

ACADEMIC YEAR: **2019-2020**

COURSE: MACHINES AND PLANTS FOR Postharvest Handling Of Fresh And Fresh-Cut Produce

TYPE OF EDUCATIONAL ACTIVITY: free choice

TEACHER: Giovanni Carlo Di Renzo

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Language: English

ECTS: 6 (5 lessons; 1 laboratory practice)	n. of hours: (lessons e tutorials/practice) 40 lessons 16 laboratory practice	Campus: Potenza School: SAFE Program: Food Science and Technology	Semester: I
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#### EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

This is an advanced course in Machine and plant for postharvest handling of fresh fruit and vegetable and fresh-cut produce with the aim to increase the knowledge about the technology available. During the course the machines and plants used for handling and storing the major fruit and vegetable produces are explained. The aim is to emphasize the results of their use on quality and safety of the followings products: table grape, cherries, kiwifruit, persimmon, peach, plum, broccoli, cauliflower, fennel, celery, tomato, salad. Furthermore are described the machines and plant layout techniques to improve the product quality and production management. The course include practical applications for quality control, storage and treatment of the major fruit and vegetable produce using laboratory instruments, pilot plants and technical visit in the major industries of Basilicata and South Italy. Signs about the most common treatments for management and control of by-products related to the production process.

- **knowledge and understanding:** Knowledge and understanding of the relation between the machine/plant mode of operation and the final quality of the product processed, the energy and water requirement, the waste production; identify sources of raw material; explain the variability and the impact on the shelf life of fruit and vegetable of storage and handling plant and equipment;
- **applying knowledge and understanding:** apply the fundamental concepts of mass, heat, and momentum transfer required in relation with the equipment/plant used for food processing and the quality of the final product; apply the knowledge of the major components of the handling line for high quality products; knowledge of the plant layout for the major fruit and vegetable produce;
- **making judgements:** Ability to identify the most effective design, technical solution, construction material, control system for food quality assurance in the development of new handling and storage process or in the improvement of existing ones; capacity to evaluate the design and layout criteria of storage and handling plant for the major fruit and vegetable produce; to evaluate and choose the optimal processing parameters (temperature, atmosphere composition, pressure, etc.) of the plant in order to control and preserve the quality;
- **communication skills:** Ability to communicate the effects of the impact of effective design, technical solution, construction material, control system on fruit and vegetable quality assurance to both non-technical and technical audiences. Risk communication skills. Ability to interact and communicate with fruit and vegetable business operators and representative of companies involved in the development and implementation of machine and plant for packing house. Ability to communicate with representative of food safety agencies, official control agencies and quality certification agencies in all the steps needed for the registration and approval of a fresh fruit and vegetable and fresh cut handling plant and during quality and safety audits.
- **learning skill:** Ability to access sources of data, documentation and information sources engineering and machine and plant on fruit and vegetable and fresh cut handling using technical and scientific literature.

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#### PRE-REQUIREMENTS

Base knowledge of Machines and Plant for Food Industry, Physics, Chemistry, and Unit operations

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#### SYLLABUS

The course is organized in 6 teaching units. For each of the unit describing processing plant/line for specific product/food will be described.

#### **Unit 1: Machine and plant for precooling and cold storage of fruit and vegetable produce (12h lecture + 4h laboratory)**

Essentials on refrigeration plant and machines. Precooling plant. Air precooling, Hydrocooling and Vacuum Cooling. Relation between precooling method and: quality produce, shelf life, energy requirements. Cold storage rooms. Direct and Indirect refrigeration. The effect of plant design on produce quality.

#### **Unit 2: Controlled atmosphere storage (6h+ 2h)**

Storage rooms requirement and design.  
The plant to control the atmosphere. CO<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, and SO<sub>2</sub> control.

#### **Unit 3: Machine and plant for fruit and vegetable handling (6h+2h)**

Cleaning, washing, brushing and treatment machines.  
Sorting lines based on: mechanical sorting, electronic sorting based on color, shape, defects, composition.  
Packing machines.

#### **Unit 4: Machine and plant for fresh cut produce (6h+4h)**

Cleaning, sorting, grading and packing lines for ready to eat products.  
Washing operation and water treatment and recovery  
Innovative packaging equipment for MAP

#### **Unit 5: Collateral machine and plant (4h+2h)**

Warehouse Internal transport and organization  
Refrigerated transport and shipment by truck, by container, by rail, by ship and by plane.  
Essentials on waste and by-product management

#### **Unit 6: Organization of the warehouse and plant (6h+2h)**

Warehouse layout. Production and service plant layout.  
Logistic inside the warehouse. The management of the products flow.

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#### TEACHING METHODS

Theoretical lessons (40 hours), Laboratory practices (16 hours). During the laboratory and technical tour students have the opportunity to learn in practice the specific operating conditions of each industry and to operate using the pilot plants present in the technological hall of the department.

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#### EVALUATION METHODS

The final exam will verify the achievement of the expected learning outcomes. It will be based on 30 questions with multiple answers, 20 questions are about theory and plant identification, 10 questions are on process control and regulation. The available time for the test will be 40 min and the student can use text and photocopies distributed during the lectures. To pass the test the number of correct answer should be equal or more than 18. The oral exam

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is required if the student don't pass the test.

#### TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

Notes and teaching materials distributed during lessons, related to the course content. The materials will be distributed using a Dropbox directory shared with all the follower students.

#### INTERACTION WITH STUDENTS

At the beginning of the course, objectives, program and methods of evaluation will be described; furthermore, it will be collected the list and data of students attending the course. During the lessons, teaching materials (shared folders) will be provided. Office hours: Monday 15.00 to 17.00 and Wednesday 9.30 to 11.30 at the teacher's study (SAFE, 3 floor, Building 2A, Viale dell'Ateno Lucano 10, Potenza). Furthermore, the teacher is available at all times for contact with students by e-mail.

#### EXAMINATION SESSIONS (FORECAST)<sup>1</sup>

11	set, 2019
9	ott, 2019
6	nov, 2019
11	dic, 2019
15	gen, 2020
5	feb, 2020
4	mar, 2020
8	apr, 2020
6	mag, 2020
10	giu, 2020
8	lug, 2020

#### EXAMINATION BOARD

Giovanni Carlo Di Renzo (President), Francesco Genovese (member), Giuseppe Altieri (substitute)

SEMINARS BY EXTERNAL EXPERTS    YES X    NO

#### FURTHER INFORMATION

<sup>1</sup> Subject to possible changes: check the web site of the Teacher or the Department/School for updates.