

MICR 337: Virology

Semester: Two, 18 points

Prerequisites: MICR 221 or MICR 223, or GENE 221

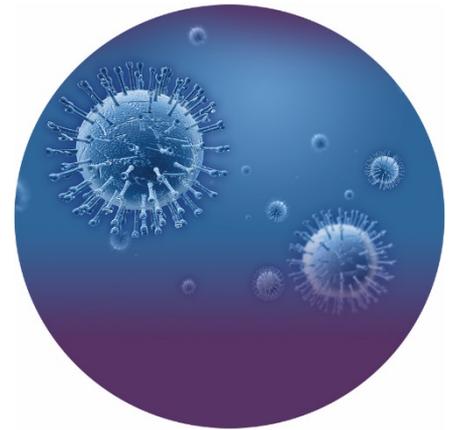
Course prescription

Molecular aspects of virus entry, replication and assembly in host cells. Mechanisms by which viruses manipulate the hosts to multiply and cause disease.

Course overview

Viruses are a diverse group of obligate intracellular pathogens that must infect another organism to replicate. Viruses infect all forms of life and cause a wide array of human diseases such as flu, COVID-19, AIDS, measles, hepatitis, polio, herpes, rabies, and cancer. Viruses manipulate host cell pathways to complete their life cycle and escape host-induced antiviral immune responses. The amazing diversity of viruses is underpinned by central themes of cell entry, genome replication, gene expression, virion assembly, and virion release.

MICR337 is the only 300 level course in a New Zealand university that is fully dedicated to virology learning. This course has three modules, and is for the students wanting a core paper on virology that includes course and team work on contemporary issues in virology from virus-host interactions through to current viral diseases. From this paper, students will acquire the knowledge essential for a career in the diagnosis, prevention, and treatment of viral diseases.



Course objectives

1. Provide the molecular understanding of how viruses with different structures and genomes enter, replicate, assemble, and release from the host cell.
2. Examine the systemic effects of viral infection on the host and highlight the mechanisms viruses employ to evade host defence.
3. Integrate information from virus replication and virus-host interactions and provide the basis of vaccine and antiviral strategies.
4. Develop hands-on research experience with virological methods and techniques.
5. Promote independent thinking and enable research and critical assessment of a topic. Foster oral communication skills and develop ability to work as a team.

Lectures

Two lectures per week for 13 teaching weeks of the second semester.

Lecture time: Thursdays and Fridays at 13:00-13:50

Lab classes

Two laboratory sessions per week on Tuesdays and Wednesdays during academic week 37-40 for a total of 8 laboratory sessions (*some lab work outside these sessions is required*). The laboratory sessions can be flexible for those students taking other courses with timetable overlap. Students may leave the lab for other commitments such as lectures and are able to plan their experiments to fit around those commitments.

In the laboratory, students will isolate and purify their own virus from an environmental sample. Then, determine its growth characteristics and host range, and identify it by visualizing it under an electron microscope. **Lab classes are compulsory, failure to attend and complete the lab classes**

means students may not sit the final exam.

Group Presentations and Individual Essays

This is a self-learning module. Students will research a given virology topic on their own, give a short group presentation to the class, and write an individual 1000-word essay.

Four group presentation sessions in Thursday and Friday lecture slots during the last week of July and/or first week of August. *One of the presentation sessions run for 100 minutes, but the clashes with other lectures can be worked around.* Individual essay submissions are due on third Monday of August.

Assessments

- a) **Presentation and essay (10% of final grade).** Self-learning exercise on below topics (*these topics are updated as needed*):
1. What is Zika virus and why should New Zealand be worried about it?
 2. What were the fundamental differences between COVID-19 and swine flu pandemics?
 3. The emergence and epidemiology of chikungunya virus.
 4. The evolution and emergence of new strains of human noroviruses.
 5. The use of reoviruses for the treatment of cancer in humans.
 6. Ebola virus: where does it come from and how can it be controlled?
 7. What is the best polio vaccine and what are the major barriers to final eradication of poliovirus?
 8. Virophages: what are they and what is their host?
 9. Bats as reservoirs of human viruses: should we be worried?
 10. The consequences of a future pandemic caused by avian influenza A H5N1 or H7N9 virus.
 11. Currently available cervical cancer vaccines and their efficacy.
 12. Epstein-Barr virus: the discovery, the disease, and the treatment.
 13. HIV vaccine: are we there yet?
 14. The potential of bacteriophage therapy in the treatment of bacterial infections.
 15. Hepatitis C antivirals: why do we need them, what is available, and what is being developed?
 16. The emergence and epidemiology of Middle East Respiratory Syndrome virus.
- b) **Two laboratory assignments (20% of final grade).** These are based on the laboratory experiments. Due on first and second Thursday of October.
- c) **Final examination, 3 hour (70% of final grade).** In a unique model, students are given 9 final exam questions below beforehand, 6 of which forms the basis of final examination. The exam format is “answer 3 either/or questions”. Scheduled as per University calendar.
1. Describe the mechanisms used by viruses to enter host cells.
 2. Discuss the structural basis of virus assembly.
 3. How do viruses maximise the protein coding potential of their genomes?
 4. How do viruses control the production of host cell proteins?
 5. Describe the intracellular pathways viruses utilise for assembly and release.
 6. Describe the key characteristics that enable viruses to establish chronic infections.
 7. Compare the life cycles of an orthomyxovirus and a coronavirus from entry to release.
 8. Describe the viral and host factors that contribute to pathogenesis of viruses.
 9. What mechanisms do viruses use to evade host defence responses?

***Note: In case the country moves back to Level 2/3/4 and the final exam conducted online, the exam questions and the format could partially or entirely change from the above.**

Students must achieve a 50% average to pass MICR 337

Textbook

Recommended text:

- Principles of Virology, Flint *et al* (3rd and 4th edition);
 - Introduction to Modern Virology, Dimmock *et al* (6th and 7th edition).
- Both are available as hard copy as well as e-book in Science and Health Sciences libraries.

Teaching staff

- [Dr Matloob Husain \(Convenor\)](#)
- [Professor Miguel E. Quiñones-Mateu](#)
- [Dr Mihnea Bostina](#)
- [Professor Vernon Ward](#)

Workload expectations

An 18 point paper has a minimum expectation of 14 hours per week per paper (180 per semester). This is made up of formal contact times (lectures, tutorials, laboratories etc.) and independent study (studying, revision, assignments, reading etc.).

Responsibilities of students

- Students are responsible for making themselves aware of all University rules and regulations pertaining to their rights and responsibilities as students and to the degree in which they are enrolled.
- Students shall be deemed to have received any information:
 - provided in scheduled classes, regardless of attendance;
 - sent to their student email address;
 - made available via Blackboard or other University-approved learning management systems.
- Students are expected to be aware of all information related to a paper that is made available to them, and, in a timely manner, to raise with staff any questions or concerns relating to this information.
- Students are expected to be aware of, and to act in accordance with, the University's [Academic Integrity Policy](#).

Academic integrity and academic misconduct

Academic integrity means being honest in your studying and assessments. It is the basis for ethical decision-making and behaviour in an academic context. Academic integrity is informed by the values of honesty, trust, responsibility, fairness, respect and courage. Students are expected to be aware of, and act in accordance with, the University's Academic Integrity Policy.

Academic Misconduct, such as plagiarism or cheating, is a breach of Academic Integrity and is taken very seriously by the University. Types of misconduct include plagiarism, copying, unauthorised collaboration, taking unauthorised material into a test or exam, impersonation, and assisting someone else's misconduct. A more extensive list of the types of academic misconduct and associated processes and penalties is available in the University's Student Academic Misconduct Procedures.

It is your responsibility to be aware of and use acceptable academic practices when completing your assessments. To access the information in the Academic Integrity Policy and learn more, please visit the University's Academic Integrity website at www.otago.ac.nz/study/academicintegrity or ask at the Student Learning Centre or Library. If you have any questions, ask your lecturer.

- Academic Integrity Policy ([www.otago.ac.nz/administration/policies/otago I I 6838.html](http://www.otago.ac.nz/administration/policies/otago%20I%206838.html))
- Student Academic Misconduct Procedures ([http://www.otago.ac.nz/administration/policies/otago I I 6850.html](http://www.otago.ac.nz/administration/policies/otago%20I%206850.html))



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