UAB
Universitat Autònoma de Barcelona

Plant Systems Biology

2026/2027

Code: 44787
Credits: 6

Degree programme	Type	Course
Plant Biology, Genomics and Biotechnology	OP	1

Contact lecturer

Name : Ana Martin Hernandez
Email : anamontserrat.martin@uab.cat

Teaching staff

Juan Jose Lopez-Moya Gomez
Elena Monte Collado

Teaching staff (external to UAB)

Antoni Gacia-Molina
Iban Eduardo
Jae-Seong Yang
Nicolas Bologna

Group languages

You can consult this information at the end of the document.

Prerequisites

Basic knowledge of Genetics and Molecular Biology

Objectives

To provide students with a comprehensive and current view of the techniques, fundamentals and applications of Plant Genomics and introduce systems biology of plants. The specific objectives include understanding the following aspects: the diversity and complexity of plant genomes, the techniques commonly used in genomics, transcriptomics, proteomics and metabolomics studies and applications to the genetic improvement of crop plants. The objectives also include the use of predictive modelling through integration of different omics data.

Learning outcomes

- CA12 (Use new bioinformatic tools to describe predictive models of experimental omics data in the fields of Plant Biology, Genomics and Biotechnology.) Use new bioinformatic tools to describe predictive models of experimental omics data in the fields of Plant Biology, Genomics and Biotechnology.
- CA17 (Apply scientific terminology to argue the results of research in terms of the genetic improvement of crop plants and communicate them orally and in writing in an international environment.) Apply scientific terminology to argue the results of research in terms of the genetic improvement of crop plants and communicate them orally and in writing in an international environment.
- KA15 (Describe the results of data analysis derived from proteomic and metabolomic studies applied to crop breeding.) Describe the results of data analysis derived from proteomic and metabolomic studies applied to crop breeding.
- KA16 (Select study methodologies in plant genomics and case studies across multiple omics data.) Select study methodologies in plant genomics and case studies across multiple omics data.
- SA28 (Communicate research results in the field of Plant Biology, Genomics and Biotechnology in English orally and in writing using appropriate scientific terminology.) Communicate research results in the field of Plant Biology, Genomics and Biotechnology in English orally and in writing using appropriate scientific terminology.
- SA29 (Apply knowledge of molecular genetics and plant breeding in different scientific and industrial fields.) Apply knowledge of molecular genetics and plant breeding in different scientific and industrial fields.
- SA30 (Apply the methods and techniques commonly used in genomic, phenomic, transcriptomic, proteomic and metabolomic studies.) Apply the methods and techniques commonly used in genomic, phenomic, transcriptomic, proteomic and metabolomic studies.
- SA31 (Apply bioinformatic tools to the genetic, evolutionary and functional study of plants and interpret the results obtained from the experiments carried out.) Apply bioinformatic tools to the genetic, evolutionary and functional study of plants and interpret the results obtained from the experiments carried out.

Contents

Systems Biology: Concepts, methodology, and case studies using multiple omics.

The case study will focus on the emergence of a new disease that affects and kills all tomato varieties. The students

will make a trip through all the -omics to unveil the cause and search for a scientific solution feasible for

application in crop plant breeding.

Specifically,

We will use practical applications of methods and techniques in plant phenomics and genomics, including the

use of molecular markers in breeding. Importance of QTL in this problem.

Analysis and application of data arising from genomics and transcriptomics studies to narrow down the problem.

Analysis and application of data arising from proteomics, interactomics, and metabolomics studies to find a

solution to the problem.

Integrative analysis of the applied case study, including Computational modelling, for crop plant breeding.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes

Lectures and expert's talks	12	0.48
Personal study	84	3.36
Preparation of reports	35	1.4
Problems and case studies	18	0.72

Lectures and Expert talks

Problems and case studies

Preparation of reports.

Personal study

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	Weight	Hours	ECTS	Learning outcomes
Final quiz	30%	1	0.04	CA12, CA17, KA16, SA29, SA30
Lectures and expert's talks	Continuous evaluation of students participation	0	0	CA12, CA17, KA15, KA16, SA29, SA30, SA31
Report	60%	0	0	CA12, CA17, KA15, KA16, SA28, SA29, SA30, SA31

Continuous evaluation 10%

Report 60%

Final Quiz 30%

This subject/module does not include the single assessment system.

For this module, the use of Artificial Intelligence (AI) technologies is allowed exclusively in support tasks, such as bibliographic or information search, text correction or translations. The student must clearly identify which parts have been generated using this technology, specify the tools used and include a critical reflection on how these have influenced the process and the final result of the activity. The lack of transparency in the use of AI in this assessable activity will be considered a lack of academic honesty and may lead to a partial or total penalty in the grade of the activity, or greater sanctions in serious cases.

Bibliography

Yunbi Xu Molecular Plant Breeding. CAB International Oxfordshire, UK disponible online a Biblioteca UAB

:http://www.cabi.org/cabebooks/FullTextPDF/2010/20103101750.pdf

Articles and specific reviews recommended during classes

Software

MapQTL 6.0

JoinMap 5.0

R

RStudio

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this link. To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TEm) Theory (master)	1	English	second semester	morning-mixed
(PAULm) Classroom practices (master)	1	English	second semester	morning-mixed