Subject identification

Subject 10008 - Eco-physiological Techniques
Credits 1.44 attended (36 Hours) 5.56 non-attended (139 Hours) 7 total (175 Hours).
Group Group 1, 2S
Semester
Teaching language

Lecturers

Lecturers	Office hours for students					
	Start time	End time	Dia	Start date	End date	Despatx
Miquel Ribas Carbó mribas@uib.cat	There are no sessions set					
Jaume Flexas Sans jaume.flexas@uib.es	There are no sessions set					

Degrees where the subject is taught

Degree	Character	Course	Studies
Master in Biology of Plants in Mediterranean Conditions	Optional		Postgraduate degree

Contextualisation

Plant ecophysiology is under a wide expansion in the recent years thanks to the development of suitable techniques to assess processes related to plant water relations, carbon gain, growth and productivity. The aim of this course is to provide the theoretical basis of the most widely used techniques, as well as to initiate students in their practical use.

Requirements

Recommended

It is recommendable that students have basic knowledge of plant ecophysiology, as well as sufficient capacity to read papers in English

Skills

Specific

1. Capacity to use techniques to assess plant water relations, including energy and gravimetrical techniques.
2. Knowledge on isotope techniques for ecophysiological measurements.
3. Competence in the use of combined gas exchange and chlorophyll fluorescence to assess plant photosynthesis and respiration.
4. Aptitude to apply models for ecophysiological data analysis.

General

1. Capacity to understand the fundamentals of the most commonly used techniques in ecophysiology.
2. Ability to correctly use he most commonly used techniques in ecophysiology.

Content

Thematic content

Introduction. Introduction

Introduction to the range of techniques used in plant ecophysiology.

Water relations. Water relations

Description and fundamentals of gravimetric and energy-based measurements of plant water content, water potential, its components, and water relations.

Spectroscopic techniques. Spectroscopic techniques

Description of the most widely used spectroscopic techniques in ecophysiology, including details on remote sensing.

Detailed background and technical specificatiosn of chlorophyll fluorescence measurements.

Gas exchange analysis. Gas exchange analysis

Fundamentals of gas exchange analysis for the assesment of photosynthesis and respiration.

Detailed use of oxygen electrodes and infra-red gas analysers.

Introduction to eddy correlation techniques.

Stable isotopes. Stable isotopes

Fundamentals of stable isotope-based techniques for the assesment of water relations, respiration, photosynthetic type and mesophyll conductance to CO2

Preparation of dry matter samples for carbon isotope analysis

Photosynthesis models. Photosynthesis models

Introduction to photosynthesis models and their use in ecophysiology studies and prediction of plant productivity.

Application of the most common models to data obtained in situ.

Teaching methodology

Attended activities

Type	Name	G. type	Description
Theory classes	Theory	Large group (G)	Aim: presentation of the fundamentals of all the techniques to be used Methodology: lectures
Seminars and workshops	Seminar	Medium group (M)	Aim: discussing details of the techniques learned Methodology: discussion of previously read articles
Practical classes	Data analysis	Medium group (M)	Aim: application of photosynthesis models to data obtained in the field Methodology: computer-based analysis of data
Laboratory classes	Practices	Medium group 2 (X)	Aim: introduction to the practical use of the techniques Methodology: field measurements using adequate equipment
Assessment	Evaluation	Large group (G)	Aim: evaluating knowledge Methodology: written exam

Non-attended activities

Type	Name	Description
Individual self-study	Study	Aim: studying the contents of lectures Methodology: study
Individual self-study	Paper term	Aim: to deepen in the knowledge of particularly selected techniques Methodology: reading, understanding, summarizing and orally presenting the main aspects of a paper read on a particular methodology
Group self-study	Data analysis	Aim: acquaring practice in model application and data analysis Methodology: analyzing given data

Workload estimate

Type	Name	Hours	ECTS	%
Attended activities		**36**	**1.44**	**20.57**
Theory classes	Theory	15	0.6	8.57
Seminars and workshops	Seminar	3	0.12	1.71
	Total	**175**	**7**	**100**

Type	Name	Hours	ECTS	%
Practical classes	Data analysis	4	0.16	2.29
Laboratory classes	Practices	12	0.48	6.86
Assessment	Evaluation	2	0.08	1.14
Non-attended activities		**139**	**5.56**	**79.43**
Individual self-study	Study	60	2.4	34.29
Individual self-study	Paper term	60	2.4	34.29
Group self-study	Data analysis	19	0.76	10.86
	Total	**175**	**7**	**100**

At the beginning of the semester the subject schedule will be available to students through the UIBdigital platform. This schedule will at least include the dates for the continuous assessment exams and assignment deadlines. Furthermore, the lecturer will inform students as to whether the subject syllabus will be carried out according to the schedule or otherwise, including Campus Extens.

Student learning assessment

Seminar

Type	Seminars and workshops
Technique	Other methods **(Non-recoverable)**
Description	Aim: discussing details of the techniques learned Methodology: discussion of previously read articles
Assessment criteria	Quality and clarity of presentation

Final mark percentage: 20% for pathway A

Data analysis

Type	Practical classes
Technique	Real or simulated task performance tests **(Non-recoverable)**
Description	Aim: application of photosynthesis models to data obtained in the field Methodology: computer-based analysis of data
Assessment criteria	Accuracy of the results obtained

Final mark percentage: 10% for pathway A

Evaluation

Type	Assessment
Technique	Short-answer tests **(Non-recoverable)**
Description	Aim: evaluating knowledge Methodology: written exam
Assessment criteria	Achievement of precise knowledge on the fundamentals and applications of the learned techniques

Final mark percentage: 40% for pathway A

Paper term

Type	Individual self-study
Technique	Oral tests **(Non-recoverable)**
Description	Aim: to deepen in the knowledge of particularly selected techniques Methodology: reading, understanding, summarizing and orally presenting the main aspects of a paper read on a particular methodology
Assessment criteria	Quality and clarity of understanding and summarizing

Final mark percentage: 20% for pathway A

Data analysis

Type	Group self-study
Technique	Student internship dissertation **(Non-recoverable)**
Description	Aim: acquaring practice in model application and data analysis Methodology: analyzing given data
Assessment criteria	Accuracy of the results obtained

Final mark percentage: 10% for pathway A

Resources, bibliography and additional documentation

Basic bibliography

Boyer, JS (1995) Measuring the water status of plants and soils. Academic Press Inc., San Diego.

Long, S.P. and Bernacchi, C.J. (2003) Gas exchange measurements, what can they tell us about the underlying limitations to photosynthesis' Procedures and sources of error. Journal of Experimental Botany 54, 2393-2401.

Maxwell, K. and Johnson, G.N. (2000) Chlorophyll fluorescence - a practical guide. Journal of Experimental Botany 51, 659-668.

Dawson, T.E. and Brooks, P.D. (2001) Fundamentals of stable isotope chemistry and measurements. In: Unkovich M, Pate J, McNeill A, Gibbs DJ (eds) Stable isotope techniques in the study of biological processes and functioning of ecosystems. Kluwer Academic Publishers, Dordrecht, pp 1-18

von Caemmerer, S. (2000) Biochemical models of leaf photosynthesis. Techniques in Plant Sciences No. 2. CISRO Publishing, Australia.

Additional bibliography

To be provided during the course