancer
Dr. Byram Bridle	Pathobiology	Oncolytic viruses
Dr. Leonardo Susta	Pathobiology	Avian virology
Dr. Shayan Sharif	Pathobiology	Viral immunology

VII. Course and University Policies (refer to the University Calendar)**UNIVERSITY and INSTRUCTOR POLICIES**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. See the undergraduate calendar for information on regulations and procedures for Academic Consideration:

As noted above, if a student does not sit the midterm examination for any reason, the final exam will count for 80% of the final grade (instead of 30% for the midterm and 50% for the final exams).

For the assignment a late penalty of a loss of 10% per day (including weekend days) will apply. As students are expected to be working on this assignment throughout the semester, it is expected that students will submit their assignments well in advance of the due date. As such, and because it is a group assignment, it is unlikely that any accommodation will be given, except for longer term issues prior to the due date.

Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Centre for Students with Disabilities as soon as possible.

For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: <http://www.csd.uoguelph.ca/csd/>

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.

Plagiarism is cheating and will be dealt with accordingly. Expulsion is one option. An example of plagiarism in this course is to re-use an assignment you have prepared for another course, including this one, or to use all or part of an assignment submitted or prepared by someone else or copying directly from the literature into your report without attribution. Otherwise, students would be claiming as their own, material provided by someone else.

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:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

E-mail Communication

As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly. UoG E-mail is the official route of communication between the University and its students. If the instructor wishes to communicate to the whole class, it will be through the course D2L and/or by email through their University of Guelph email address available on the D2L web site for the course. Students should use their UoG email account to communicate with the instructor and should include MICR3330 in the subject line, along with a short description of the nature of the email (e.g. MICR3330 news article on Zika virus in Canada)

The preferred (and often most efficient) route of communication is to meet directly with the instructor. Nevertheless short questions with short yes or no answers can be done through email. Professional Email communication is not the same as texting. Thus in email communication with faculty and staff, common courtesy applies and students are encouraged to be formal in their salutation and to use full sentences, proper punctuation, capitalization (e.g. “I” have a question, not “i” have a question) and paragraph structures. The subject line should be informative and include MICR3330. This will allow the instructor to retrieve relevant emails easily and decrease the possibility of deletion without opening. Emails from only UoG accounts will be considered.

Drop Date

The last date to drop one-semester courses, without academic penalty, is the 40th class day. To confirm the actual date, please see the schedule of dates in the Undergraduate Calendar. For regulations and procedures for Dropping Courses, see the 2016/2017 Undergraduate Calendar: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Copies of out-of-class assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments and examinations if returned to you: you may be asked to resubmit work at any time.

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 presented in class is considered as intellectual property. Permission may be granted under certain circumstances (e.g. for someone who is hearing challenged). Anything recorded with documented (e.g. by email) permission is restricted to use for this course and only that person unless further permission is granted. All recorded material should be deleted after the course is completed.

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:

<http://www.uoguelph.ca/registrar/calendars/index.cfm?index>

Cell Phones and Laptops

Use of cell phones/tablets/phablets etc in a public space like the lecture hall, is intrusive and will distract you from learning and disturb those around you. If you have to bring them with you, turn them off while in class. Using your cell phone during lecture will only distract you and your neighbours from paying attention and learning (and annoy the instructor). Do not attempt to text and learn simultaneously during lecture.

There is little reason to use your laptop during lectures. For example you do not need to access the slides on your computer as these will be projected during class. While you may bring your laptop to lectures, again recognize that it is in a public space and using the laptop can disturb those around you if used indiscriminately. Please do not use your laptop during lecture for anything other than activities (e.g. recording notes) related directly to this virology course.

There is an expectation of professional conduct and courtesy on electronic discussion groups and email communications. The instructor will not monitor the discussion board as it is meant as a forum for free student exchange. However, if someone feels a particular posting is inappropriate you can inform the poster directly or bring it to the attention of the instructor.

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VIII. Campus Resources

If you are concerned about any aspect of your academic program:

- make an appointment with a program counsellor in your degree program. <http://www.bsc.uoguelph.ca/index.shtml>. Counsellor names and contact are at <https://www.uoguelph.ca/uaic/programcounsellors>

If you are struggling to succeed academically:

- You can talk to the instructor for suggestions. In addition 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. To set up individualized appointments with a learning specialist through the library at <http://www.learningcommons.uoguelph.ca/>

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/>

If you have a documented disability or think you may have a disability:

- The Centre for Student Accessibility Services (SAS, formerly CSD) can provide confidential services and support for students with a documented learning or physical disability. They can also provide information about how to be tested for a learning disability. For more information, including how to register with the centre please see:
<https://www.uoguelph.ca/csd/>