University of Zagreb Faculty of Agriculture
Svetošimunska cesta 25, 10000 Zagreb
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Modern postharvest technology of fruit crops (296619)

Course coordinator

Prof. Tomislav Jemrić, PhD

Course description

Student gets the basic knowledge needed to begin work in the field of postharvest technology of fruit crops. This knowledge can be later upgraded with professional experience in enterprises such as large cold stores, distributive centres and retail chains, etc.)

ECTS: **6.00**

English language: **L1**

E-learning: **L2**

Teaching hours: 60
Lectures: 36
Laboratory exercises: 20
Seminar: 4

Lecturer

- Prof. Tomislav Jemrić, PhD

Associate teacher for exercises

- Assoc. Prof. Goran Fruk, PhD
- Marko Vuković, PhD

Associate teacher for seminars

- Marko Vuković, PhD

Grading

Sufficient (2): 60,00-69,99%
Good (3): 70,00-79,99%
Very good (4): 80,00-89,99%
Excellent (5): 90,00-100,00%

Type of course

- Undergraduate studies / BS Courses taught in English (Elective course, 1 semester, 1 year)

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General competencies

Students will be competent to:
• Determinate of optimal harvest date
• Determinate of physiological disorders of fruit
• Evaluate the standard fruit quality
Students will get knowledge of basic postharvest technology of fruit, postharvest fruit treatments and fruit packaging systems.

Types of instruction

- Lectures
  Lecture will be held in classroom and will be used to get teoretical knowledge about postharvest technologies used in fruit crops.
- Laboratory practice/exercises
  In Laboratory students will learn about basic parameters used to determine harvest date and fruit quality, and how to conduct those analyses.
- Practicum
  Practicum will be held in laboratory or classroom and it will provide students to see and learn to recognize symptoms of physiological disorders in fruits caused by wrong harvest date or storage conditions.
- Field work
  Field work includes trip to orchards during harvest, trip to storage and packinghouses to see different postharvest technologies used in fruit crops.
- Seminars
  Seminars will be used so students learn how to use relevant scientific and professional literature with critical review. This will be performed as written work or case study.

Learning outcomes

Learning outcome	Evaluation methods
explain basic physiological processes in fruits after harvest	written or oral exam
define and explain effect of cultivation factors on fruit quality after harvest	written or oral exam
define and explain systems for storage of fruits in normal and controlled atmosphere	written or oral exam
organize and implement determination of fruit harvest date	laboratory task
plan and implement a series of activities in storage of fruits	seminar
explain and apply the acquired knowledge and skills in storage of fruits	written or oral exam
present the results of some of the activities related to the storage of the fruits	seminar

Working methods

Teachers' obligations

Keeping lectures, exercises and seminars

Students' obligations

Regular attendance to classes, regular attendance to the exams, regular fulfillment of obligations, regularly done laboratory task, positively evaluated seminar

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Methods of grading

Evaluation elements	Maximum points or Share in evaluation	Grade rating scale	Grade	Direct teaching hours	Total number of average student workload	ECTS
Laboratory task	15%			20	8	2
Seminar	10%			4	8	1
1. midterm exam	38%			18	16	1.5
2. midterm exam	37%			18	16	1.5
Final exam	75%			16	32	3
Total	100%			60	48	6

Evaluation elements	Description	Deadline	Recoupment
Seminar	Write a seminar with at least 15 scientific relevant references in accordance with the received instructions and within the deadline set it on the system for e-learning	According to the agreement with the teacher	Obliged work off of the exercises
1. midterm exam	Answer correctly to at least 60% of the questions in the system for e-learning	According to the agreement with the teacher	Obliged work off of the exercises
2. midterm exam	Answer correctly to at least 60% of the questions in the system for e-learning	According to the agreement with the teacher	Obliged work off of the exercises
Final exam	Answer correctly to at least 60% of the questions in the system for e-learning or satisfactory answer to questions in oral exam	According to the agreement with the teacher	

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Weekly class schedule

1. Introduction and definition of the course, distribution and postharvest behavior of fruits. Classification and characteristics of fruits. L - Course introduction, situation analysis of cooling capacity of fruits in the world and in the Republic of Croatia, keeping the role of fruit in the production chain. Morphological and physiological characteristics of fruit, maturation, respiratory curve of fruits. The ethylen role in fruit. Climacteric rise, non-climacteric fruits, suppressed climacteric fruits, storage capability of fruits.
2. Classification and characteristics of fruits. The consequences of inadequate harvest. L - The ethylen role in fruit. Climacteric rise, non-climacteric fruits, suppressed climacteric fruits, storage capability of fruits. The concept of optimum harvest date, the consequences of improper harvest date and its effect on storage capability. Effect ecological, agricultural and pomotechnical operation on biochemical processes in the fruit and their effects on the length and quality of care.
3. The consequences of inadequate harvest. The factors that act before harvest to storage. L - The concept of optimum harvest date, the consequences of improper harvest date and its effect on storage capability. Effect ecological, agricultural and pomotechnical operation on biochemical processes in the fruit and their effects on the length and quality of care. Effect ecological, agricultural and pomotechnical operation on biochemical processes in the fruit and their effects on the length and quality of care (continued).
4. The factors that act before harvest to storage. Chemical analysis of fruit. L+Lab - Effect ecological, agricultural and pomotechnical operation on biochemical processes in the fruit and their effects on the length and quality of care (continued). Basic analysis of fruit quality.
5. Postharvest methods L - Chemical, physical and biological processes with fruits to improve storability (heat treatments, microwaves, radiation, etc.). Modern ways of fruit packaging, modified atmosphere packaging, the possible negative effects of packaging.
6. Postharvest methods L - Chemical, physical and biological processes with fruits to improve storability (heat treatments, microwaves, radiation, etc.). Modern ways of fruit packaging, modified atmosphere packaging, the possible negative effects of packaging.
7. Storage methods L - Storage technologies in a normal and controlled atmosphere, hypobaric storage.
8. Storage methods L - Storage technologies in a normal and controlled atmosphere, hypobaric storage.
9. Sensory test. Physiological disorders. E+L - The role of sensory tests in the assessment of storage capability, practical demonstrations. The concept of physiological disorders, causes and the procedures for their mitigation or elimination.
10. Physiological disorders. Recognition of physiological disorders E, e-L - The concept of physiological disorders, causes and the procedures for their mitigation or elimination. Recognition of visual symptoms of physiological disorders and estimation of their intensity.
11. Seminar S, Pe-L, M, I,W - Independent work of students and their presentation of seminar papers.
12. Seminar S, Pe-L, M, I,W - Independent work of students and their presentation of seminar papers.
13. Field work - Cold stores F - Visit refrigerators and practical introduction to the technological processes in cold store.
14. Field work - Distribution Center F - Visit to the distribution center and practical introduction to the technological processes in the distribution of fruit.
15. Exam S

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Obligatory literature

1. Wills, R., McGlasson, B., Graham, D., Joyce, D. 1998. Postharvest: An Introduction to the Physiology & Handling of fruit, vegetables & ornamentals, UNSW Press, CAB International, Wallingford, UK
2. Kader, A. A. 2002. Postharvest Technology of Horticultural Crops—Third Edition, ANR Publications, Oakland, USA.

Recommended literature

1. Thompson, A.K. 1998. Controlled atmosphere storage of fruits and vegetables, CAB International, Wallingford, UK
2. R. Dris i S. Mohan Jain, Eds. 2004. Production Practices and Quality Assesment of Food Crops, Vol IV: Postharvest Treatment and Technology, Kluwer Academic Publishers, Dordrecht, Nizozemska
3. Seymour, G., Taylor, J., Tucker, G., 1993. Biochemistry of fruit ripening, Chapman¸& Hall, London

Similar course at related universities

- Post harvest biology and technology of fruits, Faculty of Horticultural Science, Corvinus university of Budapest, Hungary

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