

## 28943 - Plant breeding

### Syllabus Information

**Academic Year:** 2019/20

**Subject:** 28943 - Plant breeding

**Faculty / School:** 201 - Escuela Politécnica Superior

**Degree:** 437 - Degree in Rural and Agri-Food Engineering  
583 - Degree in Rural and Agri-Food Engineering

**ECTS:** 6.0

**Year:** 4

**Semester:** First semester

**Subject Type:** Optional

**Module:** ---

### 1.General information

#### 1.1.Aims of the course

#### 1.2.Context and importance of this course in the degree

#### 1.3.Recommendations to take this course

### 2.Learning goals

#### 2.1.Competences

#### 2.2.Learning goals

#### 2.3.Importance of learning goals

### 3.Assessment (1st and 2nd call)

#### 3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

### 4.Methodology, learning tasks, syllabus and resources

#### 4.1.Methodological overview

#### 4.2.Learning tasks

#### 4.3.Syllabus

**The course will address the following topics:**

#### **Theory programme**

COURSE PRESENTATION

Introduction and methodology

Internet-Intranet.

Section 1. INTRODUCTION TO GENETIC PLANT IMPROVEMENT (3 weeks)

*Elements of general genetics*

1. Introduction.
2. Mendelian genetics. Single gene inheritance. Several genes, genetic interaction.
3. Quantitative genetics. Biometric models for working with quantitative features.
4. Population genetics. Hardy-Weimberg equilibrium. Evolution of genetic frequencies in populations. Evolutionary

dynamics of cultivated plants.

5. Molecular genetics. Fine structure of the gene. Sequencing, cloning.

## Section 2. GENETIC VARIABILITY AND SYSTEMS OF REPRODUCTION (3 weeks)

*The plant material, floral and reproductive biology.*

1. Mechanisms of reproduction.
2. Sexual reproduction, genetic consequences.
3. Mechanisms that promote selfing.
4. Mechanisms promote cross-fertilisation.
5. Asexual reproduction, genetic consequences.
6. Determining the mode of reproduction.

*Geographic distribution and the origin of cultivated plants.*

1. Centres of origin and of diversity.
2. Micro-centres of diversity.
3. Where and when agriculture arose.
4. The domestication of plants as a method of improvement.

*Philogenetic resources*

1. Definition. Genetic erosion.
2. Search and conservation.
3. Conditions and techniques of conservation.

## Section 3. METHODS OF IMPROVEMENT FOR SELF-POLLINATING AND CROSS-POLLINATING SPECIES. METHODS OF IMPROVEMENT FOR VEGETATIVE REPRODUCTION SPECIES (5 weeks)

*Methods of improvement for self-pollinating plants*

1. Methods without crossing: Individual and massal selection.
2. Methods with crossing: Massal method, genealogical method, progeny from a single seed.
3. Backcrossing.

*Methods of improvement for cross-pollinating plants*

1. Massal selection.
2. Hybrid varieties.
3. Synthetic varieties.
4. Recurrent selection.

*Methods of improvement for vegetative reproduction*

1. Clonal selection. Hybridization.

## Section 4. BIOTECHNOLOGICAL TECHNIQUES (5 weeks)

*?In vitro? cultivation and somaclonal variation.*

5. Concept of ?in vitro? cultivation.
6. The ?in vitro? cultivation laboratory.
7. Types of cultivation, Somatic hybridization and the fusion of protoplasts.
8. Application of ?in vitro? cultivation in genetic plant improvement.

*Genetic engineering.*

7. The controlled transfer of genes by means of genetic engineering.
8. Methods of obtaining transgenic plants: The use of *Agrobacterium*, electroporation, gene bombardment.
9. Strategies for improving specific characteristics.
10. Limitations and perspectives.
11. Legislation and standards framework.

*Selection aids and molecular markers.*

4. Phenotypical or morphological markers.
5. Molecular types of markers and utilities.

## Section 5. THE CONSERVATION OF VARIETIES AND SEED PRODUCTION (1 week)

*Concept of variety and production of improved seeds*

12. Categories of seeds and nursery plants.
13. Spanish legislation concerning the protection of varieties.
14. Spanish legislation concerning seed production.

## **Practical programme**

The practicals correspond to the resolution of cases associated with each of the Sections and are carried out in coordination with the theory part.

Also, three laboratory sessions are planned, each lasting 2 hours, which will be carried out in the plant production laboratory facilities of the EPS in Huesca. Aspects complementing the theory part will be studied in them.

#### **4.4.Course planning and calendar**

#### **4.5.Bibliography and recommended resources**

**BB** Cubero Salmerón, José Ignacio. Introducción a la mejora genética vegetal / José Ignacio Cubero . 2ª ed. rev. y amp. Madrid [etc.] : Mundi-Prensa, 2003

The updated recommended bibliography can be consulted in:

<http://psfunizar7.unizar.es/br13/egAsignaturas.php?codigo=28943&Identificador=14209>