MICR*3330 THE WORLD OF VIRUSES, FALL 2015

COURSE OUTLINE

Instructor: Dr. Baozong Meng
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Time: Tuesdays and Thursdays 8:30 to 9:50 AM
Place: MCLN (MacLachlan Building) Room 102
Office Hours: Fridays 3:30 – 4:30 pm

DESCRIPTION AND OBJECTIVES:

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).

PREREQUISITES:

MCB*2050 Molecular Biology of the Cell.

AREAS OF EMPHASIS:

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.

TEXTBOOKS AND OTHER RESOURCES:

The recommended textbook for the course is *Fundamentals of Molecular Virology*, 2nd edition by Nicholas H. Acheson (John Wiley and Sons, Inc. 2011). Other useful textbooks include *Understanding Viruses* by Teri Shors (Jones and Bartlett publishers 2013), *Principles of Virology* 3rd edition by S. J. Flint et al. (American Society for Virology Press), and *Fields Virology*, 6th edition by David M. Knipe and Peter M. Howley (Lippincott Williams Wilkins). 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.

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.

COURSE EVALUATION:

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.

Midterm (In class, TBA):	25%
Assignment (Due Nov 13 by 4:30 pm):	25%
Final exam (Dec 11, 8:30 to 10:30 am)*:	50%

(*Confirm with Registrar’s office for exam schedule and location.)

CALCULATION OF FINAL GRADE:

Your final grade will be calculated based on your mark for the assignment, plus both the midterm and final exam marks OR only your final exam mark, whichever would make a greater contribution toward your final grade. In other words, if you do much better on the final exam, or could not write the midterm exam for medical or other legitimate reasons, the final exam will count for 75% of the overall grade.

ASSIGNMENT:

To promoter critical thinking, data analysis, 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 in class lectures, groups of students (2-3 students per group) are required to “ask a question”, either on their own or with help from the instructor, and write a report which “answers the question” (4-5 pages in length and no more than 5 pages, double spaced, Cambria, font size 12, 2.5 cm borders all round) which includes analysis of **TWO ORIGINAL** research (not review) articles published in refereed journals in the virology field. Specific guidelines regarding the theme and formatting of the report will be provided later on. The penalty for late submission of the assignments will be 10% per day (24 hours) late.

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.

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.

GENERAL COURTESY:

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

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
Dorothy Bienzle	Pathobiology (OVC)	Feline leukemia virus
Sarah Wootton	Pathobiology (OVC)	Retrovirus and cancer
Baozhong Meng	MCB (CBS)	Plant viruses (molecular biology, genomics, diagnostics, evolution and genetic diversity)

TENTATIVE COURSE CONTENT

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

2. 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)
   - Subviral agents (viroids, virusoids, satellites)

3. 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
     - Penetration
     - Uncoating
     - Biosynthetic phase (mRNA, protein, genome replication)
     - Assembly - morphogenesis
     - Release
     - Maturation
   - 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 (1-2)
   - Cell and host specificity of viruses
   - Cellular defences to virus infection (e.g. toll-like receptors, apoptosis)
   - Host defences to virus infection (e.g. humoral and cellular immunity)
   - Viral subversion of host defences (e.g. inhibitors of apoptosis; decoys of and binding proteins to host defence proteins, RNA silencing/suppression)
   - Pathology/virulence of virus infections (plant and animal)
   - Virus movement (cell to cell and systemic movement, plant viruses)
   - Utilization of cellular structure and factors in viral trafficking and replication

5. Introduction to prevention and control of viral diseases (2)
   - 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

6. 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

7. 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).

8. 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

9. A discussion on the origin and evolution of viruses

10. Guest lectures on virology research on campus