

## 28920 - Biotechnology

### Información del Plan Docente

<b>Academic Year</b>	2016/17
<b>Academic center</b>	201 - Escuela Politécnica Superior
<b>Degree</b>	437 - Degree in Rural and Agri-Food Engineering
<b>ECTS</b>	6.0
<b>Course</b>	3
<b>Period</b>	Half-yearly
<b>Subject Type</b>	Compulsory
<b>Module</b>	---

### **1.Basic info**

#### **1.1.Recommendations to take this course**

#### **1.2.Activities and key dates for the course**

### **2.Initiation**

#### **2.1.Learning outcomes that define the subject**

#### **2.2.Introduction**

### **3.Context and competences**

#### **3.1.Goals**

#### **3.2.Context and meaning of the subject in the degree**

#### **3.3.Competences**

#### **3.4.Importance of learning outcomes**

### **4.Evaluation**

### **5.Activities and resources**

#### **5.1.General methodological presentation**

The learning program designed for this course is based in studying the fundamental topics and basic tools which are needed to know, and know to use, the main biotechnologies that are nowadays applied in agronomy. To reach this, we have combined the conceptual expositions in theoretical classes and a set of practical experiences that will allow a better understanding of these techniques and also will show its applicability.

#### **5.2.Learning activities**

Participative theoretical classes, 30 presential hours . The program of the course encompasses 15 themes, which will be

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presented in 2 h sessions. These themes are grouped in three clearly differentiated main blocks: first block deals with basic knowledge about molecular genetics and nucleic acids- based technics, which will be related to its main applications in agronomy. Second block of themes cover fundamentals of plant biotechnology and the third one topic is biotechnology for animal production.

Practical clases in laboratory/computers'room , 30 presential hours distributed in 15 sessions of 2 h. In each class, students will perform a practical experience related to the theoretical program of the course. The practical work will consist in laboratory experiments (28 h) and computer based technics (2 h).

Study for the written exam : professors will provide lecture notes and power-point slides with the information presented in the theoretical classes. They also will provide a list of references to support the autonomous work of the student (87 h).

To a better development of the learning process, profesors will encourage students to use the individual tutorial sessions

Written and practical exams: 3 hours.

### 5.3.Program

#### Theoretical contents

<b>Block I</b>	<b>Foundations and techniques</b>
Unit 1	Introduction and overall context
Unit 2	Foundations of biotechnological progress - biochemistry and molecular biology
Unit 3	Nucleic acids - molecular genetics
Unit 4	Tools and techniques of molecular genetics
Unit 5	Genomic tools
Unit 6	Analysis of the gene function
<b>Block II</b>	<b>Plant biotechnology</b>

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Unit 7	In-vitro culture of plant tissues and organs
Unit 8	Applications of plant micropogation
Unit 9	Genetic engineering of plants

### Block III

### Animal biotechnology

Unit 10	Biotechnology of animal reproduction I - detection and synchronization of estrus
Unit 11	Biotechnology of animal reproduction II - artificial insemination
Unit 12	Biotechnology of animal reproduction III - embryonic technologies
Unit 13	Applications of biotechnology in animal genetic improvement - animal genetic engineering
Unit 14	Biotechnological applications in animal feed
Unit 15	Biotechnological applications in animal diagnosis and health

### Content of practical sessions

1	Protocol in the laboratory of plant biotechnology
2	Bacteria production
3	Isolation of tomato DNA (plasmid preparation).

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4	Amplification of DNA through PCR
5	Electrophoresis of DNA
6	Bioinformatics in plant genetics
7	In-vitro plant production - organogenesis in tomato
8	In-vitro plant production - micropropagation of potato
9	Protocol in the laboratory of animal biotechnology
10	Spermiogram (1) - classic assessment
11	Spermiogram (2) - new semen analysis techniques
12	Oocyte extraction and in-vitro embryo production
13	Sex determination
14	Gamete and embryo preservation
15	Application of ELISA technique in animal production and health

### 5.4.Planning and scheduling

Calendar of presential classes

Week	Theory Class (2 h)	Practical class (2 h)	Student's work	Total
1	Theme 1	Practice 1		4
2	Theme 2	Practice 2	Study (3 h)	7
3	Theme 3	Practice 3	Study (4 h)	8

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4	Theme 4	Practice 4	Study (4 h)	8
5	Theme 5	Practice 5	Study (4 h)	8
6	Theme 6	Practice 6	Study (4 h)	8
7	Theme 7	Practice 7	Study (4 h)	8
8	Theme 8 Written partial exam (2h)	Practice 8	Study (2 h)	8
9	Theme 9	Practice 9	Study (4 h)	8
10	Theme 10	Practice10	Study (4 h)	8
11	Theme 11	Practice 11	Study (4 h)	8
12	Theme 12	Practice 12	Study (4 h)	8
13	Theme 13	Practice 13	Study(4 h)	8
14	Theme 14	Practice 14	Study (4 h)	8
15	-		Study (8 h)	8
16	-	-	Study (8 h)	8
17	-	-	Study (8 h)	8
18	Theme 15	Practice 15	Study (4 h)	8
19	-		Study (8 h)	8
20	Theory Exam (2h)	Practical Exam (1h)		3
<b>Horas total</b>	34	31	85	150

## 5.5. Bibliography and recommended resources

### Basic Bibliography

- Luque Cabrera, José. Texto ilustrado de biología molecular e ingeniería genética : conceptos, técnicas y aplicaciones en Ciencias de la Salud / José Luque Cabrera, Ángel Herráez Sánchez . Barcelona [etc.] : Elsevier , D.L. 2008
- Abecia Martínez, Alfonso. Manejo reproductivo en ganado ovino / Alfonso Abecia Martínez, Fernando Forcada Miranda . Zaragoza : Servet, [2010]
- Denis Tagu, Christian Moussard, editores. Fundamentos de las técnicas de biología molecular /traducción realizada por Josep M. Casacuberta . Zaragoza : Acribia, 2006
- Reprology: Controlar la reproducción es controlar el futuro[Archivo de ordenador] / M. Ennuyer... [et al.] . Libourne : CEVA Santé Animale, 2001
- Chawla, H. S.. Introduction to plant biotechnology / H. S. Chawla . 3rd. ed. Enfield (NH) [etc.] : Science Publishers, cop. 2009

### Complementary Bibliography

- Benítez Burraco, Antonio. Avances recientes en biotecnología vegetal e ingeniería genética de plantas / Antonio Benítez Burraco . Barcelona [etc.] : Reverté, D. L. 2005
- Klug, William S.. Conceptos de genética / William S. Klug, Michael R. Cummings, Charlotte A. Spencer ; traducción y revisión técnica, José Luis Ménsua, David Bueno i Torrens . 8ª ed. Madrid [ etc.] : Pearson, D.L. 2006
- Kreuzer, Helen. ADN recombinante y biotecnología : guía para estudiantes / Helen Kreuzer, Adrienne Massey ; [traducción a cargo de María Isabel Mora y María Jesús Arrizubieta Balardi] . Zaragoza : Acribia, 2004
- Lopez, M. (2010). Ingeniería genética (CD): laboratorio virtual de identificación de transgénicos. Madrid: Universidad Nacional de Educación a Distancia
- McKee, Trudy. Bioquímica: la base molecular de la vida / Trudy McKee, James R. McKee; [traducción : José Manuel González de Buitrago] . 1ª ed. en español, traducción de la 3ª ed. en inglés Madrid [etc.] : McGraw-Hill Interamericana, 2003
- Razdan, M.K.. Introduction to plant tissue culture / M.K. Razdan . 2nd ed. Enfield : Science Publishers, cop. 2003
- Smith, John E.. Biotecnología / John E. Smith ; traducción a cargo de Fernando Escrivá Pons... [et al.] . [1a. ed.] Zaragoza : Acribia, D.L. 2006