



MICB 306 – MOLECULAR VIROLOGY

1 COURSE AND INSTRUCTOR DETAILS

Lectures: Tuesdays and Thursdays 9:30-11am WESB 100

Tutorials: Please attend the tutorial in which you are registered. Tutorials will begin the week of September 10, 2018.

T01 Tuesdays 11-12pm Hennings 201

T02 Thursdays 12:30-1:30pm WESB 201

T05 Tuesdays 11-12pm IRC 4

Instructors:

Module 1

Dr. Marcia Graves

marcia.graves@ubc.ca

Office: Wesbrook, Room 131

Office Hours: Thursdays 2-4pm

Or, by appointment; email me or drop by my office

Module 2

Dr. François Jean

fjean@mail.ubc.ca

Office: Life Sciences Centre, Room 3559

Office Hours: Wednesdays 2-5:30 PM,
Room 238, Wesbrook Building

2 COURSE MATERIALS

Course Website: URL www.canvas.ubc.ca - MICB 306 Section 101 - 2018W; requires UBC CWL ID.

For Canvas help, contact the Help Desk: <https://students.canvas.ubc.ca/help/>

Online discussion: This course will use Piazza for online discussion. The link is available through Canvas for students to enrol, or please visit the course site directly to enrol: piazza.com/ubc.ca/winterterm12018/micb306101

Please use a UBC affiliated email address when creating a login for piazza.

Textbook:

Required: ESSENTIAL HUMAN VIROLOGY By Jennifer Louten, 2016, Academic Press, Elsevier.

Recommended but not required: Alberts et al. ESSENTIAL CELL BIOLOGY, 4th ed., 2013, Garland Press. (3rd edition is also acceptable). *This book is on 2-hour reserve at Woodward library, along with a more in depth version of this text, called "Molecular Biology of the Cell" (same authors).*

i>Clicker classroom response system: Available at UBC Bookstore.

3 PRE-REQUISITES

MICB 202 (Introductory medical microbiology and immunology)

Students should be familiar with the major concepts in virology and immunology that were discussed in MICB 202. We will review some key concepts before exploring these topics in more detail, but please review your notes from this course.

Recommended - BIOL 200 or equivalent (Cell Biology)

Students should be familiar with cellular organization and the functions of various organelles, the basic structures of DNA, proteins and membranes, and important cellular functions including transcription, mRNA splicing, translation, and protein secretion. The cell biology textbook by Alberts et al. (either "Essential Cell Biology" or "Molecular Biology of the Cell") will be an excellent resource for understanding cellular structure and function.

4 COURSE GOALS AND TOPICS COVERED IN MICB 306:

At the end of this course, students should be able to:

1. Illustrate the intricate balance between virally encoded proteins and host factors (including host immune response) to explain and make predictions about the specificity and mechanisms of viral pathogenesis.
2. Discuss the structural organization and function of key host cell pathways commonly hijacked during viral infection using examples from different virus replication strategies.
3. Discuss the impact of viral hijacking of key host-cell machineries on the development of virus-associated diseases.
4. Apply principles of molecular virology learned in this course to discuss current anti-viral strategies [direct-acting antivirals (DAAs) and indirect-acting antivirals (IAAs)] and creatively devise new therapeutic strategies.
5. Discuss in detail the virus lifecycle, viral pathogenesis, anti-viral strategies and global impact of selected human enveloped viruses on individuals and in populations (alphainfluenzavirus, flavivirus, Ebolavirus).
6. Discuss several methodologies used for detection and diagnosis of human viral infections, as well as techniques and new technologies used in experimental molecular virology.
7. Describe and interpret experimental data based on conceptual knowledge of molecular virology.
8. Discuss the interdisciplinary nature of virology and appreciate how current issues in virology intersect with global, cultural and political contexts such as public health security, bioethics, and human rights.
9. Gain an appreciation for the benefits of molecular virology research to society.
10. Gain an appreciation of the current and future grand challenges in the field of molecular virology: The continuous threats to human health and global stability associated with emerging and re-emerging human viral diseases.

Module 1 - principles in molecular virology

- Virus structure and classification
- Virus transmission and outcomes of infection
- Host cell biology and viral hijacking of host cell pathways during viral replication
- The immune response to viral infection
- Anti-viral strategies and vaccines

Note: Methods used in molecular virology (experimental approaches and diagnostic tools) will be discussed throughout module 1.

Module 2 - Case studies

Dr. Jean will reinforce the principles learned in module 1 by examining in details the current state of research and new frontiers in molecular virology research for three genera of human enveloped viruses of major public health concern in Canada and around the world:

- *The case of alphainfluenzavirus [(-)ssRNA]*
- *The case of flavivirus [(+)ssRNA]*
- *The case of Ebolavirus [(-)ssRNA]*

5 COURSE EVALUATION

Midterm*	40%	(90 min, 7pm, Wednesday Oct 17 th , 2018, Room TBA)
Final*	35%	(2.5 hr. Final exam period, Dec)
Module 1 Pre-reading Quizzes	5%	(online quizzes, due before class, based on textbook pre-readings)
Module 2 Essay Assignment	10%	(For details, see Section 11)
Lecture Participation	4%	(based on in-class activities and i>clicker use)
Tutorial	6%	(based on tutorial problem sets and i>clicker use)

***Note:** The midterm and final exam totals 85/100 of the total grade for the course. Students must obtain a total of $\geq 42.5/85 = 50\%$ to pass the course.

6 TEACHING APPROACH

Module 1 - The goal of module 1 is to create a student-centered learning space in lectures and tutorials to help students with fundamental concepts of molecular virology. Using select examples of different viruses, the objective is for students to gain enough foundational knowledge to apply what they have learned to new cases and to be able to make predictions and solve problems. We will tackle the material together! I, (Dr. Graves), will facilitate peer-to-peer and group discussions, followed by feedback to help guide you through the key concepts. I have chosen activities and questions for class and tutorials to highlight the most important concepts to help prepare you for how you will be evaluated on exams. This makes attending class and tutorials very valuable if you want to do well!

Module 2 - The goal of module 2 is to create a student-centered learning space in lectures and tutorials to help students integrate and apply the fundamental concepts of molecular virology learned in Module 1 to three genera of enveloped viruses of major public health concern in Canada and around the world. This year, first, Dr. Jean will present our current-state-of-knowledge on selected emerging and re-emerging pathogenic viruses [e.g., *influenza A virus*, dengue virus, Zika virus, and Zaire ebolavirus] and second describe the next frontiers in anti-viral drug discovery, biologics, and molecular diagnostic technologies for these life-threatening viruses.

Dr. Jean will reinforce the principles learned in module 1 by examining in details the current state of research and new frontiers in molecular virology research for three genera of human enveloped viruses of major public health concern in Canada and around the world:

- **The case of alphainfluenzavirus [(-)ssRNA]:** Global health burden; swine-origin influenza A virus (S-OIV) and avian-origin influenza A virus (A-OIV); IV-associated clinical diseases; lifecycles; Determinants of IV pathogenicity; HAo glycoprotein activation; MDx; DAAs & IAAs; Vaccine trials; Biologics
- **The case of flavivirus [(+)ssRNA]:** Global health burden; dengue virus (DENV) and Zika virus (ZIKV); flavivirus-associated clinical diseases; lifecycles; Determinants of flaviviral pathogenicity: prM glycoprotein activation; DAAs and IAAs; MDx; Vaccine trials; Biologics; [new mechanisms of transmission (Exos)]
- **The case of Ebolavirus [(-)ssRNA]:** Global health burden; EBOV-associated clinical diseases; lifecycle; Determinants of viral pathogenicity; glycoprotein isoforms (GP, SGP; ssGP); DAAs and IAAs; MDx; Vaccine trials; biologics.

7 HOW TO BE SUCCESSFUL IN THIS COURSE

- In Module 1 of MICB 306, you are expected to do the recommended textbook reading and complete a quiz in order to prepare you for class and tutorial. The textbook reading and quizzes are designed to provide you with some foundational knowledge to prepare you for class.
- The material covered in lecture and tutorial throughout both modules of the course will focus on the topics and types of problems that you will expect to see on the midterm and final examination. It is strongly encouraged that students actively engage during lecture and tutorial by answering clicker questions, participating in class discussions and asking questions.
- Module 2 of MICB 306 will focus on case studies of emerging viruses. It is vital to attend class as the material covered is based on the current status of the field from the primary literature and is not covered in the textbook.
- Other recommended tips to do well: participate on the discussion forum, keep up with the reading, review notes after class and write down the concepts you are unsure about, seek additional support by visiting your instructor in office hours with prepared questions, form study groups and learn from each other.

8 MIDTERM AND FINAL EXAM

Midterm:

Note: The Department of Microbiology and Immunology now has a policy of scheduling exams for large courses in the evening. This is to ensure that you can get the full time allotted for writing the exam.

- There will be one midterm exam worth 40% of the course grade.
- The midterm is on **Wednesday October 17, 2017 in the evening at 7-8:30pm**. Students should make every effort not to miss the exam. If your absence was unanticipated (i.e. unexpected illness), you must notify your instructor within 48 hours of the exam and have proper medical documentation (Be aware that a doctor's note that was received for an "unconfirmed illness" may not be accepted).
- If you have an evening course or university function (i.e., varsity team) that conflicts with the time of the exam, this must be reported one week prior to the exam. You would need to provide documentation to support your request for writing the midterm at an alternate time (i.e., copy of your time-table, letter from the UBC sports team). You will be required to write the exam at the earliest possible time (maybe before the rest of the class, or first thing the following morning).
- Details about the midterm exam will be released a week before the exam (i.e., the content that would be eligible for examination). The information will be sent by email using the University's registration system and will be posted on Connect. Therefore, it is important that your email address is recorded with the University.
- For the midterm exams only, any student that feels that they should have been awarded additional marks can appeal this in writing. The student must discuss (in writing, on a separate paper) why their answer should be awarded additional marks - the question will be re-evaluated by the instructors. The request for re-evaluation must be received within one week of the midterm exams being returned to the students.
- Students are reminded that the exams are photocopied prior to their return to students and that students **MUST NOT** edit their copy of the exam prior to resubmitting their exam. Students that alter their midterm exams and request the exam be re-evaluated will be subject to academic discipline.

Final exam:

- The final exam is worth 35% of the final grade and will be held during the final exam period. The final exam will cover the content taught by Dr. Jean. However, since the material in the second half of the course builds on earlier material, you will need to be familiar with the major concepts from the first half of the course. The exam period is set for Dec. 4th - Dec. 19th. This means that you should **not** make airline reservations until you know your exam schedule. The Dean's Office **will not** permit students to write final examinations at alternate times because of travel conflicts.
- Missed Final Exams: Students that are absent during the final exam must report to the Dean's Office as soon as possible and request a form for a Deferred Exams. The Dean's office will require valid documentation to explain your absence from an exam. Deferred Exams are scheduled by the Registrar's Office and are usually held in late July.
- Note that instructors are not permitted to rearrange the times of final exams for students other than in a case of exam hardship. An exam hardship is defined as 3 exams within a 24-hour period. For example, Student "A" has an exam at 8:30 am, 12:00 noon and 7 pm; this is an exam hardship and the 2nd exam would be rescheduled (probably to the following day). An example of what is **NOT** an exam hardship: Student "B" has exams scheduled at 8 am, 12:00 noon, then 8 am the following day. The third exam is in the next 24-hour period.

Exam Format:

- Both midterm and final exams may contain a combination of questions, including multiple choice, short answer, short essay, and data analysis. The midterm will largely focus on data analysis. Most questions can be answered with several sentences, or at maximum with 1 – 2 paragraphs. It is okay to present your answer in point form and diagrams often help. Clear and concise writing is better than a large volume. Responses that have the right answer, but with lots of incorrect or irrelevant information may receive lower scores than responses that are correct and concise.
- Tip: Outline your response first as opposed to writing a “stream of consciousness” answer.

9 PARTICIPATION & ICLICKERS

- Iclickers are required of all students in lecture and will be used to facilitate discussion. You must use your iclicker in class in order to have your participation counted. Doctor’s notes or other reasons will not be accepted for lack of classroom attendance.
- iclickers are registered to individual student IDs. Do not ask another person to use your iclicker in class and do not use another student’s. Misuse will result in 0 marks and you will be reported for [academic misconduct](#).
- Participation can include iclicker scores, handouts, homework, and/ or discussion board posting (example: “question of the week” in tutorial (see section 10, Tutorial), at the discretion of your lecture instructor and TAs. If you participate in >85% of classes, you will receive full iclicker participation marks. After that your grade is pro-rated accordingly, based on the number of classes that you participated in.

10 TUTORIAL

Teaching Assistants: *Note: All communication with TAs will be through the piazza discussion board, or in person during lecture or tutorials.*

- Catherine Byrne
- Zachary Morse
- Virginie Jean-Baptiste

The goal of the tutorials is to support your learning of foundational concepts in MICB 306 and to help prepare you for the midterm and final exams. The tutorials will support skills such as critical thinking, problem solving, data analysis, and how to construct quality exam responses. In each tutorial, your TA will provide extra support for the material covered in lecture, and you will work through sample exam-style problems individually, in groups, and through facilitated discussion with your TA.

11 ESSAY ASSIGNMENT

Virology ESSAY: *“Rising to meet the world’s most challenging global health issues: Defeating viral infectious diseases with revolutionary technologies and discoveries”*

- The Virology ESSAY is worth 10% of the final grade.
- One PAGE essay [not including References & one summary Figure], Due end of term, Date TBA)

Objective: Students will apply their knowledge in molecular virology to creatively solve real-world problems that are some of the biggest global challenges associated with viral diseases. We will provide a list of topics to choose from and students will sign-up for their topic of choice on Canvas. Students will be expected to write a ONE PAGE, single spaced essay on their topic of choice and produce one summary figure or infographic (digitally created or hand drawn). The one page length is for the written component only and does not include reference list or figure. **In the essay students will:**

- (i) Describe one of the world's biggest problems associated with the following research topics (a) molecular diagnosis, (b) prevention, (c) treatment or cure of emerging and re-emerging viral diseases of public health concerns. Be clear to define what the problem is.
- (ii) Describe how this specific problem could be resolved*: Present potential solutions and how to test the solutions.
- (iii) Outline the impact of the work. Describe the benefits of your proposed solution.

Examples:

**Propose how a new interdisciplinary approach is required to solve the problem; present the need for state-of-the-art technologies required to solve the problem and/or underline novel molecular tools required to solve the problem...).*

12 CLASSROOM CIVILITY

- To create and preserve a classroom atmosphere that optimizes teaching and learning, all participants share a responsibility in creating a civil and non-disruptive forum. **Students are expected to conduct themselves at all times in this classroom in a manner that does not disrupt teaching or learning.**
- You are expected to be on time. Class starts promptly at 9:30 AM. You should be in your seat and ready to begin class at this time. Class ends at 11:00 AM. Packing up your things early is disruptive to others around you and your instructor.
- Classroom discussion should be civilized and respectful to everyone and relevant to the topic we are discussing. Any discussion from class that continues on Connect should adhere to these same rules and expectations.
- Electronic devices such as computers, cell phones and tablets must be turned off during class, unless you have informed the instructor ahead of time that you are expecting an emergency message, or are using your device for class appropriate purposes only.

13 TENTATIVE COURSE SCHEDULE – 2018W TERM 1

	Date	Lecture number and topic	Pre-quiz <i>(due at 9:30am)</i>	Tutorial
Module 1: General principles in virology	T Sept 4	No Classes - Imagine UBC		--
	Th Sept 6	L1: Course details Introduction to virology Virus structure and classification	Quiz #1 due <i>(delayed due date - Sunday Sept 9, 8pm)</i>	--
	T Sept 11	L2: Virus transmission I	Quiz #2 due	T1: Types of viruses, structure and classification
	Th Sept 13	L3: Virus transmission II and outcomes of viral infections		Coaching on writing quality answers to exam questions
	T Sept 18	L4: Host cell biology overview	Quiz #3 due	T2: Example exam-style problem on virus transmission
	Th Sept 20	L5: Viral life cycle and host cell biology - hijacked cellular pathways during infection <ul style="list-style-type: none"> <i>Viral hijacking of the host secretory pathway (the endomembrane system)</i> 		
	T Sep 25	L6: Viral life cycle and host cell biology - hijacked cellular pathways during infection <ul style="list-style-type: none"> <i>Viral hijacking of master regulators of gene expression</i> 	Quiz #4 due	T3: Example exam-style problem on virus life cycle and host cell biology
	Th Sep 27	L7: Viral life cycle and host cell biology - hijacked cellular pathways during infection <ul style="list-style-type: none"> <i>Viral hijacking of metabolic pathways</i> 		
	T Oct 2	L8: Viral replication and host cell biology - hijacked cellular pathways during infection <ul style="list-style-type: none"> <i>Viral hijacking of cell cycle pathways (cancer causing viruses)</i> 	Quiz #5 due	
	Th Oct 4	L9: The immune response to viruses		T4: Example exam-style problem on virus life cycle and host cell biology
	M Oct 8	THANKSGIVING		
	T Oct 9	L10: Viral regulation and evasion of the host response	Quiz #6 due	T5: Example exam-style problem on viruses and cancer
	Th Oct 11	L11: Vaccines and anti-viral approaches (DAAs and IAAs)		
	T Oct 16	L13: REVIEW	<i>No quiz because of midterm</i>	<i>Extra office hours instead of tutorial (hours TBA)</i>
	W Oct 17	MIDTERM EXAM, 7PM		
Module 2: Case studies - InfA, DENV/ZIKV, EBOV	Th Oct 18	NO CLASS Because of Midterm		
	T Oct 23	InfA	No quizzes - instead there will be activities to support the essay assignment.	T6: Example exam-style problem
	Th Oct 25	InfA		T7: Example exam-style problem
	T Oct 30	InfA		T8: Example exam-style problem
	Th Nov 1	InfA and/or DENV/ZIKV		T9: Example exam-style problem
	T Nov 6	DENV/ZIKV		T10: Example exam-style problem
	Th Nov 8	DENV/ZIKV		T11: Example exam-style problem
	T Nov 13	DENV/ZIKV		
	Th Nov 15	DENV/ZIKV and/or EBOV		
	T Nov 20	EBOV		
	Th Nov 22	EBOV		
	T Nov 27	EBOV and/or Module 2 Review		
Th Nov 29	EBOV and/or Module 2 Review			