General Information	
Academic subject	Food storage plants (I.C. Agro-food processing plants)
Degree course	Bachelor programme: Food Science and Technology
ECTS credits	3 ECTS
Compulsory attendance	No
Teaching language	Italian

Subject teacher	Name Surname	Mail address	SSD
	Antonia Tamborrino	antonia.tamborrino@uniba.it	AGR/09

ECTS credits details		
Basic teaching activities	2 ECTS Lectures	1 ECTS Laboratory of field classes

Class schedule	
Period	II semester
Course year	Second
Type of class	Lecture- workshops

Time management	
Hours	75
In-class study hours	30
Out-of-class study hours	45

Academic calendar	
Class begins	February 25th, 2019
Class ends	June 7th, 2019

Syllabus	
Prerequisites/requirements	Basic knowledge for the design and specifications of machines and plant used in the storage equipment
Expected learning outcomes	*Knowledge and understanding* o Knowledge of the principles and laws of thermodynamics; o Knowledge of the principles of the refrigeration cycle and knowledge of the individual components of a refrigerating machine; o Knowledge of thermal loads related to a refrigerating warehouse; o Knowledge of the various types of agro-food storage systems; o Knowledge of machinery and plant solutions adopted for agri-food storage plants. o Knowledge about the layout of the food-processing industry. *Applying knowledge and understanding* o Ability to apply the laws of thermodynamics to the conservation of agri-food products; o Ability to make the specification of a refrigerating machine; o Capacity to calculate thermal loads for a refrigeration warehouse. o Capacity to describe the operation and dimensioning of machines and plants for the preservation of agri-food products; o Ability to apply the main typologies of machines commonly used in the agri-food industry, considering both the operating principle and the criteria guiding the choice; *Making informed judgements and choices* o Ability to assess the main design aspects of machines and

	plant for the storage eqipment of agri-food products. ○ Ability to correctly and critically evaluate plant and machine specifications that can be used depending on the type of product to be stored, the needs and the structure of the company. *Communicating knowledge and understanding* ○ Ability to describe the design aspects of machines and plants for the storage equipment of agri-food products. ○ Ability to interact with the various actors involved in a food industry with a technical language. *Capacities to continue learning* ○ Ability to deepen and update the knowledge about machines and plant for the storage system of agri-food products. The expected learning outcomes, in terms of both knowledge and skills, are provided in Annex A of the Academic Regulations of the Degree in Food Science and Technology (expressed through the European Descriptors of the qualification)
Contents	Applications of thermodynamics principles to the agro-food storage processing. Storage systems for agri-food products (Descriptive and critical analysis of drying plants (Drying plants, concentration plants, evaporation and membrane concentrators, crio-concentration) Descriptive analysis and critical of machines that use the heat as principle of conservation (pasteurization and sterilization plants) Descriptive and critical analysis of cold storage machines and systems (freezing plants). Plants projecting (machinery and equipment) Cooling plants (cold store plants; compressor design; evaporator design; condenser design; circuits). Refrigerating room (thermal load and design) Harvest and postharvest machine (Field packing; Harvesting for packing in a central facility; cooling and storage systems; Cooling horticultural commodities; machine and plants in the packinghouse)
Course program	
Reference books	• Lessons note • CIGR – The International Commission of Agricultural Engineering "HANDBOOK OF AGRICULTURAL ENGINEERING" Agro Processing Engineering, Published by: ASAE; • Armando Monte "Elementi di Impianti Industriali" Volume II, Edizioni Libreria Cortina Torino; • Toledo R.T., "Fundamentals of Food Process Engineering", Van Nostrand Reinhold, New York (USA), 1991. • Rapin P.J. "Impianti Frigoriferi". Edizione Tecniche nuove. • Pidatella Cipriano "Corso di Macchine Termodinamica e macchine termiche". Edizione Zanichelli. • Ingegneria dell'industria alimentare. Operazioni unitarie del food engineering. Macchine e impianti. D. Friso; CLEUP, 2013.
Notes	
Teaching methods	Course topics will be handled with PowerPoint presentations, video footage, field tour. Lecture notes and educational supplies will be provided by means of a mailing list or online platforms (i.e.: Edmodo, Google Drive…)
Evaluation methods	For students enrolled in the current year, a midterm test is foreseen. The test consists of a written test on the topics developed during the lessons. The test will be expressed in thirtieths and in the event of a positive outcome, the next oral test will focus on the topics developed during

	the lessons held in the classroom after the midterm test date. The outcome of this test is the evaluation of the profit test and is valid for one academic year.
	The exam consists of an oral exam on the topics developed during the lessons as reported in the Teaching Regulations of the Master Degree Program in Food Science and Technology (Art.9) and in the Study Plan (Annex TO).
	The assessment of the student's preparation takes place on the basis of established criteria, as detailed in Annex B of the Teaching Regulations of the Master Degree Course.
	For students who have supported the midterm test, the assessment of the profit test is expressed as the average between the vote on the mid-term test and the profit test.
	The foreign student's profit test can be done in English in the manner described above.
Evaluation criteria	*Knowledge and understanding* o Basic knowledge of the main aspects for the design of storage equipment and plant. *Applying knowledge and understanding* o Exercise and case studies on machines and plant with references to different type of companies and industries. *Making informed judgements and choices* o Properly and critically express plant and machine specifications that can be used depending on the type of product to be retained, the needs and the structure of the company. Express opinion adequately on the operations and machines and plant. *Communicating knowledge and understanding* o Describe the main typologies of machines commonly used in the agro-food industry, considering both the operating principle and the criteria guiding the choice using appropriate vocabulary *Capacities to continue learning* o Analyzing in a critical way concrete situations and case studies, working in team and managing strict deadline.
Receiving times	Monday-Friday by previous agreement by e-mail