COURSE DATA

DATA SUBJECT

Code: 36884
Name: Virology
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1111 - Grado en Biotecnología	Facultat de Ciències Biològiques	4	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1111 - Grado en Biotecnología	Optability	ELECTIVES

COORDINATION

MARTINEZ GIL LUIS

SUMMARY

Viruses are unique in nature. They are the smallest of all self-replicating organisms. In their most basic form, viruses consist solely of a small segment of nucleic acid encased in a simple protein shell. Viruses have no metabolism of their own but rather are obliged to invade cells and parasitize subcellular machinery, subverting it to their own purposes. The apparent simplicity of viruses is deceptive. The truth is that as a group, viruses infect virtually every organism in nature, they display a dizzying diversity of structures and life-styles, and they embody a profound complexity of function. The study of viruses¿Virology¿must accommodate both the uniqueness and the complexity of these organisms. The singular nature of viruses has spawned novel methods of experimentation entirely peculiar to the discipline of Virology. The complexity of viruses is constantly challenging scientists to adjust their thinking and their research to describe and understand some new twist in the central dogma revealed in a simple virus infection.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

To successfully complete the course, students must have prior knowledge in Biochemistry, Cell Biology, Molecular Biology, Genetics, and Microbiology.

COMPETENCES / LEARNING OUTCOMES

1111 - Grado en Biotecnología

Actuar con autonomía en el aprendizaje, tomando decisiones fundamentadas en diferentes contextos, emitiendo juicios en base a la experimentación y el análisis y transfiriendo el conocimiento a nuevas situaciones

Colaborar eficazmente en equipos de trabajo, asumiendo responsabilidades y funciones de liderazgo y contribuyendo a la mejora y desarrollo colectivo

Contribuir en el diseño, desarrollo y ejecución de soluciones que den respuesta a demandas sociales, teniendo en cuenta como referente los Objetivos de Desarrollo Sostenible

Demostrar razonamiento crítico y autocrítico en el ámbito de la titulación, considerando aspectos tales como la ética profesional, los valores morales y las implicaciones sociales de las diferentes actividades realizadas

Propose creative and innovative solutions to complex situations or problems, typical of the area of ¿¿¿¿connection, to donate responses to the various professional and social needs

Saber comunicarse de manera efectiva, tanto de forma oral como escrita, adaptándose a las características de la situación y de la audiencia

DESCRIPTION OF CONTENTS

Part I. Introduction to Virology

1. Principles of Virology. History of Virology. Disease burden of viruses across history. Evolutionary origins of viruses. Virus classification. Basic virus structures and genetics.

2. Viral manipulation and diagnosis. Viral isolation. Viral cultivation. Viral assays. Safety measures: BSL2, BSL3 and BSL4.

3. Population biology, diversity, and evolution of viruses. Major viral families. Sources of viral diversity and evolution. Viral mutation and recombination. Viral spread and epidemiology.

4. The viral infection cycle. Virus entry and uncoating. Viral gene expression. Viral replication strategies. Virus assembly. Release. Modes of viral transmission.

5.Pathogenesis of viral infection. Definition and basic concepts in viral pathogenesis. Viral determinants of virulence. Examples of pathogenic viruses.

6. Innate and adaptive immune responses to viral infection. Viral recognition. Antiviral defense. Viral manipulation of innate immunity. Principles of adaptive immune response to virus. Architecture of adaptive immune response. Antigen presentation. Antiviral activities of antibodies and T cells. Viral evasion of humoral and cellular immunity.

Part II. Applied virology and viral biotechnology

7. Antiviral agents. General aspects of antiviral drugs mechanisms. Principles of antiviral therapy. Drug resistance. Drug development. Specific antiviral drugs.

8. Immunization against viral infections. Principles of vaccination. Vaccine-induce immunity. Live virus vaccines. Inactivate virus vaccines. VLP vaccines. Other vaccine approaches. Vaccine production.

9. Biotechnological applications of viruses. Viruses as gene delivery vectors. Viral components with biotechnological applications. Viruses as protein expression systems. Baculoviruses. Phage display. Directed virus evolution.

10. Viruses, therapeutics and disease control. Oncolytic viruses. Phage Therapy. Viruses for plant and insect disease control.

Part III. Viral laboratory

Virology lab. Viral infection and viral growth. Viral quantitation: $TCID_{50}$, HA assay, and plaque assay. BioInformatic analysis of viral sequences and structures.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	35,00
Laboratory	10,00

Total hours	**45,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	0,00
Preparation of lessons	52,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	**52,00**

TEACHING METHODOLOGY

Theoretical Classes: Presentations of the program topics in a conventional classroom. Occasionally, a specific aspect of the syllabus may be presented by a guest specialist. Likewise, efforts will be made to attend research seminars related to the world of virology at research centers near the University.

Questionnaire Sessions: Four question-and-answer sessions will be held throughout the semester.

Journal Club: Students will present a research article directly related to the course content in public. All students will be required to write a brief summary of all the articles covered in the seminars.

Practical Classes: These will consist of practical work in a teaching laboratory (6 hours, 2-hour sessions) and two computer sessions (4 hours, 2-hour sessions). Students will conduct the proposed experiments, working in pairs in the laboratory and individually in the computer sessions. At the end of the internship, students must submit a report in which they present their experimental results and discuss them in the context of protein structure and function from a biotechnological perspective. Attendance at the internship is mandatory.

EVALUATION

The semester-long nature of the course precludes the possibility of midterm exams. Knowledge assessment will be conducted through a written exam worth 9 points. This exam will include concepts related to the theoretical and practical classes.

For new students, attendance at the practicals is mandatory. If the student repeats the course, attendance is not required.

The oral presentation of research articles, written summaries of the articles, and class participation will also be assessed; the sum of these activities will be worth 1 point. To pass the course, students must obtain at least 5 points out of 10. Students must also have obtained a score of at least 50% on each of the assessable elements.

REFERENCES

Fields Virology: Emerging Viruses 7th Edition
by Peter M. Howley MD, David M. Knipe PhD, Sean Whelan