COURSE OUTLINE

1. GENERAL INFORMATION

FACULTY/SCHOOL	SCHOOL OF PLANT SCIENCES		
DEPARTMENT	CROP SCIENCE and FOOD SCIENCE AND HUMAN NUTRITION		
LEVEL OF STUDY	*Pregraduate*		
COURSE UNIT CODE	945	**Semester:**	3rd
COURSE TITLE	Postharvest handling of fruit and vegetables		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**		**ECTS**
Lectures	3		5
Laboratory Exercises	2		
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS			
COURSE WEBSITE (URL)			

2. LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

The objective of the course 'Postharvest handling of fruit and vegetables' is to familiarize students, both theoretically and practically, with changes that occur in fresh vegetables and fruit from harvest to consumption, as well as the techniques that are applied during the storage, transportation and marketing of fresh products with the aim of maintaining quality until consumption.

The following topics are covered in detail:

1. the principles of post-harvest technology, the causes of post-harvest losses and the importance of the problem in food security
2. changes during fruit ripening related to quality (consumer perception & nutritional value)
3. climacteric and non-climacteric fruit
4. post-harvest changes in leafy and root vegetables that affect their storage duration and quality
5. the effects of growth regulators pre- and post-harvest on fruits and vegetables
6. ethylene and biostimulants in fruit
7. the structure of fresh fruits and vegetables in relation to their communication with the environment
8. methods of preservation of fresh fruit and vegetables
9. post-ripening of bulbs and tubers
10. methods of ripening and de-greening of fruit
11. post-harvest handling of fresh fruit and vegetables (cleaning, packaging, cooling, film coating, controlled and modified atmospheres, etc.)
12. physiological disorders during the preservation of fruits and vegetables and the ripening or de-greening of fruits
13. the application of EU quality criteria for fresh fruit and vegetables
14. innovative packaging materials and innovative technologies for the creation of controlled and modified atmospheres to prevent ripening and preserve fruits and vegetables

Emphasis is placed on the criteria for selecting the appropriate harvest time, as well as on the methods of harvesting, handling and packaging of the products to maintain their quality.
Finally, critical points are highlighted for maintaining quality and avoiding quality 'disorders' (such as injury from low temperature, high concentration of CO_2, ethylene, etc.)

The Laboratory Exercises are directly linked to the theory and aim to:

1. Informing students about the modern ways and means available for post-harvest handling
2. Assessment of maturity stage
3. Quality in relation to the changes associated with the ripening and post-harvest life of fresh fruit and vegetables.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking

Group/Teamwork *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Development of free, creative and inductive thinking* *……* *(Other…… citizenship, spiritual freedom, social awareness, altruism etc.)* *……*
Decision-making Environmental awareness Development of free, creative and inductive thinking	

3. SYLLABUS

Vegetables

1. The principles of post-harvest technology as it relates to horticultural crops. The causes of losses and the magnitude of losses. A brief review of the history of post-harvest technology and the importance of post-harvest handling.
2. The diversity of vegetables and post-harvest changes in metabolism, chemical composition and morphological characteristics of the products. Respiration, water loss, effect of the atmosphere in storage, the role of ethylene.
3. Quality of vegetables. EU legislation. Quality assessment. The quality criteria of the main products. Packaging, sorting, standardization. The operation of packaging plants.
4. Storage of leafy vegetables, immature flower heads, sprouts and salads.
5. Storage of vegetable fruits.
6. (i) Storage of underground organs (roots, tubers, bulbs, corms). Curing of bulbs and tubers. Physiological and morphological changes during storage.
   (ii) Cryoinjury and chilling injury. Symptoms, causes, effects on quality and storage.

Fruit

7. Changes during fruit ripening
   i. Introduction – Purpose and effectiveness of postharvest treatments
   ii. Maturity and ripening of fruit
   iii. Climacteric and non-climacteric fruit
   iv. Growth regulators in relation to ripening
8. Changes during fruit ripening and ways of controlling ripening
   . Ethylene biosynthesis
   i. Action of ethylene at the beginning of ripening
   ii. Action of ethylene as a hormone
   iii. Compounds with hormonal action used in practice to regulate fruit ripening or quality, and harvest
   iv. Changes in proteins
9. Changes during fruit ripening and ways of controlling ripening
   . Changes in fat components
   i. Aroma development
   ii. Colour development
   iii. Flavour development
   iv. Consistency changes
10. Harvest – 'Packing line' – Degreening
    . Maturity stage criteria
    i. Harvest methods (Cutting and collecting fruits of various types)
    ii. Initial quality of harvested product and main objectives of 'packing line' of whole fruits

iii. Classic and modern ways of achieving objectives in 'packing line' of whole fruits
iv. Degreening
v. Innovative technologies for determining maturity stage and quality assessment in the field and on the packing line

11. Fruit structure and 'communication' of fruit and its environment, Whole and minimally processed fruit, Fruit preservation and Principles
12. Fruit preservation

.Classical ways of achieving the preservation of fresh or dried fruit.
i. Effectiveness of the methods and technology used for the preservation of fresh fruit.
ii. Controlled and modified atmospheres.
iii. Handling with innovative compounds (pre- and post-harvest) in combination with classical and innovative preservation methods

LABORATORY

1. Identification of the main fruit tree species cultivated in the country
2. Specific Germination and fruiting characteristics of these species

4. TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In-class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of slide presentation and blackboard. Communication with students. Learning process support by access to e-class asynchronous distance learning platform.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	

Activity/ Method	Semester workload
Lectures	50
Laboratory practice	15
Individual laboratory project (data processing and commenting)	10
Personal study	50
Total of Course (25 hours of workload per ECTS)	**125**

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work,*	**I. Final written examination on course theory** includes: 1. Three midterm written assessments or 2. One final examination (written or oral) The examinations are conducted in Greek and may include: ➢ Short-answer questions

essay/report, oral exam, presentation, laboratory work, *other…….etc.* *Specifically defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	➢ Essay-type (extended response) questions ➢ Oral examination (when deemed appropriate) Assessment is based on the accuracy and completeness of the students' responses in written or oral exams, as well as their participation in laboratory exercises. Students may access their graded written exams upon request and by arrangement with the course instructor responsible for the assessment. **II. Assessment of the laboratory part of the course** includes: Oral or written examination, which includes: ➢ Short-answer questions ➢ Essay-type question ➢ c. Critical thinking questions

5. SUGGESTED BIBLIOGRAPHY:

1. Μετασυλλεκτική Μεταχείριση Καρπών και Λαχανικών, 2016. Πάσσαμ Χ.Κ., Τσαντίλη Ε., Χριστόπουλος Μ., Καυκαλέτου Μ., Αλεξόπουλος Α., Καραπάνος Ι. E-BOOK, ISBN: 978-960-603-261-5, ID: 320234. ΚΑΛΛΙΠΟΣ. (in Greek)
2. Μετασυλλεκτική Μεταχείριση Καρπών και Λαχανικών, 2013. Χ. Πάσσαμ και Ε. Τσαντίλη (Θεωρία και Εργαστήριο). Πανεπιστημιακές Σημειώσεις Γ.Π.Α. (in Greek)
3. Μετασυλλεκτική Φυσιολογία και Τεχνολογία Νωπών Οπωροκηπευτικών Προιόντων, 1995. Ε. Σφακιωτάκης. (in Greek)

Related Scientific Journals:

1. Postharvest Biology and Technology, https://www.sciencedirect.com/journal/postharvest-biology-and-technology
2. International Journal of Postharvest Technology and Innovation, https://www.inderscience.com/jhome.php?jcode=ijpti