School of Agriculture
Course Unit Syllabus

Level of qualification:
First cycle (EQF level 6) - Bachelor
Study cycle:
Agronomy

Course Unit: **900337** – **Genetics and Plant Breeding**

Year 3 **Semester 6** **ISCED Code: 0811** **ECTS: 3.0**

Tipe of Course Unit: Compulsory **Delivery Mode:** Face-to-face **Language of Instruction:** Portuguese

COURSE COORDINATOR: Manuel Patanita

HOURS OF WORK

TOTAL HOURS	Contact Hours								Hours in autonomous work
	Theory	Theory and practice	Practical and laboratory work	Field work	Seminar	Internship	Tutorial guidance	Other	
75		**45**							**30**

Prerequisites (if applicable): Not applicable

LEARNING OUTCOMES (knowledge, skills and competence)

Knowledge the organization and transmission of the genes.

Characterize the main types of plant populations of widespread use, especially its way of fertilization and reproduction. Knowledge of the main sources of biological variation.

Apply the concepts of genetics to the breeding process.

Understand and select methodologies for obtain new cultivars used in crop species of sexual reproduction (self-pollination and cross-pollination) and asexual reproduction

Understand what are the Genetically Modified Organisms (GMOs).

Identify the importance of genetic engineering and its applications in plant breeding. Understand the relationship between the plant breeding and Agronomy.

CONTENTS

Classical Genetics: Mendel's laws and inheritance; Mendel's analysis.

Molecular Genetics and Cytogenetic: cell division; DNA and RNA; DNA replication, transcription and translation; genetic code. Quantitative Genetics: characteristics of continuous variation; mean, standard deviation and variance; additive effect of genes;

heritability; selection and improvement.

Reproduction in crop plants: sexual reproduction; asexual reproduction.

Biological variation: intraspecific hybridization; induction of mutation; variations in chromosome number; somaclonal variation; genetics transformation; extranuclear genomes; genetic diversity in gene banks.

Introduction to plant breeding: story, justification, definition, strategy and guidance. Plant breeding of self-pollination

Plant breeding of cross-pollination

Plant breeding of vegetative propagation Genetic engineering of plants.

DEMONSTRATION OF THE CONTENTS COHERENCE WITH THE COURSE UNIT'S LEARNING OUTCOMES

The syllabus allows achieving the proposed objectives, because it contains a set of essential topics to expected learnings in the area of genetics and improvement of crop species. The progressive and sequential approach of the UC program by initiates the genetic bases necessary for the upgrade. Mendelian analysis, cell division; DNA and RNA; replication and gene expression.

Differentiate the characteristics of continuous variation and identify the various forms of reproduction of plants. Are the various

ways of obtaining the genetic variability as a fundamental factor for the phenotypic selection. The integration of such knowledge will perceive the adoption of different selection methodologies for plants according to their mode of reproduction. Finally we present genetic engineering as a tool for improving conventional.

TEACHING METHODOLOGIES

Lectures and ttheoretical-practical classes for exercises resolution. Field practices with several crop species Presentation and analysis of technical and scientific studies. Bibliographic research. Elaboration, presentation and discussion of group work. Study visits to institutions engaged in plant breeding. Seminars by experts in the genetics and plant breeding, in order to promote knowledge and discussion.

DEMONSTRATION OF THE COHERENCE BETWEEN THE TEACHING METHODOLOGIES AND THE LEARNING OUTCOMES

The teaching methodologies to be applied in this Curricular Unit (CU) are based mainly on the adoption of student-centered teaching-learning strategies, interactive, and collaborative learning. As such, in addition to an exhibition period, the school will have a working component in the classroom based on application exercises, observation of thematic videos and analysis of technical and scientific articles. This methodology is complemented with field classes for identification and observation of genotypic variability, as well as study visits to the reference institutions on improving conventional plants and on plant biotechnology.

It is intended to establish study-based learning contexts and individual student work as well as in critical thinking and teamwork.

The demonstration of the consistency of teaching methodologies with the objectives of the CU is based on the conviction that their diversity and complementarity are essential for motivation and commitment of students and for a more consistent and learning consistent with the practice and the inevitability of the genetic improvement of plants.

Students evaluation will also serve for gauging the effectiveness of teaching methodologies developed in pursuit of the objectives, and may be made some fixes in these methodologies, if this is considered necessary.

EVALUATION METHODS

The evaluation consists of written tests on theoretical and practical aspects and individual or group work of literature revi ew or analysis of scientific technical articles.

Final ranking: 70% (written exam) 30% (group or individual work).

MAIN BIBLIOGRAPHY

Cubero, J. I. 2003. Introducción a la Mejora Genética Vegetal. Ed. Mundi-Prensa, Madrid. Gallais, A. & Bannerot, H. 1992. Amélioration des espèces végétales cultivées. INRA Ed., Paris.

Griffiths, A., Miller, J., Suzuki, D., Lewontin, R. & Gelbart, W. 1996. An Introduction to Genetic Analysis, 6ª Edition. W. H. Freeman and Company.

Hayward, M., Bosemark, N. & Romagosa, I. 1993. Plant Breeding – principles and prospects. Chapman & Hall, London. Lacadena, J. 1981. Genetica, 3ª Edicion. A.G.E.S.A.

Pires, D. 1953. Técnica do melhoramento de plantas. Livraria Sá da Costa, Lisboa.

Poehlman, J. M. 1983. Breeding Field Crops, second edition. Avi Publishing Company, inc. Westport, Connecticut. Romero, F. 1989. Semillas - Biologia y Tecnologia. Ed. Mundi-Prensa, Madrid.

Stansfield, W. 1983. Schaum's Outline of Theory and Problems of Genetics. McGraw-Hill, Inc., New York.

Videira, A. 2001. Engenharia Genética – princípios e aplicações. Lidel, Lisboa.

Year of implementation: 2016/2017 | Date of approval by the Technical-Scientific Board: