

**COURSE DATA****DATA SUBJECT**

Code: 36855
Name: Pathogens and Diseases
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1106 - Degree in Biology	Facultat de Ciències Biològiques	4	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1106 - Degree in Biology	Optatividad	ELECTIVES

COORDINATION

FOUZ RODRIGUEZ BELEN

MONTERO ROYO FRANCISCO ESTEBAN

SUMMARY

The course 'Pathogens and Diseases' covers the study of the main infectious organisms and parasites of public health concern, as well as the biological processes that determine their ability to cause infection. Through the analysis of interactions between the pathogen and the host, students will gain a comprehensive understanding of the mechanisms of pathogenesis, the virulence factors involved in disease development, and the strategies currently available for prevention, diagnosis and control.

Throughout the module, students will explore in depth the nature of the host-pathogen relationship and the classification of different infectious agents. To this end, representative models of interaction in bacteria, viruses, fungi and parasites will be studied, taking into account fundamental aspects such as their taxonomy and epidemiology. Furthermore, the course will analyse the clinical manifestations associated with the diseases they cause, the molecular and cellular mechanisms underpinning their virulence, and the systems that regulate the expression of the genes involved in these processes. The programme is rounded off with a study of the main diagnostic methodologies and the tools used for the prevention and treatment of diseases, including vaccines and immunostimulants.

PREVIOUS KNOWLEDGE



RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

COMPETENCES / LEARNING OUTCOMES

1106 - Degree in Biology

(CB3) Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.

(CB4) Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.

(CB5) Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

Design and conduct experiments by using scientific techniques and instruments appropriately and complying with laboratory safety regulations.

Organise, plan and manage information in a manner that allows the individual to analyse, synthesise and develop critical reasoning that can be applied to solve problems, make decisions and carry out work.

Recognize the main infectious and parasitic diseases and their etiological agents, as well as understand the host-pathogen interaction mechanisms and the fundamentals of the main therapeutic strategies.

Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.

Use scientific language, both oral and written, and be able to adapt the register to the target audience and/or readers. Use the most common foreign languages in each discipline as a vehicle for communication in a globalised system.

DESCRIPTION OF CONTENTS

Topic 1. Infectious diseases and epidemiology. Transmission and reservoirs. Herd immunity. Characteristics of epidemic diseases. Main bacterial and viral diseases: airborne, contact-transmitted, vector-borne; associated with soil, water and/or food.

Topic 2. Pathogens and their evolution. The concept of a pathogen and classification of pathogens.



Host-pathogen relationship. Pathogenicity and virulence. Horizontal gene transfer and the pan-genome. Pathogenicity islands. Examples of pathogen evolution

Topic 3. Interaction between the pathogen and the host. Entry portals. Adhesion, invasion. Survival strategies within the host: intracellular and extracellular pathogens. Mechanisms of tissue damage. Cellular and epigenetic alterations induced by microorganisms. Persistent infections and microbial oncogenesis.

Topic 4. Regulation of virulence and adaptation to the host. Detection of environmental signals and adaptation to the niche. Gene expression regulatory systems. Collective regulation: quorum sensing. Phenotypic variation and genetic plasticity. Co-ordination of virulence factor expression.

Topic 5. Types of vaccines and immunostimulants. First-generation vaccines: live and inactivated. Second-, third- and fourth-generation vaccines. Strategies for redirecting and enhancing immunity; immunostimulants. Vaccines in use and immunisation schedules in Spain. Stages in the approval process for new vaccines.

Parasites

Topic 6. Animal relationships. Parasites and hosts. Terminology in parasitology. The prevalence of parasitism in the animal kingdom. The origin and evolution of parasitism. Adaptations and pre-adaptations. Parasite-host co-evolution.

Topic 7. Life cycles of parasites. Direct cycles. Indirect cycles. The importance of intermediate hosts in the epidemiology of parasitic diseases.

Topic 8. Diversity of parasites of economic and public health significance. Main groups: unicellular and multicellular. Life cycles and associated pathologies.

Topic 9. Encounter and recognition of the host. Parasitic epidemiology. Parasite invasion mechanisms. Classification based on routes of transmission. Routes of exit. Effects of the parasite on the host. Host countermeasures.

Practical sessions

Block I. Bacteria

P1. Introduction to vibriosis: diagnosis; serological and genetic variability; epidemiology; mechanisms of pathogenicity and control.

P2. Isolation on different culture media.



P3. Identification using conventional methods (morphological, biochemical).

P4. Identification using genetic methods. Multiplex PCR.

P5. Identification using serological methods.

P6. Virulence factors: resistance to host serum.

P7. Treatments: antibiotic susceptibility testing.

Block II. Parasites

P8. Anisakiasis: identification and inactivation of *Anisakis* spp. larvae from fish.

P9. Identification of parasitic forms (I): protists.

P10. Cestodiasis: a case of *Echinococcus granulosus*

P11. Identification of parasitic forms (II): metazoans.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	1,00
Theory	26,00
Laboratory	18,00
Total hours	45,00

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	10,00
Independent study and work	57,50
Preparation of lessons	0,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	67,50

TEACHING METHODOLOGY



The following teaching methodologies will be used for the course activities:

Lectures. Based on the expository/lecture method and on the study and resolution of issues relating to the subject matter covered.

Practical classes. Reinforcement, practice and application of concepts presented in the theory classes. Encouraging active student participation through problem-solving and case studies (presentation and group discussion).

Group/individual tutorials. Sessions to assist students with any problems that arise during the course of both face-to-face and distance learning activities.

Summary of teaching methods:

Lecture

Practical laboratory session

Participatory classes and/or debates

Analysis/case studies/material

EVALUATION

Assessment system	Minimum weighting	Maximum weighting
Assessments consisting of written examinations to assess theoretical content	60%	80%
Assessments consisting of written examinations to assess laboratory practicals	20%	40%
Assessment of laboratory practical sessions: attitude, skills, reports	5%	10%



1. Assessment of theoretical knowledge (70% of the final mark).

The concepts covered in the theory sessions will be assessed through an examination comprising short-answer and multiple-choice questions. The examination will take place at the end of the term in accordance with the timetable approved by the Faculty Board.

2. Assessment of practical knowledge (30% of the final mark).

Work carried out in the laboratory will be assessed on a continuous basis (5%) and through an examination (25%) to be held alongside the theory examination at the end of the term. This examination will contain questions and problems relating to the practical sessions.

Attendance at laboratory practicals is compulsory. In accordance with the University of Valencia's assessment regulations (Art. 6.9), students must attend at least 80 per cent of the sessions, and absences due to force majeure must be duly justified. Students who have not achieved 80 per cent attendance will forfeit their right to sit the practicals examination.

The final mark for the module will be the sum of the mark obtained in Block 1 – Bacteria/Viruses (70 per cent) and that obtained in Block 2 – Parasites (30 per cent). To pass the module, students must pass both the theory and practical components of the two blocks, with a minimum mark of 5 or above.

Students who do NOT sit any part of the final examination in the first sitting (theory and/or practicals) or who fail any part of it will be recorded as '**NOT PRESENT**' in the examination records.

Second announcement:

Students who do not pass the module in the first announcement of the academic year will have their mark for the passed part carried over to the second announcement.

The mark for the laboratory practicals will be carried over to the following academic year if it is 5 out of 10 or above.

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REFERENCES

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References are supplemented by review articles that are updated annually.