

COURSE: Machinery and Equipment for dairy production

ACADEMIC YEAR:2019/2020

TYPE OF EDUCATIONAL ACTIVITY: Elective

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Language: Italian

ECTS: 6 (lessons e tutorials/practice)	n. of hours: 56 (40+16) (lessons e tutorials/practice)	Campus: Potenza/Matera Dept./School: School of agriculture, forestry, food and environmental sciences Program:	Semester: I (First)
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EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The course of Machinery and Equipment for dairy production aims to deepen the technical aspects related to dairy production. Therefore, as part of the course will cover topics related to the design, construction and operation of all machinery and plants present in the modern dairy industry, with reference both to small and medium-large size dairy companies. The lectures, supplemented with seminars by industry experts, are accompanied by practical exercises held in the laboratory of pilot plants for dairy processing, where experimental tests of cheese production will be carried out, with active participation of students. The goal is to provide students with the knowledge of the basic elements for the selection and sizing of the machines and equipment used for the execution of unit operations performed during the production of cheese and other dairy products, and knowledge about the start and the use of machines in a MINI-DAIRY plant.

- **knowledge and understanding:** Students acquire Knowledge and understanding of the relation between the machine/plant mode of operation and the final quality of cheese and milk based produce, the energy and water requirement, the waste production; identify sources of raw material; explain the variability and the impact on food processing plant and equipment;
- **applying knowledge and understanding:** to apply the fundamental concepts of mass, heat, and momentum transfer required in relation with the equipment/plant used for dairy processing and the quality of the final product; apply the knowledge of the major components of a processing line for high quality products; knowledge of the plant layout for dairy processing
- **making judgements:** Students develop ability to identify the most effective design, technical solution, construction material, control system for food quality assurance in the development of new products and processes and in the improvement of existing ones; capacity to evaluate the design and layout criteria of production plant for dairy; to evaluate and choose the optimal processing parameters of the plant in order to control and increase the quality.
- **communication skills:** Ability to communicate the effects of the impact of effective design, technical solution, construction material, control system on food quality assurance to both non-technical and technical audiences. Risk communication skills. Ability to interact and communicate with food business operators and representative of companies involved in the development and implementation of machine and plant for the food industry. 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 food production/distribution plant and during audits.
- **learning skill:** Ability to access sources of data, documentation and information sources on food engineering and machine and plant for dairy processing using technical and scientific literature.

PRE-REQUIREMENTS

A good knowledge of "Food Engineering" and "Unit Operations of the food industry" is need.

SYLLABUS

Introduction (4h)

Introductory remarks on the dairy industry systems and the needs of the industry The materials used in the dairy, the

role of stainless steel, receipt and storage of milk machines

Standardization of the milk and heat exchange (8h+4h Laboratory)

Homogenizers and deaerators Bactofughe and Centrifuges pasteurization and sterilization of milk plants

Production of pasta filata cheeses and other products (16h + 6h Laboratory)

Equipment for the production of mozzarella

Equipment for the production of cheese

Equipment for the production of yogurt

Introduction to Plant for the production of cottage cheese, butter, ice cream

Equipment for the production of soluble powders and freeze-dried milk

The recovery of the dairy industry by-products (4h + Lab 2h)

tangential filtration equipment (ultrafiltration and reverse osmosis)

Principles of operation of a line for the recovery of the whey proteins

Principles of operation of a line for the recovery of lactose

Automation and measurement in the dairy (2h + 2h Lab)

case study of automation and control in the dairy industry

Measurement of the rheological properties of milk, cheese and other derivatives

Dairy design (6h+2h laboratory)

Design of dairy spaces and outdoor areas

Service facilities (water, electricity, compressed air, steam)

Design examples of a dairy plant and mini-dairy plant

Processing cost estimate and business plan

TEACHING METHODS

The course includes 56 hours of teaching between theoretical lessons and “on plant” experimentation. In particular it is provided 40 hours of lessons in the classroom and 16 hours in the laboratory of pilot plants for dairy processing. There will be seminars held by experts, for n. 4 hours. During the lectures the teacher involves students on the subjects presented in order to foster an exchange of considerations. During the exercises and practical experiences, students, individually or by groups, are required to prepare and discuss, in the presence of the teacher, short presentations (max 10 minutes) on specific topics of study included in the course programme.

EVALUATION METHODS

The aim of the examination is to test the level of achievement of the previously mentioned educational goals. At the end of the course the final exam will be done. The exam consists of an oral discussion of a paper prepared by the candidates on a topic, previously agreed with the teacher, among the topics of the program. The time available for the oral discussion of the paper is 15 minutes. The evaluation of the elaborate is based on criteria of completeness and on level of detail, as well as on the basis of quotations of technical, plant, commercial and scientific references. The test is passed with a minimum score of 18/30.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

The reference material consists of notes selected by reference texts and provided to students, supplemented with educational materials produced by the teacher. All course material is regularly provided to students by sharing in a Dropbox folder reserved for the students present in class who include their e- mail address.

INTERACTION WITH STUDENTS

At the beginning of the course, after describing the objectives, program and methods of verification, the list of

students who intend to assiduously attend the course and participate in the laboratory demonstrations will be collected. The teacher provides the students the course material at the end of each lesson through shared folders to which students have access. In addition to weekly reception, the teacher is available at all times for a contact with the students, both at his office and by mail.

Office hours: Monday from 10 to 12 and from 16 to 17:30; Thursday from 10 to 13. The office is situated on the 4th floor ex DITEC Dept. (3A sud building - Campus Macchia Romana)

EXAMINATION SESSIONS (FORECAST)¹

The examination dates will be available on the ESSE3 Web Platform.

EVALUATION BOARD

dott. F. Genovese (President), Prof. G.C. Di Renzo, (Member), Prof. G. Altieri (Replacement Member)

SEMINARS BY EXTERNAL EXPERTS YES ● NO □

FURTHER INFORMATION

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