Viruses and Disease (MBMB 441)

Course Director: William Halford
To be offered: Spring 2010
Time: TR, 8:00 – 9:15 a.m.

Location: Springfield (site of lectures), Room 3690, SCLF II building
Carbondale (telecast lectures), Room 244, LSII building
Textbook: Fundamentals of Molecular Virology, 2007 (Acheson)

Week		Topic	Instructor	Textbook Reading
	T	Origins of Virology	Halford	
1	R	Overview of Virology		Ch. 1
	T	Virion structure-1	Gershburg	
2	R	Virion structure-2		Ch. 2
	T	Virus entry	Gershburg / Halford	
3	R	Poliovirus-1 ***Virus model system 1***		Ch. 3, 16
	T	Poliovirus-2	Halford	
4	R	Other + ssRNA viruses and associated diseases		Ch. 16, 17, 18
	T	**Midterm 1** (on Weeks 1-4)	Halford	
5	R	-ssRNA viruses: Paramyxoviruses		Ch. 20
	T	segmented -ssRNA viruses: Influenza virus	Halford	
6	R	-ssRNA viruses and associated diseases		Ch. 21, 23
	T	Retroviruses-1 ***Virus model system 2***	Halford	
7	R	Retroviruses-2		Ch. 25
	T	Retroviruses and cancer	Wilber	
8	R	HIV and AIDS		Ch. 26 and 27
	T	DNA viruses (papilloma, adeno, and herpesvirus)	Gershburg	
9	R	DNA viruses and associated diseases		Ch. 11, 12, 13
	T	Antiviral drugs	Halford	
10	R	Quasispecies and antiviral drug resistance		Ch. 32
	T	**Midterm 2** (on Weeks 1 – 10)	Halford	
11	R	Bacteriophage, insect, and plant viruses		Ch. 8, 14
	T	Subviral agents and retrotransposons	Halford	
12	R	Origin of viruses?		Ch. 29
	T	Biotechnology 1: viral gene delivery vectors	Wilber	
13	R	Biotechnology 2: human gene therapy		Ch. 33
	T	Viruses that cause cancer	Gershburg	
14	R	Biotechnology 3: Viruses as cancer-killing machines		Ch. 8 / Ch. 9
	T	Childhood viral vaccines	Halford	
15	R	Frontier in vaccine research		Ch. 34
		Final Exam (Comprehensive)		

Textbook: Fundamentals of Molecular Virology, 2007, Nicholas Acheson

Readings: Several topics are not covered in sufficient depth by the textbook for the purposes of this course (e.g., antiviral drugs, history of virology, picornavirus replication, etc). Therefore, 1 - 2 supplemental readings may be assigned via Blackboard each week.

Attendance: Students are expected to attend all classes, unless prevented by sickness. In the event of an absence, students will be held responsible for the materials covered in that class on the exam.

Exams: Two midterms and a final exam will be administered during the semester. Each exam will be cumulative, and will predominantly consist of multiple choice questions. A subset of questions will test students' knowledge of the biochemical structures of amino acids, nucleotides, and antiviral drugs.

Grading:

Midterm I (Weeks 1-4)	60 points	(20%)
Midterm II (Weeks 1-10)	120 points	(40%)
Final Exam (Weeks 1-15)	120 points	(40%)
Total Possible	300 points	

Honor Code: Academic misconduct on any test, as defined by University policies, will result in a grade of 'F' in the course.

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Objectives: The goals of Virology are to (1) emphasize basic principles of molecular virology through the discussion of human viruses and the diseases they cause, (2) illustrate the ubiquity of viruses in nature through discussion of viruses that infect humans, plants, insects, and bacteria, and (3) to discuss the relationship between viruses and the mobile genetic elements that are present in the genomes of all living organisms. A few specific viruses that are representative of a group of viruses will be discussed in depth. Viruses that possess RNA genomes face different hurdles to the completion of their replication cycle as opposed to DNA viruses. Likewise, plant viruses face different physical barriers to their dissemination than animal viruses because of the different architecture of plant and animal tissues. Such principles will be highlighted in class, reinforced by the textbook, and tested in three examinations.

Overview of Course Structure

Weeks 1 - 4: Principles of virology, single-stranded RNA viruses of + polarity

Week 1 - 2: **Principles and origins of virology**

- nomenclature, concepts, virion structure, viral entry
- big picture of virology as a field

Weeks 3-4: **(+) single-stranded RNA viruses**

- picornaviruses (e.g, poliomyelitis)
- togaviruses and flaviviruses (e.g., mosquito-borne viral diseases such as yellow fever)

Weeks 5 - 8: Representative examples of other types of human viruses

Weeks 5-6: **(-) single-stranded RNA viruses**

- rhabdoviruses (e.g., rabies) and paramyxoviruses (e.g., measles, mumps)
- orthomyxoviruses (e.g., influenza)

Weeks 7 -8: **Retroviruses**

- simple retroviruses (e.g., murine leukemia virus)
- complex retroviruses (e.g., HIV) and AIDS
- retroviruses that cause cancer

Weeks 9-10: **DNA viruses and antiviral drugs**

- herpesviruses (e.g., herpes simplex virus)
- adenoviruses / polyomaviruses / papillomaviruses
- antiviral drugs
- Mechanisms by which viruses become resistant to antivirals (or host antibodies)

Weeks 13 - 15: Perspective and current topics in virology

Week 11-12: **Subviral agents and the origin of viruses**

- ubiquity of viruses (viruses exist wherever there is life)
- subviral agents, hepatitis D virus, and other helper virus phenomena
- retrotransposons, retroelements, and endogenous retrotransposons
- 'Selfish gene' theory of how self-replicating nucleic acids evolved into viruses (retroviruses, human retrotranposable elements, and fly telomeres are remarkably similar)

Weeks 13-15: **Applications of viruses in medicine and biotechnology research**

- Viruses as gene delivery vehicles
- Viruses as potential cancer-killing machines
- Viral vaccines: how we protect the human population against outbreaks of viral disease, and why we still lack a vaccine against some viruses such as HIV