



Proyecto/Guía docente de la asignatura

Project/Course Syllabus

Asignatura <i>Course</i>	Conservation and improvement of forest genetic resources		
Materia <i>Subject area</i>			
Módulo <i>Module</i>	Optativo		
Titulación <i>Degree Programme</i>	Grado en Ingeniería Forestal y del Medio Natural Semestre Internacional de la ETS Ingenierías agrarias		
Plan <i>Curriculum</i>	449 / 903	Código <i>Code</i>	47138
Periodo de impartición <i>Teaching Period</i>	2nd quarter	Tipo/Carácter <i>Type</i>	Elective
Nivel/Ciclo <i>Level/Cycle</i>	Grade	Curso <i>Course</i>	4º
Créditos ECTS <i>ECTS credits</i>	3		
Lengua en que se imparte <i>Language of instruction</i>	English		
Profesor/es responsable/s <i>Responsible Teacher/s</i>	Jonatan Niño Sánchez PhD candidate		
Datos de contacto (E-mail, teléfono...) <i>Contact details (e-mail, telephone...)</i>	jonatan.nino@uva.es +34979108416		
Departamento <i>Department</i>	Plant production and forest resources		
Fecha de revisión por el Comité de Título <i>Review date by the Degree Committee</i>	30 de junio 2026		



1. Situación / Sentido de la Asignatura

Course Context and Relevance

1.1 Contextualización

Course Context

This course provides students with the scientific basis, technical knowledge, and strategic perspective required for the conservation and improvement of forest genetic resources. Genetic variability is essential both for evolutionary adaptation and for supporting breeding programs aimed at sustainable forest management. Students will explore the global state of forest genetic resources, threats to their diversity, and tools for their conservation and improvement under current environmental and socio-economic challenges.

1.2 Relación con otras materias

Connection with other subjects

- Plant biology and botany
- Genetics and plant breeding
- Ecology
- Silviculture

1.3 Prerrequisitos

Prerequisites

- Basic knowledge of Biology, Genetics, and Forest Ecology.
- Ability to read and communicate in English.
- Interest in biodiversity, sustainability, and forest management.

2. Resultados del proceso de formación y de aprendizaje (RD 822/2021) o competencias (RD 1393/2007)***Learning outcomes (RD 822/2021) or competences (RD 1393/2007)*****2.1 (RD1393/2007) Competencias Generales*****General Competences***

All general competences (G1 to G27) will be fulfilled. Especially:

- G3: Analytical and synthesis skills: Ability to interpret, structure, and integrate complex biological and environmental data.
- G5: Communication skills: Capacity for oral and written expression in both academic and technical contexts, including English-language scientific materials.
- G8: Teamwork and collaboration: Ability to work effectively in interdisciplinary and multicultural teams.
- G1: Critical thinking and autonomous learning: Ability to evaluate information critically and independently manage learning processes.

2.2 (RD1393/2007) Competencias Específicas***Specific Competences***

- Understanding of genetic diversity and its relevance in forest ecosystems, breeding programs, and conservation planning.
- Ability to identify and assess threats to forest genetic resources at local, regional, and global levels.
- Capacity to design and justify conservation strategies (in situ, ex situ, and circa situ) based on ecological, genetic, and socio-economic criteria.
- Knowledge of forest tree breeding programs, including their phases, selection methods, and expected outcomes.
- Ability to apply principles of population and quantitative genetics to forest resource management and improvement.
- Capacity to critically evaluate the ethical and legal aspects of forest genetic conservation and biotechnology.



3. Objetivos

Course Objectives

Upon completing this course, students will be able to:

1. Define and explain key genetic concepts and principles of forest genetics.
2. Understand the global context of forest genetic resources conservation.
3. Identify risks to genetic diversity and apply suitable conservation strategies.
4. Distinguish between in situ, ex situ and circa situ approaches.
5. Describe the steps and objectives of forest tree breeding programs.
6. Apply genetic knowledge to real-world conservation and improvement scenarios.
7. Develop a critical and ethical view on genetic interventions in forestry.



**4. Contenidos y/o bloques temáticos****Course Contents and/or Modules****Module 1: Foundations of forest genetics and genetic resources**

Carga de trabajo en créditos ECTS: 0,5
Workload in ECTS credits:

a. Contextualización y justificación**a. Context and rationale**

This introductory block establishes the conceptual basis of forest genetics and genetic resources. It explores the importance of genetic variation for adaptation and resilience and introduces international definitions and frameworks. The contents prepare students for more applied conservation and breeding strategies in later modules.

b. Objetivos de aprendizaje**b. Learning objectives**

1. Define forest genetic resources and genetic diversity at different levels.
2. Explain key concepts in forest population genetics.
3. Identify the main international institutions and frameworks involved in genetic resource conservation.

c. Contenidos**c. Contents**

- Concepts of genetic variability and population structure
- Genetic erosion and its consequences
- Definitions and scope of forest genetic resources
- Institutional frameworks

d. Métodos docentes**d. Teaching and Learning methods**

See section 5

e. Plan de trabajo**e. Work plan**

See section 6

f. Evaluación**f. Assessment**

See section 7

Module 2: Global conservation strategies for forest genetic resources



Carga de trabajo en créditos ECTS: 1
Workload in ECTS credits:

a. Contextualización y justificación***a. Context and rationale***

This module focusses on global strategies of forest genetics resources conservation. It explores the importance of genetic variation in global context and enhances the relevance of plan of actions for conservation strategies.

b. Objetivos de aprendizaje***b. Learning objectives***

1. Realize of the importance of forest genetic resources at global level.
2. Understand how to prepare a conservation of forest genetic resources at tree species level.

c. Contenidos***c. Contents***

- Forest genetic resources in the world: Relevance, current status, drivers of loss
- Conservation strategies: *In situ*, *ex situ*, *circa situm*.
- Plan of actions for preserving forest genetics resources

d. Métodos docentes***d. Teaching and Learning methods***

See section 5

e. Plan de trabajo***e. Work plan***

See section 6

f. Evaluación***f. Assessment***

See section 7

Module 3: Genetic improvement and forest tree breeding

Carga de trabajo en créditos ECTS: 1,5
Workload in ECTS credits:

a. Contextualización y justificación***a. Context and rationale***

This module explores how genetic principles are applied in forest tree breeding programs aimed at improving productivity, adaptation, and resistance. Students will understand selection methods and breeding cycles, as well as how to balance genetic gain with the conservation of variability.

b. Objetivos de aprendizaje***b. Learning objectives***

1. Describe the main objectives and stages of forest breeding programs.
2. Apply basic concepts of quantitative genetics to evaluate forest populations.
3. Compare selection methods and breeding strategies.
4. Understand the relationship between genetic improvement and conservation.

c. Contenidos***c. Contents***

- Objectives and phases of forest tree breeding
- Mass selection, progeny testing, family selection
- Genetic gain and heritability
- Breeding populations vs. conservation stands
- Examples of breeding programs in different species

d. Métodos docentes***d. Teaching and Learning methods***

See section 5

e. Plan de trabajo***e. Work plan***

See section 6

f. Evaluación***f. Assessment***

See section 7

g. Material docente***g. Teaching material*****g.1 Bibliografía básica*****Required Reading***

- Wintheiser, T. (2023). Forest Genetics and Tree Breeding. White Press Academic. (new comprehensive treatment of breeding techniques)
- FAO & IPGRI (2024). Forest Genetic Resources Conservation and Management: In Plantations and Genebanks. United Book Prints. (latest ex situ conservation guide)

g.2 Bibliografía complementaria***Supplementary Reading***

- Lebedev, V., Jurcic, S., & Grattapaglia, D. (2024). "Genomic selection in forest trees comes to life: unraveling its potential." *Frontiers in Plant Science*, 15, 1462285.
- Grattapaglia, D. (2022). "Twelve Years into Genomic Selection in Forest Trees." *Forests*, 13(10), 1554.
- Young, A., Boshier, D., & Boyle, T. (2000). *Forest Conservation Genetics: Principles and Practice*. CSIRO Publishing.
- FAO, IPGRI (2021). *State of the World's Forest Genetic Resources*. FAO Report.
- Frankham, R., Ballou, J. D., & Briscoe, D. A. (2010). *Introduction to Conservation Genetics*, 2nd Ed. Cambridge University Press.
- Neale, D. B., & Kremer, A. (2011). "Forest tree genomics: growing resources and applications." *Nature Reviews Genetics*, 12(2), 111–122.
- Choda, P. K. (2023). *Genetic Techniques in Forest Tree Breeding*. American Academic Publishers.

- Aitken, S. N. (2023). Conservation and Management of Forest Genetic Resources. American Academic Publishers.

g.3 Otros recursos telemáticos (píldoras de conocimiento, blogs, videos, revistas digitales, cursos masivos (MOOC), ...)

Additional Online Resources (microlearning units, blogs, videos, digital journals, massive online courses (MOOC), etc.)

- FAO FGR Platform: <https://www.fao.org/forestry/en/>
- EUFORGEN: <https://www.euforgen.org>
- APFORGEN: <https://www.apforgen.org> TreeGenes Database. Forest tree genome and trait information.
- Moodle UVa Virtual Campus – Course materials, forums, peer assessment tools.
- PI@ntNet – Collaborative phenotyping and species identification platform.

h. Recursos necesarios

Required Resources

i. Temporalización

Course Schedule

CARGA ECTS <i>ECTS LOAD</i>	PERIODO PREVISTO DE DESARROLLO <i>PLANNED TEACHING PERIOD</i>
3	Second quarter

5. Métodos docentes y principios metodológicos

Instructional Methods and guiding methodological principles

Guiding Methodological Principles

- Constructive alignment: All teaching activities, learning outcomes, and assessment tools are interconnected to ensure coherence and measurable skill development.
- Progressive cognitive development: Learning evolves from understanding basic concepts to analyzing complex systems and applying genetic strategies in forestry.
- Student-centered learning: Students are active participants in their learning process through seminars, case studies, and individual tasks.
- Contextualized knowledge: Theoretical concepts are linked to real-world examples and global conservation and breeding programs.
- Scientific and ethical literacy: The course promotes responsible use of biotechnology and critical thinking in decision-making processes related to biodiversity and genetic manipulation.

Instructional Methods

- Interactive lectures: Short theoretical inputs with problem-based questions and visual aids.
- Case-based learning: Real examples of conservation and improvement programs discussed in class.
- Individual project: Student selects a species and proposes a conservation or breeding strategy.
- Guided reading and concept mapping: Structured reading of technical literature to support independent learning.

6. Tabla de dedicación del estudiantado a la asignatura

Student Workload Table

ACTIVIDADES PRESENCIALES o PRESENCIALES o A DISTANCIA ⁽¹⁾ FACE-TO-FACE/ ON-SITE or ONLINE ACTIVITIES ⁽¹⁾	HORAS HOURS	ACTIVIDADES NO PRESENCIALES INDEPENDENT / OFF-CAMPUS WORK	HORAS HOURS
Interactive lectures	20	Independent study and reading	20
Problem-solving sessions	5	Practice problems and problem set resolution	10
Field trip	5	Preparation of individual project	15
Total presencial <i>Total face-to-face</i>	30	Total no presencial. <i>Total non-face-to-face</i>	45
TOTAL presencial + no presencial <i>Total</i>			75

7. Sistema y características de la evaluación

Assessment system and criteria

INSTRUMENTO/PROCEDIMIENTO ASSESSMENT METHOD/PROCEDURE	PESO EN LA NOTA FINAL WEIGHT IN FINAL GRADE	OBSERVACIONES REMARKS
Written exam	50 %	Short-answer questions on conceptual content
Individual Project	50 %	

CRITERIOS DE CALIFICACIÓN ASSESSMENT CRITERIA
- Convocatoria ordinaria. First Exam Session (Ordinary) ... - Convocatoria extraordinaria^(*) Second Exam Session (Extraordinary / Resit) ^(*): ...

8. Consideraciones finales

Final remarks

The use of Generative Artificial Intelligence (AI) is permitted for certain tasks in this course. To find out which tasks allow its use, it is advised to carefully review the specific instructions for each task when they are posted on the virtual campus, announced in class, included in the course schedule, and/or detailed in the syllabus. It is recommended to use only the tools for which the University of Valladolid holds a license and to understand the implications of each license regarding privacy and data usage by these tools. It is the student's responsibility to be aware of these specific permissions. Each assignment must include a declaration of which specific tools were used and how Generative AI was employed. The exact format for this declaration will be announced in due course in class and on the virtual campus.

