

Microbial Genomics

Code: 100983
ECTS Credits: 6

2024/2025

Degree	Type	Year
2500502 Microbiology	OT	4

Contact

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Teaching groups languages

You can view this information at the [end](#) of this document.

Prerequisites

It is recommended to have taken subjects related to Molecular Biology of Prokaryotes and Bioinformatics.

Objectives and Contextualisation

The main objective of this course is to broaden the vision of microbial genomics and the molecular and bioinformatics techniques used as well as their current and future applications.

Learning Outcomes

1. CM11 (Competence) Propose strategies for molecular cloning, mutant generation and genetic improvement using omics analysis with ethical responsibility and gender perspective to provide innovative responses to the needs and demands of society.
2. CM12 (Competence) Integrate knowledge and skills of molecular biology and genomics to develop and present academic work in the field of microbiology, either in English or in one's own language or others and working individually and in groups.
3. KM18 (Knowledge) Identify the methods of study of nucleic acids for their sequencing, modification and interpretation of their expression products.
4. SM15 (Skill) Use bibliography and databases related to molecular biology and genomics, both in English and in one's own language.
5. SM17 (Skill) Apply omics tools (genomics, transcriptomics, proteomics, metagenomics, etc.) to solve problems related to molecular biology and the study of populations and communities.

Content

The students will work on the following contents within the scope of microbiology:

- Methods for the study of genomics
- Genomic analysis

- Prokaryotic species concept and taxogenomics
- Structural genomics and evolution of genomes
- Comparative genomics. Core and accessory genome and pangenome
- Functional genomics: from genome to function
- Population genomics of microorganisms
- Genomic structure of microbial communities
- Pathogenomics and other omics
- Current challenges of microbial genomics and case studies.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	3	0.12	CM11, CM12, KM18, CM11
Problem/Project-Based Learning	37	1.48	CM11, CM12, KM18, SM15, SM17, CM11
Type: Supervised			
Tutorship	3	0.12	CM11, CM12, KM18, SM17, CM11
Type: Autonomous			
Integrate information and generate hypotheses	20	0.8	CM11, CM12, CM11
Preparation of the work plans, reports and oral presentations	21	0.84	CM11, CM12, KM18, SM15, SM17, CM11
Reading specialized texts	40	1.6	KM18, SM15, KM18
Search and management of information	20	0.8	KM18, SM15, SM17, KM18

This course will be taught mostly following the problem-based learning (PBL) method with two different approaches. The class group will be divided into small groups that will independently work two problems and one project. For the last case the teams could choose between different types of problems and the goal is to propose a project. At the beginning of each problem there will be a participatory lecture to introduce key concepts. Each of the problems will last approximately 13 classroom sessions, including the evaluation tests.

The student's role will be to actively participate in the working group, to assign group moderator roles, spokesperson and activities coordinator to the group members. They should also work individually to research, select and manage the information to share, discuss and re-elaborate the new knowledge with their workgroup. Finally, the group will prepare reports, present and/or discuss with the rest of the class the knowledge acquired, its application in the context of the problem and in other contexts. The groups could also present scientific articles relevant to each problem as seminars.

The role of professors will be to facilitate the learning process, stimulate group discussions and critical thinking, provide the necessary tools for students to build knowledge and guide them. If necessary, some additional participatory master classes can be performed. As supervised activities and to support the learning activities indicated above, individual and collective mentoring will be possible. At the beginning of the course, teachers will explain to the students the organization of the subject and will give the working guidelines.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Assessment of delivery Problem 1	20%	0	0	CM11, CM12, KM18, SM15, SM17
Assessment of delivery and presentation Problem 2	20%	1	0.04	CM11, CM12, KM18, SM15, SM17
Assessment of delivery and presentation Problem 3	20%	2	0.08	CM11, CM12, KM18, SM15, SM17
Individual self-evaluation	5%	0.5	0.02	CM11, CM12
Problem 1 Individual written exam	15%	1	0.04	CM11, CM12, KM18, SM15, SM17
Problem 2 individual written exam	15%	1	0.04	CM11, CM12, KM18, SM15, SM17
Teamwork self-assessment	5%	0.5	0.02	CM11, CM12

The evaluation of the subject consists of three units associated with each of the proposed problems. The evaluation of each unit will be made according to the following distribution:

1. Exams associated with each problem. Consistent in a specific written test or oral presentation where the course-specific competencies, concepts and methodologies worked on each problem is assessed. Only for problems 1 and 2. Weigh 15% each.
2. Deliveries and/or reports associated with the problem. The report may consist of a written assignment and/or an oral presentation. The number and specific weight of each delivery, report, and/ or co-evaluation activity, as well as their format, will be indicated in the problem presentation session. Global weight 60%.
3. Self-assessment of individual and teamwork. Each member of the group should evaluate himself/herself and the functioning of the team in solving the problem. The maximum mark is 1.0 points out of 10 (10%).

Optional seminars and active and creative participation in class/forum may add up to 1 point on the final grade of the subject. In some cases, co-evaluations of other students' seminars will be carried out.

To pass each unit the student must obtain at least a score of 4.5 points out of 10 in the individual exams. If the student does not pass any of the individual written tests, he/she will perform a retake examination. To be eligible for the retake process, the student should have been previously evaluated in a set of activities equaling at least two-thirds of the final score of the course or module.

To pass the subject, it is mandatory to attend a minimum of 20 classroom sessions, including attendance at the working sessions of the class group, whose date of celebration will be established during the course development. The absence without justification or non-profit of the classroom sessions may subtract up to 1 point from the final grade of the subject.

The students pass the course when the average mark of the evaluation activities is equal to or greater than 5.

The student will be graded as "Non-evaluable" if the weight of all conducted evaluation activities is less than 67% of the final score.

For those students who choose the single assessment system, this assessment will consist of a single written test in which the contents of the entire program of the subject will be evaluated. The test will consist of multiple choice questions, other types of short questions and topics to be developed. The grade obtained in this test will account for 30% of the final grade. In addition, students will deliver all the reports related to the different problems addressed during the course (65% of the final mark) and will do a self-assessment of their achievement (5%). The format and content of these reports will be indicated at the beginning of the course and could be different from the problems developed during the regular course. These students will be able to participate in classroom sessions and be part of group work without affecting the functioning of the teams. The single assessment test and the deadline for deliveries will coincide with the date of the last assessment activity. The same system for the retake examination and revision of the final qualification and the same criteria for passing will be applied as for the continuous evaluation.

Bibliography

It is the responsibility of the student to seek the bibliography necessary for the resolution of the problems raised. To do this he/ she can be advised by the teachers. Still the following textbooks are recommended for basic concepts on genomics concepts and case studies.

- Genome and Genomics: From Archaea to Eukaryotes. Chaitanya, K. V. 2019. Singapore: Springer Singapore Pte. Limited.

https://bibcercador.uab.cat/permalink/34CSUC_UAB/1c3utr0/cdi_askewsholts_vlebooks_9789811507021

- The Pangenome Diversity, Dynamics and Evolution of Genomes / Edited by Hervé Tettelin, Duccio Medini. Ed. Hervé. Tettelin and Duccio. Medini. 1st ed. 2020. Cham: Springer International Publishing.

https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991010360498206709

- Population Genomics: Microorganisms Edited by Martin F. Polz, Om P. Rajora. Ed. Martin F. Polz and Om P. Rajora. 1st ed. 2019. Cham: Springer International Publishing.

https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991010404004706709

- Bacterial Pathogenomics. Editor(s):Mark J. Pallen Editor-in-chief, Karen E. Nelson, Gail M. John Wiley & Sons, Inc., 2014. https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991010350952606709

- Microbial Functional Genomics. Zhou, Jizhong, Dorothea K Thompson, and James M Tiedje. 2004. Hoboken: John Wiley & Sons, Incorporated.

https://bibcercador.uab.cat/permalink/34CSUC_UAB/1c3utr0/cdi_proquest_ebookcentral_EBC3056645

Software

There is no specific software for this subject. Each team will prepare its own list of software throughout the course according to the needs that arise from each problem.

Language list

Name	Group	Language	Semester	Turn
(TE) Theory	74	Spanish	second semester	morning-mixed

PROVISIONAL