Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Module title	Unit operations in food processing
Course code	44700
Scientific sector	AGR/15
Degree	Food Sciences for Innovation and Authenticity
Semester	I
Year	I
Academic year	2018/19
Credits	12
Modular	No

Module title	Food Sciences for Innovation and Authenticity
Module code	44700A
Scientific sector	AGR/15
Degree	Master
Semester	I
Year	I
Academic year	2018/19
Credits	6
Modular	No

Total lecturing hours	36
Total lab hours	12
Total exercise hours	12
Attendance	Recommended
Prerequisites	
Course page	

Specific educational objectives	**Aims** The course aims to provide concepts related to the phenomenological understanding of the main unit operations of food technology. It is mainly focused on the description of the operating principles and design of industrial equipment, used in the processing, storage and packaging of foods. The analysis of the unit operation provides the basic background to understand food processes and their impact on the product quality. Mass and energy balances are applied to the main unit operations of the food industry as evaporation, distillation, extraction, and drying. Examples applied to different foods are incorporated to ensure that the student gains an

	understanding of the relationship between foods and processes. **Educational objectives:** 1) The student is able to represent the unit operations of a food process 2) Given a unit operation, the student is able to understand the main processing parameters 3) Given a unit operation, the student is able to describe the theory and the phenomena occurring during the process 4) Given a unit operation, the student is able to analyze the process, describe the variables governing it, write and solve the energy and mass balances, predict the changes occurring to foods

Lecturer	Giovanna Ferrentino, NOI Technology Park, via Ipazia 1, Bolzano, giovanna.ferrentino@unibz.it
Scientific sector of the lecturer	AGR/15
Teaching language	English
Office hours	16 From Monday to Friday (appointment requested)
Teaching assistant (if any)	To be recruited

List of topics covered	**Section 1. Introduction**
	- Definition of unit operation
	- Degree of freedom and variables of project
	- Dimensional analysis
	- Mass balance on a single unit operation
	- Energy balance on a single unit operation
	
	Section 2. Fluid flow in food processing
	- Liquid Transport Systems
	- Properties of Liquids
	- Handling Systems for Newtonian Liquids
	- Energy Equation for Steady Flow of Fluids
	- Flow Characteristics of Non-Newtonian Fluids
	
	Section 3. Unit operations for separation of food components
	- Distillation
	  ○ Principles of the unit operation
	  ○ Application of distillation in the food industry
	  ○ Flask distillation
	  ○ Continuous distillation with reflux

	• Material balances in plate columns • Number of ideal plates; McCabe-Thiele Method - Liquid-liquid extraction ○ Extraction equipment ○ Principle of extraction ○ Mass balance ○ Number of ideal stages **Section 4. Unit operations for stabilizing food through water removal** - Evaporation ○ Principles of the unit operation ○ Application of evaporation in the food industry ○ Types of evaporators ○ Mass and energy balances on single effect evaporator ○ Mass and energy balances on multiple effect evaporators - Drying ○ Principle of the unit operation ○ Application in the food industry ○ Phase equilibria ○ Mass and energy balances during a drying process **Section 5. Packaging Concepts** - Introduction - Mass transfer in packaging materials - Innovation in food packaging - Food packaging and product shelf life
Teaching format	Frontal lectures, exercises, labs, projects

Learning outcomes	**Knowledge and understanding** The student will gain a deep knowledge of the process plants and the unit operations. He will get familiar with simplified models correlating operational and/or project parameters with their effects on the energy and mass balances. **Applying knowledge and understanding** The student will be able to apply the theoretical knowledge of the course to practical problems. **Making judgments** The student will be able to assess the applicability of the unit operations by highlighting the advantages and disadvantages deriving from their use. **Communication skills**

	The student will develop a written report on a topic concerning the unit operations described during the course using an appropriate technical-scientific terminology. **Learning skills** The student will learn how to solve mass and energy balances applied to unit operations by means of calculations and graphics.

Assessment	The final assessment includes a written exam. It will include the resolution of numerical problems and the answer to theoretical questions to test the knowledge and the skills acquired during the course.
Assessment language	English
Evaluation criteria and criteria for awarding marks	The evaluation comprises of a written exam divided in two part: 1. Resolution of a numerical exercise (80%, 24 points of 30) 2. Answer to a theoretical question (20%, 6 points of 30) Criteria for the resolution of the numerical part are: • The correct identification of the process parameters involved in the unit operation • The correct writing of the mass and energy balances • The correct expression of the results Criteria for the answer to the theoretical question are: • clarity of answers • ability to summarize and establish relationships

Required readings	Slides discussed during the lecture R. L. EARLE. Unit operations in food processing. (www.nzifst.org.nz/foodreactiontechnology/index.htm) R Paul Singh; Dennis R Heldman. Introduction to food engineering. Elsevier.
Supplementary readings	McCabe Warren L., Smith J.C., Harriott P. Unit operations of chemical engineering. McGraw-Hill International Editions. R.H. Perry, D.W. Green: Perry's Chemical Engineer' Handbook, Mc Gaw-Hill

Course title	Innovation and authenticity for winery products (6 ECTS)

Course code	44700B
Scientific sector	AGR/15 Food Science and Technology
Degree	Master in Food Science for Innovation and Authenticity
Semester	1st
Year	I
Academic year	2018/19
Credits	6
Modular	Yes

Total lecturing hours	40
Total lab hours	20
Total exercise hours	
Attendance	Strongly recommended
Prerequisites	Knowledge of food chemistry and technology
Course page	https://www.unibz.it/en/faculties/sciencetechnology/master-food-sciences-innovation-authenticity/courses-offered/?academicYear=2018

Specific educational objectives	• type of course: *area caratterizzante* • the scientific area: Innovation and authenticity in food processing • the course is part of the common study programme The course gives a general overview of scientific contents and is designed for acquiring professional skills and knowledge Educational objectives (a) provide an adequate knowledge and critical approach to develop projects related to the production of various types of wine and other winery products, taking into account innovative technologies and the official wine regulations; (b) provide an adequate knowledge of the authenticity aspects of wines and chemical/instrumental approaches to determine it

Lecturer	Emanuele Boselli, BZ L5.00, emanuele.boselli@unibz.it, +390471017217, https://www.unibz.it/en/faculties/sciencetechnology/academic-staff/person/37607-emanuele-boselli Edoardo Longo, BZ L5.00, edoardo.longo@unibz.it, +39 0471 017691, https://www.unibz.it/it/faculties/sciencetechnology/academic-staff/person/35783-edoardo-longo
Scientific sector of the lecturer	AGR/15
Teaching language	English
Office hours	before and after the lectures or upon appointment
Teaching assistant (if any)	Dr. Bruno Plasinger

Office hours	before and after the lectures or upon appointment
List of topics covered	Elements of basic wine enology: grape berry composition, traditional winemaking techniques, treatments for wine stabilization. Innovative technologies and products: techniques for lowering or replacing chemical additives in wines with natural approaches; alcohol reduction; no/low sulfite wines; vegan wines; high hydrostatic pressures; inert atmospheres and vacuum.; other innovations Introduction to wine laboratory practices and procedures; basics of wine chemistry; conventional analytical procedures from berry to bottle; innovative approaches for the evaluation of authenticity of wines (for the determination of grape blends, geographical origin, winemaking practices)
Teaching format	Frontal lectures, labs, projects.

Learning outcomes	Knowledge and understanding (a) adequate knowledge and understanding about the development of projects related to the production of various types of wine and other winery products, taking into account innovative technologies and the official wine regulation; (b) provide an adequate knowledge of the authenticity aspects of wines and chemical/instrumental approaches to determine it Applying knowledge and understanding (a) developing the capability of integration of information, both in horizontal way (technological, chemical, biological, and regulatory aspects involved in each innovative processing technology) and in vertical way (reasonable sequence of processes along the innovative wine production chain); (b) capability of carrying out strategies for the introduction of innovative processes in the wine sector; (c) capability of evaluating the potentiality of innovative technologies; (d) capability of applying the right chemical/instrumental technique to assess wine authenticity. Making judegments Capability of identifying the information needed to introduce sustainable innovations and to ensure/evaluate authenticity of wines and winery products with instrumental techniques. Communication skills capability of clearly and exhaustively communicate notions, ideas, problems and technical solutions to interlocutors, either professional or not, representative of the various and specific competencies in the wine supply chain (agronomists, engineers, biologists, chemists, nutritionists, administrators).

	Learning skills To get the learning skills that are necessary to update the winery plants and to obtain wine products with innovative technologies without loss of authenticity and with a good level of autonomy.

Assessment	Written and project work: written exam with review questions and written project report done in groups
Assessment language	English
Evaluation criteria and criteria for awarding marks	Successful completion of the examination will lead to grades ranging from 18 to 30 with honors (50% written and 50% project work). • relevant for written exam: clarity of answers, mastery of language (also with respect to teaching language), ability to summarize, evaluate, and establish relationships between topics; • relevant for project work: ability to work in a team, creativity, skills in critical thinking, ability to summarize in own words

Required readings	Keynotes and scientific papers provided by the lecturers
Supplementary readings	Ribéreau-Gayon P., Dubourdieu D., Donèche B., Lonvaud A. – Handbook of Enology – Vol. I and II – free pdf version available in the internet OIV technical standards and documents http://www.oiv.int/en/technical-standards-and-documents Introduction to Wine laboratory practices and procedures, JL Jacobson, Springer