DEPARTMENT OF MOLECULAR AND CELLULAR BIOLOGY,

UNIVERSITY OF GUELPH

MOLECULAR VIROLOGY (MICR*4330) COURSE OUTLINE

WINTER SEMESTER 2017

"The difficulty lies, not in the new ideas, but in escaping from the old ones, which ramify, for those brought up as most of us have been, into every corner of our minds"
– John Maynard Keynes

INSTRUCTOR:
Dr. Baozhong Meng, Science Complex, room 4255; Email: bmeng@uoguelph.ca

LAB DEMONSTRATOR:
Ms. Debra Flett, Science Complex, room 3504; Email: dflett@uoguelph.ca

LECTURES:
Mondays and Wednesdays 12:30 - 13:20 pm, MCKN room 236

LABORATORIES:
Wednesdays OR Thursdays 2:30 - 5:20 pm, Room SSC 4111

COURSE OBJECTIVES:
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. We emphasize on students centered learning and skills in independent learning and scientific communication through active participation of students in presentations and peer-review process. Building upon the introductory virology course, World of Viruses (MICR*3330), this advanced course will focus on three broad areas that are important to both basic and practical aspects of virology: (1) strategies used by different groups of viruses in their transcription, translation, genome replication; (2) their interactions with cellular processes and the defense mechanisms of the infected host; and (3) evolutionary aspects of viruses, viral ecology and emerging viruses and viral diseases. Examples of viruses from select families will be used to demonstrate the various interactions between viruses and their host cells, including various components of the host defense mechanism and counteracting strategies used by viruses. These will be achieved through lectures, in-class student presentations, as well as a term paper assignment. The laboratory component will provide students the opportunity for hands-on experience with some of the most essential experimental systems and technologies used in virology research.

TERM PAPER (MINI REVIEW):
To engage students in self-motivated and active learning, and to enhance the skills and ability of students in critical thinking, analysis and understanding of scientific publications, organization and presentation of scientific communication, and teamwork, students are required to complete a group term paper and in-class presentation project. Students will form groups of two and, with the help of the instructor, choose a clearly defined topic in virology and virus-host interactions, and write a formal mini review on the chosen topic following the format and requirement outlined by the journal Virology. Specific requirements on the content, format, and page limits are provided in "Guidelines for Mini Review".

Deadline for submission of draft paper for peer-review: Monday, March 6, 2017.

Deadline for submission of final paper: Friday, March 24, 2017 at 17:00. Important: 10% penalty per day will be given for late submissions.

To familiarize you with the process of publishing in biological sciences, draft term papers will undergo a similar peer review process as used in scientific publication by peer students who are required to provide constructive comments and suggested changes that would improve the quality of the draft papers. You are encouraged to take full advantage of the feedbacks from others and revise the review before final submission. These activities will be highly beneficial to students, as these activities would prepare you for skills in scientific research and communication.

STUDENTS IN-CLASS PRESENTATIONS:
In addition to the mini-review, the same groups of students are required to give an in-class presentation of some of the papers chosen by the group for their mini review. The presentation will be 20 minutes for each group, followed by 5 min for questions and answers. The in-class presentation must be in the Powerpoint format and include: (1) title of your presentation; (2) sufficient background information necessary for the audience to understand and easily follow your presentation; (3) hypothesis and objectives; (4) experimental strategies and methodologies used; (5) results; and (6) conclusion and future directions you would like to suggest. Active participation in other students' presentations is required of all students and is measured by involvement in asking questions and providing comments.

TEXTBOOK AND RESOURCES:
There is no textbook required for this course. Lecture materials will be derived from a wide range of sources including textbooks, review articles and primary research papers. *Principles of Virology* (3rd edition by Flint et al., 2009, ASM Press) and *Fields Virology* (6th edition by Knipe and Howley, Wolters Kluwer/Lippincott Williams and Wilkins, 2013) are two of the most useful references in virology and will be available on reserve in the library. In addition, materials pertaining to lectures, labs, assigned reading materials, as well as announcements will be posted on the course site available on the University website through Courselink.

COURSE EVALUATION

Forms of assessment	**Weighting**
Laboratory:	25%
Final Exam (April 18):	35%
In-class group presentation:	10%
Term paper (due March 27 at 4 pm):	20%
Participations:	10%

Components of participations:	**Weighting**
Asking questions during presentations:	2.5%
Peer review comments:	5.0%
Attendance to classes and labs	2.5%

ATTENDANCE:
Due to the requirement for students' active participation in lectures and lab exercises, it is mandatory for students to attend lectures and labs. Under special circumstances, for example, severe illness, if a student has to miss a class, you must inform Dr. Meng (for lectures) or Ms. Flett (for labs) ahead of time. Given the complexity and high cost nature of laboratory exercises, we will be unable to schedule for make-up labs. Any students who miss a lab session without

proper documentation for illness or other compassionate grounds will receive a grade of zero for that particular lab.

ACADEMIC MISCONDUCT:
The University of Guelph consider Academic Misconduct as a very serious issue. Academic misconduct includes such activities as cheating on exams, plagiarism, and misrepresentation. It also includes submitting the same material for different courses without written consent from the instructors involved in these courses. Please refer to the University of Guelph Undergraduate Calendar, Section VIII (Undergraduate Degree Regulations and Procedures at http:/www.uoguelph.ca/undergrad_calendar for further information on policies and procedures concerning examination, academic misconduct and deferred final examinations.

SCOPE OF LECTURES AND TENTATIVE SCHEDULE OF LECTURES

PART I (2 lectures): A brief review of the world of viruses, the virus replication cycle and common experimental systems and methods used in virology research.

PART II (4 lectures): Discussion on the diverse strategies used by different categories of viruses for the expression and replication of their genomes

Transcription and processing of mRNAs
Translation and post-translational modifications
Strategies for genome replication

PART III (3-4 lectures): Molecular and cellular basis of virus-host cell interactions

Cell biology aspects of virus-host interactions
Host defense against viral infections: innate immune responses (small RNA biology and RNA silencing as an ancient defense mechanism against RNA viruses)
Host defense against viral infections: innate immune responses (Toll-like receptors, interferons, apoptosis, natural killer cells, etc.)
Viral counter-defense mechanisms (inhibition of apoptosis, mimicry of cellular proteins involved in antigen presentation and recognition, suppression of RNA silencing, etc.)

PART IV (3 lectures): Pathogenesis, viral oncogenesis, and human interventions

Pathogenesis
Patterns of viral infection and disease
Viruses and cancer
Antivirals (vaccines and therapeutics)

PART V (2 lectures): Metagenomics, bioinformatics, phylogenetics and virus evolution

PART VI (2-3 lectures): Virology research at Guelph and special topics in virology

WEEKLY SCHEDULE OF LECTURES (TENTATIVE)

Date	Week	Topic
Jan 9	Week 1	Organization meeting and introduction to the course
Jan 11		Experimental systems and methods used in virology, a brief overview
Jan 16	Week 2	Review of viruses and general discussion on virus replication cycle
Jan 18		Strategies for transcription and RNA processing - RNA viruses
Jan 23	Week 3	Guest lecture on Baculoviruses, Dr. Peter Krell
Jan 25		Strategies for transcription and RNA processing - DNA viruses
Jan 30	Week 4	Strategies for translation of viral proteins and polyprotein processing
Feb 1		Strategies for viral genome replication
Feb 6	Week 5	Molecular basis for virus-host interactions
Feb 8		Molecular basis for virus-host interactions
Feb 13	Week 6	Pathogenesis and patterns of viral infections
Feb 15		Human interventions against viral diseases: vaccines and antivirals
Feb 20		**Winter week; no classes**
Feb 27	Week 7	Virus as vectors for gene therapy and cancer treatment
March 1		Metagenomics in the discovery of viruses
March 6	Week 8	Bioinformatics, phylogenetics and their role in taxonomy
March 8		Origin and evolution of viruses
March 13	Week 9	Special topics in virology: plant virology and grapevine virology
March 15		Students presentations
March 20	Week 10	Students presentations
March 22		Students presentations
March 27	Week 11	Students presentations
March 29		Students presentation
April 3	Week 12	Students presentations
April 5		Review of lectures
April 18		Final exam. Place: TBA