Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Biochemistry and physiology of agricultural plants
Course code	40140
Scientific sector	AGR/13
Degree	Agricultural and Agro-environment Sciences L-25
Semester	II
Year	II
Academic year	2017-2018
Credits	6
Modular	*No*

Total lecturing hours	40
Total lab hours	
Total exercise hours	16 for each group - Laboratory exercises repeated 3 times for three groups of students
Attendance	
Prerequisites	To have attended the lectures and the exercises of the General Inorganic Chemistry and Organic Chemistry courses.
Course page	

Specific educational objectives	The course belongs to the area of learning that characterize the Study Course (*corsi caratterizzanti*) and specifically in the context of the disciplines of Plant Production. The aim of the course is to provide students with an adequate mastership of general scientific principles and methods as well as some specific professional knowledge. The aim of the course is to acquire the basic knowledge that is necessary to understand the chemical changes that matter undergoes in living organisms by relating qualitative and quantitative aspects of agriculture. In particular, it is expected that the student acquires knowledge on the main properties and characteristics of biomolecules in relation to the structures they form, on the enzyme properties, functions and regulation, on bioenergetics and trans-membrane transport, and on some main metabolic pathways and their regulation.

Lecturer	Prof. Stefano Cesco, K Building, Room 1.01, e-mail *stefano.cesco@unibz.it, tel 0471017160,*
Scientific sector of the lecturer	AGR/13
Teaching language	English
Office hours	From Monday to Thursday by appointment

Teaching assistant *(if any)*	Dr. Fabio Valentinuzzi, K Building, Room 1.02, e-mail *fabio.valentinuzzi@unibz.it*
Office hours	From Monday to Thursday by appointment
List of topics covered	• Structure and functions of biological macromolecules: amino acids and proteins, carbohydrates and lipids. • The enzyme kinetics, inhibition, regulation of membrane and soluble enzyme systems; isoenzymes. • Bioenergetics: energy changes in biological systems, forecasting feasibility of reactions, exo- and endo-endergonic reactions and calculation of ΔG and ΔG0, and mechanisms of energy transfer. • Composition and functions of cell membranes: energy of trans-membrane transport, structure and function of membrane proteins, transport of ions and metabolites. Root uptake of Nutrients, their translocation and allocation at the leaf and fruit level. • Oxidative metabolisms: glycolysis and its regulation; tricarboxylic acid cycle and its regulation, the mitochondrial electron transport chain, oxidative phosphorylation, cyanide-resistant respiration, β-oxidation of fatty acids and glyoxylate cycle, the cycle of the pentose phosphate. • Photosynthesis: Pigments and their synthesis, light absorption and energy transfer, photosystems and bright reactions, photophosphorilation, incorporation and reduction of CO_2, C3, C4 and CAM plants, photorespiration and glycolate metabolism. • Notes on the absorption and assimilation of nitrogen and sulfur compounds: mechanisms of trans-membrane transport, nitrate reduction, the GS-GOGAT system, sulfate reduction and assimilation. • Plant mineral nutrition: the biochemical role of macro- and micronutrients
Teaching format	The course consists of lectures during which the Professor presents the different topics. Practical lessons and laboratory activities conducted by the Teacher and the Teaching Assistants are also foreseen. Course topics will be presented using Power Point presentations and at the end of a single lesson a paper copy will be distributed directly to students.

Learning outcomes	**Knowledge and understanding** of chemical transformations that matter undergoes in living organisms in relation to qualitative and quantitative aspects of both production practices and processing in agriculture.

	Capability in applying knowledge by developing practical laboratory skills and the ability to draw information out from practical laboratory activities in support/integration to the theoretical lessons. **Making judgments** based on the choice of analytical protocols, writing a report. **Capability in presentation of the skills acquired** with an appropriate language and use of technical and specific terms. **Acquisition of learning strategies** based on the use of technical information and knowledge updating.

Assessment	Assessment is conducted via *oral examination* that includes *a)* questions to assess the knowledge and understanding of the course topics and *b)* questions designed to assess the ability to transfer these skills to case studies of crop production. Space will also be dedicated to the evaluation of the ability to rework the experience of the laboratory.
Assessment language	English
Evaluation criteria and criteria for awarding marks	Attribution of a single final mark. *Criteria for awarding the mark: the clarity of the response, mastery of language (including in relation to the language of the course), the ability to summarize, evaluate, and establish relationships between topics, the independence of judgment, the ability to rework.*

Required readings	D.L. Nelson, M.M. Cox, Lehninger principles of biochemistry, Freeman, New York, 2008 R. Pinton, M. Cocucci, P. Nannipieri, M. Trevisan. Fondamenti di Biochimica Agraria, Patron Editore, Bologna ISBN: 978-88-555-3322-5
Supplementary readings	Buchanan, B.B. Biochemistry & Molecular Biology of Plants Published by Wiley-Blackwell (2009), ISBN: 9780943088396