

Course RQ02019: (INTRODUCTION TO BIOTECHNOLOGY)

1. General information

- Term: 4
- Credits: **Total credits 2 (Lecture: 1,5 – Practice: 0,5)**
- **Self-study: 6** credits
- Credit hours for teaching and learning activities: 30 hrs
- Self-study: 90 hrs.
- Department conducting the course:
 - Department: Department of Plant Biotechnology
 - Faculty: Faculty of Biotechnology
- Kind of the course:

Foundation <input type="checkbox"/>		Fundamental <input type="checkbox"/>		Option 1 <input type="checkbox"/>		Option 2 <input type="checkbox"/>	
Compulsory <input type="checkbox"/>	Elective <input type="checkbox"/>	Compulsory <input type="checkbox"/>	Elective <input type="checkbox"/>	Compulsory <input checked="" type="checkbox"/>	Elective <input type="checkbox"/>	Compulsory <input checked="" type="checkbox"/>	Elective <input type="checkbox"/>

- Prerequisite course(s):

2. Course objectives and expected learning outcomes

* *Course objectives:*

- Knowledge: Course provides for students with knowledge in the fundamental theoretical foundations and research methods of modern biotechnology, the main applications of biotechnology in the agricultural field. Understand some issues of concern about biosafety of genetically modified organisms.
- Skills: Course provides for students with skills in using essential equipment of laboratory for molecular biology and plant tissue culture
- Attitude: Course provide students a responsible attitude towards work, the environment and social ethical standards.

* *Course expected learning outcomes*

Notation	Course expected learning outcomes After successfully completing this course, students are able to	PLO performance criteria
Knowledge		
CELO1	Mastering the principles, methods and applications of the following techniques: Restriction enzymes; cloning DNA; PCR; create a DNA bank; Molecular hybridization, DNA sequencing, DNA markers	2.1 (P)
CELO2	Mastering the scientific basis of in vitro plant culture and technology; Principles, methods and applications of in vitro techniques: clonal propagation, creation of virus-free plants through apical meristem culture, haploid plants, cell culture, pollination and culture embryo implantation, preservation of genetic resources	2.1, 2.2 (P)

CELO3	Understand the scientific basis of the technology to breed transgenic plants; Principles and methods of transgenic plants and some orientations in breeding transgenic plants	2.2 (P)
Skills		
CELO4	Perform basic operations of some basic techniques of modern biotechnology (DNA extraction, DNA cloning by PCR, DNA electrophoresis on agarose gel, gel staining and imaging of electrophoresis results).	6.1 (P)
CELO5	Perform basic operations of in vitro plant tissue culture techniques	6.1 (P)
Attitude		
CELO6	Understand the potential benefits and risks of GM crops; Having the right attitude and opinion about GM crops on a scientific basis.	9.1 (P)

3. Course description

This course includes General Introduction to Biotechnology; Background techniques of modern biotechnology; Biotechnology in horticulture: plant tissue culture technology and genetically modified plant breeding technology; Biosecurity of genetically modified crops.

4. Teaching and learning & assessment methods

CELOs	CELO1	CELO2	CELO3	CELO4	CELO5	CELO6
Teaching and learning						
Lecturing	x	x	x			x
Teaching through practical work				x	x	x
Assessment						
Rubric 1. Attendance (10%)	x	x	x	x	x	x
Rubric 2. Practical (15%)				x	x	
Rubric 3. Middle exam (15%)	x	x				x
Rubric4. Final exam (60.%)	x	x	x	x	x	x

5. Student tasks

- Attendance: All students attend classes according to the Academy's regulations.
- Preparation for the lecture: Students participating in this module are required to read the lecture and reference materials before learning related content.
- Mid-term exam: All students Students must complete the exercises and test 15 minutes.
- Final exam: All students The final exam must meet the requirements.

6. Text books and references

* Text Books/Lecture Notes:

General Biotechnology Lecture. Agriculture Publishing House 2020

* Additional references:

1. Mohammad Anis, Naseem Ahmad (2016). Plant Tissue Culture: Propagation, Conservation and Crop Improvement. Springer publisher.
2. Nguyen Quang Thach, Nguyen Thi Ly Anh, Nguyen Thi Phuong Thao (2005). Agricultural biotechnology. Agriculture Publishing House.

7. Course outline

Week	Content	Course expected learning outcomes
1	Chapter 1: Introduction to biotechnology	
	A/ Main contents: (3 hours) Theories: 3(... hours) 1.1. The concept of biotechnology 1.2. History of the development of biotechnology 1.3. Objectives and role of biotechnology in agricultural development 1.4. Achievements and directions of biotechnology application Practice: 0 (0 hours)	CELO 1
	B/ Self-study contents: (9 hours) 1.5. Read the textbook, lecture, and find out information related to the content of the chapter.	CELO 1
2	Chapter 2: Fundamental/ Essential techniques of modern biotechnology	
	A/ Main contents: 12.5 (12.5 hours) Theories: 8 (8 hours) 2.1. Concept and role of modern biotechnology. 2.2. The main techniques used in modern biotechnology: - Restriction Enzymes - DNA cloning - PCR technique - Techniques to create genome banks and cDNA banks - DNA sequencing technology - Molecular hybrid engineering - Molecular indicator technique 2. Practice: 4,5 (9 hours) 2.3. Perform at the plant genetic engineering laboratory the following operations: - DNA extraction DNA electrophoresis on agarose gel, stain the gel and photograph the electrophoresis results	CELO1, 4

	<p>B/ Self-study contents: (25 hours) 2.4 Read the textbook, lecture, and find out information related to the content of the chapter.</p>	CELO1, 4
	<p>Chapter 3: Biotechnology in horticulture</p>	
3	<p>A/ Main contents: (12.5hours) Theories: 8 (8 hours) 3.1. Technology of plant tissue culture in fruit and vegetable breeding - Scientific foundation of in vitro plant culture and technology - Principles, procedure and applications of in vitro techniques: In vitro cloning; creating virus-free plants through apical meristem culture; create haploid plants in vitro; cell culture and fusion; pollination and embryo culture in vitro; preservation of plant genetic resources in vitro. 3.2. Technology to breed fruits and vegetables by transgenic - The scientific foundation of the technology of breeding transgenic plants - Principles and procedure of gene transfer into plants: gene transfer by <i>Agrobacterium tumefaciens</i>, direct gene transfer by gene gun, electric pulse, microinjection... - Some research orientations and achievements in breeding transgenic vegetables, flowers and fruits Practice: 3 (6 hours) 3.3. Perform at the laboratory of plant cell and tissue culture technology the following operations: -Preparation of in vitro plant tissue culture media - <i>In vitro</i> plant culture starter/propagation</p>	CELO2, 5
	<p>B/ Self-study contents: (22 hours) 3.4 Read the textbook, lecture, and find out information related to the content of the chapter.</p>	CELO2, 5
	<p>Chapter 4: Biosafety of GM crops</p>	
4	<p>A/ Main contents: 1.5 (1.5 hours) Theories: 1.5 (8 hours) 4.1. Benefits and risks of GM crops 4.2. Concept and content of biosafety of transgenic plants 4.3. Regulation on biosafety of genetically modified organisms of Vietnam</p>	CELO3, 6
	<p>B/ Self-study contents: 4.5 hours) 4.4 Read the textbook, lecture, and find out information related to the content of the chapter.</p>	CELO3, 6