# Virology
## Biology 475 (3 credits)
Biology Department, New Mexico State University, Spring 2016

**Instructor** Dr. Kathryn Hanley, Office: Foster 471
Phone: 646-4583 Email: khanley@nmsu.edu

**Meetings** MWF 11:30-12:20, Domenici 102; optional evenings as specified

**Office Hours** W 1:00-2:00, F 9:30-10:30, or by appointment; Foster 479

**Text** The required text is *Principles of Virology* (third edition; 2 volumes) by S.J. Flint, L.W. Enquist, V.R. Racaniello, and A.M. Skalka, which is available from the NMSU bookstore. Readings from the book will be supplemented with papers from the primary and secondary literature, which will be made available on the class website. I strongly encourage you to complete the reading assigned to each class prior to that class.

**Overview** The diversity of viruses exceeds that of all other living organisms, combined. This course will introduce students to virus genome organization and composition, transmission cycles and epidemiology, mechanisms of infection and replication, as well as strategies to prevent or treat virus infections.

Virus families that infect animals will be discussed, with a focus on virus species of medical relevance. Bacteriophage and prions will be addressed briefly; viruses of plants are covered in EPWS 451/551 and will not be considered here.

**Commun-ication** Readings, useful websites, assignments, lecture notes, and other important materials, and announcements about the class will be posted on the **class website on Canvas**, please check it regularly. Note that lecture notes posted on Canvas will contain substantial omissions of actual material presented in class, thus downloading the notes is not a substitute for attending lecture.

ICT Customer Service Center is equipped to deal with all of your information technology (IT) and telecommunications needs at NMSU. The ICT Customer Service Center hours of operation are from 8:00 AM until 5:00 PM Monday through Friday. Please feel free to contact them at 646-1840 or via e-mail at helpdesk@nmsu.edu.

You can also go to the Student Technology Help web page and the Student Resource tab on learn.nmsu.edu for additional information on NMSU Technology requirements. Official communication to you will often come through your NMSU e-mail box- check it regularly.

**BIOL 475: Virology**
**Spring 2016 Syllabus**
**Instructor: Dr. Kathryn A. Hanley**
**khanley@nmsu.edu; 6-4583; Foster 479**

| Date | Day | Topic | Readings* |
|---|---|---|---|
| *History of Virology and Virological Methodols* | | | |
| 1/20 | W | Class Overview & History of Virology | Syllabus |
| 1/22 | F | Foundations | Flint I.1 |
| 1/25 | M | Infectious Cycle & Methods.1 | Flint I.2 |
| 1/27 | W | Infectious Cycle & Methods | http://media.invitrogen.com. edgesuite.net/tutorials/ 4Intro_Flow/player.html |
| 1/29 | F | Infectious Cycle & Methods.3 | Quinones-Mateu et al. 2014 |
| *Virus Evolution* | | | |
| 2/1 | M | Genomes | Flint I.3 (pgs 53-72 only) |
| 2/3 | W | Evolution.1 | Lauring & Andino 2010 |
| 2/5 | F | Evolution.2 ***Last Day to Cancel a Course*** | Kerr 2012 (skip sections 8, 9, &10) |
| 2/8 | M | Evolution.3 | Theves et al. 2014 |
| *Molecular Virology* | | | |
| 2/10 | W | Attachment and Entry | Flint I.5 (omit boxes) |
| 2/12 | F | *In-Class Review* | |
| 2/15 | M | **Exam I** | |
| 2/17 | W | Replication. RNA viruses | Flint I.6 (omit boxes) |
| 2/19 | F | Replication. DNA viruses | Flint I.9 (omit boxes) |

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|---|---|---|---|
| 2/22 | M | Translation.1 | Flint I.11 (omit boxes) |
| 2/24 | W | Translation.2<br>** ***Homework I assigned*** ** | |
| 2/26 | F | ***No Class*** | |
| *Antiviral Immunity* | | | |
| 2/29 | M | Intrinsic Host Defenses.1<br>RNA interference | Haasnoot et al. 2007 |
| 3/2 | W | Intrinsic Host Defenses. 2 | Flint II.3 pgs 55-77 |
| 3/4 | F | Immune Defenses. 1 | Flint II. 4 pgs 87-99 (paragraph 1) |
| 3/7 | M | Immune Defenses. 2 | Flint II. 4 pgs 99-131 |
| *Prions* | | | |
| 3/9 | W | Prions<br>***Evening Review Session: Time/Location TBA*** | Huang et al. 2015<br>Liberski et al. 2012 (skip sections on Neuropathology and Electron Microscopy) |
| 3/11 | F | **Exam II** | |
| 3/14-3/18 | | ***Spring Break. No Class*** | |
| *RNA viruses* | | | |
| 3/21 | M | Picornaviridae. 1<br>** ***Homework I due*** ** | |
| 3/23 | W | Picornaviridae. 2 | Minor 2014 |
| 3/25 | F | ***Spring Holiday-No Class*** | |
| 3/28 | M | Filoviruses<br>***Last Day to Drop a Course with a W*** | Anthony & Bradfute 2015 |
| 3/30 | W | Ebola and the Ethics of Deploying Unregistered Therapies In a Public Health Emergency | Cohen & Kupferschmidt 2014<br>WHO statement 2014<br>Dawson 2015<br>Haire & Folayan 2016<br>*Note: all short readings* |

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|---|---|---|---|
| 4/1 | F | Flaviviridae: A new era for HCV | Barth 2015 |
| 4/4 | M | ***No Class*** | |
| 4/6 | W | Flaviviridae: Dengue virus | |
| 4/8 | F | Influenza viruses. 1 | Taubenberger and Kash 2010 |
| 4/11 | M | Influenza viruses. 2 | Wong and Webby 2013 |
| *DNA viruses* | | | |
| 4/13 | W | Herpesviridae | Flint II.5 pgs 150-160 |
| *Retroviruses* | | | |
| 4/15 | F | Retroviruses &<br>host genome evolution | Stoye 2009<br>Dupressoir et al. 2009 |
| 4/18 | M | HIV molecular biology<br>& epidemiology | Flint II.6 |
| 4/20 | W | Origins and evolution of HIV | Sharp & Hahn 2011 |
| 4/22 | F | Controlling the HIV Pandemic<br>*Evening Review Session:*<br>*Time/Location TBA* | Demberg & Robert-Guroff 2012 |
| 4/25 | M | **Exam III** | |
| *Viruses and Cancer* | | | |
| 4/27 | W | Viral Oncogenesis. 1<br>** ***Homework II assigned*** ** | Flint II.7 pgs 201-240 |
| 4/29 | F | Viral Oncogenesis. 2 | |
| 5/2 | M | Viral Oncolysis. 1 | Lichty et al. 2014 |
| 5/4 | W | Viral Oncolysis. 3 | |
| 5/6 | F | Viral Oncolysis. 3<br>** ***Homework II due*** ** | |
| **5/9** | **M** | ***Evening Review Session: Time/Location TBA*** | |

**5/11 W FINAL EXAM: 10:30-12:30**

* For textbook (Flint) readings, Roman numerals refer to volume (I or II) and Arabic numerals refer to the chapter within the volume. Other readings are posted on Canvas and a complete bibliography is listed at the end of the syllabus.

**Evaluation** Final grades will be based on the following exercises/exams:

| Category | Number | Points/Percent of grade |
|---|---|---|
| Class Participation | -- | 12% |
| Homework | 2 | 28% (14% each) |
| Midterm exams | 3 | 40% (20% each for top two midterm exam scores, lowest of three scores will be dropped) |
| Final exam (cumulative & mandatory) | 1 | 20% |

The association between point totals and letter grades will be determined at the conclusion of the course at the discretion of the instructor, with the stipulation that students who receive 90%, 80%, 70% and 60% of point totals will receive no less than an A, B, C and D respectively, and students who receive less than 50% of possible points will fail. I do use fractional grading; cutoffs for assignment of + and – will be determined at the conclusion of the class and will not always be symmetric (ie I may offer a broader range for +'s than –'s; I will not do the opposite).

Homeworks will be described in more detail in separate documents. To earn class participation points, it is not sufficient to merely be present at lectures; you must be prepared to answer questions when asked (and you will be asked; I call on students regularly during lectures). Even better, be prepared and willing to ask me questions.

**Missed Exercises/ Exams** Students are expected to complete all exercises/exams as scheduled; Exercises/exams will be rescheduled only for university business or grave emergencies. The former must be documented a minimum of two weeks in advance and alternative arrangements scheduled with me. The latter must be formally documented, for example with a letter from a physician or funeral home. **The lowest of your three midterm exam scores will be dropped. Therefore, the first midterm exam that you**

**miss due to grave emergency will count as your dropped score, and you will not be offered a makeup.**

Late homeworks and other exercises will be downgraded by 10% of the total available points for each day they are late. Any exercise is not considered "turned in" until it is in my hands. If you slide a homework under my door on Friday night, and I don't see it until Monday morning, the submission date is Monday morning.

**Extra Credit** Three optional, graded, in-class extra credit exercises, 2.5% of the total point score, will be offered. These will NOT be announced prior to the class. The best two grades will be added to the total point score as extra credit. Since only the best two grades will be used, no make-ups will be offered under any circumstances.

**Withdrawals:** It is the responsibility of the student to complete the necessary paperwork to withdraw from the class should they decide to do so.

**Academic Honor**

**I expect each student to submit his or her own original work in every exercise.**

The current Student Code of Conduct definition of plagiarism can be found at: http://studenthandbook.nmsu.edu/student-code-of-conduct/academic-misconduct/ Students are expected to read it within the first week of class.

Even with a citation, failure to put quotation marks around direct quotations also constitutes plagiarism, because it implies that the writing is your own. Material should either be paraphrased or clearly designated as a quotation. Note that replacing words with synonyms, changing verb tense or other minor alterations do not qualify as paraphrasing.

**Intentional or unintentional plagiarism or other cheating will result in a 0 on the specific exercise and, depending on the gravity of the plagiarism or cheating, and at the discretion of the instructor, failure of the class. If a student is unsure whether he or she is being academically dishonest, then he or she should ask me for clarification (in person or via email) prior to completing the exercise.**

**Attendance:** Lecture attendance is expected except for documented university business or extreme emergencies, and regular participation will greatly improve your success in the course. You will be graded on your participation during regular lectures, thus unexcused absences will directly impact your final grade.

**Disabilities and Accommodations:** Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act Amendments Act (ADAAA) covers issues relating to

disability and accommodations. If a student has questions or needs an accommodation in the classroom (all medical information is treated confidentially), contact:

Trudy Luken, Director
Student Accessibility Services (SAS) - Corbett Center, Rm. 244
Phone: (575) 646-6840 E-mail: sas@nmsu.edu
Website: http://sas.nmsu.edu/

**Discrimination:** NMSU policy prohibits discrimination on the basis of age, ancestry, color, disability, gender identity, genetic information, national origin, race, religion, retaliation, serious medical condition, sex, sexual orientation, spousal affiliation and protected veterans status.
Furthermore, Title IX prohibits sex discrimination to include sexual misconduct: sexual violence (sexual assault, rape), sexual harassment and retaliation.

For more information on discrimination issues, Title IX, Campus SaVE Act, NMSU Policy Chapter 3.25, NMSU's complaint process, or to file a complaint contact:

Gerard Nevarez, Title IX Coordinator
Agustin Diaz, Title IX Deputy Coordinator
Office of Institutional Equity (OIE) - O'Loughlin House, 1130 University Avenue
Phone: (575) 646-3635 E-mail: equity@nmsu.edu
Website: http://www.nmsu.edu/~eeo/

Other NMSU Resources:

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| NMSU Police Department: | (575) 646-3311 |
| www.nmsupolice.com | |
| NMSU Police Victim Services: | (575) 646-3424 |
| NMSU Counseling Center: | (575) 646-2731 |
| NMSU Dean of Students: | (575) 646-1722 |
| For Any On-campus Emergencies: | 911 |

**Supplemental Readings (available on Canvas)**

ANTHONY, S. M. & BRADFUTE, S. B. (2015). Filoviruses: One of These Things is (not) Like the Other. Viruses, 7(10), 5172-5190.
COHEN, J. & KUPFERSCHMIDT, K. (2014). Infectious Diseases. Ebola vaccine trials raise ethical issues. Science, 346(6207), 289-290.
DAWSON, A. J. (2015). Ebola: what it tells us about medical ethics. J Med Ethics, 41(1), 107-110.
DEMBERG, T. & ROBERT-GUROFF, M. (2012). Controlling the HIV/AIDS epidemic: current status and global challenges. Front Immunol, 3, 250.
DUPRESSOIR, A., VERNOCHET, C., BAWA, O., HARPER, F., PIERRON, G., OPOLON, P. & HEIDMANN, T. (2009). Syncytin-A knockout mice demonstrate the critical role in placentation of a fusogenic, endogenous retrovirus-derived, envelope gene. Proc Natl Acad Sci U S A, 106(29), 12127-12132.
HAASNOOT, J., WESTERHOUT, E. M. & BERKHOUT, B. (2007). RNA interference against viruses:

strike and counterstrike. Nat Biotechnol, 25(12), 1435-1443.
HAIRE, B. G. & FOLAYAN, M. O. (2016). Ebola: what it teaches us about medical ethics. A response to Angus Dawson. J Med Ethics, 42(1), 59-60.
HUANG, W. J., CHEN, W. W. & ZHANG, X. (2015). Prions mediated neurodegenerative disorders. Eur Rev Med Pharmacol Sci, 19(21), 4028-4034.
KERR, P. J. (2012). Myxomatosis in Australia and Europe: a model for emerging infectious diseases. Antiviral Res, 93(3), 387-415.
LAURING, A. S. & ANDINO, R. (2010). Quasispecies theory and the behavior of RNA viruses. PLoS Pathog, 6(7), e1001005.
LIBERSKI, P. P., SIKORSKA, B. & BROWN, P. (2012). Kuru: the first prion disease. Adv Exp Med Biol, 724, 143-153.
LICHTY, B. D., BREITBACH, C. J., STOJDL, D. F. & BELL, J. C. (2014). Going viral with cancer immunotherapy. Nat Rev Cancer, 14(8), 559-567.
MINOR, P. (2014). The polio endgame. Hum Vaccin Immunother, 10(7).
QUINONES-MATEU, M. E., AVILA, S., REYES-TERAN, G. & MARTINEZ, M. A. (2014). Deep sequencing: becoming a critical tool in clinical virology. J Clin Virol, 61(1), 9-19.
REYNOLDS, M. G., CARROLL, D. S. & KAREM, K. L. (2012). Factors affecting the likelihood of monkeypox's emergence and spread in the post-smallpox era. Curr Opin Virol, 2(3), 335-343.
SHARP, P. M. & HAHN, B. H. (2011). Origins of HIV and the AIDS pandemic. Cold Spring Harb Perspect Med, 1(1), a006841.
STOYE, J. P. (2009). Proviral protein provides placental function. Proc Natl Acad Sci U S A, 106(29), 11827-11828.
TAUBENBERGER, J. K. & KASH, J. C. (2010). Influenza virus evolution, host adaptation, and pandemic formation. Cell Host Microbe, 7(6), 440-451.
THEVES, C., BIAGINI, P. & CRUBEZY, E. (2014). The rediscovery of smallpox. Clin Microbiol Infect, 20(3), 210-218.
WONG, S. S. & WEBBY, R. J. (2013). Traditional and new influenza vaccines. Clin Microbiol Rev, 26(3), 476-492.