

RQ02025: PRINCIPLES OF GREENHOUSE CROP PRODUCTION

1. General information

- Term: 4
- Credits: **Total credits: 2 (Lecture: 1.5 – Practice: 0.5) - Self-study: 6.0**
- Credit hours for teaching and learning activities:
 - Lectures: 1 sections per week. 3 periods (100 minutes per section).
 - Practice in laboratory/greenhouse: 3 practices (250 minutes for each)
 - Self-study: 90 periods (50 minutes each)
- Department conducting the course:
 - Department: Horticulture & Landscape design
 - Faculty: Agronomy
- Kind of the course:

General <input type="checkbox"/>		Foundation <input type="checkbox"/>		Specialization 1 <input checked="" type="checkbox"/>		Specialization 2 <input checked="" 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"/>

- Parallel course(s): None
- Prerequisite course(s): None
- Course language: English Vietnamese

2. Course objectives and program learning outcomes

* Course objectives

- Knowledge: Course provides students with knowledge in the structure, materials and equipment of greenhouses that affect crop growth and product quality.
- Skills: Course provides students with skills in operating equipment of greenhouse to control the environmental factors according to the requirements of crops.
- Attitude: Course provides students with attitudes of a high sense of responsibility in work and environmental protection.

* Program learning outcomes

- Program learning outcomes and program's performance criteria to which the course contributes:

Program learning outcomes After successfully completing this program, students are able to	Program Learning outcome's performance criteria
<i>Professional knowledge</i>	
PLO2. Apply scientific knowledge and cultivation techniques to produce horticultural products to meet market demand.	2.1. Apply crop science knowledge to build high-tech demonstration farms/ advanced procedures for producing horticultural products to meet market demand.
	2.2. Apply crop farming techniques to build high-tech demonstration farms/ advanced procedures for producing horticultural products to meet market demand.

PLO3. Apply knowledge of landscape design, construction and maintenance to meet specific cultural, social, environmental and economic needs.	3.3. Apply knowledge of landscape for constructing landscapes to meet design standards.
Professional skill	
PLO8. Transfer technical advances and new technologies to horticultural production and landscape management.	8.1. Transfer technical advances and new technologies into horticultural production.
Attitudes	
PLO9. Maintain professional ethics, carry out environmental protection responsibilities and behave in accordance with ethical standards and respect multiculturalism.	9.2. Take responsibility for environmental protection .

3. Summary of the course content

RQ02025. Principles of greenhouse crop production (2TC: 1.5-0.5- 4)

Introduction to the structure, materials and equipment of different types of greenhouses; operating equipment of greenhouse to control the environmental factors according to the requirements of crops; controlling plant growth and development by nutrition, irrigation methods, plant growth regulators, substrates; Basic principles of pest management and product quality maintenance in greenhouse production .

4. Methods of teaching, learning and assessment

CELOs	CELO1	CELO2	CELO3	CELO4	CELO5
TEACHING METHODS					
Lecture	x	x	x		
Practice				x	x
Essay					x
ASSESSMENT					
Rubric 1. Practice (20%)				x	
Rubric 2. Essay (30%)	x	x	x		x
Rubric 3. Final exam (50%)	x	x	x		

5. Student duties

- Learning attitude: students must attend all lectures in class and practice.
- Preparation for lectures, self-study: students must read or prepare materials related to the lesson in class under the guidance of the teacher.
- Practice and discussion in groups: students complete practical exercises, write individual reports or in groups under the guidance of teachers.
- Final exam: students must complete the essay and final exam in accordance to the regulations of the university.
- Essay: students must complete the essay in accordance to teacher's guide.

6 . Textbooks/references

*** Textbooks/Lectures:**

1. Vu Thanh Hai (2019). *Lecture on the principles of greenhouse crop production*. (Hanoi University of Agriculture).

*** Other references:**

1. Michael Raviv, J. Heinrich Lieth and Asher Bar-Tal (2019). *Soilless Culture: Theory and Practice: Theory and Practice (2nd Edition)*. Academic Press.
2. Ted Goldammer (2019). *Greenhouse Management: A Guide to Operations and Technology*. Apex Publishers

*** Studies and research results:**

1. Vu Thanh Hai, Pham Van Cuong, 2021. Effects of Equal Chemical Fertilizer Substitutions with Organic Fertilizer on the Growth, Yield and Quality of Orange Sanh in Bac Quang - Ha Giang and CS1 in Cao Phong - Hoa Binh. *Vietnam Journal of Agricultural Sciences*, 19(2), pages 151-160.
2. Dinh Hong Duyen, Nguyen The Binh, Nguyen Thi Loan, Vu Thanh Hai, Do Tat Thuy (2022). Effects of replacing chemical fertilizers with microbial organic fertilizers in the form of pellets on yield and quality of Suu pomelo fruit at Doan Hung - Phu Tho. *Vietnam Journal of Agricultural Science* 2022, 20(3): 333-340

7. Course outline

Week	Content	CELOs
1	Chapter 1: Introduction to the subject and types of greenhouses	
	<p><i>A/ The Main contents : (3 periods)</i> The theoretical contents: (3 periods) 1.1. Introduction of course content 1.2. Pros and cons of greenhouse crop production 1.3. Types of greenhouse structures</p>	CELO1
	<p><i>B/ The self-study contents: (4 hours)</i> - Update statistics on area, productivity, output, production value of greenhouse production in the world and Vietnam.</p>	
2, 3	Chapter 2: The principles of design, structure, materials and equipment of greenhouses	
	<p><i>A/ The main contents : (9 periods)</i> The theoretical contents: (6 periods) 2.1. Choose an appropriate area to build a greenhouse 2.2. Structure of greenhouse 2.2.1. The frame of greenhouse 2.2.2. The floor of greenhouse 2.2.3. Materials used for covered surround greenhouse 2.2.4. The door of greenhouse 2.2.5. The appliances of greenhouse Light control system Air conditioning system Irrigation system and nutrient supply Plant trellis, shelf and tray system Disinfection and waste collection system</p>	CELO1, CELO2, CELO4

	<p>supplement systems and other equipment: sub- power line system, equipment for measuring humidity, temperature, light intensity...</p> <p>2.2.6. Maintenance of greenhouse systems and sustainable production</p> <p>Practical content: (3 periods) Lesson 1: Visit, describe and determine the appropriate type of greenhouses for different crops.</p>	
	<p>B/ The self-study contents: (18 hours) Refer reading materials on the structure and classification of greenhouses for commercial cultivation. Refer to documents and research on the growth and development of crops in greenhouse.</p>	
4.5 _	<p>Chapter 3: Technical application in greenhouses</p> <p>A/ The main contents: (13 periods) The theoretical contents: (6 periods)</p> <p>3.1. Control of environmental factors 3.1.1. Temperature 3.1.2. Light intensity 3.1.3. Humidity and moisture 3.1.4. Gas concentration 3.1.5. pH, EC in nutrient solution 3.2. Technology for supplying nutrition in soluble form 3.2.1. Structure of the system 3.2.2. Specifications of application 3.2.3. The role of the basic nutrient elements and the chemicals used to prepare the nutrient solution 3.2.4. Requirement of water quality for making nutrient solution 3.2.5. Appropriate types of fertilizer for making the nutrient solution 3.2.6. Formula and technical application for making nutrient solution 3.2.7. Control nutrient solution and plant growth 3.2.8. Plant medium/ substrate 3.2.9. The principle operation of nutrient solution systems 3.3. Trellis, training supported frame for plants in greenhouse 3.4. Application of plant growth regulators in control of plant growth 3.5. Additional pollination in greenhouses</p> <p>Essay content: (2 hours) Technical treatments applied to greenhouse crop production: Technical application such as hydroponic vegetable production, aeroponics, mixed media, potted plants, plant propagation, environmental control in greenhouse...</p> <p>Practical content: (5 hours) Lesson 2: Producing substrates and raising seedlings for greenhouse production</p>	<p>CELO2, CELO3, CELO4, CELO5</p>

	<p>Lesson 3: Practice in growing selected plants in greenhouse</p> <p>Lesson 4: Operating equipment and controlling some environmental factors in a greenhouse (This lesson is optional to replace Lesson 3)</p>	
	<p>B/ The self-study contents: (26 hours)</p> <p>Refer to documents and research on the influence of environmental factors, growing methods, types of media, technical applications affecting growth and development of plants in greenhouse.</p>	
6.7	<p>Chapter 4: The principles of integrated pest management in greenhouses</p>	
	<p>A/ The main contents: (4 periods)</p> <p>The theoretical contents: (2 hours)</p> <p>4.1. The environmental factors of greenhouse and their effects on pests and diseases of plants</p> <p>4.2. Basic principles of integrated pest control in greenhouses</p> <p>Presentation content: (Optional 2 hours)</p> <p>Similarities and differences of infestation of pests and diseases on plants in greenhouse.</p>	CELO2, CELO3, CELO5
	<p>B/ The self-study contents: (8 hours)</p> <p>Refer to documents and research on technical applications to manage pests and diseases on plants in greenhouses.</p>	
8	<p>Chapter 5: The principles of harvest and preservation of products in greenhouse production</p>	
	<p>A/ The main contents: (1 period)</p> <p>The theoretical contents: (1 period)</p> <p>5.1. Causes of post-harvest losses of horticultural production in greenhouse production</p> <p>5.2. Scientific basis of post-harvest technical applications</p> <p>5.3. Technical application to reduce post-harvest losses</p>	CELO1, CELO2
	<p>B/ The self-study contents: (2 hours)</p> <p>Refer literature and research papers on the difference between harvest and preservation of horticultural products in greenhouse production.</p>	