

## MIC433/ MIC533 Medical and Molecular Virology

### Description of Course

Structure, classification, replication, and mechanisms of pathogenesis of human and animal viruses.

### Locations and Times

Offered Spring semester

VSM room 129

2:00-2:50 M,W,F

Limited to 35 students (25 undergraduate, 10 graduate students)

### Pre-requisites

MIC181R, MIC181L, MIC 205A (General Microbiology) or consent of instructor. Consent of the instructor will only be given based on demonstration of completion of equivalent coursework. In addition, a sound knowledge of molecular/cellular biology is strongly advised.

### Instructor Information

Name: Fiona McCarthy

Office: VSM 102A

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Office Hours: by appointment

### Course Objectives and Expected Learning Outcomes

1. To understand the nature of viruses, including their structure, replication and classification.
2. To explore how infection and replication of viruses is constrained by the viral genome and host immune defenses.
3. To learn how transmission strategies, immune evasion and host responses contribute to viral pathogenesis.
4. To understand viral evolution mechanisms and how they contribute to emergence and re-emergence of viral disease.
5. To become familiar with biological, environmental and human behavior (including social and political behavior) contributes to transmission of viruses, particularly emerging and re-emerging disease.
6. To comprehend and appreciate the major and varied laboratory techniques and research approaches employed in the field of virology.

### Teaching Format & Required Text

The teaching format for this class is a combination of lectures and group discussion/activities. The suggested text is *Understanding Viruses*, Second Edition by Teri Shors (Jones & Bartlett Learning). Class material will also be drawn from

- *Fields Virology* sixth edition by David M Knipe and Peter Howley (Wolters Kluwer)
- additional journal publications and reviews

(Note that *Fields Virology* is considered the authoritative reference book for virology.)

Each lecture presentation will be made available on D2L *after* the class.

## **Course Content**

### Unit 1. Introduction to virology.

Introduction of viruses, history of virology, structure and classification of viruses, introduction to laboratory techniques, viral replication and eukaryotic cell constraints.

### Unit 2. The viral replication cycle

Replication strategies for DNA and RNA genome viruses, viral receptors, attachment and entry of enveloped and non-enveloped viruses, uncoating and disassembly, structural and nonstructural viral proteins, viral genome replication, assembly and maturation of virions.

### Unit 3. Pathogenesis – viral entry, spread and host response.

Routes of entry and transmission, tissue tropism, evasion of host response, latency, persistence, transformation. Acute and persistent infections. Implications of virus induced transformation, viral oncogenes and endogenous viruses.

### Unit 4. Virus evolution

Variation and viral polymerases, natural selection, drift vs shift, recombination and reassortment, virus-host co-evolution, emergence and re-emergence.

### Unit 5. Transmission

Transmission strategies, incubation and generation time, risk factors (biological, social, environmental), epidemic and endemic viruses, herd immunity, detection and surveillance, eradication and control.

### Unit 6. Detection and prevention

Eradication of viral diseases, laboratory methods for detecting and classifying viruses, the human virome. Techniques for developing viral vaccines.

### Unit 7. Virus family case studies.

dsDNA viruses – adenoviruses, herpesviruses, poxviruses. ssDNA viruses – circoviruses and parvoviruses. dsRNA viruses – reoviruses. Positive sense ssRNA viruses – picornaviruses, caliciviruses, flaviviruses, coronaviruses. Negative sense ssRNA viruses – orthomyxoviruses, paramyxoviruses, rhabdoviruses, bunyaviruses, fioloviruses. ssRNA viruses with Reverse Transcriptase – retroviruses. dsDNA viruses with Reverse Transcriptase – hepadnaviruses.

## **Grading and Evaluation**

This course is a split level undergraduate/graduate level course, and the grading scale will be the same for undergraduate and graduate students. This course has been divided into units and there will be an in-class exam at the end of Units 3, 7 and 10. The final grade will be assigned based on the cumulative average performance on the scale of:

- > 90% = A
- 80 – 89% = B
- 70 – 79% = C
- 60 – 69% = D

< 60% = E

The final grade will be determined as follows:

Undergraduate students –

In class exams:	75%	(25% each)
Class activities:	25%	(5% each)

Graduate students -

In class exams:	75%	(25% each)
Class activities:	15%	(5% each)
Graduate report:	10%	

**Exams:** There will be three in-class exams that contribute to the final grade. Exams will include a 3 min perusal period in which there will be *no writing*; rather students are expected to use this time to read the questions and requirements *carefully*. Exams will be designed to test how well students understand key concepts and applying these concepts to novel situations as well as linking information covered in the different units.

**In class activities:** There will be five lecture periods set aside for group activities. For each activity students will address a series of more complex questions and case studies and each group will write and submit a short report (no more than three US letter pages with 12-point Times or Arial font, single spaced, one inch margins). These activities are designed to demonstrate how to apply facts learned in class to more complex concepts about virology and infectious disease. Each class activity will be weighted equally and students graded on participation and timely submission of the group reports.

**Reports:** Graduate students only will also complete a report on a special topic assigned at the beginning of Unit 1, which will contribute 10% of the final grade. Reports will be in the form of a 20min in-class presentation *and* a written report (4 pages of 12-point Times or Arial font, single spaced, one inch margins; page limit excludes bibliography). An outline of the written report (one page) will be due 5pm Friday 13 February and full written report will be due 2pm Monday 27 April. Class presentations will be 20 min and will be presented 4-6 May.

Exams will be:

- exam 1 (units 1 & 2): Monday 16 February
- exam 2 (units 3 & 4): Monday 23 March
- exam 3 (units 5-7): Friday 1 May

More information about the content and expectations for evaluation will be directly addressed during class. There will be no curving of the grades. No make-up exams or extra work will be assigned to improve grades, only for students who missed an exam due to illness or emergency.

### Classroom Behavior

Laptops/tablets can be brought to class but *are not allowed during exams and must be set to silent mode*. All cell phones and pagers are required to be set to silence mode during class. The

Arizona Board of Regents' Student Code of Conduct <http://web.arizona.edu/~policy/threatening.pdf>. ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to one's self. See: <http://policy.web.arizona.edu/~policy/threaten.shtml>.

### **Special Needs and Accommodations Statement**

Students who need special accommodation or services should contact the Disability Resources Center, 1224 East Lowell Street, Tucson, AZ 85721, (520) 621-3268, FAX (520) 621-9423, email: [uadrc@email.arizona.edu](mailto:uadrc@email.arizona.edu), <http://drc.arizona.edu/>. You must register and request that the Center or DRC send me official notification of your accommodations needs as soon as possible. Please plan to meet with me by appointment or during office hours to discuss accommodations and how my course requirements and activities may impact your ability to fully participate. *The need for accommodations must be documented by the appropriate office.*

### **Student Code of Academic Integrity**

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: <http://deanofstudents.arizona.edu/codeofacademicintegrity>

### **Confidentiality of Student Records**

Confidentiality of student records follows UA policy: <http://www.registrar.arizona.edu/ferpa/default.htm>

### **Copyright**

UA policies state: (1) the instructor holds the copyright for lectures and course materials, (2) this copyright includes student notes or summaries that reproduce the lectures or materials, (3) these materials are made available only for personal use by students, and (4) *students may not distribute or reproduce these materials for commercial purposes without express written consent from the instructor*. The selling of classroom lectures and other materials to commercial websites is considered copyright infringement.

### **Subject to Change Statement**

Information contained in the course syllabus may be subject to change with advance notice, as deemed appropriate by the instructor.