Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	**Reaction kinetics in food processing**
Course code	44704
Scientific sector	AGR/15
Degree	Food Sciences for Innovation and Authenticity
Semester	II
Year	I
Academic year	2019/2020
Credits	8
Modular	No

Total lecturing hours	48
Total exercise hours	32
Attendance	Yes
Prerequisites	Use of spreadsheet
Course page	

Specific educational objectives	**Aims** The course aims to provide specific skills to analyze the chemical, physical or biological changes occurring to foods during processing or storage. The course is mainly focused on data analysis and model building. Thanks to the extensive use of spreadsheets, the students will be able to model experimental data, derive and select the most appropriate kinetic model and evaluate the overall effect of the process on food quality. A number of practical problems of great relevance for the food industry will be discussed and analyzed, including storage stability, shelf-life estimation, fermentation, lipid oxidation and browning reactions. **Educational objectives:** 1) the student is able to describe the theory of reaction kinetic and what is behind the main reactions discussed during the course. 2) given a set of kinetic models, the student is able to comprehend the type of reaction, the rate constant, the reaction order, the rate of change and the main variables. 3) given the description of a specific storage or processing situation, the student is able to identify the most important reactions that may occur, describing the theory governing those reactions and identifying the key element to control them. 4) given a set of experimental data, the student is able to derive the best kinetic model, analyze the

	situation, describe the appropriate procedure to report the solution to the problem, predict the changes occurring to foods.

Lecturer	Matteo Mario Scampicchio, Ksenia Morozova
Scientific sector of the lecturer	AGR/15
Teaching language	English
Office hours	24
Teaching assistant (if any)	Mohsen Ramezani
List of topics covered	1) **Introduction to reaction kinetic** *Problems in food processing, practical use of modelling, theory of reaction rates in solutions, effect of temperature and pressure, analytical solution of the main rate laws.* 2) **Application of reaction kinetics to the study of chemical, biochemical and physical changes in foods** *Maillard reactions, vitamin loss, thermal microbial destruction, fermentation kinetics, enzyme kinetics and inhibition, autoxidation and radical chain reactions, antioxidants, colloidal stability.* 3) **Modelling of kinetic data** *Parameter estimation for linear models, uncertainty of the estimates, propagation of errors, numerical methods for non-linear models, statistical process control.*
Teaching format	Frontal lectures, exercises, labs, projects

Learning outcomes	The learning outcomes are: **Knowledge and understanding** The student will gain knowledge of the main reactions occurring in food during storage and processing, their principles, and theoretical basis. The student will learn the use of spreadsheet to derive rate laws, fit experimental models and validate the results. **Applying knowledge and understanding** The student will be able to apply the theoretical knowledge of reaction kinetics on practical problems occurring to foods. **Making judgements** The student will be able to derive, analyze and compare the rate of reactions and make judgments on the main factors that can affect them.

	Communication skills The student will develop a written report to describe, analyze and evaluate some case studies related to reactions occurring to foods. **Learning skills** During classes, the student will learn how to solve kinetic problems by means of spreadsheets and graphics.

Assessment	The oral assessment is based on a written project report. The exam is based on review questions, oral exam to test knowledge application skills and the evaluation of results
Assessment language	English
Evaluation criteria and criteria for awarding marks	The evaluation consists of: • written exam (100%) Criteria for the written exam: • Readability: logical structure of the report in sections, conciseness of sentences, appropriate use of terms. In oppose to wordiness, complexity or difficulty of reading. • Scientifically soundness: precision of processing data, appropriate use of the kinetic model, accurate expression of results. • Ability to communicate the results: scientific soundness, conciseness, preciseness.

Required readings	Slide and spreadsheets discussed during the lecture Earle, R. Earle ,M., Fundamentals of Food Reaction Technology (free version online at the following link: www.nzifst.org.nz/foodreactiontechnology/index.htm)
Supplementary readings	Kinetic Modeling of Reactions In Foods Martinus A.J.S. van Boekel (ISBN 9781574446142)