Dipartimento di Scienze Agrarie, Alimentari e Ambientali

Programs

A.A. 2015-2016

AGRARIAN INDUSTRIES

NATALE GIUSEPPE FREGA

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic knowledge of chemistry and physics.

Course contents

The didactic method is based on ppt lectures (4 ECTS) (provided in copies to the students) and laboratory experiences and visits to local and national food industries (2 ECTS).

Objectives of the course

Knowledge and understanding:

The course enables students to acquire knowledge about (a) compositional and nutritional properties of vegetable oils, milk, dairy products and wine (b) the technological process applied to the production of vegetable oils, milk, dairy products and wine.

Applying knowledge and understanding

1. Ability to operate production choices, focused on high-quality production.
2. Ability to design control activities to optimize the technological process in line with business goals.

Cross-expertise:

(a) making judgements: capability of identify the information be needed to improve the efficiency of the processes and the quality of the final products;

(b) communications: 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 agro-food supply chain (engineers, biologists, chemists, nutritionists, administrators).

Program

Oils, fats and derivatives - Nutritional, chemical and technology of oils and fats. Composition of oils and fats. Alteration of raw materials. Mechanical and solvent extraction. Refining. Autoxidation and antioxidants. Hydrogenation. Margarines (2 ECTS).

Milk and dairy products - milk composition. Lactose. Alteration of lactose. Lipids, proteins, salts, enzymes and minor components of milk. Chemical and physical indices. Rennet coagulation and acid coagulation. Cleansing milk. Creams outcrop and centrifugation. Butter. Milk: powdered, concentrated and evaporated. Cheese. Alterations of the cheese (2 ECTS).

Wine - Composition of grapes and wine. Correction and maintenance musts. SO2 in wine. Fermentations. Vinification in white, red and rosé. Winemaking for carbonic maceration and vilification details. Composition of wine. Correction, clarification, stabilization and treatment of clarifying wines. Conservation, aging and diseases of wine (2 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion on the subjects listed in the teaching program.

Learning evaluation criteria

The student will have to demonstrate knowledge of: (a) the chemical and nutritional proprieties of the main agricultural products: vegetable oils, milk , dairy products and wine (b) technological process involved in the production of the vegetable oils, milk, dairy products and wine (e) appropriate usage of technical terminology.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 with honors.

Final mark allocation criteria

The oral examination consist of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10. In order to pass the examination, the student will have to demonstrate: (a) overall understanding of the subjects; (b) appropriate usage of technical terminology. In order to obtain the best evaluation, the student will have to demonstrate: (a) in-depth knowledge and understanding of the subjects; (b) fluency in the usage of the technical lexicon; (c) ability to identify the critical points of the technological process applied to the production of agricultural products

Recommended reading

C. LERICI, G. LERCKER: Principi di tecnologie alimentari, Coop. Univ. Libr., Bologna, 1983

C. ALAIS: Il latte, Ed. Tecniche Nuove, Milano, 1984

P. BASTASIN, L. CERESA: Industrie Agroalimentari, F. Lucisano Ed., Milano, 1991

SCIANCALEPORE V., Industrie agrarie. Olearia, enologica, lattiero-casearia (ed. UTET 2006)

CAPPELLA P., FEDELI E., BONAGA G., LERCKER G. Manuale degli oli e grassi. Tecniche nuove (1997).

Tutorial session

Thursday from 12 am to 2 pm.

AGRICULTURAL AND FOREST ENTOMOLOGY AND ZOOLOGY

NUNZIO ISIDORO

Seat Agraria
A.A. A.A. 2015-2016
Credits 9
Hours 81
Period 2^ semestre

Prerequisites

Basic knowledge of general biology, botany and chemistry.

Course contents

The didactic method is based on ppt lectures (6 ECTS) (provided in copies to the students), and laboratory experiences and guided tours in protected areas will be organized in order to put into practice what the students have learned in class (3 ECTS). The course will be also available through an e-learning version using the Moodle platform. Within this platform, the course will be divided into: (i) teaching materials composed by different learning units; (ii) self-assessment tests; (iii) laboratory exercises and guided tour information and reservations.

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge about the biology and damages of the most important pests, as well as on integrated pest management strategies against them with a reduced environmental impact view.

Applying knowledge and understanding. The main aim of this course is to provide a fully development ability of the students in recognizing the most important arthropods and animal parasites, their different symptoms on plants taking into account both different mouthparts and ovipositors that produced them in order to adopt sustainable and environmentally friendly strategies of pest control .

Cross-expertise. (i) making judgements: capability of identify the information needed to manage the pests in a forest environment; (ii) communications: capability of clearly and exhaustively communicate notions, ideas, problems and technical solutions to interlocutors, either professional or not, representative of the various and specific expertises in the forestry environment (engineer, architect, biologist, administrator).

Program

1. Course presentation. General Entomology: introduction to arthropods. External structure and function: head and its appendages; different types of mouthparts associated to damages caused by insects; thorax and its appendages; abdomen and its appendages (2 ECTS).

2. Internal structure and function: exoskeleton; nervous system and sensory organs, digestive system, circulatory system, respiratory system, excretory system, endocrine system, reproductive system. Insect growth and development: egg, growth and metamorphosis. Reproductive strategies. Quiescence and diapause. Insect-plant relationship (2 ECTS).

3. Insect-Plant Interactions. Insect ecology and their impact on the forest. Plants predisposition to infestation. Primary and secondary phytophagous. Methods of pest population assessment and damage thresholds. Description and evaluation of the damage caused by leaf-feeders, fruit-feeders, sap-feeders, bark-feeders and borers on plants. Direct and indirect control methodologies (biological, chemical and integrated). Dissertation on main pests (3 ECTS).

4. Taxonomy, phylogeny and systematics of the main zoological groups of forest interest: Pulmonat Gastropods, Mites and Nematodes (2 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the teaching program. During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

In the oral classwork, the student will have to demonstrate: (i) knowledge of the identification of the main insect pests and zoophagous; (ii) knowledge of the morphological and anatomical pest structures; (iii) life cycle, damages and control strategies of the major pests. To pass the oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

1. Zangheri S., Pellizzari Scaltriti, 1988. “**Parassitologia animale dei vegetali**”. CLEUP, Padova.

2. Baronio P., Baldassari N., 1997. “**Insetti dannosi ai boschi di conifere**”, Edagricole, Bologna.

3. Ferrari M., Menta A., Marcon E., Montermini A., 1999. “**Malattie e parassiti delle piante da fiore**, **ornamentali e forestali**”, Edagricole, Bologna.

4. Gullan P.J., Cranston P.S., 2010. “**The Insects** – **An outline of Entomology**” 4th ed.

Office hours:

Tuesday and Thursday from 3 pm to 6 pm.

AGRICULTURAL AND FOREST ENTOMOLOGY AND ZOOLOGY

PAOLA RIOLO

Seat Agraria
A.A. A.A. 2015-2016
Credits 9
Hours 81
Period 2^ semestre

Prerequisites

Basic knowledge of general biology, botany and chemistry.

Course contents

The didactic method is based on ppt lectures (6 ECTS) (provided in copies to the students), laboratory experiences and guided tours, mainly in farms and structures for the processing of agricultural products, will be organized in order to better understanding what the students have learned in class (3 ECTS). The course will be also available through an e-learning version using the Moodle platform. Within this platform, the course will be divided into: (i) teaching materials composed by different learning units; (ii) self-assessment tests; (iii) laboratory exercises and guided tour information and reservations.

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge about the biology and damages of the most important pests, as well as on integrated pest management strategies against them with a reduced environmental impact view.

Applying knowledge and understanding. The main aim of this course is to provide a fully development ability of the students in recognizing the most important arthropods and animal parasites, their different symptoms on plants taking into account both different mouthparts and ovipositors that produced them in order to adopt sustainable and environmentally friendly strategies of pest control .

Cross-expertise. (i) making judgements: capability of identify the information needed to manage the pests in a agroecosystem; (ii) communications: capability of clearly and exhaustively

communicate notions, ideas, problems and technical solutions to interlocutors, either professional or not, representative of the various and specific expertise in the agroecosystem (engineer, architect, administrator, etc.).

Program

1. Course presentation. General Entomology: introduction to arthropods. External structure and function: head and its appendages; different types of mouthparts associated to damages caused by insects; thorax and its appendages; abdomen and its appendages (2 ECTS).

2. Internal structure and function: exoskeleton; nervous system and sensory organs, digestive system, circulatory system, respiratory system, excretory system, endocrine system, reproductive system. Insect growth and development: egg, growth and metamorphosis. Reproductive strategies. Quiescence and diapause. Insect-plant relationship (2 ECTS).

3. Insect-Plant Interactions. Insect ecology and their impact on the agroecosystem. Plants predisposition to infestation. Primary and secondary phytophagous. Methods of pest population assessment and damage thresholds. Description and evaluation of the damage caused by leaf-feeders, fruit-feeders, sap-feeders, bark-feeders and borers on plants. Direct and indirect control methodologies (biological, chemical and integrated). Dissertation on main pests of the various agroecosystems (3 ECTS).

4. Taxonomy, phylogeny and systematics of the main zoological groups of agricultural interest: Pulmonate Gastropods, Mites and Nematodes (2 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the teaching program. During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

In the oral classwork, the student will have to demonstrate: (i) knowledge of the identification of the main insect pests and zoophagous; (ii) knowledge of the morphological and anatomical pest structures; (iii) life cycle, damages and control strategies of the major pests. To pass the oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of three questions concerning the subjects listed in the program, each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

1. Gullan P.J., Cranston P.S., 2010. “**The Insects** – **An outline of Entomology**”, 4th ed.. Wiley-Blackwell, Oxford.

2. Fiori G., Bin F., Sensidoni A., 1983. **“Atlante entomologico - morfologia esterna”**. Galeno Editrice, Perugia.

3. Pollini A., 1988. **“Manuale di Entomologia applicata”,** Edagricole, Bologna.

4. Zangheri S., Pellizzari Scaltriti, 1988. “**Parassitologia animale dei vegetali**”. CLEUP, Padova.

Tutorial session

Tuesday and Thursday from 3 pm to 6 pm.

AGRICULTURAL AND FOREST GENETICS

LAURA NANNI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge of plant biology and **general and organic** chemistry will facilitate the understanding of the course topics

Course contents

Lectures will be presented through PC assisted tools (Powerpoint, Adobe Acrobat, etc.), slide projector, overheads (4 ECTS) and provided in copies to the students, laboratory experiences (practices) and guided tours to Research Centers will be organized (2 ECTS). In parallel, an e-learning version of the course using the Moodle platform will be available, including teaching materials organised in learning units, self-evaluation tests and results, information and booking for seminars and visits.

Objectives of the course

Knowledge. The course is structured to provide a guide to acquire the basics of the biochemistry and the organization of genetic material, the gene structure, the genetic control of characters, the processes that regulate gene interactions and their heritability.

Applying knowledge and understanding. The aim of the course is to provide a basic information on general genetics and molecular biology, for understanding the main features of heredity in order to ensure a proper management of agricultural and forest resources, also on the basis of innovative molecular technologies.

Cross-expertise.(i) Acquisition of skills related to the analysis of genetic data and useful knowledge for the management of agricultural resources even on the basis of modern molecular technologies; (ii) the achievement of the educational goals gives the basics for applying selection principles and

plant breeding methodologies used for the improvement of quality and quantity of crop production.

This knowledge is applicable in the context of seed, agro-energy and nursery sector.

Program

Organization of living organisms, heritability and variability. Relationship between genetic material and phenotypic traits. The genetic code - Organization and transmission of genetic material (2 ECTS).

Mendelian genetics- Segregation and recombination. Genetic interactions: epistasis, complementary gene action, pleiotropy, penetrance and expressivity - Multiple alleles (2 ECTS).

Genetic Linkage and Genetic Maps. Heredity and Sex. Mobile genetic elements and mutations. Molecular genetics. Extrachromosomal inheritance. (2 ECTS).

Practical lessons (laboratory activities)

- DNA extraction from plant tissues

- Exercise of formal genetics

- Segregation analysis of F2 progenies derived from plant species of agricultural interest

- Genetics maps

Development of the course and examination

Learning evaluation methods

Final assessment will consist of a written test and an oral discussion on of the subjects listed in the teaching program. During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

.

In the written test the student will have to show: a) knowledge of the biochemistry and the organization of genetic material and the mode of transmission of the characters; b) understanding of the principles of Mendelian genetics; c) construction of genetic maps. To pass the oral exam, the student must demonstrate an overall understanding of the contents, set out sufficiently corrected by using appropriate scientific terminology, and to be able to deal with deductive reasoning in order to implement appropriate connections within the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The written test consists of ten exercises concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 3. The final grade will be awarded after the interview. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

GENETICA AGRARIA. Genetica e biotecnologie per l'agricoltura. Franco Lorenzetti, Salvatore Ceccarelli, Daniele Rosellini. PATRON 2011

Barcaccia G., Falcinelli M. Genetica e Genomica Volume I Genetica generale. LIGURI EDITORE

Tutorial session

Thursday from 2 pm to 4 pm.

AGRICULTURAL AND FOREST GENETICS

ELENA BITOCCHI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic knowledge of plant biology and **general and organic** chemistry.

Course contents

The teaching method used to enhance and optimise student learning implies classroom lectures (Power Point presentations that will be provided to students), laboratory practical classes, seminars and visits to national research institutes (6CFU). In parallel, an e-learning version of the course using the Moodle platform will be available, including teaching materials organised in learning units, self-evaluation tests and results, information and booking for seminars and visits.

Objectives of the course

Knowledge. The course provides the acquisition of the basics of molecular and Mendelian genetics and the organization of genetic material, the gene structure, the genetic control of characters, the processes that regulate gene interactions and their heritability to be used for the management of agricultural and forest genetic resources.

Applying knowledge and understanding. The aim of the course is to provide a basic information on general genetics and molecular biology, for the understanding of the main features of heredity in order to ensure a proper management, conservation and valorization of agricultural and forest genetic resources, also considering the most recent innovative molecular technologies.

Cross-expertise. (i) Acquisition of skills related to the analysis of genetic data and useful knowledge for the management of agricultural and forest genetic resources even on the basis of modern molecular technologies; (ii) capability of clearly and exhaustively communicate notions, ideas, problems and technical solutions to interlocutors, either professional or not, involved in the management, conservation and valorization of agricultural and forest genetic resources.

Program

Organization of living organisms, heritability and variability. Relationship between genetic material and phenotypic traits. The genetic code - Organization and transmission of genetic material (2 ECTS, 18 hours).

Mendelian genetics- Segregation and recombination. Genetic interactions: epistasis, complementary gene action, pleiotropy, penetrance and expressivity - Multiple alleles (2 ECTS, 18 hours).

Genetic Linkage and Genetic Maps. Heredity and Sex. Mobile genetic elements and mutations

Molecular genetics . Extrachromosomal inheritance. (2 ECTS, 18 hours).

Practical lessons (laboratory activities)

- DNA extraction from plant tissues.
- Exercise of formal genetics.
- Segregation analysis of F2 progenies derived from plant species of agricultural interest.
- Genetics maps.

Development of the course and examination

Learning evaluation methods

Final assessment will consist of a written test and an oral discussion on of the subjects listed in the teaching program. During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

In the written test the student will have to show: a) knowledge of biochemistry and organization of the genetic material and the hereditabilty of the traits; b) understanding of the principles of Mendelian genetics; c) construction of genetic maps. To pass the oral exam, the student must demonstrate an overall understanding of the contents, set out sufficiently corrected by using appropriate scientific terminology, and to be able to deal with deductive reasoning in order to implement appropriate connections within the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The written test consists of ten exercises concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 3. The final grade will be awarded after the interview. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

GENETICA AGRARIA. Genetica e biotecnologie per l'agricoltura. di Franco Lorenzetti, Salvatore Ceccarelli, Daniele Rosellini. PATRON 2011

Barcaccia G., Falcinelli M. Genetica e Genomica Volume I Genetica generale. LIGURI EDITORE

Tutorial session

Thursday from 14 pm to 16 pm.

AGRICULTURAL CHEMISTRY AND BIOCHEMISTRY

COSTANTINO VISCHETTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 9
Hours 81
Period 2^ semestre

Prerequisites

Basic knowledge of general biology and inorganic and organic chemistry

Course contents

Lectures in ppt (supplied in copies to the students) and laboratory experiences that involve students individually (written protocols of the experiences are also supplied).

The method has the aim to supply the basic knowledge for the understanding of the matter and to realize the opportune connection among the topics.

The course will be also available through an e-learning platform. General information is present in the introductive part (Course presentation, Program); The Forum for communication between students and the Forum news for communication between teacher and students are also present. Within this platform the course will be divided into: i) teaching material composed by different learning units ii) self-assessment tests; iii) link to specific websites.

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge about the soil chemistry and plant biochemistry and about the laboratory analytical methods to determine the soil physico-chemical characteristics and the plant primary metabolites. Acquired knowledge could be useful to better understand other processes and phenomena linked to plant physiology and crop production.

Applying knowledge and understanding. The main objective of the course is to provide a fully development ability of the students in making laboratory analysis of the main soil physico-chemical characteristics and plant metabolites, including the phases of soil sampling in fields. The interpretation of the laboratory data will allow to draw fertilization plan and amendment and corrective actions in soils.

Cross-expertise: a) selection of the best fertilization and soil amendment and correction strategies, according to the other experts in the field; b) choice of the best farm management strategies both for crop production and environmental safety.

Program

Pedogenesis environment. Structure and properties of silicates. Silicate hydrolysis. Pedogenesis factors (0.4 ECTS). Soil texture and structure. Texture determination. (0.2 ECTS). Soil colloidal properties. Structure and properties of Al and Fe Hydroxyoxides, micas, smectites, vermiculites and kaolins (0.4 ECTS). Humus: extraction, fractionation, composition and physico-chemical properties. Determination of soil organic carbon content (0.4 ECTS). Cation retention (exchange) in soils. Determination of cation exchange capacity. Exchange equations (Kerr and Gapon) (0.4 ECTS). Soil pH and buffer power, soil pH measurement (0.4 ECTS). Calcareous soils. Characteristics and correction of acid, sodic and alkaline soils. (0.4 ECTS). Fertilization: macro and micro-elements in soils. Determination of bio-available elements in soil. Nitrogen fertilizers, phosphorous fertilizers, potassium fertilizers, compost, complex and liquid fertilizers (0.4 ECTS). Environmental risk in agriculture: pesticides, phosphorus, nitrogen, heavy metals (0.4 ECTS).

Bioenergetics: exergonic and endergonic reactions. ATP cycle. Redox reactions in biology. Standard redox potential (0.4 ECTS). Enzymes: classification, characteristics, composition, coenzymes and cofactors. Enzyme kinetics: Michaelis-Menten equation. Factors affecting enzyme activity: pH and temperature. Enzyme inhibition (0.4 ECTS). Photosynthesis: factors affecting photosynthesis. Photosynthetic pigments, Structure of tilacoid membrane. Mechanism of light capture. The light reaction: ATP formation. The dark reaction: C2, C3 and C4 cycles. Photosynthesis efficiency (0.4 ECTS). Cellular respiration: glycolysis, anaerobic fermetation, Krebs cycle, RPP Cycle, electron transport chain (0.4 ECTS). Lipids: general information and classification. Biosynthesis and catabolism of fatty acids and triacylglicerols. Glioxylate cycle and gluconeogenesis (0.4 ECTS). Nitrogen cycle: nitrogen fixation, organication. Glutamine biosynthesis. Amino-acids and proteins. Mineralization of proteic nitrogen, transamination and deamination, nitrification and denitrification (0.4 ECTS). Plant pigments and vitamins. Phytohormones: auxins, gibberellins, cytokinins, abscisic acid, ethylene (0.4 ECTS).

Laboratory analyses of soil physico-chemical characteristics (texture, organic carbon, total and active calcium carbonate, pH and electric conductivity) and plant metabolites (chlorophyll) (0.4 ECTS).

Development of the course and examination

Learning evaluation methods Oral discussion on four of the subjects listed in the teaching program. During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide useful information about the student skill level.

Learning evaluation criteria In the oral discussion, the student will have to demonstrate: i) knowledge of the main chemical and biochemical reactions occurring in soil and plant tissues; ii)

acquiring knowledge on laboratory analysis of soil chemical and plant biochemical characteristics. To pass the oral exam, the student must demonstrate an overall understanding using appropriate technical terminology and to be able to deal with deductive reasoning.

Learning measurement criteria The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranking from 18 to 30 “cum laude”

Final mark allocation criteria The oral examination consists of four questions concerning the subjects listed in the teaching program, the final degree being the mean of the four replies. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject

Recommended reading

- Learning material on Moodle platform

- AUTORI VARI, Fondamenti di Chimica del suolo, Patron Editore, 2005.

- M. BUSINELLI, Chimica del suolo, Morlacchi Editore, 2009

- L. SCARPONI, Biochimica Agraria, Galeno Editrice, 1996

- M. MAFFEI, Biochimica Vegetale, Piccin Nuova Libraria, 1999.

Tutorial session

Wednesday 9-11 a.m.

Thursday 11 a.m. -1 p.m.

AGRICULTURAL ECONOMICS (Module 1 C.I.)

MATTEO BELLETTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic skills in economics

Course contents

The present module is based on 36 hours (4 ECTS) of lectures complemented by 18 hours (2 ECTS) of practice. Moreover, an ongoing e-learning activity using the *Moodle* open source platform will be provided. The e-learning activity will include: (i) teaching materials composed by different learning units; (ii) Self-assessment tests; (iii) Cooperating and community-based activities aimed to leverage the training process on communication and e-learning feedback. Finally, consider that this module is strictly complementary to the module of *agricultural policy.*

Objectives of the course

Knowledge

In this course, firstly you will acquire the fundamental knowledge about the behaviour of agricultural markets. Secondly, a comprehensive framework of the most important microeconomics and accounting concepts applied to the farm management and business planning will be provided during the module.

Applying knowledge and understanding

First, the student will acquire the capability to design a basic business plan applied to the agribusiness. Second, the student will acquire the aptitude to understand an integrated outline of the agricultural economy in the globalization and climate change.

Cross-expertise

(i) Capability in contextualizing a theoretical framework; (ii) Communication: capability in clearly and exhaustively communicating notions, ideas, problems and technical solutions to interlocutors, either professional or not, representative of the various and specific competencies in agriculture agribusiness (entrepreneurs, engineer, policy makers, biologist, administrators, activists).

Program

Part I – Farm management

- Farm and decision-making process. Enterprise as a system. Economic analysis of the farm. Management operations and dynamics of the values. Farm and socio-economic aspects. Macro socio-economic analysis. Micro socio-economic analysis. Environmental impact of farm decisions. Enhancing enterprise-wide positive externalities (1.5 ECTS).
- Agricultural enterprises and new forms of agriculture. Multifunctional farms. Business strategies. The competitive advantage. Cost leadership and quality. The differentiation. Collaboration strategies. Innovation and agricultural enterprises (1.5 ECTS).

Part II – Business planning

- Strategic management and innovation farm size and growth. Entrepreneurial ideas. Building of business models. The construction of a Business Plan: marketing plan, production plan, sales plan, financial plan. Evaluating and managing risk (1.5 ECTS).
- Understanding the time value of money in agriculture; financial reporting; balance sheet equation; revenues and expensive; income statement; cash flow statement; ratio analysis; business plan and decision-making; the problem of liquidity in the short run; the problem of income generation in the long run; exploring entrepreneurship in the agribusiness (1.5 ECTS).

Development of the course and examination

Learning evaluation methods

Written test: (i) multiple choose; (ii) four optional answers for each question; (iii) true/false answers present candidates with a binary choice: a statement is either true or false.

Oral test: the oral exam is optional for those students who have passed the written test while it is mandatory for that students who had not made and passed the written test.

Learning evaluation criteria

To pass the exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Final mark allocation criteria

WRITTEN TEST: 20 (correct answers) * 1.5 (points) = 30/30. The minimum grade to pass the written test is 18/30 (12 correct answers).

ORAL EXAM: if you passed the written test, you can freely decide to take also the oral exam for integrating the score obtained in the written test. On the other hand, if you did not pass the written test you have to take the oral exam. The oral examination consists of three questions concerning the subjects listed in the teaching program; each of ones scores up to 10 points. Moreover, it can be arranged during the course some practical sessions in the form of processed spreadsheet that may contribute to the definition of the final vote (in an amount of not more than 5/30).

Recommended reading

1. Torquati, B. *Economia e gestione dell'impresa agraria*. Edagricole
2. Agliati, M. *Amministrazione e controllo nell'impresa agricola*. Egea

Tutorial session

Wednesday from 12.30 am to 2.30 pm.

AGRICULTURAL MECHANIZATION (2° year)

ESTER FOPPA PEDRETTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge of physic and mathematics.

Course contents

The teaching method is based on ppt lectures (4 CFU) and visits to farms and contractor companies or workshops (2 CFU).

The course material will be available during class.

Objectives of the course

Knowledge. The course enables students to acquire adequate basic knowledge of agricultural mechanics. Agricultural machineries are studied in their construction and operation aspects highlighting the features and adjustments related to the mechanical quality of its work. Moreover, worksite planning for a correct choice of machines will be carried out.

Applying knowledge and understanding. The main aim of this course is to provide the ability to identify the most suitable machinery, making choice based on construction machines characteristics, on their ability to work in relation to the company needs in which they are introduced and on any existing regulatory restrictions.

Cross-expertise. a) Autonomy of student to identify the information useful to a proper selection of the farm machinery; b) Communication skills: clear and comprehensive transfer of information, ideas, problems and techniques to stakeholders involved in manufacturing solutions, i.e. farmers.

Program

1 Presentation of the course. Design and Operating Characteristics of the main parts of the tractor (engine and transmission system; hitching systems; tires and traction; innovative elements) (2 CFU).

2 Operating machines: design characteristics, functions and calibration, innovation. Machinery for: I) soil tillage; II) crop planting; III) chemical application; III) forage harvesting and grain harvesting; IV) fruit harvesting (2 CFU).

3) Machinery management. Machinery selection. Machinery costs (2 CFU).

Development of the course and examination

Learning evaluation methods. Written questions and oral discussion on three of the subjects listed in teaching program.

Learning evaluation criteria. During the written classwork, the student will have to demonstrate to know the methodologies for proceeding to the choice of the farm machinery. During the oral classwork the student will have to demonstrate knowledge about: i) tractor characteristics; ii) characteristics of operating machinery. To pass the oral exam, the student must demonstrate an overall knowledge of the content using appropriate technical terminology, and be able to deal with deductive reasoning that enables him to create links within matter, and to have a complete ability of the subject.

Learning measurement criteria. The vote is expressed in thirtieths. The examination will be considered passed with a note from 18 to 30 “cum laude”.

Final mark allocation criteria. The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will count for 10 points. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

1. Bodria L., Pellizzi G., Piccarolo P., (2013), Meccanica agraria, Edagricole

Recommended readings during class

Tutorial session

By appointment

AGRICULTURAL MICROBIOLOGY

CRISTIANA GAROFALO

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic knowledge of mathematics, physics, chemistry, biochemistry and genetics are propaedeutic to the comprehension of the topics treated in the present course.

Course contents

The course consists of: a) theoretical lectures (4 ECTS), b) other theoretical-practical activities carried out in groups (in class and/or at the laboratory), and possible guided visits (2 ECTS). An e-learning course is available in parallel with the lectures and practical activities carried out in presence. It includes: a) the educational material organized in learning units; b) guidelines and reports concerning the laboratory activities; c) self-evaluation tests; d) interactive forum and other tools.

Objectives of the course

Knowledge and understanding:

(i) proper theoretical knowledge concerning the structure and functioning of microbial cells, and microbial ecology and biodiversity; ii) theoretical and practical knowledge on microbiological techniques.

Applying knowledge and understanding:

(i) ability to apply the knowledge acquired as a basis for understanding of microbiological aspects involved within agricultural productions; (ii) ability to perform laboratory activities concerning

microorganisms.

Cross-expertise:

(i) independent judgment: ability to integrate the specific knowledge of the biology of microorganisms with those already acquired in other basic disciplines and to understand the value of this knowledge in the perspective of the entire curriculum; (ii) communication skills: ability to transfer in a clear and comprehensive way the information obtained using an appropriate scientific vocabulary.

Program

History of Microbiology. Microbial world. The trees of life. Microbial diversity: *Bacteria, Archaea, Eukarya* (0.5 ECTS).

Structure and cellular functions in *Bacteria* and *Archaea.* Eukaryotes microorganisms: structure and cellular functions (general outline). Biology of yeasts and filamentous fungi (general outline). Microscopy (general outline) (1.5 ECTS).

Nutrition, culture, microbial growth and factors affecting it. Methods measurement of microbial g

Genetics and molecular biology of *Bacteria*: DNA synthesis, transcription and translation (general outline). Mutations, plasmids, horizontal gene transfer. Viruses (basic aspects) (0.5 ECTS).

Cycles of nutrients: the carbon cycle, the nitrogen cycle, sulfur cycle (0.5 ECTS).

Microbial symbiosis (0.5 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the teaching program. During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

To pass the oral exam, the student must demonstrate proper knowledge of the topics treated and listed in the program, capacity to make links and to discuss these topics, always using a proper scientific-technical language.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

Brock Biology of Microorganisms (14th Edition) Volume 1 and 2. M.T. Madigan, J.M. Martinko, K.S. Bender, D.H. Buckley, D.A. Stahl, T. Brock. Eds. Pearson. ISBN-13: 978-0321897398. ISBN-10: 0321897390.

Microbiology: A Laboratory Manual (10th Edition) J.G. Cappuccino, N. Sherman. ISBN-13: 000-0321840224. ISBN-10: 0321840224.

Other educational material is available on the e-learning web platform.

Tutorial sessions

Monday 3 pm to 5 pm.

AGRICULTURAL POLICY

DEBORAH BENTIVOGLIO

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge of Principles of economics

Course contents

The teaching includes ppt lectures (4 ECTS) provided in copies to the students and exercises at the computer lab (2 ECTS). The teaching includes e-learning tools available at the moodle platform. Within this platform there will be: a) teaching materials b) supplementary documents c) exercises.

Objectives of the course

Knowledge

The course provides students with adequate knowledge of the Italian agro-food sector and the current status quo of agriculture; the main aspects of the Common Agricultural Policy (CAP) from its origins until today, as well as the agri-food quality policy, the environmental policy and the strategies for the renewable energy development from agricultural biomass.

Applying knowledge and understanding

The course enables students to acquire adequate knowledge about the main characteristic of agricultural sector in accord with the Common Agricultural Policy. The course also provides the background for understanding the main regulations related to quality and food safety and environmental policy. The student acquires the basis for analyzing and follow the development of agricultural policies and the capacity to evaluate the economic impact that results from their application.

Cross-expertise

(a) Capability to identify the policy for the support and the protection of the agriculture secto

Program

General aspects (1 ECTS)

The agri-food sector and overview about the agriculture

The Common Agricultural policy (CAP) (2ECTS)

Historical evolution of the CAP

The new CAP 2014-2020: First and Second Pillar

The application of rural development policy in the Italian regions: the RDP

The agri-food quality policy (1 ECTS)

Definitions, general aspects, regulations

Innovation policy in the agro-food sector: EIP and OP

Environmental policy (1 ECTS)

Environmental measures

Policies and strategies for renewable energy from agricultural biomass

Development of the course and examination

Learning evaluation methods

Final assessment will consist of two tests: Oral exam and an individual project related to the analysis of an agricultural sector (Common Organisation of the markets – CMO). The student will prepare a summary report based on ppt (maximum 15 slides) in line with a suggested scheme.

Learning evaluation criteria

In the oral classwork, the student will have to demonstrate: (a) knowledge of the status quo of European and National agriculture (b) knowledge of the Common Agricultural Policy, the agri-food quality policy and the environmental policy.

To pass the oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him

to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The individual project gives a score from 0 to 10. The oral test will consist in different questions each of which will be evaluated using a score ranging from 0 to 6 points. The degree of 30 “cum laude” is attributed to students who got a total score greater than 30.

Recommended reading

1.Vieri S., 2000, La politica agraria, Edagricole, Bologna

2.Lechi F. 1998, La politica agraria Etaslibri, Milano

3.Finco A. 2007, Ambiente, Paesaggio e Biodiversità nelle politiche di sviluppo rurale, ARACNE Ed. pp.155.

Tutorial session

Every day from 15.00 to 18.00 directly at the teacher's office. An appointment via email is recommended.

AGRICULTURAL POLICY (Module 2 C.I.)

ADELE FINCO

Seat Agraria
A.A. A.A. 2015-2016
Credits 3
Hours 27
Period 1^ semestre

Prerequisites

Basic knowledge of Economics

Course contents

The didactic method is based on ppt lectures (2 ECTS) (provided in copies to the students) and laboratory experiences (1 ECTS). The course will be also available through an e-learning version using the Moodle platform. Within this platform, the course will be divided into: (i) teaching materials composed by different learning units, and (ii) scientific and technical documents.

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge Common Agricultural Policy (CAP), national and regional policies.

Applying knowledge and understanding. The main aim of this course is to provide the knowledge of national and European agricultural and agrifood system, Common Agricultural Policies, in order to stimulate the students to understand the different opportunity to the sector.

Cross-expertises: (i) making judgements: capability of identify the information needed to manage the strategies for agro-forestry systems; (ii) communications: capability of clearly and exhaustively communicate notions, ideas, problems and technical solutions to different stakeholders; (iii) Critical comment on contemporaneous policies issues from an economics perspective.

Program

1. Agricultural sector and agrifood system in european and italian context (1 ECTS)
2. Common Agricultural Policy CAP: I and II Pillar (2 ECTS)
    1. CAP implementation in the National and regional context
    2. Agro-Environmental policies
    3. Renewable energies policy from agricultural biomass
    4. Product quality policy: origin schemes and organic farming

Development of the course and examination

" Agricultural Economics and policy" is an integrated course consisting of two modules: Agricultural Economics (6 ECTS) and Agricultural policy (3 ECTS). Each module is independently evaluated, but with a unique final grade, resulting from the weighted average of the grades obtained in the two modules (weights results from the respective number of ECTS for each module).

Learning evaluation methods

Oral discussion: two of the subjects listed in the teaching program and one essay (project work)

Learning evaluation criteria

In the oral classwork, the student will have to demonstrate: (i) knowledge of common agricultural policies; (ii) knowledge of strategies promote rural development; (iii) ability to comment critically on contemporaneous policy issues from an economics perspective.

To pass the oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of two questions concerning the subjects listed in the teaching program and one question concerning individual project work. Each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

Handouts and other materials distributed by the teacher during the course.

Swinen J. (ed.), 2015. The Political Economy of the 2014-2020 Common Agricultural Policy, CEPS, Brussels, 596 p.

De Castro P., 2010. L'agricoltura Europea e le nuove sfide globali, Donzelli, Bologna, 141 p.

Vieri S., 2000. La Politica Agraria, Edagricole, Bologna

Finco A. (ed), 2012. Biofuels Economics and Policy, Franco Angeli, Bologna, 202 p.

Finco A. (ed.), 2007. Ambiente, Paesaggio e Biodiversità nelle politiche di sviluppo rurale, ARACNE Ed. pp.155.

Tutorial session

Tuesday from 3 pm to 5 pm.

AGROENERGY

ESTER FOPPA PEDRETTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic knowledge of physic, chemistry, agricultural mechanization and forestry mechanization.

Course contents

The teaching method is based on ppt lectures (4 CFU), laboratory exercises and visits to renewable energy production plants of agro-forestry biomass (2 CFU). The course material will be available during class.

Objectives of the course

Knowledge. The course enables students to acquire adequate basic knowledge on agro-energy sectors, considering the different stages of production: from the biomass feedstock to its processing and use. The biomass is studied on the basis of its energy characteristics. In addition, the course highlights the technical, economical and environmental aspects of its production and use, proceeding to: a) define the main types of transformation plant; b) identify standards within which placing the production; c) illustrate the possible market; d) provide the main elements to assess their sustainability.

Applying knowledge and understanding. The main aim of this course is to provide the ability to detect potential energy production from agro-forestry biomass, and to correct design the processing chain.

Cross-expertise. (i) Autonomy of judgements: a) identify the information useful to assess the qualitative and quantitative characteristics of the agro-forestry biomass for energy transformation; ii) understand standards in the production of agro-energy systems; (b) Communications: i) clear and comprehensive transfer of information, ideas, problems and associated technical solutions to

partners, specialists and stakeholders involved in the agro-energy transformation sectors (agro-forestry companies, public administrators, etc.).

Program

1 Course presentation. Biomass characterization: chemical and physical characteristics of lignocellulosic biomass, oils and biomass for the biogas production (2 CFU).

2 Chains of agro-energy production: a) Wood energy chain. Production of dedicated and residual biomass. Machines and installations for the first processing of biomass. Energy conversion technologies; b) Oil energy chain. Production of dedicated biomass and residual. Machines and installations for the first processing of biomass. Energy conversion technologies; c) Supply chain for the production of energy from biogas. Production of dedicated and residual biomass. Machines and equipment for the first processing of biomass and biogas. Energy processing technologies (3 CFU).

3 Framework. European law and Italian legislation for the development and dissemination of renewable energy and for environmental sustainability of the agro-energy production (1 CFU)

Development of the course and examination

Learning evaluation methods. Oral discussion on three of the subjects listed in the teaching program.

Learning evaluation criteria. During the oral examination, the student will have to demonstrate: a) knowledge of chemical-physic biomass characteristics; b) knowledge of biomass production technology; c) knowledge of the main European directives and Italian laws linked to the production of agro-forestry biomass. To pass the oral exam, the student must demonstrate an overall understanding of the contents using appropriate technical terminology, and to be able to deal with deductive reasoning that enables him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria. The vote is expressed in thirtieths. The examination will be considered passed with a note from 18 to 30 “cum laude”.

Final mark allocation criteria. The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will count for 10 points. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

1. Fiala M., 2013, Filiere agroenergetiche, Maggioli Editore
2. AA.VV., 2011, Biomassa ed energia, Maggioli Editore

Recommended readings during class

Tutorial session

By appointment

AGROFORESTRY POLICIES AND ENVIRONMENTAL EVALUATION

ADELE FINCO

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge of general economics and rural appraisal

Course contents

The didactic method is based on ppt lectures (4 ECTS) (provided in copies to the students) and laboratory experiences (2 ECTS). The course will be also available through an e-learning version using the Moodle platform: (i) teaching materials composed by different learning units ii) documents, scientific articles, reports

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge about agro-environmental policies and mountain areas (LFAs); moreover the course take into account the methods to evaluate the environmental goods including landscape.

Applying knowledge and understanding. The main aim of this course is promote the students to understand the environmental issue concerning agroforestry system and to promote strategies to improuve the sustainable management of agro-forestry systems

Cross-expertise. (i) making judgements: capability of identify the information needed to manage the environment and to improve sustainable development; (ii) communications: capability of clearly and exhaustively communicate notions, ideas, problems and technical solutions to stakeholders.

Program

Sustainable development, market failure, externalities, public goods. Environmental instruments: command and control; Fiscal (Pigouvian taxes and subsidies); market-based (1 ECTS)

Agro-Environmental Policy in the CAP as an instrument to internalize externalities (2 ECTS)

- Agro-environmental policies at national and regional level: RDP programs. Analysis and implementation
- Mountain areas strategies to manage sustainability rural development

Environmental Economics and Evaluation (2 ECTS):

Total Economic Value

Revealed preference methods of valuation including: hedonic pricing - HP; travel cost methods -TC;

-Stated preference methods of benefits determination including contingent valuation MCV; choice experiments CE; Auctions.

Environmental Impact assessment (EIA) (1 ECTS).

Development of the course and examination

Learning evaluation methods

Final oral discussion related to two of the subjects listed in the teaching program and an individual work project (i.e. EU project) about the issues proposed by professor.

Learning evaluation criteria

In the oral classwork, the student will have to demonstrate: (i) knowledge of agro-environmental economics and policy and sustainability topics (ii) project management concerning the agroforestry systems (iii); environmental evaluation to support the decision making.

To pass the oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of two questions concerning the subjects listed in the teaching program and one oral dissertation of work project. Each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

Handouts and other materials distributed by the professor during the course.

Bernetti J., Romano S., 2007, Economia delle risorse forestali (2 volumi), Liguori Ed., Napoli, p.888

Perman R. et al. (4a edition – 2012) Natural Resource&Environmental Economics, Prentice Hall Edinburgh, p.712

Turner K.R., Pearce D., Bateman I., 2003, Economia ambientale, il Mulino, Bologna, p.264

Finco A. 2012, Biofuels Economics and Policies, Franco Angeli, Milano, p.204

Finco A. 2007, Ambiente, Paesaggio e Biodiversità nelle politiche di sviluppo rurale, ARACNE, p.155.

Office hours

Tuesday from 3 pm to 5 pm.

ANALYTICAL QUALITY CONTROL

PASQUALE MASSIMILIANO FALCONE

Seat Agraria
A.A. A.A. 2015-2016
Credits 12
Hours 108
Period 1^ semestre

Prerequisites

The following topics are propaedeutic to the teaching: basic knowledge of food chemistry, biochemistry, microbiology and unit operations of the food processing.

Course contents

All the learning subjects will be treated both under theoretical and practical point of view, and some laboratory session of teaching will be planned including numerical calculus on the design and evaluation of the shelf-life of foods and beverages The course consists mainly of classroom theoretical lectures (8 ECTS, 72 hours), and other activities, including laboratory experiences, carried out individually or in small groups, seminars and visits to local and national food industries (4 ECTS, 36 hours, in all). An e-learning course is available to support the classroom lectures, that provides all the educational documents organized in learning units, free exercises for the self-evaluation, instructions for the laboratory experiences, information and booking for seminars and visits, info on the exams calendar.

Objectives of the course

Knowledge and understanding:

1. Getting knowledge on the basics of food quality as well as of its technological origin into the main foods and beverages
2. Getting knowledge about the strategies giving quality and safety assurance
3. Getting knowledge and understanding on both the mechanisms and kinetics of quality decay during storage
4. Getting knowledge about the possible food contaminants and their origin
5. Getting knowledge and understanding on the role, properties, functions of the packaging
6. Getting knowledge and understanding about the theoretical principles, instrumental configuration and qualitative-quantitative analytical capacity of the main instrumental techniques largely used in food quality studies and evaluation
7. Getting knowledge and understanding on the main techniques to acquire and process experimental data on the food quality

Applying knowledge and understanding:

(a) development of the ability to apply and integrate all previously basics of knowledge gained about food and beverage quality aspects, including composition, physical, biological, microbiological, market, health, sensory as well as the authenticity, functionality and safety, with the purpose to self individuate all suitable and objective index of quality

(b) development of the ability to apply and integrate all previously basics of knowledge and understanding gained about the technological process and mechanism of quality decay in food and beverage, with the purpose to rationally design, verify and estimate the actual quality level, when the main quality decay mechanisms are dependent on product, process or packaging variables.

(c) development **of** the ability to apply and integrate the plan of experiments, sampling method, and instrumental analysis with the purpose to gain new knowledge about the food quality decay and understanding about the authenticity of food and beverage.

Cross-expertise:

1. making judgements: ability into the screening among the quality descriptors those suitable to trace the actual quality profile in foods and beverages;
2. ability for individuate the basic information on the base of which it is possible improvee, assure and verify the food quality
3. communicating skillness: ability to communicate with clarity all ideas and problems concerning food and beverage quality to food experts, specialists with an appropriate technical language

Program

1. *Theoretical Basis of Food Quality and Quality Descriptors [3 ECTS]*

Different aspects of food quality including nutritional value, safety level, functional, dietetic, sensory, rheological, technological, intended for health purposes, authenticity, typical, and frauds. Mechanisms and kinetics of the main quality decays (fatty acids aoutoxidation and thermooxidation, sugar caramellization, Maillard reactions, etc.) Potential contaminants and their origin (environment, product, and process).

1. *Assuring Food Quality [3 ECTS]*

Public, private, collective labels (protected designation of origin), nutritional and health claims, microbiological risk assessment, rapid alert system, traceability, inspection and monitoring.

1. *Design, Assessment, and Predictive Analysis of the Food Quality [3 ECTS]*

Mathematical modelling of quality decay kinetics. Relationships between food shelf-life,

composition, water activity, phase and state transitions, relaxation time. Predictive analysis of product, process and packaging dependent food shelf-life. Role and functional properties of the packaging. Design of the best packaging for a sustainable food industry.

1. *Instrumental diagnosis and assessment of the food authenticity [3 ECTS]*

Theoretical basis, instrumental configuration, qualitative and quantitative capacity of the main instrunìmental techniques, including densitometry, refractometry, potentiometry; volumetry e gravimetry, cromatografy; spectroscopy; thermal analysis, rheolocial analysis. Development and validation of an instrumental method. Sampling method, design of the experiments. Combining more than two experiments with the purpost to evaluate the food authenticity.

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the teaching program, one of which will be chosen by the student. During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

The student will have to demonstrate: (a) adequate understanding of the basics to be used to individuate the quality descriptor, (b) adequate knowledge and understanding the basics in order to perform a rational design of the food quality of a food or beverage chosen from the student; (c) development of the ability to apply and integrate all previously basics of knowledge and of understanding gained on the instrumental techniques in order to perform the quality assessment of a food or a beverage chosen by the student.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 with honors.

Final mark allocation criteria

The oral examination consist of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10.

In order to pass the examination, the student will have to demonstrate: (a) overall understanding of

the subjects; (b) appropriate usage of technical terminology. In order to obtain the best evaluation, the student will have to demonstrate: (a) in-depth knowledge and understanding of the subjects; (b) fluency in the usage of the technical lexicon; (c) ability to solve simple problems about modifications of the process parameters or the sequence of unit operations.

Recommended reading

Teaching and educational documents are available on the e-learning web platform, that include several self-evaluation tools and interactive tests.

In the following some texbooks:

La qualità dei prodotti alimentari. J.L. Multon. Tecnihce Nuove

Food Packaging. Materiali, Tecnoogie e Qualità degli alimenti. Ed. Luciano Piergiovani e Sara Limbo. Springer-Verlag Italia

Food Materials Science: Principles and Practice (Food Engineering Series), Aguilera, Lillford, 2008, Springer

Food Texture and Viscosity: Concept and Measurement by Malcolm C. Bourne (2002). Publisher: Elsevier Science & Technology Books. ISBN: 0121190625

ANATOMY AND PHYSIOLOGY OF FARMING ANIMALS AND ANIMAL PRODUCTS

MARINA PASQUINI

Seat Agraria
A.A. A.A. 2015-2016
Credits 9
Hours 81
Period 2^ semestre

Prerequisites

Basic knowledge of general biology, chemistry.

Course contents

The didactic method is based on ppt/pdf lectures (6 ECTS) (provided to the students at the end of the course), projection of thematic videos, recognizing anatomic organs with 3D animal models, and guided tours in livestock farms, dairy plants and slaughtering houses will be organized to put into practice what the students have learned in class (3 ECTS).

Objectives of the course

Knowledge and understanding.

The course enables students to acquire the fundamental knowledge about the anatomy and physiology of the main apparatus of the animal species producing meat, milk and eggs for human consumption; chemical and nutritional composition of raw animal materials (meat, milk, eggs) in relation to their use in the food industry.

Applying knowledge and understanding.

The main aim of this course is to provide a fully development ability of the students in recognizing the most important species and breed of interest in animal production systems, their physiology in relation to their productive performance (meat milk and eggs), the composition of animal raw materials, their qualitative aspects and relationships with their attitude to the food processing industry.

Cross-expertise.

(a) making judgements: capability of identify the information needed to manage farmed animals and their products; (b) communications: 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 management of farmed animals, and in the management of animals raw materials in processing field (veterinarians, chemists, animal nutritionists, technical assistance, food technologists, nutritionists, etc.).

Program

1. Course presentation. Specific terms of anatomy and physiology, anatomical planes.

Tissues: epithelial, secretive and connective tissues; cartilaginous and bony and ossification; muscular tissue (smooth, cardiac, skeletal); blood and lymph (1 ECTS).

2. Anatomy and physiology: Locomotor apparatus (bones, joints, main skeletal muscles of commercial interests -cuts). Respiratory apparatus (respiratory canals, lungs, mechanical respiration, gaseous exchange). Cardio-circulatory apparatus (heart, blood vessels, systemic and pulmonary circulation, lymphatic circulation). Digestive apparatus (prehensile and preparatory organs, stomach of monogastrics, rumen, reticulum, omasum and abomasus of polygastrics, small, large and rectum intestine, liver, pancreas; physiology of digestion and absorption; avian digestive tract). Urinary apparatus (kidney structure, nephron, urine ultra-filtration and re-absorption). Male reproductive apparatus (testicles, epididymis, deferent duct, penis, urethra, accessory glands, spermatogenesis, semen, structure of sperm). Female reproductive apparatus (ovaries and physiology of reproduction, fecundation, embryo nesting, placentation, embryo-sacs, pregnancy length and delivery phases; avian reproductive tract). Mammary gland (secretory cells, galactophorous ducts, gland cistern, teats; hormonal control of milk synthesis and ejection; lactation and dry period). Outlines on endocrine apparatus and main hormones (5 ECTS).

3. Raw materials of animal origin:

Meat- Main beef cattle breeds, chemical composition of meat of different livestock species, growth, fattening, yields, slaughtering, carcasses classification based on SEUROP grids, commercial cuts, meat quality parameters and main livestock management aspects conditioning meat quality and its use in the meat processing industry (1 ECTS).

Milk- Main dairy cattle breeds, chemical composition of colostrum and milk of different livestock species, milking techniques, livestock and hygiene aspects conditioning milk quality, alterations of mastitis milk, physico-chemical and technological requirements of milk for human consumption and for cheese-making production, milk protein polymorphisms and relations with the cheese- making process, lactodynamographic profiles, cheese yield and cheese yield predictive formulas (1.5 ECTS).

Eggs- Laying chicken breeds, morphology of the eggs, factors that influence laying, preservation and evaluation of egg freshness, labelling and identification marking of eggs according to EU regulations and their traceability, chemical and nutritional composition of eggs (0.5 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion on subjects listed in the teaching program and /or on technical aspects observed and discussed during in animal farms guided tours.

Learning evaluation criteria

In the oral examination, the student will have to demonstrate: (a) knowledge of the recognition of the main species/breeds suitable for meat and milk production; (b) knowledge of their anatomical parts and physiological processes related to meat, milk and egg productions; (c) knowledge of meat, milk and eggs composition, their qualitative aspects and husbandry management aspects that may affect the quality of raw materials and their use in food processing.

To pass the oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final grade is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of one chosen subject and four questions concerning the subjects; each answer will be quantified in the range 0 - 6. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

1. Bortolami R., Callegari E., Clavenzani P., Beghelli V., 2009. “Anatomia e fisiologia degli animali domestici” Edagricole, BO

2. Veggetti A., Falaschini A., 2009. “Anatomia, fisiologia e zoognostica” Calderini Edagricole, BO

3. Veggetti A., Falaschini A., Balasini D., Tesio F., 2015. “Basi tecnico-scientifiche di zootecnica - vol. A” Edagricole Scolastico, BO.

ANIMAL BIOLOGY AND BASIC ANIMAL SCIENCE

MARINA PASQUINI

Seat Agraria
A.A. A.A. 2015-2016
Credits 9
Hours 81
Period 1^ semestre

Prerequisites

Basic knowledge of general biology, chemistry.

Course contents

The didactic method is based on ppt/pdf lectures (6 ECTS) (provided to the students at the end of the course), projection of thematic videos, recognizing anatomic organs with 3D animal models, guided tours in livestock farms will be organized to put into practice what the students have learned in class (3 ECTS).

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge about the anatomy and physiology of the main apparatus of the animal species producing meat or milk for human consumption; moreover competence on the applicability to animal breeding and managing of artificial insemination and embryo-transfer, advanced biotechnologies, sexing semen, castration, basic and quantitative genetics, breeding value and mating strategies (inbreeding, cross-breeding, selection) will be provided.

Applying knowledge and understanding. The main aim of this course is to provide a fully development ability of the students in recognizing the most important species and breed of interest in animal production systems, their physiology in relation to their main products (meat and milk), the use of the main techniques and biotechiniques for reproduction and the increase of their productive perfomance through the genetic improvement, selection, and mating strategies.

Cross-expertise. (i) making judgements: capability of identify the information needed to manage farmed animals; (ii) communications: 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 animal production field (engineers, veterinarians, animal nutritionists, geneticists, breeders, technical assistance, etc.).

Program

1. Course presentation. Specific terms of anatomy and physiology, anatomical planes'.

Tissues: epithelial, secretive and connective tissues; cartilaginous and bony and ossification; muscular tissue (smooth, cardiac, skeletal); blood and lymph (1 ECTS).

2. Anatomy and physiology: Locomotor apparatus (bones, joints, main skeletal muscles of commercial interests -cuts). Meat composition. Respiratory apparatus (respiratory canals, lungs, mechanical respiration, gaseous exchange). Cardio-circulatory apparatus (heart, blood vessels, systemic and pulmonary circulation, lymphatic circulation). Digestive apparatus (prehensile and preparatory organs, stomach of monogastrics, rumen, reticulum, omasum and abomasus of polygastrics, small, large and rectum intestine, liver, pancreas; physiology of digestion and absorption). Urinary apparatus (kidney structure, nephron, urine ultra-filtration and re-absorption). Male reproductive apparatus (testicles, epididymis, deferent duct, penis, urethra, accessory glands, spermatogenesis, semen, structure of sperm). Female reproductive apparatus (ovaries and physiology of reproduction, fecundation, embryo nesting, placentation, embryo-sacs, pregnancy length and delivery phases). Mammary gland (secretory cells, galactophorous ducts, gland cistern, teats; hormonal control of milk synthesis and ejection; lactation and dry period). Chemical composition of colostrum and milk in main animal species. Outlines on endocrine apparatus and main hormones. Projection of thematic videos, recognizing anatomic organs with 3D animal models (4 ECTS).

3. Basic animal science: Animal domestication, species, breeds and sub-groups, habitus and constitution. Main bovine, ovine, caprine, equine and swine breeds. Puberty, sexual dimorphism, sexual traits, fertilization and fertility; natural and artificial insemination, semen production, sexed semen, estrus synchronization, embryo transfer and sexed embryos, cloning. Traits variability related to environment, feeding, functional exercise of apparatus, castration and its effects on animal productivity (1.5 ECTS).

4. Animal Genetics: references to the Mendelian inheritance and basic genetics, livestock examples of chromosomal mutations (rob 1:29 translocation and free-martin mosaicism), epistasis, pleiotropy, (halothane gene), polyallelic genes (polymorphic expression of lacto-protein genes and Marked Assisted Selection). Lethal genes in productive animals, Population genetics and Hardy-Weinberg equilibrium. Quantitative traits and their genetic model to establish the breeding value of a parent (pedigree data, sib test, progeny test and performance test), hereditability and repeatability, correlation between two traits. Basic concepts, technical evolution and applications of mating strategies: inbreeding, cross-breeding, selection, to understand animal productions' progress (2.5 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion on subjects listed in the teaching program and /or on technical aspects observed and discussed during animal farms guided tours.

Learning evaluation criteria

In the oral examination, the student will have to demonstrate: (i) knowledge of the recognition of the main species/breeds suitable for meat and milk production; (ii) knowledge of their anatomical structures and their physiology; (iii) competence on artificial insemination and embryo-transfer, advanced biotechnologies; (iv) basic and quantitative genetics and mating strategies related to genetic improvement of livestock and their productions.

To pass the oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final grade is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of one chosen subject and four questions concerning the subjects; each answer will be quantified in the range 0 - 6. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

1. Bortolami R., Callegari E., Clavenzani P., Beghelli V., 2009. “Anatomia e fisiologia degli animali domestici” Edagricole, BO

2. Veggetti A., Falaschini A., 2009. “Anatomia, fisiologia e zoognostica” Calderini Edagricole, BO

3. Veggetti A., Falaschini A., Balasini D., Tesio F., 2015. “Basi tecnico-scientifiche di zootecnica - vol. A” Edagricole Scolastico, BO.

4. Pagnacco G., 2004. “Genetica animale applicata” Casa Editrice Ambrosiana, MI

5. Pagnacco G., 1995. “Genetica applicata alle produzioni animali” Città Studi Edizioni, MI

6. Bourdon M., 1999. “Understanding animal breeding” Ed. Prentice-Hall Inc.

Tutorial session

Wednesday and Friday from 1.00 to 3.00 pm

ANIMAL FEEDING AND EXSTENSIVE PRODUCTION

MARIA FEDERICA TROMBETTA

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge of biology, chemistry and agronomy.

Course contents

The teaching method is based on lectures in ppt (5 CFU), given to the students and educational visits in farms, parks and / or protected areas (1 CFU). As part of the Moodle platform are available: a) teaching materials structured learning units; b) items in the PDF format of interest for deepening of the topics covered in class.

Objectives of the course

Knowledge. The course aims to provide students with the basics of the knowledge of the digestive structure and physiology of digestion of livestock species and wild ungulates to achieve better use of forage resources and to make known races and principles of extensive farming techniques.

Applying knowledge and understanding. The course has as a teaching goal to provide students with the basic skills to improve land management in order to maintain a balanced ecosystem with the ability to manage ungulates farm animal and wild applying rearing systems with low environmental impact.

Cross-expertise. a) judgement skills: identifying the information necessary to understand the problems of the area; b) transfer in a clear and comprehensive information, ideas and relevant technical solutions to both, and not specialists, representing the different and specific skills involved in the management of farms in mountain and marginal environments (officials, biologists, fauna researchers, farmers).

Program

1. Basic skills of anatomical and physiological characteristics of the digestive system: ruminant and monogastric (0.5 ECTS).

2. Management techniques of grazing pastures behavior and outline the interaction of domestic and wild ungulates, quality of pastures. (1 ECTS)

3. Food characteristics, mode of fodder conservation and rationing outline (1 ECTS).

4. Main autochthonous breeds (beef, sheep and goat, pigs, horses, donkey) farm animal to rear in marginal / mountainous areas and basic knowledge of farming techniques (1.5 ECTS)

5. Ethology and guidelines for the breeding of wild ungulates (1 ECTS).

6. Educational visits on farms, parks and / or protected areas (1 ECTS)

Development of the course and examination

Learning evaluation methods

Final assessment will focus on a discussion on the topics covered, with in-depth presentation of a topic chosen by the student.

Learning evaluation criteria

The student, during the oral test, will have to prove: a) knowledge of the morphological and physiological digestive structure of farm animals and wild ungulates. b) knowledge of techniques and effects due to grazing management; c) quality of forage and conservation technologies d) breeds suited to the type of extensive farming techniques e) ethology knowledge of wild ungulates and guidelines for farm management. To pass the oral exam, the student must demonstrate an overall understanding of the content, set out sufficiently corrected with the use of appropriate technical terminology, and to be able to deal with deductive reasoning that will enable them to achieve the appropriate connections within the matter and to have acquired a complete mastery.

Learning measurement criteria

The final grade is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral test will be divided into at least three main questions, in addition to the subject of your choice. The answers will be evaluated with a score from 0 to 10 and the overall assessment will make the final judgment of thirty. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

- Sjaastad Ø. V., Sand O., Hove K. 2013 Fisiologia degli animali domestici Ed Italiana a cura di Tamanini C. Casa Editrice Ambrosiana
- Frandson R.D. 1987 Anatomia, Fisiologia e Morfologia degli animali domestici. Ed. italiana a cura di Pelagalli G.V. e Botte V. Edi-Ermes
- Balasini D. 2000 Zootecnica Basi tecnico –Scientifiche Calderini Edagricole
- Balasini D. 2000 Zootecnica applicata Cavalli-asini-muli-bardotti Calderini Edagricole
- Balasini D. 2000Zootecnica applicata Bovini e bufali Calderini Edagricole
- Falaschini A. 1996 Zootecnica speciale Calderini Edagricole
- Hector D e J 1976 Allevamento del cinghiale Ed italiana a cura di Perillo G. Edagricole

Tutorial session

Tuesday from 3 pm to 4 pm.

Thursday from 3 pm to 4 pm

ANIMAL NUTRITION

MARIA FEDERICA TROMBETTA

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Propaedeutic to this course basic knowledge of biology, anatomy and physiology of digestion, general livestock.

Course contents

The teaching method is based on lectures in ppt presented to students (4.5 ECTS), laboratory exercises and educational visits in farm and the feedingstuffs industry (1.5 ECTS). As part of the Moodle platform. They are available: a) teaching materials structured learning units; b) PDF articles of interest for deepening of the topics discussed in class.

Objectives of the course

Knowledge. The course will be held in order to give students the basics that characterize the capacity utilization of nutrients of farm animals and provide the basics of animal nutrition

Applying knowledge and understanding. The course has as a teaching goal to provide students with the principles governing the use of feed digestion and the basis for formulating a ration that meets bred animal's nutritional requirements.

Cross-expertise. Judgement skills: identifying the information needed to understand the issues related to the preparation of rations; b) transfer in a clear and comprehensive information, ideas and relevant technical solutions to both, and not specialists, representing the different and specific skills involved in the management of farming techniques and rationing (farmers, feeding technicians).

Program

1 Concept of nutrition and feeding, intrinsic and extrinsic factors (0.5 ECTS).

2 Water, Minerals and Vitamins (0.5 ECTS)

3 Carbohydrates, Proteins, Lipids (1 ECTS).

4 Energy, unit of measure, voluntary intake of feed (0.5 ECTS).

5 Techniques of forage conservation (0.5 ECTS).

6 Characteristics and chemical composition of the feed (0.5 ECTS)

7 Nutritional needs of the animals according to the physiological conditions and rationing concepts (1.0 ECTS).

6 Educational visits to livestock farms and laboratory exercises (1.5 ECTS).

Development of the course and examination

Learning evaluation methods

Final assessment will focus on a discussion on the topics covered, with in-depth presentation of a topic chosen by the student.

Learning evaluation criteria

The student, during the oral test, will have to prove: a) knowledge of the concepts that regulate the use of feed digestion. b) knowledge of the techniques of conservation of forage and treatments c) knowledge of the importance of chemistry feed assessment d) knowledge of rationing concepts based on the physiological condition of animals raised. To pass the oral exam, the student must demonstrate an overall understanding of the content, set out sufficiently corrected with the use of appropriate technical terminology, and to be able to deal with deductive reasoning to enable it to implement appropriate connections within the matter and to have acquired a complete mastery.

Learning measurement criteria

The final grade is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral test will be divided into at least three main questions, in addition to the subject of your choice. The answers will be evaluated with a score from 0 to 10 and the overall assessment will make the final judgment of thirty. The degree of 30 “cum laude” is attributed when the student

demonstrates complete mastery of the subject.

Recommended reading

- Antongiovanni M., Gualtieri M. 1998 Nutrizione ed alimentazione Animale Edagricole
- Antongiovanni M. 2004 Nutrizione degli animali in produzione zootecnica L'utilizzazione degli alimenti nei ruminanti e monogastrici. Edagricole.
- Pacchioli M.T. 2004 Alimentazione della vacca da latte. III ed. CRPA Informatore agrario edizioni
- Dryden G. McL. 2008 Animal Nutrition Science Cab International

Tutorial session

Tuesday from 3 pm to 4 pm.

Thursday from 3 pm to 4 pm

APPLIED GELOGY AND HYDROLOGY

ALBERTO TAZIOLI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic knowledge of general mathematics, physics, chemistry and pedology.

Course contents

The didactic method is based on ppt lectures (4 ECTS) (provided in copies to the students) and classroom, laboratory and field experiences and guided tours in pilot areas (2 ECTS). The course will be also available through an e-learning version using the Moodle platform. Within this platform, the course will be divided into: (a) teaching materials composed by different learning units; (b) additional research and study material; (c) test exercises and examples; (d) field trip information and reservations and practice experiences information.

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge about hydrology and hydrogeology, as well as on more detailed knowledge on hydrogeological risk evaluation in a watershed.

Applying knowledge and understanding. The main aim of this course is to provide a fully development ability of the students in recognizing the most important hydrogeological units, in evaluating the water balance in basic conditions, in being acquainted with aquifers and aquicludes features and with groundwater flow properties.

Cross-expertise. (i) capability of identify the main hydrogeological and hydrological problems in an area ; (ii) capability of clearly and exhaustively communicate notions, ideas, problems and technical solutions to interlocutors, either professional or not, working in the hydrogeological risk analysis.

Program

1. Course presentation. Hydraulics and HYDROLOGY: basic principles, river flow measurements with artificial tracers and current meter, stage-discharge relationship, infiltration tests (1 ECTS).

2. WATERSHED: definition, summary of lithology, water balance (particularly referred to infiltration and soil and water cycle), natural hazards, erosion and sedimentation processes, hydraulic works, exercise on topographic and geological maps at a basin scale (2 ECTS).

3. GEOMORPHOLOGY. Fluvial terraces, main geomorphological units in Italy, land degradation, landslides (classification and stabilization works), fluvial erosion and watercourse management works (1 ECTS).

4. HYDROGEOLOGY: groundwater and surface flow, definition of aquifer and aquiclude; aquifer characteristics and parameters; chemical, geological and physical classification of springs; piezometric line (definition and drawing); recharge area evaluation of aquifers; tracer tests in hydrogeology; isotope hydrology and hydrogeology; the Umbria-Marche meso-cenozoic sequence (2 ECTS).

Development of the course and examination

Learning evaluation methods

Written assessment and oral discussion. The written assessment will be composed of multiple choice and/or short answer questions and of hydrology and hydrogeology exercises. The oral discussion will have 2 to 4 questions.

Learning evaluation criteria

During the written assessment the student will have to prove: a) knowledge of the main points of lithology; b) knowledge of the geomorphological structures and processes; c) problem solving ability of applied hydrology and hydrogeology. To pass the written assessment the student will have to set up the exercises and give the correct solution and to know the theoretical topics. In the oral classwork, the student will have to demonstrate: (a) knowledge of the applied aspects of hydrology; (b) knowledge of the morphological and watershed basic aspects; (c) knowledge of hydrogeological processes and fundamental parameters. To pass the oral exam, the student must demonstrate an overall understanding of the subjects using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The written assessment will be composed of a theoretical part (total mark in the range 0 – 12) and a practical part (total mark in the range 0 – 18). The minimum grade to pass the written test is 18/30. The oral examination will be organized on the basis of the written test grade: i) range 18/30 – 23/30: one question per subject (Hydrology total mark in the range 0-6, Watershed 0-8, Geomorphology 0-6, Hydrogeology 0-10); ii) range 24/30 – 27/30: one question on Geomorphology (0-12), Hydrogeology (0-18); iii) grade higher than 28/30: one question on Hydrogeology (0-30). The final grade will mainly depend on the oral discussion grade (variable weight over 60%). The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

Ferro V., Elementi di idraulica e idrologia per le scienze agrarie, ambientali e forestali. McGraw-Hill

Sanna S., Sistemazioni idraulico-forestali nella difesa del suolo, Dario Flaccovio Editore, 2007.

Ferro V., La sistemazione dei bacini idrografici, McGraw-Hill, 2nda edizione.

Celico P. Elementi di idrogeologia per lauree in scienze geologiche, scienze della natura, scienze ambientali e ingegneria ambientale. Liguori ed.

Tutorial session

Every day (please email before)

Tuesday from 11.30 am to 1 pm.

BIOCHEMISTRY 1

SILVERIO RUGGIERI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

The following topics are propaedeutic to this teaching: adequate knowledge of general chemistry, inorganic chemistry, organic chemistry , physics .

Course contents

The course consists of a total 6 Credits (ECTS) of class lectures and activities, including 2 Credits (ECTS) laboratory practicals .

Objectives of the course

Knowledge and understanding:

Adequate knowledge and understanding about the structure and structure-function relationship of biomolecules and biological macromolecules; basic knowledge about enzyme functioning and about biochemical energetics.

Applying knowledge and understanding:

Developing the ability to apply knowledge and comprehension of acquired notions in order to recognize the relationships between the chemical structure of biomolecules and their molecular biochemical functions, including their respective role in enzyme catalysis and kinetics, in the biochemical energetics, in the genetic information and metabolism, and food transformation whenever appropriate.

Cross-expertise:

(a) making judgements: capability to identify the information of biochemical structural character needed to recognize structure-function relationship related to biochemical processes occurring

either within organisms or in the raw food materials, that are instrumental to improve the efficiency of the food processes and the quality of the final food products;

(b) communication skills: ability to clearly and exhaustively communicating notions, ideas, problems and technical solutions to interlocutors, either professional or not, representative of the various and specific expertises in the agro-food supply chain (engineers, biologists, chemists, nutritionists, advertisers, dealers, administrators).

Program

1.Chemical-molecular logic and composition of living organisms: Structure-function relationships. Hydrocarbon backbone and functional groups in biomolecules; Water: biochemically relevant structural-functional properties; Hydrogen bond; Hydrophobic bond. (0.5 ECTS)

2. Lipids: structure, classes, properties, structure-function relationships. Fatty acids. Phospholipids; Biological membranes. Isoprenoids, steroids, eicosanoids. Liposoluble Vitamins. (0.5 ECTS).

3. Carbohydrates: structure, classes, structure-function relationships of Monosaccharides, Disaccharides, Polysaccharides. Glycosaminoglycans. Glycoconjugates. (1.25 ECTS)

4. Amino acids: structure, classes, structure-function relationships. Peptide bond. Protein structure and function relationships : Protein-ligand interactions. (1.25 ECTS)

5. Bases, Nucleotides and Nucleic acids (DNA; RNAs): Structure-Function Relationships. ATP, ADP, AMP. NAD and NADP. FAD. (0.75 ECTS)

6. Equilibrium and kinetics in the control of biochemical reactions. Principles of Bioenergetics. ATP and phosphoryl groups transfer in biosynthetic reactions and membrane transport. NAD and NADP in biological oxidation-reduction reactions. (1 ECTS)

7. Enzyme kinetics and catalysis; Michaelis-Menten equation. Allosteric enzymes. Reversible inhibition and irreversible inhibition. Enzyme regulation. Coenzymes and vitamin cofactors. (0.75 ECTS)

Development of the course and examination

Learning evaluation methods

Written test about the topics listed in the Course Program, and Oral discussion.

Learning evaluation criteria

In the written test the student need to demonstrate to have achieved a sufficient level of knowledge of the topics enclosed in the Course Program and proposed in the form “True/False” test. In order to be admitted to Oral discussion the student must achieve a score of at least 18/30 in the written test. In the subsequent Oral discussion the student will have to discuss a topic among those

included in the written test and demonstrate to be adequately able to exploit his knowledge, in a structure-function perspective of and with proper lexicon.

Learning measurement criteria

The final mark is given in thirtieths. Successful completion of the examination will lead to grades ranging from a minimum of 18 to a maximum of 30 *cum laude*.

Final mark allocation criteria

The student will pass the examination when he demonstrates to possess adequate overall knowledge of the topics included in the course program and to express correctly the subjects using proper biochemical terminology.

The maximum mark of 30 *cum laude* will be awarded when the student demonstrates a deeper knowledge and understanding of the subjects, ability to draw biochemical structures, and fluency in the biochemical terminology, as well as ability to solve simple problems about subjects included in the course program.

Recommended reading

Nelson D.L., Cox M.M. “Introduzione alla Biochimica di Lehninger”. Zanichelli Ed.

BIOCHEMISTRY 2

NADIA RAFFAELLI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge in chemistry and in the topics addressed in the course “Biochemistry 1”.

Course contents

The course consists of 6 ECTS (54 hours) lessons, including 2 ECTS (18 hours) classroom practicals.

Objectives of the course

Knowledge and understanding:

Adequate knowledge and understanding of: (a) metabolism of carbohydrates, lipids and aminoacids; (b) integration and hormonal regulation of mammalian metabolism; (c) the role played by vitamins in metabolism; (d) metabolic adaptation of organs and tissues to various physiological conditions; (e) fundamental concepts in the transfer of genetic information.

Applying knowledge and understanding:

Capability of using the acquired knowledge to understand the biochemical transformations occurring during food and beverage processing and production, and capability to apply knowledge on the fundamental aspects of integration and regulation of metabolism to understand nutritional claims.

Cross-expertise:

Capability of identify the information required to improve the quality of the final products; capability of clearly and exhaustively communicate notions and ideas to different interlocutors.

Program

Catabolism of hexoses – Glycolysis. Lactic acid and alcohol fermentation. Pentose phosphate pathway. Glycogenolysis (1 ECTS)

Catabolism of fatty acids – Mobilization and transport of fatty acids. Oxidation of fatty acids. Ketone bodies (0.5 ECTS)

Catabolism of aminoacids- Metabolic fate of amino groups. Urea cycle. Oxidation of chetoacids (0.5 ECTS)

The citric acid cycle. Oxidative phosphorylation. Photophosphorylation (1.0 ECTS)

Anabolism – Biosynthesis of glycogen. Gluconeogenesis. General aspects of biosynthesis of fatty acids, aminoacids and nucleotides (0.5 ECTS).

Functional properties of vitamins (0.5 ECTS)

Integration and hormonal regulation of mammalian metabolism- Hormones and mechanisms of action. Tissue-specific metabolisms. Fasting (1 ECTS)

DNA replication. Transcription. Genetic code. Protein synthesis (1 ECTS)

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the teaching program.

Learning evaluation criteria

The student will have to demonstrate sound knowledge on the molecular mechanisms underlying the metabolism of sugars, lipids and aminoacids, and should give a view of the metabolic pathways in the context of the whole organism. Knowledge on the role played by vitamins in metabolism, the metabolic adaptation to different physiological conditions, and the biochemical principles of the transfer of the genetic information will also be required.

Learning measurement criteria

The final mark is attributed in thirtieths.

Final mark allocation criteria

In order to pass the examination, the student will have to demonstrate a comprehensive

understanding of the subjects, and the capability to use an appropriate biochemical terminology.

Recommended reading

Nelson D.L., Cox M.M. “Introduzione alla Biochimica di Lehninger”. Zanichelli Ed.

BIOLOGICAL CONTROL AND INTEGRATED PEST MANAGEMENT

NUNZIO ISIDORO

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic knowledge of entomology, agronomy, arboricolture, chemistry and ecology.

Course contents

The didactic method is based on ppt lectures (4 ECTS) (provided in copies to the students), in addition laboratory experiences and guided tours inside farms will be organized in order to put into practice what the students have learned in class (2 ECTS). The course will be also available through an e-learning version using the Moodle platform. Within this platform, the course will be divided into: (i) teaching materials composed by different learning units; (ii) self-assessment tests; (iii) laboratory exercises and guided tour information and reservations.

Objectives of the course

Knowledge. The course enables students to acquire appropriate knowledge about the biology and damages, to different agro-ecosystems, of the most important phytophagous insects, as well as on different control methods against them.

Applying knowledge and understanding. The main aim of this course is to provide a fully development ability of the students to develop and implement biological and integrated pest control strategies against phytophagous insects with a reduced environmental impact.

Cross-expertise. In order to improve the independent development and the communication skills of students it is proposed the study of specific topics carried out in a team work with a final delivery report.

Program

Ecology of insect pests. Population dynamics. Sampling techniques. Economic thresholds. Forecasting models. Phytosanitary legislation (1 ECTS).

Evolution of control strategies for agricultural crops: from the blind use of chemical control methods to the integrated agricultural production. Insect pests control methods: agronomic and genetic, physical, mechanical, biological, microbiological, biotechnical, chemical (insecticides, miticides, nematicides, molluscicides) (2 ECTS).

Strategies for integrated and biological control of the major insect pests of orchard crops (olives, grapes, pome and stone fruit), herbaceous (corn, potato) and vegetables (tomato, pepper, eggplant, etc.) (3 ECTS).

Development of the course and examination

Learning evaluation methods

The final exam will be based on an oral discussion. During the course, there will be self-evaluation tests available on the Moodle platform (e-learning mode), in order to provide to the students useful information about their skill level.

Learning evaluation criteria

During the oral exam, the student will have to demonstrate: (i) knowledge of the identification of the main phytophagous and zoophagous insect pests; (ii) knowledge of the different control methods against phytophagous insects; (iii) life cycle, damages and control strategies of the major phytophagous insect pests in different agro-ecosystems. To pass the oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology; in addition, the student must be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of three questions; each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

TREMBLAY E., “Entomologia Applicata”. Liguori Editore. Napoli, 1985.

POLLINI A., “Manuale di Entomologia Applicata”, Edagricole, Bologna, 1998.

VIGGIANI G., “Lotta biologica e integrata nella difesa fitosanitaria”, Vol. II., Liguori Editore Napoli, 1997.

Tutorial session

Thursday 11 am – 1 pm

BIOLOGY OF MICROORGANISM

LUCIA AQUILANTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge of mathematics, physics, chemistry, biochemistry and genetics are propaedeutic to the comprehension of the topics treated in the course.

Course contents

The course consists of: theoretical lectures (4 ECTS = 36 hours) and theoretical-practical activities carried out in groups of students (individually or in groups), integrated with at least a guided visit (2 ECTS = 18 hours, all). An e-learning course is available in parallel with the lectures and activities carried out in presence. It includes: the educational material organized in learning units; guidelines and reports on the theoretical-practical activities; self-evaluation tests (*in itinere* and final); interactive forum and other tools; details on the guided visits.

Objectives of the course

Knowledge and understanding. Proper theoretical knowledge concerning the structure and functioning of microbial cells; microbial ecology and biodiversity; theoretical and practical knowledge on microbiological techniques; solid prerequisites for the subsequent learning concerning Food microbiology and Food hygiene.

Applying knowledge and understanding. Ability to apply the knowledge acquired as a basis for understanding, management and monitoring of biotechnological processes in the food sector; ability to apply knowledge of the topics included in the program as a basis for the understanding and management of different issues related to the quality and safety of food and consumer safety and health; ability to perform laboratory activities concerning microorganisms

Cross-expertise. Independent judgment: ability to integrate the specific knowledge of the biology of microorganisms with those already acquired in other basic disciplines and to understand the value of this knowledge in the perspective of the entire curriculum; communication skills: ability to transfer in a clear and comprehensive way the information obtained using an appropriate scientific vocabulary

Program

- Microbiology and Microbial world: history and scope of the Microbiology; microbial diversity: *Bacteria, Archaea, Eukarya*; viruses (basic aspects); techniques in biological optical and electron microscopy (0.5 ECTS)
- Structure and cellular functions in *Bacteria* and *Archaea* (1 ECTS)
- Nutrition, culturing and metabolism of microorganisms; microbial growth and main ecological factors affecting it (2 ECTS)
- Genetic expression in *Bacteria*: replication, transcription and transduction; mutations, chromosomes and plasmids, horizontal gene transfer (1 ECTS)
- Eukaryotes: structure and cellular functions (place); biology and systematics of yeasts and filamentous fungi, systematic (general outlines) (0.5 ECTS)
- Viruses (general outlines) (0.5 ECTS)
- Molecular systematics and microbial evolution (general outlines) (0.5 ECTS).

Development of the course and examination

Learning evaluation methods

Oral exam consisting of three principal questions about the subjects listed in the program. During the course, self-evaluation tests (e-learning mode) are available.

Learning evaluation criteria

To pass the exam, the student will have to demonstrate: sufficient understanding of the topics listed in the program of the course and proper use of the terms. To obtain the best evaluation, the student will have to demonstrate: (a) in-depth knowledge and understanding of the topics; (b) fluency in the use of the scientific/technical lexicon; (c) ability to solve simple problems concerning manufacturing and conservation of fermented foods.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the exam will lead to marks ranging from 18 to 30 with honors.

Final mark allocation criteria

The final mark will be awarded on the basis of the answers to three principal questions (quantified 0 to 10 thirtieths, each) about three topics randomly selected by the teacher among those listed in the teaching program. To pass the exam, the student will have to demonstrate a sufficient knowledge of each of the three selected topics.

Recommended reading

- Brock Biology of Microorganisms (14th Edition) Volume 1, ISBN-13: 978-0321897398. ISBN-10: 0321897390

Other educational material is available on the e-learning web platform.

BIOMASS ENERGY

GIOVANNI LUCA RIVA

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

None

Course contents

The course introduces the study of energy production from renewable sources alternative to the current energy supply system based mainly on fossil fuel. The course will be developed in two parts: the first part provides an introduction to the main renewable energy sources and their performances, a second part that concerns the most important agricultural and agro-industrial biomass supply chains. Environmental and economic aspects will be discussed.

Description of the course (introductory notes): The course consists of three main parts. In the first the potential and the properties of the most common biomasses and biofuels are presented; the second part deals with aspects of biomass energy chains; third part deals with the themes of the characterization of biomass and of other materials produced in the context of energy applications.

Objectives of the course

The course aims to address the student in a systematic to the main application contexts relatedto the use of biomass for energy purposes.

Program

Biomass : definition, types and classes of product. Physical, chemical and energy. Production chains. Pre-treatment technologies and energy conversion . Biofuels solid, liquid and gaseous fuels. Thermal plants in the domestic and industrial use. Environmental aspects of sustainability. Product specifications and technical standards.

Development of the course and examination

oral examination.

Recommended reading

suggestions for readings will be given during the course

BIOMASS FOR ENERGY (Module 1 C.I.)

GIUSEPPE TOSCANO

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

~~knowledge of the basic concepts of physics and mathematics.

Course contents

~~the course deals with aspects related to energy production and utilization of lignocellulosic biomass. In particular, the basic elements are provided for evaluation of technical, economic and environmental impacts of energy supply chains and biofuel products. The topics are addressed through the support of power point presentations and supplemental papers available during the course. In addition, laboratory exercises are carried out for learning biomass analysis laboratory techniques.

Objectives of the course

~~knowledge of the elements useful for the management of the supply chain wood biomass energy.

Program

~~energy and renewable sources. Biomass fuels and definitions, types and classification. Regulations and laws. Physical and chemical properties of biomass. Biomass supply chains. Physical and thermal treatment of biomass for the production of solid, liquid and gaseous biofuels. Quality standards in the biomass fields. Principles of combustion, energy conversion systems, and environmental aspects. Methods for evaluating the characteristics of biomass. Costs and energy and environmental sustainability of supply chains.

Development of the course and examination

oral

Recommended reading

~~Lecture notes.
The handbook of biomass combustion & Co-firing – S.v. Loo, J. Kaap – Earthscan.

BIOMASS FOR INDUSTRY (Module 2 C.I.)

GIUSEPPE TOSCANO

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

knowledge of the basic concepts of physics and mathematics

Course contents

the course consists of three main parts. In the first part are addressed industrial uses of biomass for energy, biofuels and chemicals production. The contents of the second part are related to the characteristics of the wood, its physical and mechanical properties and main industrial sectors. The third part deals with aspects of the supply chains and products sustainability. The topics are addressed through the support of power point presentations and supplemental papers and documents available during the course.

Objectives of the course

knowledge of the elements useful for the management of the supply chain wood-energy-industry.

Program

industrial plants for the energy production and district heating systems. Biorefineries and biobased from ligno-cellulosic material. Wood: structure, chemical and physical properties. Relationship water-wood and dimensional modification. Defects and anomalies. Mechanical properties of wood and classification of materials. Electrical, acoustic and thermal properties. Wood industry: main processes and products. Energy and environmental sustainability of the production.

Development of the course and examination

~~oral.

Recommended reading

lecture notes.

CONTROL OF PLANT DISEASES

GIANFRANCO ROMANAZZI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge of plant pathology, agronomy, arboriculture, genetics, and chemistry.

Course contents

The didactic method is based on ppt lectures (4 ECTS) (provided in copies to the students), in addition laboratory experiences and guided tours inside farms will be organized in order to put into practice what the students have learned in class (2 ECTS). The course will be also available through an e-learning version using the Moodle platform. Within this platform, the students will find teaching materials, organized in learning units, supplemental literature material, guided tour information and reservations.

Objectives of the course

Knowledge. The course enables students to acquire appropriate knowledge about the management of pre and postharvest plant diseases induced by fungi, bacteria, virus and phytoplasma.

Applying knowledge and understanding. The main aim of this course is to provide a fully development ability of the students to develop and implement strategies for plant disease management with a reduced environmental impact.

Cross-expertise. In order to improve the independent development and the communication skills of students, it is proposed the study of specific topics carried out in a team work with a final delivery report.

Program

Control of plant diseases in the behalf of the crop protection. The plant protection: technical, toxicological, environmental, economic, political, legislative, managerial and commercial aspects. Evolution of plant protection strategies and current trends (1.5 ECTS).

State of the art of biological and integrated pest management. Means and methods for the control of plant diseases (agronomical, genetic, physical, biological and chemical) and integration in the biological and integrate disease management (1.5 ECTS).

Fungicides: evolution, classification, properties, mechanisms of action. Possibilities to control diseases caused by bacteria, virus and phytoplasma. Possibilities to control postharvest decay of fruit and vegetables (1.5 ECTS).

Practical application of biological and integrated disease management on the main crop of Mediterranean area (grapevine, stone and pome fruits, olive, cereals, main horticultural crops) (1.5 ECTS).

Development of the course and examination

Learning evaluation methods

The final exam will be based on an oral discussion.

Learning evaluation criteria

During the oral exam, the student will have to demonstrate: (i) knowledge of the plant protection approached in organic and integrated disease management; (ii) knowledge of the different control methods and means for plant protection; (iii) knowledge of fungicides and main mechanisms of action. To pass the oral exam, the student need to demonstrate an overall understanding of the content using appropriate technical terminology; in addition, the student have to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of three main questions, each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

Belli G., 2012. Elementi di Patologia Vegetale. Piccin editore

Bautista-Baňos S., Ed., 2014. Postharvest decay – Control Strategies. Academic Press

Muccinelli M., 2011. Prontuario degli agrofarmaci - XIII edizione. Edagricole

Bautista-Baňos S., Romanazzi G., Jimenez-Aparicio A., Eds, 2016. Chitosan in the preservation of agricultural commodities, Academic Press

Tutorial sessions

Tuesday and Wednesday, from 5 pm to 7 pm

CROP SCIENCE

ROBERTO ORSINI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Students who intend to take the examination of Crop science must be clear about the concepts give

Course contents

For the discussion of the items are provided both theoretical lessons the contents of which will

Objectives of the course

Knowledge:

The course enables students to acquire basic knowledge of the agronomic and environmental factors

Applying knowledge and understanding:

The course has as main educational objective the development of the student's ability to identify

Cross-expertise:

a) making judgment: capability of identify the information needed to manage the main herbaceous c

Program

Course presentation.

General section:

• **Notes on Soil Tillage:** objectives, classification, tools, factors conditioning the choices with

•**Herbaceous cropping systems and crop rotation:** definitions, purposes, types and agro-environment

• **crop planting technique:** factors conditioning the density choices, distribution pitch, depth an

• **Seed production:** seed agricultural value and evaluation of the factors that influence the agron

• **weed control:** definitions, general knowledge of weeds and classification, direct and indirect d

Special section:

• **Herbaceous crops:** classification, general aspects and distribution at the local and global leve

• **Morphology and cultivation technique examples for herbaceous plants characterized by autumn-spr**

• **Forage crops:** classification, agronomic management method; Alfalfa: characteristics, environmen

Development of the course and examination

Learning evaluation methods

Oral discussion on the subjects listed in the teaching program.

Learning evaluation criteria

The student, during the oral test, will have to demonstrate: (i) knowledge of the main agronomic and environmental issues that affect the management of herbaceous cropping systems; (ii) knowledge of farming techniques given for the main field crops covered in the course.

To pass the oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of three/four questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

F. Bonciarelli, 1999. Agronomia. Edagricole scolastico, Bologna.

L. Giardini, 2002. Agronomia generale ambientale e aziendale. Pàtron Editore, Bologna.

R. Landi, 1999. Agronomia e ambiente. Edagricole, Bologna.

F. Bonciarelli, 1998. Coltivazioni erbacee da pieno campo. Ed agricole scolastico, Bologna.

R. Baldoni, L. Giardini, 2000. Coltivazioni erbacee: Cereali e proteaginose. Pàtron Editore, Bologna.

M. HANF, 1990. Le infestanti d'Europa, le loro plantule, i loro semi. Edizioni Edagricole

Tutorial session

Monday and Wednesday from 8 am to 9 am

ECOLOGICAL FOREST PLANNING

CARLO URBINATI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Knowledge of Forest measurement and Silviculture, Forest economics and environmental appraisal, Forest (rural) policy.

Course contents

The course includes classroom lectures (4 ECTS – 36 hrs) training in computer room and field work (2 ECTS – 18 hrs). Students will be divided in working groups in order to prepare short ppt presentation, comment scientific articles and work in progress on self-evaluation material. Lab and field activities are important part of the course and are highly recommended. The course is available also on e-learning mode on the Moodle platform (https://lms.univpm.it/).

Objectives of the course

Knowledge and skills. The aim of the course is to provide specific knowledge on ecological forest planning at different spatial scales (from regional to farm): i) main principles of forest planning, ii) planning tools at different spatial scales; iii) opportunities and constraints of forest management to guarantee sustainability e replicability of forest products and services, iv) forest conservation in Europe and in Italy.

Applying knowledge and understanding

This course provides knowledge about forest management planning in accordance with the principles and criteria of sustainable forest management. Students will integrate ecological principles, forest regulations, and management techniques to gain skills on how to analyze and prepare a forest plan at regional and local scale.

Cross-expertise.

The course explores the possibility to apply ecological principles to forest resource planning at different spatial scales. Information and tools for decision making will be analyzed in the perspective of guaranteeing sustainable supply of forest products and services in public, private, regular and protected lands.

Program

Course introduction and international overview of forest planning. Ecological approach participation process in forest planning. Forest resources in the landscape. Forest types classification for management and planning (**2 ECTS**).

Principles, criteria and indicators of sustainable forestry. Forest planning at national, regional and local scale: tools and regulations. Forest planning and conservation constraints (Protected areas, Natura 2000, HNV) (**2 ECTS**).

Forest planning of small properties: wood volume, increment and allowable cut determination. Non-wood prodcuts and environmental services. Forest plan structure and maps (**2 ECTS**).

Development of the course and examination

Learning assessment methods

The exam includes two parts: 1) group preparation and individual presentation of a topic chosen with the instructor during the course; 2) an oral test about other course topics. Self-evaluation exercises are available on the Moodle course site and can be compiled by students for exam preparation.

Learning assessment criteria

The students throughout the different tasks of the course should demonstrate knowledge and skills: i) main forest planning methods and tools at different spatial scales; ii) a synoptic view of different topics covered and ability to link them at different levels using an appropriate technical terminology; iii) ability to apply principles and methods learned to the process of preparation of ecological forest plans.

Learning measuring criteria

Final grade is expressed in 30th as a weighted average of scores earned in the two parts of the exam.

Final grade allocation criteria

The final mark (expressed in 30th) is a weighted average of the single scores obtained in the two parts. The PPT presentation on the chosen topic shares 40% and the oral test 60% of the final score; the latter is based upon three main questions each graded from 0 to 10.

The exam is passed when both parts have been positively evaluated and students demonstrate an overall knowledge of the subjects treated during the course, exposed in an adequate manner and with a suitable technical terminology and ability of linking different topics. The maximum score (30/30 cum laude) is released to students with excellent knowledge and skills.

Recommended reading

Bettinger, Boston, Siry, Grebner (2008) Forest Management and Planning, Academic Press, p. 360

Corona, Barbati, Ferrari, Portoghesi (2011) Pianificazione ecologica dei sistemi forestali, Compagnia delle Foreste, Arezzo, p. 206

ECONOMICS AND MARKETING

SIMONA NASPETTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 9
Hours 81
Period 2^ semestre

Prerequisites

The following topics are propaedeutic to the teaching: basic knowledge of mathematics.

Course contents

The course consists of a balance of theoretical lectures (6 ECTS, 54 hours) and other activities, such as classroom experiments, carried out individually or in small groups, seminars and business game (3 ECTS, 27 hours, in all). An e-learning course is available in parallel with the lectures. It includes: the educational material organized in learning units, the materials and instructions for the classroom experiments, self-evaluation tests and results.

Objectives of the course

Expected learning outcomes

The course aims to provide an introduction to the economic theory and to the knowledge of the agro-food system. The course combines theory with training skills; marketing of agro-food products, with the opportunity to apply marketing concepts to real-world situations. Everyone will be encouraged to participate. Learning by playing. We'll apply further the marketing concepts to specific firm's situations by using a simulation software (business game).

Knowledge and understanding:

The course enables students to acquire adequate knowledge and understanding of the characteristics of the agro - food system; basic knowledge of microeconomics, theory of firm and market structure, with particular reference to the agricultural and agro -industrial sector; understanding of the principles of economic behavior of market players for the planning and evaluation of economic performance; basic knowledge of the marketing tools with particular reference to the agri - food sector and consumer behavior.

Applying knowledge and understanding:

Students will learn how to identify strategies for proper management of the agro-food businesses and businesses consulting and services related to them; todevelop an integrated business perspective, using marketing tools to understand and manage the enterprise's position on the market; to develop the ability to work in a collaborative and cooperative arrangements in teams, managing conflicts in a constructive and negotiating way.

Cross-expertise:

Participation in all learning activities will help students to work out plans to regulate the agro - food production and for a marketing proposal; to improve their 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 agro-food supply chain (engineers, biologists, chemists, nutritionists, administrators), to improve their ability to set collaborative relationships within a group.

Program

The first part of the course introduces microeconomic concepts and analysis. Students will be introduced to different types of market structures, with particular emphasize on the Agro-Food sector. The second part of the course focuses on agricultural production and the management of agro-food firms. The third part of the course focuses on consumer behaviour and the principles of agricultural marketing.

1st part – Micro and macroeconomics (4 ECTS)

Microeconomics: scopes, methods and economic tools .

Supply theory

- The production theory: production systems, short and long run, fixed and variable inputs.
- The production function.
- The cost function in the short and long run.
- Profit and revenue: supply function from the profit function.
- Short and long run equilibrium of the firm under various market structures (perfect competition, competitive markets, oligopoly, monopoly).

Demand theory

- Budget constraint.
- Demand curves from the Engel curves.

2nd part: (5 ECTS)

- Introduction to agricultural marketing.
- The agro-food system and competitor analysis.
- Marketing management theories.
- Demand analysis and consumer behaviour.
- Strategic marketing for the agro-food sector.
- Segmentation and positioning.
- Marketing mix: the 4 p's of marketing (product, price, place, promotion).
- Agricultural policy and regulatoryconstraints.
- Business game

Development of the course and examination

Learning evaluation methods

Written exam, oral discussion on the subjects listed in the teaching program, continuous self-assessment (trough case studies, discussions in class and on eLearning platform). A business game will be also part of the evaluation for both the team and the single students results.

Learning evaluation criteria

based on the Association to Advance Collegiate Schools of Business (AACSB) standards.

Tests are planned to verify students learning levels as related to:

• Use of economic terminology accurately and appropriately;

• Select, understand and organize information appropriately to investigate economic behavior;

• Applytheir knowledge and skills appropriately to critical understanding and effectively to address problems and issues

• knowledge an comprehension of market competition in the simulation environment;

• developing a business strategy in an integrated business perspective;

• applying marketing mix instruments to manage the firm position on the market;

• Presenting the firm results in a clear style and with an appropriate use of language and marketing terms.

• team working and decision making during simulation.

Learning measurement criteria

All tests and practical tests will be evaluated and the final vote expressed in thirty.

Attending students:

• E-learning platform will be used to evaluate learning throughout different instruments (tests, Forum Use, questions, etc;

• Group effort will be measured by the Group Simulation (Business Game) performance

• individual effort will be measured during the Group Simulation (Business Game) and in oral tests;

• Results of a written (test) the learning level (objectives) reached

NOT attending students:

• individual Performance on a Simulation (Business Game);

• Results of a written (test) about the learning level reached;

• individual effort measured via an oral final exam.

Final mark allocation criteria

Wieghted mean of the learning measurement scores

Recommended reading

Peter P. e J. H. Donnelly jr. Marketing. McGrawHill, ultima edizione.

Staffolani S., Microeconomia, McGrawHill, 2011.

Begg D., Vernasca G., Fischer S., Dornbusch R., Microeconomia 4/ed, McGrawHill

Frank R.H., Microeconomia, MICROECONOMIA 5/ed, McGrawHill

All other educational material is available on the e-learning web platform.

ENOLOGY

EMANUELE BOSELLI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

The following topics are propaedeutic to the teaching: basic knowledge of inorganic and organic chemistry, biochemistry mathematics and physics.

Course contents

The course consists of a balance of theoretical lectures (6 ECTS) and other activities, such as classroom practicals, carried out individually or in small groups, seminars and visits to local and national food plants and factories (3 ECTS). An e-learning course is available in parallel with the lectures. It includes the educational material organised in learning units, the materials and instructions for the classroom practicals, self-evaluation tests and results, information regarding seminars and visits.

Objectives of the course

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; (b) adequate knowledge of the technical aspects related to the official wine and vine regulations.

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 unit operation) and in vertical way (reasonable sequence of unit operations along the wine production chain); (b) capability of carrying out strategies for the optimization of a technological or biotechnological process in the wine sector; (c) capability of evaluating the potentiality of innovative technologies.

Cross-expertise:

(a) making judgements: capability of identify the information be needed to improve the efficiency of the processes and the quality of the winery products; (b) communications: 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 (agronomist, engineers, biologists, chemists, nutritionists, administrators).

Program

Introduction to oenology; history, production; grape composition, determination of the date of the harvest; acidity of the grapes and grape must; crushing and pressing of the grapes; techniques of must correction, reversed osmosis; acidification, deacidification; flow-chart of the main winemaking techiniques (2 ECTS). Technological aspects of sulfur dioxide; technological aspects of fermentation. Colloidal state and colloidal stability of the wine; elaboration of white wines; clarification, precipitation); innovative techniques for white wine elaboration (2 ECTS). Stabilization of wines, electrodialysis; elaboration of red wines; advances in red wine elaborations, carbonic maceration, ageing of wine, closure systems (1 ECTS). Defects and alterations of wines; technology of sparkling wines; essential concepts on special wines, vinegars, grappa and other popular alcoholic beverages (2 ECTS). Elements of sensory analysis of wines (1 ECTS); participation in conferences and / or trade fairs, visit to wineries and factories (1 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the teaching program, one of which will be chosen by the student.

During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

The student will have to demonstrate: (a) sound knowledge of definitions and regulatory aspects of the winery products and other popular alcoholic beverages; (b) knowledge and understanding of the reasons for the technical and technological choices that characterize the process flow-sheets; (c) appropriate usage of the technical lexicon.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 with honors.

Final mark allocation criteria

The oral examination consist of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10.

In order to pass the examination, the student will have to demonstrate: (a) overall understanding of the subjects; (b) appropriate usage of technical terminology. In order to obtain the best evaluation, the student will have to demonstrate: (a) in-depth knowledge and understanding of the subjects; (b) fluency in the usage of the technical lexicon; (c) ability to solve simple problems about modifications

of the process parameters or the sequence of unit operations.

Recommended reading

Ribéreau-Gayon P., Dubourdieu D., Donèche B., Lonvaud A. – Trattato di enologia –. Vol. I e II – Ed. Edagricole, Bologna

Nardin G., Gaudio A., Antonel G., Simeoni P., Impiantistica enologica, Edagricole, Bologna

Codice Internazionale delle Pratiche Enologiche http://www.oiv.int/, pubblicazioni

All other educational material is available on the e-learning web platform.

Tutorial Session

Tuesday 11 am – 1 pm

ENVIRONMENTAL MONITORING OF AGROECOSYSTEMS

FABIO TAFFETANI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Propaedeutic to this course basic knowledge of Systematic Botany and Forestry.

Course contents

The teaching method is based on lectures using Power Point presentations (4 CFU), supplied in copies to the students, and practical exercises at the cartographic laboratory, along with essential educational tours in rural areas (2 CFU). The course is also given in e-learning using the Moodle platform. Within this platform are available: a) teaching materials exposed b) educational and integrative scientific material made available by the teacher (scientific articles, insights, dissertations, etc ..) c) exchange of materials.

Objectives of the course

Knowledge

Provide the basis for agro environmental analysis to acquire the knowledge and organization of plant biodiversity criteria through the interpretation of the flora, vegetation and plant landscape and for the identification of the most appropriate ways of reading and managing complexity territorial.

Applying knowledge and understanding

Main educational goal is the development of the student's ability to analyze the diversity of the plant landscape. Through theoretical activities and the student practices acquires the basics of creating a monitoring system of biodiversity and vegetation for use in measuring the overall environmental impact of all the factors that determine the local composition, including direct and indirect anthropogenic ones.

Cross-expertise

Ability to identify the mode of analysis, monitoring and environmental design through the application

of policies relating to agro-environmental measures, the application of compulsory measures of new conditionality (greening) and those of agronomic management, forestry and livestock resulting from: criteria for the application of the EFAs, the identification of HNV Farmland, the management of areas and habitats of Natura 2000 network.

Program

introductory aspects (1 CFU)

The agro-ecosystem as a system of ecosystems, current situation and recent changes in rural landscapes, the dynamism of the plant landscape, the vegetation series to natural and productive potential, system of indicators for environmental monitoring of agro-ecosystems.

Species and habitats of plant landscape Italian and European (3 CFU)

Analysis of species (and habitats that house) of Italian and European flora on the basis of the principal families, ordered according to the morphological evolutionary significance: pteridophytes, gymnosperms, angiosperms.

Problems of knowledge and environmental management (1 CFU)

Rural landscape and woodland remnants of Italian Adriatic coast;

Monitoring, maintenance and management of biodiversity.

Development of the course and examination

Methods of assessment of learning

Final assessment will focus on an oral interview and discussion on personal herbarium.

The student will prepare a herbarium, according to one of modes suggested addressing the description of morphological, ecological and management of the species belonging to a given taxonomic family.

Criteria for assessment of learning

The student, during the oral test, will have to prove: a) knowledge of biodiversity agro-based vegetation, b) knowledge of procedures for analyzing, monitoring and sustainable management in the field of agro environmental policies.

To pass the oral exam, the student must demonstrate an overall understanding of the content, set out sufficiently corrected with the use of appropriate technical terminology, and to be able to deal with deductive reasoning to enable it to implement appropriate connections within the matter and to have acquired a complete mastery.

Criteria for measuring learning

Attribution of the final mark out of thirty.

Criteria for awarding the final grade

individual work which gives a score from 0 to 9. Oral examination divided 3 questions, each of which will be evaluated using a score ranging from 0 to 7 points. The honors will be given to students who, having achieved the highest rating, have demonstrated the complete mastery of the subject.

Recommended reading

1.http://www.prodromo-vegetazione-italia.org

2.http://vnr.unipg.it/habitat/index.jsp

3.TAFFETANI F., RISMONDO M., LANCIONI A., 2011 - Environmental Evaluation and Monitoring of Agro-Ecosystems Biodiversity. Ecosystems Biodiversity, Oscar Grillo and Gianfranco Venora (Ed.), InTech: 333-370.

Tutorial session

Every day from 12.00 to 14.00 directly at the teacher's office. An appointment via email and telephone is recommended.

ENZIMOLOGY

SILVERIO RUGGIERI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic knowledge of: biochemistry, food biochemistry, food technologies, chemistry.

Course contents

The course consists of 4 ECTS (36 hours) of theoretical lessons, and 2 ECTS (18 hours) of practical laboratory activities.

Objectives of the course

Knowledge and understanding:

To achieve adequate knowledge and understanding of theoretical principles and practical parameters of enzymatic processes, for suitable exploitation of enzymes in the enzymatic analysis and in the managing of technological food processes involving exogenous or endogenous enzymes.

Applying knowledge and understanding:

Provide capability to exploit the acquired knowledge toward rational use of enzymes in the fields of enzymatic analysis of food material and of technological food processes involving endogenous and/or exogenous enzymes, for the improvement of both processes and food quality.

Cross-expertise:

Capability of identifying critical points and suggesting best practices at the different levels of production processes to improve the quality and efficiency of food production; capability of clearly communicate notions, ideas and technical solutions to interlocutors of different expertises.

Program

EC Classification. Enzyme kinetics. Kinetic parameters of enzyme performance and specificity. Reversible and irreversible Inhibition. Optimum Temperature, Thermal stability. Optimum pH. Enzyme catalysis. Exploiting kinetic parameters for optimization of enzymatic food processes.

Enzyme extraction and purification; Enrichement parameters. Structure-function issues in enzyme-based food processes: solubility, chemical stability, denaturation, inactivation, engineering. Commercial enzymes. Enzymatic analysis. Enzyme Units. Factors influencing enzyme activity. Direct and indirect Methods for enzyme activity quantitation. Enzymatic methods for quantitation of food analytes. Enzyme modifications of nutritional and flavor characters. Enzymes as markers of food quality. Exogenous enzymes and food processes. Immobilized enzymes. Biosensors. Bioreactors. Eterologous enzymes. Enzymes acting on Carbohydrate, Protein and Lipid components of food materials; Specificity, applications, sources, safety rules. Oxidoreductase enzymes and food. Perspectives on enzyme-based food technologies**.**

Development of the course and examination

Learning evaluation methods.

Oral discussion on the subjects listed in the teaching program.

Learning evaluation criteria.

The student will have to demonstrate sound knowledge on the theoretical and practical parameters for the rational exploitation of enzymes.

Learning measurement criteria

The final mark is assigned in thirtieths. Maximum mark is 30 cum laude.

Final mark allocation criteria

In order to pass the examination, the student will have to demonstrate a comprehensive understanding of the subjects and the use of proper terminology.

The maximum mark of 30 cum laude is awarded when the student shows excellent understanding of the subjects, fluency in the subject terminology, and ability to deal with simple problems about enzymes.

Recommended reading

Enzimologia: Dai Fondamenti Alle Applicazioni. S.Pagani, M.Duranti - Piccin, Padova

Principi Di Analisi Enzimatica. H. Ulrich Bergmeyer, Piccin Ed., Padova

Innovazioni Nell'impiego Degli Enzimi In Enologia, Vitivinicoltura, N.41, 1996

Enzymes in food technology. Whitehurst R., Sheffield Academic Press, UK

Principles of Enzymology for the Food Sciences . JR Whitaker. Marcel Dekker Inc., New York

Biotecnologia: tecnologie enzimatiche. R. Scriban, Calderini, Bologna

Food biochemistry and food processing. Hui Y.H. editor, Blackwell Publishing

Biochemistry of Foods. Eskin NAM and Shahidi F Eds, Academic Press

Biochimica Industriale, Enzimi e loro applicazioni nella Bioindustria, Verga R, Pilone M. Springer

FOOD BIOCHEMISTRY

NADIA RAFFAELLI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic knowledge of food chemistry, biochemistry, microbiology, food processing technology.

Course contents

The course consists of 4 ECTS (36 hours) of theoretical lessons, and 2 ECTS (18 hours) of practical laboratory activities.

Objectives of the course

Knowledge and understanding:

Adequate knowledge of metabolism and biochemical processes occurring in raw plant and animal food materials, with special focus on those processes causing and affecting food transformations.

Applying knowledge and understanding:

Capability of using the acquired knowledge to evaluate and improve the characteristics of the primary raw food materials from agriculture and animal farming.

Cross-expertise:

Capability of identify and suggest the best practices at the different levels of the production process to improve the quality and efficiency of food production; capability of clearly and exhaustively communicate notions, ideas and technical solutions to interlocutors of different expertise.

Program

Basics of enzymology. Enzymology in food (2 ECTS)

Protein cross-linking in food. Manipulating protein cross-linking during processing. Transglutaminases.

Enzymatic browning. Tyrosinase.

Structure and function of pectin. Biochemistry of pectic enzymes.

Biochemical properties of the principal constituents of meat, milk and fruit (3 ECTS).

Biochemistry of muscle and post-mortem biochemical changes.

Biochemistry of milk processing.

Metabolism in fruit ripening and softening.

Biochemistry of bread (1 ECTS)

Cereal composition. Biochemical properties of wheat flour. Biochemical changes during dough development, baking and storage.

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the teaching program.

Learning evaluation criteria

The student will have to demonstrate sound knowledge on the biochemical components of food and their modification during food processing.

Learning measurement criteria

The final mark is attributed in thirtieths.

Final mark allocation criteria

In order to pass the examination, the student will have to demonstrate a comprehensive

understanding of the subjects, and the capability to use an appropriate technical terminology.

Recommended reading

“Food Biochemistry and Food Processing”, Hui Y.H. Ed, Blackwell Publishing

“Biochemistry of Foods”, Eskin NAM and Shahidi F Eds, Academic Press

FOOD CHEMISTRY

NATALE GIUSEPPE FREGA

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic knowledge of chemistry and physics.

Course contents

The didactic method is based on ppt lectures (4 CFU) (provided in copies to the students) and laboratory experiences and visits to local and national food industries (2 CFU).

Objectives of the course

Knowledge and understanding:

The course enables students to describe: (a) the chemical and nutritional characteristics, reactivity and interactions between the main food constituents; (b) the mechanisms with which the main degradation processes of nutrients take place.

Applying knowledge and understanding

1. developing the capability of illustrate the chemical and nutritional proprieties of animal and vegetable foods used for human nutrition
2. developing the capability of illustrate the chemical and nutritional characteristics of raw material used un food industries
3. developing the capability to predict the chemical alteration of food

Cross-expertise:

Making judgements: capability of identify the information be needed to improve the efficiency of the processes and the quality of the final products;

Communications: 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 agro-food supply chain (engineers, biologists, chemists, nutritionists, administrators).

Program

Introduction to the food chemistry.

Carbohydrates: monosaccharides, disaccharides and oligosaccharides in foods. Starch and polysaccharides. Dietary fiber: chemical and biological usefulness. Main foods rich in carbohydrates. Changes in the carbohydrate fraction of food as a function of technological treatments of stabilization: the Maillard reaction, the chemical alteration of carbohydrates (1 ECTS).

Proteins. Amino acids, the peptide bond, primary, secondary, tertiary and quaternary structure of proteins. Functions of proteins in nature. Enzymes and heat denaturation. The protein fraction of the food. Main foods rich in protein: milk, cheese, meat, fish. Changes in protein fraction as a function of technological treatments and food production (1 ECTS).

Lipids. Triglycerides and fatty acids, unsaponifiable and saponifiable matter. The distribution of fatty acids into triacylglycerol structure. Modifications of fatty acids as a function of technology: the formation of positional and geometric isomers. Phospholipids: distribution and function in nature. The minor components and the fraction of unsaponifiable matter, hydrocarbons, tocopherols, alcohols, metilsteroli, sterols, carotenoids, polyphenols. The autoxidation of fats: Reaction Mechanism and importance of natural and synthetic antioxidants. Margarines. Hydrogenation of oils and fats (3 ECTS)

Vitamins; hydrosoluble and lyposoluble. Biological activity of vitamins. Principals cations and anions present in the foods and their biological activity. Nutritional properties of foods. (0.5 ECTS)

Chemical composition and nutritional proprieties of the main food productions: vegetable oils, milk and wine. (0.5 ECTS)

Development of the course and examination

Learning evaluation methods

Oral discussion on the subjects listed in the teaching program.

Learning evaluation criteria

The student will have to demonstrate knowledge of: (a) chemical composition of vegetable and

animal foods; (b) main chemical transformation that occur during the technological treatment of the food; (c) nutritional value of foods; (e) appropriate usage of technical terminology.

Learning measurement criteri

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 with honors.

Final mark allocation criteria

The oral examination consist of five questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 6. In order to pass the examination, the student will have to demonstrate: (a) overall understanding of the subjects; (b) appropriate usage of technical terminology. In order to obtain the best evaluation, the student will have to demonstrate: (a) in-depth knowledge and understanding of the subjects; (b) fluency in the usage of the technical lexicon; (c) ability to identify what are the positive and negative attributes of a food depending on its composition.

Recommended reading

P. Cappelli, V. Vannucchi, "Chimica degli alimenti. Conservazione e trasformazioni", Zanichelli (1994), Bologna

P. Cabras, A.Martelli, "Chimica degli alimenti” Piccin Nuova Libraria (2004), Padova

FOOD MICROBIOLOGY AND HYGIENE

LUCIA AQUILANTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 9
Hours 81
Period 1^ semestre

Prerequisites

Basic knowledge of chemistry, biochemistry and microbiology

Course contents

The course consists of theoretical lectures (6 ECTS, 54 hours) and other activities, including theoretical-practical activities, carried out by students (individually or in small groups), seminars and guided visits at local and national food plants and factories (3 ECTS, 27 hours, in all). An e-learning course is available in parallel with the lectures; this includes: the educational material organized in learning units; guidelines and reports on the theoretical-practical activities; self-evaluation tests; interactive forum and other tools; details on guided visits.

Objectives of the course

Knowledge and understanding:

Full knowledge and comprehension of: (a) the biotechnological aspects dealing with the use of microorganisms and their enzymes for the manufacturing and storage of food products; (b) biochemical pathways and effects of the main fermentation processes; (c) the mechanisms involved in the emergence of food-borne diseases caused by pathogenic microorganisms or their toxins.

Applying knowledge and understanding:

Capability of: (a) correlating changes in the process parameters with changes in the food quality and safety; (b) planning the most appropriate analyses for the evaluation of food quality and

hygiene parameters; (c) using selected microorganisms and their enzymes for both the bio-catalysis of food-manufacturing processes and the control of the desired or undesired biochemical processes; (d) planning and managing strategies for the optimization of biotechnological process for the production of food and beverages; (e) integrating physical, chemical, biochemical, and microbiological parameters data; (f) evaluating the potentiality of innovative biotechnologies in different food processes.

Cross-expertise:

Making judgements: capability of identifying the key information needed to improve the efficiency of processes aimed at improving the quality of food products.

Communications: 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 agro-food supply chain (engineers, biologists, chemists, nutritionists, etc.).

Program

- The role of microorganisms in food products. The main abiotic factors affecting the growth of food-borne microorganisms; microbial competition and physico-chemical methods used in processing of foods to improve food stability (1 ECTS).
- Pro-technological microorganisms: lactic acid bacteria, propionic bacteria, acetic bacteria, coagulase-negative bacteria; eumycetes (yeasts and moulds) (1 ECTS)
- Starter cultures (1 ECTS)
- Cheese-making: milk; acid and enzymatic milk coagulation; cheese definition and classification; cheese-making process and role of the main microbial groups involved; spoilage and pathogenic microorganisms potentially occurring in cheese (1 ECTS)
- Fermented milks- yoghurt: classification and manufacturing processes; role and properties of the starter cultures used for the production of yoghurt; health claims (0.5 ECTS)
- Bread-making: classification, physico-chemical, rheological and fermentative properties of cereal flours; leavened baked goods: classification; biological leavening agents: classification, properties, propagation, and mode of action; bread-making process and role of the main microbial groups involved; spoilage and pathogenic microorganisms potentially occurring in baked goods (1 ECTS).
- Fermented sausages: physico-chemical properties of raw meat; manufacturing process of fresh and fermented sausages: main steps and role of the microorganisms involved; spoilage and pathogenic microorganisms potentially occurring in fresh and fermented sausages (0.5 ECTS)
- Mechanisms of microbial pathogenicity and host defense: food infection, intoxication, toxi-mediated infection; definition of pathogenic, virulence, infectious and lethal dose; toxigenic microorganisms: exo- and endotoxins; human microbiota; non-specific and specific defense mechanisms (1 ECTS)
- Hygine indicator microorganisms. Pathogenic bacteria and viruses causing food infections, ; intoxications, toxi-mediated infections (1 ECTS)
- Micotoxins and foodborne diseases caused by prions, biogenic amines and chemical

contaminants (0.5 ECTS)
- Microbiological analyses of food, working surfaces and air (0.5 ECTS)

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the teaching program. During the course, self-evaluation tests (e-learning mode) are available.

Learning evaluation criteria

In order to pass the exam, the student will have to demonstrate: overall understanding of the subjects and appropriate usage of technical terminology. In order to obtain the best evaluation, the student will have to demonstrate: (a) in-depth knowledge and understanding of the subjects; (b) fluency in the usage of the technical lexicon; (c) ability to solve simple problems dealing with the manufacturing and storage of fermented foods.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the exam will lead to marks ranging from 18 to 30 with honors.

Final mark allocation criteria

The final mark will be awarded on the basis of the answers to three principal questions (quantified 0 to 10 thirtieths, each) about three topics randomly selected by the teacher among those listed in the teaching program. To pass the exam, the student will have to demonstrate a sufficient knowledge of each of the three discussed topics.

Recommended reading

- Modern Food Microbiology. James M. Jay; Martin J. Loessner; David A. Golden. Springer (last edition)
- Food Microbiology. Martin R Adams and Maurice O Moss. RSC Publishing

All other educational material is available on the e-learning web platform.

FOREING LANGUAGES - INTERMEDIATE LEVEL

***** NON ASSEGNATO*

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Program

Prof.ssa E. Foppa Pedretti and Dott. C. Casucci

(responsible for the Faculty of Agricultural Studies)

***English*: Dr. P. M. Jones** (elementary level),

Dr.S.A.Hill (intermediate level)

Dr. E.D.Agnelli (advanced level)

***French*: Dr. B. Dupouts,**

***Spanish*: Dr. M. J. Simón Villares**

***German*: Dr. I. Mesits**

(C.S.A.L. Language Assistants)

Intermediate level for undergraduate (three year) degree courses in:

AGRICULTURAL SCIENCE AND TECHNOLOGY

VITICULTURE AND ENOLOGY

FORESTRY AND ENVIRONMENTAL SCIENCE

FOOD SCIENCE

Advanced level for the postgraduate course (Specialist degree course) in:

AGRICULTURAL SCIENCE AND TECHNOLOGY (AST)

Introduction

• Students may take the language test in one of the following languages: English,

French, Spanish or German. Students from foreign countries taking part in the

Erasmus programme may take a test of Italian.

• The language assistants from the University Language Centre (CSAL) work in collaboration with the Faculty to assist any students who need to improve their knowledge of foreign languages. Foreign students who need to improve their knowledge of Italian may also take advantage of the services offered by the CSAL.

• Any students who have obtained internationally valid language certificates in one of the four abovementioned languages may ask for recognition of this level of language competence. The certificates will be converted into ECTs, according to the table drawn up by the Faculty.

Organisation of the study syllabus and the exams

Three levels of study activities have been organised:

Intermediate level: classes for second year students to consolidate and extend their understanding of grammar through reading skills, with particular emphasis on scientific texts. The students must be able to understand the general meaning of various types of text and the most important information contained in scientific or technical texts.

The level of knowledge attained will be assessed through a written examination (translation of a scientific or technical text).

Advanced level: classes for students attending the second year of the postgraduate degree course (AST), to consolidate and extend their knowledge of vocabulary and to practice their ability to speak about scientific subjects. The students must be able to discuss scientific or technical subjects.

The level of knowledge attained will be assessed through an oral examination (presentation in a foreign language of a chosen scientific or technical subject).

Italian as a foreign language

Any foreign students taking part in the Erasmus programme who need to improve their knowledge of Italian may take advantage of the services offered by the University

Language Centre (CSAL) in collaboration with the Faculty.

Recommended reading

Reference Texts:

English

“Essential Grammar in Use with key and CDRom" by Murphy and Pallini. ed: CUP 3rd edition for the elementary level.

Photocopied material will be provided for the intermediate level.

French

« Le nouveau sans frontières n°1 + cahier d'exercices n°1 »- Edition Clé International- Authors: Philippe Dominique (for the first year).

« Civilisation progressive du français » - Author: Ross Steele - Edition Clé International (for the second year).

German

« Passwort Deutsch 1 »

« Passwort Deutsch 2 »

Spanish

« Contacto Nivel 1 » -ed. Zanichelli for the elementary level

« Contacto Nivel 2 » -ed. Zanichelli for the intermediate level

Additional activities for students interested in studying English.

1. Quick Placement Test (QPT)

During the periods indicated by the language assistants first year students may do this test in the Faculty computer room to assess their knowledge of English. The score obtained, between level 0 and level 5, is to be interpreted as follows:

Level 0: Using the computer room facilities the student must follow the self-study elementary language course software “English Express” so as to arrive at the minimum

level of English required in order to attend the elementary English classes.

Level 1: the student already knows English sufficiently well to be able to attend the elementary English classes

Levels 2 – 5: The student knows enough English to be able to take the elementary level English test without attending the classes.

2. Self-study

Any students who wish to practice English on their own may use the English Express software which is available in the computer room of the Faculty.

.....

FOREING LANGUAGES - INTERMEDIATE LEVEL

***** NON ASSEGNATO*

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Program

Prof.ssa E. Foppa Pedretti and Dott. C. Casucci

(responsible for the Faculty of Agricultural Studies)

***English*: Dr. P. M. Jones** (elementary level),

Dr.S.A.Hill (intermediate level)

Dr. E.D.Agnelli (advanced level)

***French*: Dr. B. Dupouts,**

***Spanish*: Dr. M. J. Simón Villares**

***German*: Dr. I. Mesits**

(C.S.A.L. Language Assistants)

Intermediate level for undergraduate (three year) degree courses in:

AGRICULTURAL SCIENCE AND TECHNOLOGY

VITICULTURE AND ENOLOGY

FORESTRY AND ENVIRONMENTAL SCIENCE

FOOD SCIENCE

Advanced level for the postgraduate course (Specialist degree course) in:

AGRICULTURAL SCIENCE AND TECHNOLOGY (AST)

Introduction

• Students may take the language test in one of the following languages: English,

French, Spanish or German. Students from foreign countries taking part in the

Erasmus programme may take a test of Italian.

• The language assistants from the University Language Centre (CSAL) work in collaboration with the Faculty to assist any students who need to improve their knowledge of foreign languages. Foreign students who need to improve their knowledge of Italian may also take advantage of the services offered by the CSAL.

• Any students who have obtained internationally valid language certificates in one of the four abovementioned languages may ask for recognition of this level of language competence. The certificates will be converted into ECTs, according to the table drawn up by the Faculty.

Organisation of the study syllabus and the exams

Three levels of study activities have been organised:

Intermediate level: classes for second year students to consolidate and extend their understanding of grammar through reading skills, with particular emphasis on scientific texts. The students must be able to understand the general meaning of various types of text and the most important information contained in scientific or technical texts.

The level of knowledge attained will be assessed through a written examination (translation of a scientific or technical text).

Advanced level: classes for students attending the second year of the postgraduate degree course (AST), to consolidate and extend their knowledge of vocabulary and to practice their ability to speak about scientific subjects. The students must be able to discuss scientific or technical subjects.

The level of knowledge attained will be assessed through an oral examination (presentation in a foreign language of a chosen scientific or technical subject).

Italian as a foreign language

Any foreign students taking part in the Erasmus programme who need to improve their knowledge of Italian may take advantage of the services offered by the University

Language Centre (CSAL) in collaboration with the Faculty.

Recommended reading

Reference Texts:

English

“Essential Grammar in Use with key and CDRom" by Murphy and Pallini. ed: CUP 3rd edition for the elementary level.

Photocopied material will be provided for the intermediate level.

French

« Le nouveau sans frontières n°1 + cahier d'exercices n°1 »- Edition Clé International- Authors: Philippe Dominique (for the first year).

« Civilisation progressive du français » - Author: Ross Steele - Edition Clé International (for the second year).

German

« Passwort Deutsch 1 »

« Passwort Deutsch 2 »

Spanish

« Contacto Nivel 1 » -ed. Zanichelli for the elementary level

« Contacto Nivel 2 » -ed. Zanichelli for the intermediate level

Additional activities for students interested in studying English.

1. Quick Placement Test (QPT)

During the periods indicated by the language assistants first year students may do this test in the Faculty computer room to assess their knowledge of English. The score obtained, between level 0 and level 5, is to be interpreted as follows:

Level 0: Using the computer room facilities the student must follow the self-study elementary language course software “English Express” so as to arrive at the minimum

level of English required in order to attend the elementary English classes.

Level 1: the student already knows English sufficiently well to be able to attend the elementary English classes

Levels 2 – 5: The student knows enough English to be able to take the elementary level English test without attending the classes.

2. Self-study

Any students who wish to practice English on their own may use the English Express software which is available in the computer room of the Faculty.

.....

FOREST MEASUREMENT AND SYLVICULTURE

CARLO URBINATI

Seat Agraria
A.A. A.A. 2015-2016
Credits 12
Hours 108
Period Corso annuale

Prerequisites

Knowledge of Mathematics, Principles of Statistics, Botany, Zoology and Enthomology is strongly recommended.

Course contents

The course includes classroom lectures (8 ECTS – 72 hrs) training in computer room and field work (4 ECTS – 36 hrs). Students will be divided in working groups in order: a) to work on forest measurement exercises and simulations; b) to read and comment journal articles; c) to discuss on technical videos; d) to prepare short PPT presentations; e) to work on self-evaluation tests.

Field activities are strongly recommended. The course is available also on e-learning mode on the Moodle platform (https://lms.univpm.it/).

Objectives of the course

Knowledge and skills. The aim of the course is to provide specific knowledge on: i) structure, composition and main functional processes of forest ecosystems; ii) methods and tools to measure structure and growth of forest trees and stands; iii) main silvicultural systems used in Europe and in Italy.

Applying knowledge and understanding

The course will allow the students to apply knowledge and skills to: 1) integrated analysis of forest ecosystems; ii) sustainable management of forest resources and related environmental processes at stand and community level.

Cross-expertise. The course will provide students expertise: i) to assess the multiple role of forests from community to landscape scale; (ii) to apply most appropriate silvicultural methods to balance forest productivity and conservation; iii) to transfer technical skills and communicate with other experts in the field of forest and environmental resource management.

Program

First part: Forest assessment and mensuration (6 ECTS) first semester.

Course introduction and short international overview. physiognomy, structure and growth of forest trees. Structure and composition of forest stands. Methods and devices for tree and forest measurements (tree diameter, height, age) on living and dead trees. Basics of forest sampling in coppice and high forests. Modelling trees and height-diameter curves (**2 ECTS**).

Tree volume measurement of felled trees: taper coefficient, volume general formula, Huber, Smalian, Cavalieri-Newton and Heyer formulas. Volume measurement of standing trees and forests, volume and yield tables, remote sensing and other methods (**3 ECTS**).

Commercial wood products and measurement; volume increments; basics of dendrochronology. (**1 ECTS**).

Second part: Sylviculture (6 ECTS) second semester

Course introduction, national and and international overview. Basics of forest ecology: structure and functions of forest ecosystems. Interactions of main environmental factors in forest ecosystems. Spatial and chronological structure of forest ecosystems. Silvigenetic phases: growth, ageing, mortality and regeneration of forests. Fertility and productivity of forest ecosystems. Basics of forest vegetation classification. National and regional forest types and inventories (**2 ECTS**).

Applied sylviculture. Productive forest management: timber products and wood energy, non-wood products. Coppice and high-forest management systems. Clearcut, shelterwood, selection systems, thinning, conversion from coppice to high forest. Main national and regional forest regulations. Basic techniques in forest nursing, plantation and short-rotation forestry (**2 ECTS**).

Non-productive forest management: climate mitigation, slope-erosion control, biodiversity and habitat conservation. Sustainability and forest policy. Forest certification schemes. Local forestry in a global context (**1 ECTS**).

Development of the course and examination

Learning assessment methods

The exam is made of two parts and can be completed in two ways: 1) one part at the end of each semester; 2) both parts at the end of the course. The *Forest measurement* part is a written test including: i) 1 exercise concerning the volume assessment of a forest stand; ii) n. 2 questions and open answers on main course topics; iii) a set of multiple choice questions (n. 10-15) on other course topics. The *Silviculture* part is an oral test about the course topics. Self-evaluations excercises are available on the Moodle course site and can be compiled by students for exam preparation.

N.B. The oral test can be taken only upon successful completion of the written test.

Learning assessment criteria

The students throughout the different tasks of the course should demonstrate knowledge and skills: i) in sampling and measurement techniques of main tree and forest structural variables; ii) of principles and applications of forest volume measurements; iii) of main structural and functional features of forest stands and ecosystems; iv) main silvicultural treatments for sustainable management of forest products and services.

Learning measuring criteria

Final grade is expressed in 30th as an average of scores earned in the two parts

Final grade allocation criteria

The score of the *Forest Measurement* test (expressed in 30th) is composed as weighted average of the single scores obtained in the different parts: stand volume exercise (50% of the total weight); questions with open answers (35%) and multiple choice questions (15%).

The score of the *Silviculture* test (expressed in 30th) is based upon three main questions each grades from 0 to 10.

The exam is passed when the students demonstrate to have an overall knowledge of the subjects treated during the course, exposed (both in oral and written mode) in an adequate manner and with a suitable technical terminology and ability of linking different topics. The maximum score (30/30 cum laude) is released to students demonstrating excellent knowledge and skills.

Recommended reading

- Avery T.E., Burkhart H.E. - *Forest Measurements*. Ed. Mc Graw- Hill, N.Y., 1994
- La Marca O. *Elementi di Dendrometria* (seconda edizione). Patron, 2004
- Bernetti G, Del Favero R, Pividori M. *Selvicoltura produttiva*. Edagricole, 2012
- Piussi P., Alberti G. *Selvicoltura Generale. Boschi, società e tecniche colturali*. Compagnia delle Foreste, 2015.
- Puettmann KJ, Coates KD, Messier Ch. *A critique of Silviculture. Managing for complexity*. Islandpress, 2009.
- Sands R. *Forestry in a global context*. CABI Publ. 2005

FOREST PATHOLOGY

SERGIO MUROLO

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic knowledge of general biology, botany, chemistry, and genetics.

Course contents

The didactic method is based on ppt lectures (4 ETCS) (provided in e-copies to the students) and laboratory experiences and guided tours in forest nursery, regional forests, and urban areas, where phytosanitary problems outbreak (2 ETCS). The course will be also available through an e-learning version using the Moodle platform. Within this platform, the course will be divided into: (i) teaching materials composed by different learning units; (ii) self-assessment tests; (iii) the forum section where there are the field trip information and reservations .

Objectives of the course

Knowledge. The course enables students to acquire the fundamental and essential knowledge about the pathogen biology, predisposing factors, damages induced by main pathogens in forest and in urban green areas, the diagnostic techniques and biological and integrate control strategies.

Applying knowledge and understanding. The main aim of this course is to provide a fully development ability of the students in recognizing the most important symptomatic frames, hypothesizing causal biotic or abiotic agents, verifying and identifying the causal agents by lab techniques, elaborating sustainable control strategies in forest and urban environment.

Cross-expertise. (i) making judgements: capability of identify the information needed to manage the main pathogens (fungi, bacteria, virus, viroids, phytoplasma) in a forest environment; (ii) communications: 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 involved in the management and mitigation of phytosanitary problems (engineer, architect, administrator).

Program

The program is composed of two main sections: general aspects and specific plant diseases.

General aspects

- Plant Diseases: the concept of diseases in plants, symptoms (morphological and physiological changes in infected plants), evaluation of losses induced by plant diseases, detection and diagnosis of plant pathogens and plant diseases (1 ETCS).
- Development of diseases in plants and in forest environment: disease cycle, host, pathogen and environmental effects on the development of infectious plant diseases; plant-pathogen interactions, recognition mechanisms between host and pathogen; susceptibility and resistance (1 ETCS).
- Plant disease epidemiology. Control methods (sylvicultural, physical, chemical, genetic, and biological approaches, regulatory control measures) in organic, sustainable and integrated pest management (0.5 ETCS).

Specific plant diseases

- Main forest disease caused by fungi on hardwoods (*Castanea*, *Quercus*, *Fagus*, *Ulmus*, *Platanus*, *Acer*, *Betula*, *Juglas*, *Fraxinus*, *Prunus*, *Aesculus*) and on conifers (*Pinus*, *Abies*, *Larix*, *Cupressus*, *Pseudotsuga*): damping-off, root- and collar-rots, powdery mildews, rusts, cankers, vascular wilts, leaf spots (1 ETCS)
- Main forest diseases caused by bacteria and phytoplasma, virus and viroids (0.5 ETCS)

Moreover, in the course 30% of hours (2ETCS) are reserved for practical lessons in the laboratory or for field surveys

Development of the course and examination

Learning evaluation methods

Oral discussion about selected subjects listed in the teaching program. During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

In the oral classwork, the student will have to demonstrate: (i) knowledge of the main symptpmatic

frames induced by pathogens; (ii) knowledge of the lab techniques applying to identify forest pathogens; (iii) life cycle, damage and control strategies of the major pathogens in forest and urban environment. To pass the oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of three questions concerning *general aspects* and two questions about the *specific plant diseases*. Each question about the general aspects is evaluated in the range 0-7, on the other hand each question about the specific plant diseases is quantified in the range 0-5. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

- Agrios G.N. **Plant Pathology** - 5th Edition. Elsevier Academic Press, 2004
- Belli G. **Elementi di Patologia Vegetale**. Piccin editore, 2007
- Capretti P., Ragazzi A. **Elementi di Patologia forestale**. Patron Editore, 2009.

- Intini M., Panconesi A., Parrini C. **Malattie delle alberature in ambiente urbano**. Ed. Studio Leonardo, 2000

- Panconesi A., Moricca S., Ragazzi A., Dellavalle I., Tiberi R. **Parassiti delle piante arboree forestali ed ornamentali**. Patron Editore, 2014.

Tutorial session

On Tuesday and Thursday from 2 pm to 5 pm.

FOREST PEDOLOGY

GIUSEPPE CORTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 9
Hours 81
Period 2^ semestre

Prerequisites

Good knowledge on chemistry, biochemistry, plant biology, maths, physics

Course contents

The didactic method consists of front lessons with the help of ppt projections (provided in copy to the students) (7 ECTS), and lab experiences (main chemical, physical and instrumental methods used for pedological studies) and field excursions (2 ECTS).

Objectives of the course

Knowledge. The main aim of the course is to give the basic knowledge for recognizing the processes responsible for soil genesis, and understand the complexity of the forest and natural ecosystems, so as to develop the capability to take decisions for their eventual conservation and/or protection. With this course, the student will also understand part of the complex interactions among soil, plants, animals, water and air.

Applying knowledge and understanding. The course is organized to give the students scientific and technical tools that allow him/her to take decisions on destination, evaluation, purpose and design of environments that span from forests, natural or threatened ecosystems, territories submitted to extremes conditions such as those affected by cold, aridity, salinity, etc..

Cross-expertise. a) development of the ability to linking pedological issues to arguments treated in the courses of “Systematic and forest botany”, “Dendrometry and silviculture”, Forest chemistry”; b) development of an own judging capability on themes like conservation and protection of ecosystems, based on scientific and technic knowledge; c) ability to properly transfer information, ideas, problems and relative technical solutions to experts with different scientific and technical background involved in managing forest and natural ecosystems (foresters, hydraulic engineers, ecologists, land surveyors, administrators of parks, reserves, local entities).

Program

General topics

- soil definition, FAO resolution about soil protection, concept of pedosphere, Jenny equation; profile and horizons (O, E, A, B, C, R); main horizon characteristics (colour, texture, structure, consistence, roots, mottling, concretions, clay skins, silt caps) (1 ECTS)

- soil forming forces; parent materials; climate and topography; time (modern, ancient and buried soils); biota (plants, microorganisms and animals) (1 ECTS)

- soil composition; main soil minerals; mineral alteration (congruent and incongruent dissolution); genesis and evolution of the soil organic matter and organic matter incorporation (1 ECTS)

Special topics

- importance of litter and pedofauna in the global carbon cycle; structure formation and its importance in soil protection; ecological solutions (rain, stemflow, throughfall, litterfall) and phenomena linked to soil erosion; pedogenetic processes in the main pedological environments (1 ECTS)

- glacialism, permafrost, periglacial conditions, cryoturbation and genesis of the Gelisols; rubefaction, ferrolysis and genesis of the Entisols; swamping and genesis of the Histosols (1 ECTS)

- lessivage, formation of fragipan, and genesis of Alfisols and Ultisols; melanization and genesis of the Mollisols; podzolization and genesis of the Spodosols (1 ECTS)

- volcanic materials, andosolization and genesis of the Andisols; laterization and genesis of the Oxisols; Inceptisols, Vertisols, Aridisols, submarine soils (1 ECTS)

- fields excursions: opening and description of a soil profile; geological, geomorphological, and climatic setting of the site; soil sampling; soil characterization through lab analyses; data interpretation (2 ECTS)

Development of the course and examination

Learning evaluation methods

Final assessment will focus on an oral examination lasting 40-45 minutes.

Learning evaluation criteria

During examination the student has to demonstrate the knowledge of the topics treated during

lessons and field excursions, and the capability to properly expose the arguments with an appropriate technical-scientific language. Particular attention will be given to the ability to deal with deductive reasoning and connections so as to demonstrate mastery of the discipline.

Learning measurement criteria

The oral exam consists of 2-3 questions on arguments treated during the course (30% of the final mark) and 2 queries dealing with reasoning on and connections among arguments that are typical of soils and pedological environment treated during the course (remaining 70% of the grade).

Final mark allocation criteria

The assignment of the final mark will be out of thirty and will be determined by the weighted mean of the marks obtained in the two sets of questions. The *cum laude* will be given to the student who has achieved the highest mark and has also demonstrated the ability to connect course arguments and make deductive reasoning.

Recommended reading

1) A. GIORDANO, Pedologia forestale e conservazione del suolo, Utet, 2002.

2) G. SANESI, Elementi di pedologia, Edizioni Edagricole, Bologna, 2000.

3) R.J. SCHAETZL, S. ANDERSON, Soil genesis and geomorphology, Cambridge University Press.

4) SOIL SURVEY STAFF, Soil Taxonomy. A Basic System of Soil Classification for Making and Interpreting Soil Survey, United States Department of Agriculture & Nat. Res. Cons. Serv. U.S. Govern. Print. Office, Washington, D.C., 2010.

5) ASSOCIATION FRANÇAISE POUR L'ETUDE DU SOL (AFES), Référentiel Pédologique. Édition Quæ, Versailles, France. 2008.

Office hours

On Wednesday from 3 to 5 p.m., or other day by appointment taken via email or telephone.

FORESTAL CHEMISTRY

CRISTIANO CASUCCI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

It is expected to know the basic chemistry. It is important that students have already addressed the study and/or passed the exam in General and Organic Chemistry.

Course contents

The topics of the course will be treated with the help of Power Point presentations, provided in copies to the students, both for lectures (4 CFU) that for the laboratory exercises (2 CFU).

Objectives of the course

Knowledge. The course aims to provide students with knowledge on the main chemical, chemical-physical and biological processes involved in soil formation, chemical and biological soil fertility and in the main enzymatic and biochemical mechanisms of plants in order to understand the vital role that they play in the sustainability of agricultural, forestry and natural environments.

Applying knowledge and understanding. The main aim of this course is to provide students with necessary knowledge for use of the main classification systems of soil, the assessment of soil fertility and the interactions between soil and plant.

Cross-expertise. Ability to use the knowledge acquired during the course for the study and evaluation of potential risks of environmental pollution resulting from the management of the soil-plant system.

Program

Course presentation Pedogenesis environment. Structure and properties of silicates. Silicate hydrolysis. Pedogenesis factors. Soil colloidal properties. Structure and properties of Al and Fe Hydroxyoxides, micas, smectites, vermiculites and kaolins (1 ECTS).

Humus: extraction, fractionation, composition and physico-chemical properties. Forest soils. Forest humus (1 ECTS)

Soil Adsorbing capacity. Mechanical, biological and chemical absorption . Adsorption exchange (anionic and cationic). Soil pH and buffer power.(1 ECTS)

Enzymes: classification, characteristics, composition, co-enzymes, cofactors, prosthetic groups. Enzyme kinetics and mechanisms of inhibition (0.5 ECTS).

Photosynthesis: exogenous and endogenous factors affecting photosynthesis. Photosynthetic pigments. Structure of the thylakoid membrane. Step light of photosynthesis: the formation of ATP. Dark phase of photosynthesis: C3 and C4 cycles. Photosynthetic efficiency (1 ECTS).

Cellular respiration: glycolysis, anaerobic fermentation, Krebs cycle, electron transport chain. Nitrogen cycle: nitrogen-fixing, and into organic nitrogen mineralization, biosynthesis of glutamine. Amino-acids and proteins (1 ECTS).

Secondary metabolism: biosynthesis of phenols, pectin, cellulose, aromatic aminoacids and lignin (0.5 ECTS).

Development of the course and examination

Learning evaluation methods

Final assessment will focus on an oral examination lasting about 40/60 minutes.

Learning evaluation criteria

The student will demonstrate, during the interview, that he had acquired both the knowledge of the topics covered during the course and knowing how to properly expose them with a technical-scientific language appropriate that the ability to write and comment the chemical reactions involved in chemical and biochemical mechanisms studied.

Learning measurement criteria

The oral test will be on two main questions, each of which will be evaluated with a score ranging from 0 to 5 points.

Final mark allocation criteria

The assignment of the final degree will be out of thirty and is the sum of the scores obtained in each question. The honors will be given to students who have achieved the highest rating and will have

demonstrated the ability to connect the course topics.

Recommended reading

Autori vari, Fondamenti di Chimica del suolo, Patron Editore, 2005.

M. Businelli, Principi di Chimica del suolo, Morlacchi Editore, 2001

L. Scarponi, Biochimica Agraria, Galeno Editrice, 1996

M. Maffei, Biochimica Vegetale, Piccin Nuova Libraria, 1999

Autori vari, Biochimica Agraria, Patron Editore, 2003

FOSERST LANSCAPE ANALYSIS

MATTEO GARBARINO

Seat Agraria
A.A. A.A. 2015-2016
Credits 9
Hours 81
Period 2^ semestre

Prerequisites

Basic knowledge of forest ecology, forest measurements, silviculture, GIS and topography.

Course contents

The didactic method is based on: ppt lectures (4 CFU) provided in copies to the students; laboratory exercises (3 CFU); field data collection (2 CFU). The course will be also available through an e-learning version using the Moodle platform. Within this platform, the course will be organized into: (i) teaching materials composed by different learning units; (ii) interactive activities (e-tivity); (iii) field trip information and reservations.

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge about landscape ecology applied to the most important forest ecosystems, through the integration within a GIS environment of remotely sensed and field data.

Applying knowledge and understanding. The main aim of this course is to provide analytical skills and tools to manage a huge amount of spatially explicit data derived from different sources. This is done through the use of freeware software and other advanced instruments for field forest measurements.

Cross-expertise. (i) autonomous capability to collect and analyze geographical data of forest landscapes; (ii) communications: 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 forest management sector (foresters, agronomists, engineers, architects, biologists, administrators).

Program

1. Introduction to landscape ecology: a) Landscape ecology principles, b) Heterogeneity and scale concepts, c) Sampling design at landscape scale. (1 ECTS).

2. Geographic Information Systems and GPS applied to forest landscapes (with laboratory exercises): surface analysis, georeferencing tools, and photointerpretation techniques. (1 ECTS).

3. Introduction to remote sensing of environment: a) Remotely sensed data (aerial photographs, satellite images, LiDAR), b) Image processing, c) Categorical maps validation. (2 ECTS).

4. Forest landscape patterns and processes: landscape mosaic and its measurements (e.g. landscape metrics and spatial analysis); natural and anthropogenic disturbances, land use change, climate change (3 ECTS).

5. Analysis of forest landscapes: measuring landscape patterns to understand ecological processes using remote sensing and field based data (with lab exercises and field data collection) (1 ECTS).

Development of the course and examination

Learning evaluation methods

The exam includes: a) a technical report of all the lab exercises done during the course, b) an oral test with open questions concerning the whole course contents.

Learning evaluation criteria

In the oral classwork, the student will have to: (i) report on lab and field exercises; (ii) demonstrate knowledge of characteristics and main applications in forest ecology of remote sensing data; (iii) demonstrate knowledge of basic principles of landscape ecology applied to relevant forest dynamics and other processes. To pass the oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

Relevant scientific papers will be given and discussed during the course. No textbook is required for this course; you may find the following texts to be useful background material:

1. Turner M.G., Gardner R.H. 2015. “**Landscape Ecology in Theory and Practice: Pattern and Process**”, Springer, New York.

2. Gergel S.E., Turner M.G. 2002. “**Learning Landscape Ecology: A Practical Guide to Concepts and Techniques**”, Springer, New York.

3. Pickett, S.T.A., White PS., 2013. “**The ecology of natural disturbance and patch dynamics**”. Academic Press, San Diego.

4. Lillesand, TM., Kiefer R.W., Chipman J.W., 2015. “**Remote Sensing and Image Interpretation**”, Wiley, Hoboken.

Tutorial session

Tuesday from 2 pm to 4 pm.

FRUITCULTURE

FRANCO CAPOCASA

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Useful for this course basic knowledge of Arboriculture, Agronomy and Ecology.

Course contents

The course is organized on powerpoint lectures (available in the e-learning system before each lesson) (4 ECTS), laboratory exercises and guided tours at fruit farms (2 ECTS).

The course will be also available on e-learning system, using the Moodle platform. Within this platform will be available: teaching materials composed by different learning units, the results of evaluation test and various information.

Objectives of the course

Knowledge and understanding. The course enables students to acquire knowledge on the analytical capabilities of the choices that affect the production chain of fruit and the identification of species and varieties of interest for the different cultivation areas.

Applying knowledge and understanding. The main aim of the course are: to introduce students to the problems of fruit three species cultivation with particular attention to the varietal characteristics and fruit quality; to supply an opportunity to know about origin and spread of the main fruit species; to allow to know the reality of fruit culture; to develop students' interest in learning the technical knowledge, to help the designing of new plants and spread the cultivation of fruit trees.

Cross-expertise. (i) making judgements: capability of identify the information needed to manage the main varietal decision; (ii) communications: 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 involved in the management and realization of orchards

Program

1. Introduction to Fruitculture: history and evolution of fruit cultivation, statistics of fruit production in the world, European and Italian situation (0.5 ECTS).

2. Fruit production chain: The chain of fruit production and determination of the quality of the fruit; physical maturation index, chemical and nutritional quality of fruits (0.5 ECTS).

3. The main species belonging to the group of Pome (Apple and Pear) and Stone Fruit (Peach, Apricot, Japanese plum, European plum and Cherry), Strawberry and the Small fruits (Raspberry, Blackberry and Blueberry). Varietal choice (rootstocks and varieties), vesting schedules, agricultural and commercial characteristics of the main varieties. Recent results of the breeding. Cultivation technique: forms of training and pruning, spacing, soil management and nutrition. Overview of ripening date, fruit picking and storage aptitude of the fruit. Laboratory activities (3.5 ECTS).

4. The Nuts (almond, chestnut, hazel, etc.), the minor fruit (Table Grape, Kiwi and Table Olives) and Citrus fruit (Sweet orange, Mandarin orange and Lemon). Varieties description, technical cultivation, planting material, only aspects of the cultivation techniques and material properties of the fruit are considered (1.5 ECTS).

Development of the course and examination

Learning evaluation methods

Test final examination will be based a written test (optional) and / or oral examination..

Learning evaluation criteria

The student in the course will have to possess the following knowledge i) the fruit tree species explained during the course ii) identify the species most suitable for cultivation, including the choice of rootstocks and varieties that corresponds to the soil and climate, the corporate structure and destination of the product; iii) the ripening index and management of post-harvest fruits.

The students, during the oral test, will have to demonstrate an overall knowledge of the contents, using appropriate technical terminology and to be able to handle with deductive reasoning that enable him to create links within matter, and to have acquired a complete mastery of discipline.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The written test (optional) consists of 33 open-ended questions about the topics. for each one questions will be evaluated with score maximum of 10 point. The final result of the written test will be expressed in thirtieths.

The oral examination consists of three questions concerning the subjects listed in the teaching program. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

If the student wants to perform both tests (written and oral), the final grade will result from the average of the two results expressed in thirtieths.

Recommended reading

1. Autori Vari (1991). Frutticoltura Speciale. Reda – Edizioni per l’agricoltura
2. Sansavini S., Errani A. (1998). Frutticoltura ad alta densità. Edagricole.
3. Sansavini S. (2007). Nuove frontiere dell’arboricoltura italiana. Oasi Albero Perdisa
4. Autori Vari (2012). Arboricoltura generale. Patron Editore Bologna

Tutorial session

Tuesday from 01:30 pm to 03:30 pm.

FRUITCULTURE AND QUALITY OF PRODUCTS HORTICULTUTAL

LUCA MAZZONI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

The following topics are propaedeutic to the teaching: the basic knowledge of plant biology, chemistry and food chemistry.

Course contents

The course is taught through frontal lectures (4 ECTS, 36 hours) with the help of power point presentations, while the second part of the course (2 ECTS, 18 hours) consists of practical exercises in the classroom and in the laboratory, regarding the main techniques of analysis of fruit quality. The course is also developed in e-learning platform, by providing free access to the presentations exposed in the classroom; in addition, insights on the informations provided in the classroom and on topics of interest for the course (ex. varietal lists, regulations, etc.) are given in the platform.

Objectives of the course

Knowledge and understanding:

(a) to achieve adequate basic knowledge on the botanical origin, agricultural and productive characteristics, and on the main cultivation techniques of the most marketed fruits; (b) to know and understand the control methods of food and fruit raw materials safety and quality; (c) to know the scientific basis for the use of analytical techniques in the quality diagnosis and prediction; (d) to know the analytical methods for the qualitative and quantitative determination of specific vitamins and nutrients; (e) to know and understand the factors that positively or negatively influence the quality of a fruit product.

Applying knowledge and understanding:

(a) ability to understand the nutritional characteristics of the main fruit products; (b) ability to assess the characteristics of the fruit products in a perspective of optimizing the quality of food products derived; (c) organize the laboratory analyses necessary to ascertain the quality and safety of the

fruit products.

Cross-expertise:

(a) making judgements: ability to identify the surveys needed for the qualitative characterization of agro-food products of fruit origin, and for the evaluation of the safety requirements; (b) communication: 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 agro-food supply chain in the fruit sector.

Program

• Introduction to the fruitculture, definition of the concept of quality and its determinant factors (0.5 ECTS).

• Native area and spread of major fruit species and their pedo-climatic adaptability. Genetic classification, outlines of cultivation techniques and commerial properties of stone fruits, pome fruits, minor fruits, berries, nuts, dual-purpose cultivations, local fruits and citrus. Mentions of floral biology: flowering time, incompatibility, pollination, fertilization, parthenocarpy (1 ECTS).

• Evaluation of fruit quality: factors that affect the fruit quality, the objectives of fruit quality, the difference between qualitative and nutritional aspects, quality and ripeness of the fruit (some mentions on the maturation physiology) (0.5 ECTS).

• Tools for the evaluation of fruit quality: control methods, post-harvest technical standards, ICE standards and common quality standards (0.5 ECTS).

• The importance of sensory analysis in the evaluation of fruit quality: examples of practical application of sensory analysis (1 ECTS).

• The importance of the nutritional analysis in the evaluation of fruit quality: deepening their meaning and the most used laboratory instruments for their implementation (1.5 ECTS).

• Techniques for processing, packaging and storage of fruits and their derivatives (0.5 ECTS).

• The biotechnology applied to fruitculture for the improvement of fruit quality: future scenarios and relationship with the consumers' health (0.5 CFU).

Development of the course and examination

Learning evaluation methods

Final written test consisting of 30 questions with open or closed answer, regarding the main topics covered during the course. The written test is followed by a supplementary oral examination on two topics of the course, one of which is chosen by the student.

Learning evaluation criteria

During the written and oral tests, the student will have to show: (a) the basic knowledge of botanical and morphological characteristics of the main fruit species treated; (b) the knowledge and understanding of the main factors that affect the fruit quality at different stages of the production cycle; (c) the knowledge of analytical methods for the qualitative and quantitative determination of specific vitamins and nutrients; (d) an adequate knowledge of the definitions of quality and the use of technical terminology.

Learning measurement criteria

The final mark is attributed in thirtieths.

Final mark allocation criteria

The written test will consist of 30 questions, each of which will allow for a maximum of 1 point. Only in the case of at least 18 points in the written test, it is possible to access the oral exam. This exam will consist of two questions, each of which can allow a score ranging from 0 to 6 points.

Recommended reading

FRUTTICOLTURA SPECIALE, Autori Vari, 1991, REDA - Edizioni per l'Agricoltura

FRUTTICOLTURA GENERALE, Autori Vari, 1992, REDA - Edizioni per l'Agricoltura

PICCOLI FRUTTI, Giancarlo Bounous, 2009, EDAGRICOLE

Magazines related to fruitculture, such as "L'informatore agrario", "Terra è vita", "Rivista di frutticoltura e di ortofloricoltura" are also recommended.

The educational material used during the lessons and the additional educational material, including pomological cards and lists of varieties, are available on the e-learning web platform.

GENERAL AGRONOMY

RODOLFO SANTILOCCHI

Seat Agraria
A.A. A.A. 2015-2016
Credits 9
Hours 81
Period 1^ semestre

Prerequisites

Basic knowledge of plant biology, organic and inorganic chemistry.

Course contents

The teaching method includes both lectures (6 CFU) and practicals (3 CFU), performed as room exercises and field visits.

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge on agro-meteorology, physical and hydrological characteristics of agricultural soils and on the basic principles of their water and fertility management.

Applying knowledge and understanding. The main aim of this course is to deepen the information already gained with the basic courses, in order to form a technician able to handle the complex agronomic problems typical of modern agriculture.

Cross-expertise: (i) making judgements: ability to identify the information needed to manage the main agronomic issues of the agricultural soils; (ii) communications: ability to clearly and exhaustively communicate notions, ideas, problems and technical solutions to interlocutors, either professional or not, representative of the various and specific competencies involved in the management of the cropping systems (farmers, engineer, architect, biologist, administrator).

Program

1. Presentation of the course. Importance of the agro-meteorology. Insights on the climatic factors (radiation, temperature, precipitation, wind, air humidity) and their effects on the growth of crops (1 ECTS). Insights on evapotranspiration and water balance (0.5 ECTS).

2. The soil environment. Assessment of the physical characteristics of soils (texture, porosity, structure, etc.) in relation to the growth of crops (1 ECTS). Insights on various aspects of agricultural hydrology (water potential, soil water retention curve, water movement in the soil) (1 ECTS).

3. Water management issues in agricultural soils. Soil water management: importance and application techniques (1 ECTS). Dryland farming. Irrigation: technical elements of irrigation, irrigation systems (1.5 ECTS).

4. Soil tillage: functions, instruments, classification, new guidelines (1.5 ECTS).

5. Management of fertility of soils: nutrient cycling, meaning of the terms fertilization, correction, amendment. Chemical fertilizers, fertilization plans (2 ECTS).

Development of the course and examination

Learning evaluation methods

Final assessment will focus on an oral interview.

Learning evaluation criteria

In the oral classwork, the student will have to demonstrate the knowledge in each of the areas covered in the program.

Learning measurement criteria

The final mark is attributed in thirtieths.

Final mark allocation criteria

The oral examination consists of four main questions that will be quantified in the range 0 – 7.5. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

Bonciarelli F., Bonciarelli U., 2003. “Agronomia”. Edagricole scolastico, Milano.

Giardini L., 2001. “Agronomia generale, ambientale ed aziendale”. Patron Editore, Bologna.

LANDI R., 1999. “Agronomia e ambiente”. Edagricole, Bologna.

Tutorial session

Monday to Friday, from 11 am to 1 pm.

GENERAL AND ORGANIC CHEMISTRY

PATRICIA CARLONI

Seat Agraria
A.A. A.A. 2015-2016
Credits 12
Hours 108
Period 1^ semestre

Prerequisites

An elementary knowledge of mathematics and physics that is acquired in the majority of secondary schools, is propaedeutic to the teaching.

Course contents

The course consists of a balance of theoretical lectures (8 ECTS, 72 hours) and other activities, such as classroom practicals (4 ECTS, 36 hours). An e-learning course is available in parallel with the lectures. It includes: the educational material organised in learning units, the materials and instructions for the classroom practicals, self-evaluation tests and results, information, videos of laboratory experiments or supporting theoretic explanations.

Objectives of the course

Knowledge and understanding:

At the end of the course, students will have achieved:

(a) adequate knowledge of principles and fundamentals of the experimental sciences; (b) adequate scientific and methodological knowledge of chemistry; (c) appropriate knowledge and understanding of the fundamental chemical phenomena; (d) knowledge of the main classes of organic compounds and understanding of their reactivity; (e) knowledge of the main organic reactions used in the field of food technology.

Applying knowledge and understanding:

At the end of the course, students will have to:

(a) know how to use the basic knowledge on experimental sciences to approach profitably applicative disciplines; (b) possess the ability to set the mass and energy balances and apply dimensional analysis to verification; (c) understand the chemical principles underlying the

instrumental investigation techniques and the laws that describe them; (d) understand the chemical principles underlying the unit operations of food technology and the laws that describe them; (e) be able to use the learned basic knowledge along the entire production chain of food.

Cross-expertise:

Students will obtain: (a) independent judgment for the analysis and understanding of the various chemical phenomena related to food production; (b) the communication skills so they can clearly transfer information, ideas, problem's solutions and techniques to specialists representative of the various and specific areas involved in the agro-food chains (engineer, biologist, chemist, nutritionist, administrator).

Program

1. GENERAL CHEMISTRY (4 ECTS, 36 hours): Introduction to Matter: Elements and Compounds; Atoms, Molecules and Ions. The Atomic Theory of Matter: Modern View of Atomic Structure; Electronic Structure of Atoms; Atomic Orbitals; Representations of Orbitals; Orbitals in many-electron atoms; Electronic Configurations. The Periodic Table: Periodic Properties of the Elements; Sizes of Atoms; Ionization Energy; Electronic Affinities; Metals, Nonmetals and Metalloids; Group Trends. Basic Concepts of Chemical Bonding: Lewis Symbols and the Octet Rule: Ionic Bonding;, Covalent bonding, Atomic and Molecular Orbitals, Bonding orbitals, Polarity of molecules, Multiple bonding: sigma & pi bonds, Delocalization of pi electrons, Drawing Lewis Structures; Resonance Structures, The Shape of Molecules, Hybridization of atomic orbitals. Metallic bonding, Intermolecular Forces. The states of the matter. Gases: Characteristics of Gases; Pressure; The Gas Law; The Ideal Gas Equation; Gas Mixtures and Partial Pressures; Properties of Liquids: Viscosity and Surface Tension; Changes of State; Vapor Pressure; Phase Diagrams; Structures of Solids; Bonding in Solids. Compounds: Nomenclature of Inorganic Compounds: oxides, hydroxides, metallic cations, oxygenated acids, poliatomic anions, hydrides, peroxydes, salts, coordinations compounds. Calculation of formulas for compounds. The Mole Concept: Avogadro number, The mole concept, molar mass, Stoichiometry. Solutions & Their Behavior: Solutions & units of concentration; the solution process; Raoult's law; colligative properties. Stoichiometry: Reagents and products, Stoichiometric coefficients in equations; Limiting reactants, Percent yield, Equivalent mass, Normality, Reactions in solution: Ionic Reactions, Types of reactions, acids & bases, Redox reactions, Stoichiometry of reactions in solution. Thermodynamics: Energy Relations in Chemistry, Thermochemistry: The Nature of Energy; The first law, Heat capacity and specific heat, Enthalpy, Hess's law, Second law of thermodynamics; Entropy; Gibbs free energy. Chemical Equilibria: Equilibrium constant and reaction quotient, LeChatelier's principle. Aqueous equilibria; Acids and bases, Brønsted-Lowry acid-base equilibria, Lewis acid-base equilibria, pH, Kw, Ka, Kb, Hydrolysis of salts, Equilibria involving weak acids, weak bases, and salts, Common ion effect and buffer solutions; Henderson-Hasselbalch equation, Acid-base neutralization reactions. Heterogeneous Equilibria: Solubility and solubility product, Kps, Common ion effect. Electrochemistry: Oxidation and reduction; oxidation numbers; Redox equations; Cells, Half cells and half cell reactions, Half cell potentials, Nernst equation, pH meter, Electrolysis. Chemical Kinetics: Introduction, Rates of reactions, Rate equations, Collision theory, Arrhenius

equation, Kinetics constant, Catalysis.

2. ORGANIC CHEMISTRY (4 ECTS, 36 hours): Nucleophilicity & Basicity, Acid-Base Catalysis, The functional groups. Alkanes, Nomenclature, Constitutional Isomers, Conformational Isomers, Combustion, Substitution (of H by halogen), Cycloalkanes, Configurational Isomers, Stereoisomers, Stereochemistry, Chirality & Symmetry, Optical Activity, Configurational Nomenclature, Compounds with Several Stereogenic Centers, Fischer Projection Formulas, Achiral Diastereomers, Summary of Isomerism, Alkenes & Alkynes, Nomenclature, Geometric Isomers, Carbocations, Electrophilic Additions, Electrophilic Halogen Reagents, Other Electrophilic Reagents, Reduction, Oxidation, Hydrogenation, Acidity of Terminal Alkynes (Substitution of H), Benzene & Derivatives, Nomenclature, Resonance, Electrophilic Substitution, Reactions of Substituted Benzenes, Reaction Characteristics, Alkyl Halides, Nomenclature, General Reactivity, Substitution(of X), SN2 Mechanism, SN1 Mechanism, Elimination (of HX). Alcohols, Nomenclature, Reactions of Alcohols, Substitution of the Hydroxyl H, Substitution of the Hydroxyl Group, Elimination of Water, Oxidation of Alcohols, Reactions of Phenols, Acidity of Phenols, Oxidation to Quinones, Antioxidant activity, Ethers, Nomenclature, Reactions of Ethers, Acid Cleavage, Epoxide Reactions, Thiols & Sulfides, Sulfur Analogs of Alcohols & Ethers. Amines, Nomenclature, Properties of Amines, Basicity of Nitrogen Compounds, Reagent Bases, Reactions of Amines. Aldehydes & Ketones, Nomenclature, Occurrence of Aldehydes & Ketones, Properties of Aldehydes & Ketones, Reversible Addition Reactions, Hydration & Hemiacetal Formation, Acetal Formation, Imine Formation, Enamine Formation, Organometallic Reagents Additions, The Aldol Reaction, Ambident Enolate Anions, Carboxylic Acids, Nomenclature, Related Derivatives, Acidity, Salt Formation, Substitution of Hydroxyl Hydrogen, Substitution of the Hydroxyl Group, Reduction & Oxidation, Carboxylic Derivatives, Nomenclature, Reactions of Carboxylic Acid Derivatives, Acylic nucleophilic Substitution, Mechanism, Acidity of C–H, The Claisen Condensation.

3. EXERCISES (4 ECTS, 36 hours): Chemical language – Chemical Reactions. Reagents and products, Stoichiometric coefficients in equations; Limiting reactants, Percent yield, Equivalent mass, Normality, Reactions in solution: Ionic Reactions, Types of reactions, Acid-base reactions, Redox reactions, Solutions, Equilibria in the aqueous phase, pH of acidic and alkaline solutions, Hydrolysis - Balance of poorly soluble compounds: solubility product, Reactions in organic chemistry.

Development of the course and examination

Learning evaluation methods

The exam consists in a written test which includes two open-ended questions on the two main sections of the course, three stoichiometric exercises on the topics of practicals and 17 multiple choice questions on the whole course content. Oral discussion of the written test.

Optional tests of self-evaluation through exercises and questionnaires are available on the e-learning platform, which aims to provide students useful information about their skill level.

Learning evaluation criteria

The student have to demonstrate a thorough knowledge of the contents of the course, with the use of appropriate lexicon and the ability to apply that knowledge for solving simple problems.

Learning measurement criteria

The final mark is awarded out of thirty. The exam is passed when the grade is equal or greater than 18. It is possible to be awarded with the highest marks with honors (30 cum laude).

Final mark allocation criteria

For each question and exercise a score, that ranges from 0 to 3 points modulated on the completeness and accuracy of the answers, is given. As for the multiple-choice tests 1 point for each correct answer and 0 points for each wrong answer will be assigned. To pass the exam the sum of all scores will not be less than 18. The discussion of the written text can change the total score for a maximum of two points (both positive or negative). Praise is attributed when the score obtained from the previous sum exceeds the value 30 and the student has demonstrated full mastery of the subject.

Recommended reading

General Chemistry

• Chang, Goldsby • Fondamenti di Chimica Generale 2Ed • ISBN 9788838668012 • McGraw-Hill Education, Milano, (2015) € 61,00.

• Atkins -Jones • Fondamenti di Chimica Generale • ISBN 978-8808636140 • Zanichelli, Bologna, (2014) € 59,50.

Organic Chemistry

• Hart , Hadad , Craine , Hart • Chimica Organica 7Ed • ISBN 978-8808193506 • Zanichelli, 2012, € 41,40.

• Gorzynski Smith • Fondamenti di chimica organica 2/ed • ISBN: 978-88-386-6825-8 • McGraw-Hill Education, Milano, (2014) € 59,00.

• Wade • Fondamenti di Chimica Organica • ISBN: 978-88-299-2300-7 • Piccin, 2013 € 35,00

All other educational material is available on the e-learning web platform.

GENERAL AND ORGANIC CHEMISTRY

MARIO ORENA

Seat Agraria
A.A. A.A. 2015-2016
Credits 12
Hours 108
Period Corso annuale

Prerequisites

Knowledge of some chemistry topics including both molecular structure and types of chemical bonds.

Course contents

Lectures are planned (12 credits, 108 hours) concerning the most important topics of General Chemistry and most significant reaction mechanisms of Organic Chemistry. The lectures' educational activity is supported in e-learning mode with all slides discussed in class and audio files of all the lectures; the final examinations texts with solutions are also given, thus allowing students to assess their level of preparation.

Objectives of the course

Knowledge:
The course enables students to acquire the basic knowledge about the fundamental topic of Chemistry and reactions mechanisms of most relevant organic compounds present in biological systems, in order to understand their action in living organisms.

Ability to apply knowledge:

The student should acquire the ability to define chemical ideas so that he can apply this knowledge within other courses, in particular those dealing with biological chemistry and molecular biology.

Transversal skills:

The solution of selected problems, with single and group work, can improve the student insight together with the ability to communicate stemming from teamwork.

Program

Section A – General Chemistry **(6 ECTS)**

1. Classifications of matter. Physical and chemical properties of matter. Measurement units. Atomic mass. The Avogadro's number. Molecular mass. Chemical reactions and chemical equations. The atomic theory. The structure of the atom. Atomic number, mass number, and isotopes. The periodic table. Molecules and ions. Chemical formulas. Naming compounds (0.5 ECTS).

2. From classical physics to quantum theory. The photoelectric effect. The hydrogen atom. The dual nature of the electron. Quantum numbers. Atomic orbitals. Electron configuration. Development of the Periodic Table. Periodic classification of the elements. Periodic changes in physical properties. Ionization energy. Electron affinity. Variation in chemical properties of the representative elements (0.5 ECTS).

3. Lewis dot symbols. The ionic bond. The covalent bond. Electronegativity. Formal charge and Lewis structures. The concept of resonance. Bond enthalpy. Molecular geometry. Dipole moments. Hybridization of atomic orbitals in molecules containing double and triple bonds (0.5 ECTS).

4. Substances that exist as gases. Pressure of a gas. The gas laws. The ideal gas equation. Dalton's law of partial pressures. The kinetic molecular theory of gases (0.5 ECTS).

5. General properties of aqueous solutions. Precipitation reactions. Acid-base reactions. Oxidation-reduction reactions. Concentration of solutions. Solution stoichiometry. Types of solutions. A molecular view of the solution process. Concentration units. Effect of temperature on solubility. Effect of pressure on the solubility of gases. Colligative properties (0.5 ECTS).

6. The nature of energy and types of energy. Energy changes in chemical reactions. Introduction to thermodynamics. Enthalpy of chemical reactions. Standard enthalpy of formation and reaction. The three laws of thermodynamics. Spontaneous processes. Entropy. The second law of thermodynamics. Gibbs free energy. Free energy and chemical equilibrium (0.5 ECTS).

7. The kinetic molecular theory of liquids and solids. Intermolecular forces. Properties of liquids. Crystal structure. Bonding in solids. Phase changes. Phase diagrams (0.5 ECTS).

8. The rate of a reaction. The rate laws. Activation energy and temperature dependence of rate constants. Transition states and intermediates. Reaction mechanisms. Catalysis (0.5 ECTS).

9. The concept of equilibrium. Ways of expressing equilibrium constants. What does the equilibrium constant tell us? Factors that affect chemical equilibrium (0.5 ECTS).

10. Brønsted acids and bases. The acid-base properties of water. pH - A measure of acidity. Strength of acids and bases. Weak acids and acid ionization constants. Weak bases and base ionization constants. Molecular structure and the strength of acids. Lewis acids and bases (0.5 ECTS).

11. Homogeneous versus heterogeneous solution equilibria. Buffer solutions. Acid-base titrations. Acid-base indicators. Solubility equilibria (0.5 ECTS).

12. Redox reactions. Galvanic cells. Standard reduction potentials. Thermodynamics of redox reactions (0.5 ECTS).

Section B - Organic Chemistry (6 ECTS).

1. Introduction to the structure of organic molecules. Atomic orbitals and electronic configuration. The chemical bond. The rendering of an organic structure. Functionalities and nomenclature of organic compounds (0.5 ECTS).

2. Resonance structures. Non-covalent interactions. Relationship between non-covalent interactions and physical properties of organic compounds (0.5 ECTS).

3. Conformations of linear and cyclic molecules. Configurations and stereochemistry: chirality and chirality centres. Enantiomers and diastereomers (0.5 ECTS).

4. Introduction to reaction mechanisms. Thermodynamics and kinetis of organic reactions. Energy graphics and reaction plots. Electrophiles and nucleophiles (0.5 ECTS).

5. The acid-base processes. Structure effects on acidity and basicity (0.5 ECTS).

6. The nucleophilic substitution to sp3 carbons. Associative nucleophilic substitution: SN2 mechanism. Dissociative nucleophilic substitution: SN1 mechanism. Leaving groups and their properties. The SN1 o SN2 mechanism can be easily provided starting from structural considerations.

7. Elimination reactions leading to double bonds. E1 and E2 mechanisms (0.5 ECTS).

8. The p moieties as bases and nucleophiles. The electrophilic addition process. Cations as reaction intermediates. Intermediate cations stabilized by mesomeric or hyperconiugative effect. Cationic intermediates within alkylation of aromatic substrates (0.5 ECTS).

9. Addition of nucleophiles to the carbonyl group. Keto-enolic tautomerism. Steric and electronic effects within the addition process. The addition process occurs as an equilibrium reaction. Kinds of nucleophiles. Nucleophiles at carbon: cyanide anion and enolate anions (1 ECTS).

10. Aldol reaction, retroaldol reaction and aldol condensation. Addition of nucleophiles to the carbonyl group followed by removal of a leaving group. Nucleophiles at carbon leading to b-dicarbonyl compounds. Addition of nucleophiles to a,b-unsaturated systems (1 ECTS).

Development of the course and examination

Learning measurement criteria

The examination consists of a written test and oral discussion with commentary of the written test results and explanation of three slides of Organic Chemistry presented within the lectures. In the task there are six exercises concerning concepts of general chemistry. For each response is given a score between zero and five. In order to overrun the written test, the student must attain a score not less than half of the available points. The exam is passed when after the oral test final vote is

greater than or equal to 18.

Learning evaluation methods

Within the written test, the student must demonstrate knowledge of the major chemical reaction mechanisms and to have acquired basic knowledge about the reactivity of the most common class of compounds.

Learning evaluation criteria:

The final mark is awarded out of thirty. The examination is passed when the grade is greater than or equal to 18. It is expected to be awarded the highest marks with honors (30 cum laude).

Final mark allocation criteria

The final grade is given by adding to the written score the evaluation of the oral interview, up to a maximum of five points. Praise is attributed when the score obtained from the previous sum exceeds the value 30, while the student has demonstrated full mastery of the subject.

Recommended reading

Whitten, K.W., Davis, R.E., Peck, M.L., Stanley, G.G. “Chimica Generale”, VII Ed., Piccin

Hart, H., Craine, L.E., Hart D.J. “Chimica Organica” Zanichelli

Tutorial session

Monday from 12.00 am to 1.00 pm

GENERAL VITICULTURE

ORIANA SILVESTRONI

Seat Agraria
A.A. A.A. 2015-2016
Credits 9
Hours 81
Period Corso annuale

Prerequisites

Basic knowledge of general biology, botany, genetics, agronomy and tree biology and physiology.

Course contents

The teaching method is based on lectures supported by slides in digital format (6 CFU), supplied in copies to the students, and experiences in vineyard and laboratory (3 CFU). The course is also available in e-learning using the Moodle platform. Within this platform are available: a) teaching materials composed by learning units; b) self-assessment tests and their results; c) information and reservations for field trips educational visits.

Objectives of the course

Knowledge. The course enables students to acquire adequate basic knowledge on grape growing and its historical evolution, morphology and biology of the grapevine, vineyard establishment and management in the light of environmental and economic sustainability and adaptation to the new climate phase.

Applying knowledge and understanding. The aim of the course is to develop the student ability to design new vineyards through the choice of rootstocks, scions, training and pruning systems, to manage the main vineyard operations by limiting the impact on the environment and ensuring health and safety of operators and to follow and regulate the evolution of berry ripening.

Cross-expertise. (i) making judgements: identifying the information needed to establish and manage vineyards in different environmental contexts; (ii) communications: communicate clearly and comprehensively information, ideas, problems and related technical solutions to interlocutors, either professional or not, representative of the various and specific competencies in the wine sector (winemakers, grape-growers, administrators, journalists, sommeliers, etc.).

Program

1. Presentation of the course. The Vitaceae family, the genus Vitis, the relevance of *Vitis vinifera*. A brief history of viticulture from the romans to phyllossera fight and to its recent evolution. Viticulture in the world with special references to Italy. The system of wine appellation in Italy and in Europe and the cultivar choice. Case study: traits of some appellation rules of Italian wines (1 ECTS).
2. Morphology, biology and phenology of the vine: permanent and annual organ, bud and shoot system (leaves, inflorescence and flowers, tendrils, etc.). The life cycle of the plant, the annual cycle of grapevines in temperate environments. Introduction to ampelography: traits of young shoot and leaf, inflorescences and flowers, adult leaves, clusters and berries. The national register of grapevine varieties: how to use its on-line application (1 ECTS).
3. Grapevine rootstocks: general introduction, main features of genotypes spread out in Italy, selection criteria. Mineral elements required by the vine, their availability in the soil and the need of fertilization according to vineyard traits. Vineyard design and establishment: selection of site and cultivars, soil preparation, planning and planting the vineyard. Managing a vineyard the first year after planting (1 ECTS).
4. Training young vines: goals, principals and methods. Dormant pruning of adult vines: goals, principles and methods. Cane and spur pruning. Pruning length and fruitfulness of the basal nod. Balanced pruning and crop load. Practical activity in the vineyard: grapevine pruning (1 ECTS).
5. Relation between dormant pruning and trellis-training systems. Selection criteria of trellis training systems and planting distances in relation to environment, cultivar and mechanization. The major trellis-training systems of grapevines, their main features and management techniques to be adopted (bush system, free cordon, GDC, VSP systems such as Guyot, umbrella system, spur-pruned-cordon, sylvoz, casarsa, over-head systems and pergolas) (2 ECTS).
6. Soil management in the vineyard (cultivation, chemical weed control, sod culture, etc.). Summer pruning and canopy management (suckering, shoot positioning, topping and trimming, leaf removal, shoot and cluster thinning). Practical activity in the vineyard: canopy management (1 ECTS).
7. Formation, development and growth of the shoot and evolution of stored carbohydrates and nitrogen. Fruit bud formation, Flowering, pollination and berry set. Factors affecting berry set. Berry growth and development. Factors affecting berry growth and ripening. Seasonal evolution of berry ripening: vineyard sampling and criteria for harvesting, proper maturity (1 ECTS).
8. Grapevine physiology: respiration, photosynthesis, translocation and transpiration. Practical activity in the vineyard (1 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the teaching program. During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

The student, during the oral test, will have to prove: a) general knowledge of the grape and wine industry and its evolution; b) general knowledge of genotypes used in vineyard establishment including rootstock and scion cultivars; c) knowledge of morphology and biology of the grapevine; d)

knowledge of the vineyard management techniques (fertilization, vineyard planting, pruning, and trellising, grapevine training, canopy management, etc.) and of their physiological basis. To pass the oral exam, the student have to demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him/her to create links within matter, and to have an adequate mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

Palliotti, Poni, Silvestroni, 2015: La nuova viticoltura, Edagricole, Bologna - Codice ISBN-978-88-506-5453-6.

Autori vari, 2004: Viticoltura ed enologia biologica, Edagricole, Bologna - Codice ISBN88-506-4966-5.

Sansavini, Costa, Gucci, Inglese, Ramina, Xiloyannis, 2012: Arboricoltura Generale, Patron Editore, Bologna p.536, ISBN 978-88-555-3189-4.

Coombe, Dry, 2004: Viticulture Volume 1– Resources – 2nd Edition, Winetitles, Australia, Codice ISBN 0975685007 Winkler, Cook, Kliewer, Lider, 1974: General viticulture. University of California Press, Berkley.

Autori vari, 2005: Manuale di viticoltura, Edagricole, Bologna - Codice ISBN-88-5064981-9

Tutorial session

Wednesday from 8:15 am to 10:15 am

GEOBOTANY APPLICATION

SIMONE PESARESI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge in biology

Course contents

The course includes theoretical lessons with multimedia files (4 ECTS) as well as practical exercises (with R software) and study visits (2 ECTS).

Objectives of the course

Knowledge.

The course enables students to acquire the basic knowledge of Numerical Ecology applied to geobotanical data.

Applying knowledge and understanding.

The course enables students to properly apply the main Numerical Ecology techniques useful to describe, model and spatialize the environmental-vegetation relationships (at species and plant community level). Those analysis are required for many aspects of environmental research, resource management, and conservation planning as biodiversity assessment.

Cross-expertise.

The theoretical and practical knowledge acquired by the students are very useful not only for the geobotany and plant communities investigations but also for any other eco-discipline.

Program

1. Geobotany introduction.

Plant communities and the factors influencing. Vegetation mapping (1 ECTS).

2. Numerical ecology applied to plant communities.

Ecological descriptors. Ecological multidimensional space.

Ecological resemblance (Similarity, distance and dependence coeffiencients).

Cluster analysis (fuzzy, hard, supervised e unsupervised). Ecological interpretation of clustering results. Species Indicator Analysis.

Ecological and plant communities gradients. Ecological and plant communities data ordination. (Indirect and direct gradient analysis). Ecological interpretation of ordination results. (3 ECTS).

3. Practical exercises (in R software) and study visits (2 ECTS)

Development of the course and examination

Learning evaluation methods

Oral discussion on the subjects listed in the teaching program.

Learning evaluation criteria

Knowledge of the topics listed in the program and appropriateness of the technical-scientific language.

Learning measurement criteria

The final vote is attributed in thirtieths.

Final mark allocation criteria

The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10.

Recommended reading

PEDROTTI F. e VENANZONI R. - Geobotanica, in Enciclopedia delle Scienze. De Agostini, Novara.

ZUUR, A.F., IENO, E.N. & SMITH, G.M. (2007) Analysing Ecological Data. Springer, New York.

PIGNATTI S. - *Ecologia vegetale*. Zanichelli, Bologna.

PODANI J. (2007) – Analisi ed esplorazione multivariata dei dati in Ecologia e Biologia. Liguori Editore S.r.l, Napoli

Tutorial session

Friday from 2 pm to 4 pm.

GEOMATICS FOR LAND MANAGEMENT

EVA SAVINA MALINVERNI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Previous acquired skills about Surveying and GIS

Course contents

The teaching includes lectures (6 ECTS) adopting power point presentations, provided to the students in digital form during the lessons, and practical exercitations by means of the surveying devices and by means of software to process the data (3 ECTS).

Objectives of the course

Knowledge. The course enables students to acquire adequate knowledge to acquire, process, analyze, manage, enhance and take under control the landscape and its resources. In particular, it is possible to deepen the main survey and mapping methods in relation to the knowledge of cartography, photogrammetry and remote sensing, this is useful for landscape analysis and monitoring performed by means of GIS (Geographic Information Systems) tools, at different levels of scale.

Applying knowledge and understanding. The course gives to the student the ability to organize, in self manner, a technical work or a research. In particular the course provides some skills in order to choose the most advanced and appropriate tools for survey, process, analysis and management of spatial data. Therefore the student must be able to use technical and software tools necessary to make these procedures by himself to plan landscape management at different spatial scales.

Cross-expertise. a) Capability for autonomous decisions: well-known knowledge to choose techniques and tools to obtain an accurate knowledge of the landscape at different scales. The student will be enabled to operate properly on the territory to plan correctly the environment resources, to manage the land and to use rationally the natural resources; b) Capability for mindful tasks: clear and comprehensive application of the Geomatic basic concepts to solve territorial problems, finding relevant technical solutions. Ability to communicate with stakeholders, not always specialists, with different and specific skills involved in the management of the main territorial issues

(engineer, architect, administrator, etc.) .

Program

Basic Geodetic and Cartographic principles (1 ECTS)

Reference surfaces. Reference systems. Cartographic representations. National and international mapping. The geodetic networks. Global Positioning Systems (GPS).

Photogrammetry (1 CFU)

Theoretical concepts. Digital photogrammetry (Digital cameras, UAV). Methods and devices for photogrammetric plotting**.** Cartographic products: DTM and orthoimage.

Remote Sensing (2 ECTS)

Data acquisition systems. Main sensors. Georeferencing of images. Radiometric corrections. Unsupervised and supervised image classification. Thematic map generation.

Geographic Information Systems (GIS) (2 ECTS)

Basic concepts. Database organization. Features and main functions. Thematic mapping organization. Exercises by some GIS software (commercial and open source).

Development of the course and examination

Learning evaluation methods Final assessment will consist of oral test on the subjects listed in the teaching program starting from a topic developed by the student.

Learning evaluation criteria

The student during the oral test will must demonstrate: a) the knowledge of the concepts discussed in the classroom; b) the ability to choose the Geomatic techniques to collect cartographic data; c) the knowledge of the digital image processing; d) the ability to solve the raster and vector data processing in a GIS environment. To pass the oral exam, the student must demonstrate an overall understanding of the contents, to be able to present them with appropriate technical terminology, to deal with deductive thinking to provide appropriate links within the Geomatic topics to solve in better way the problems.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral test will consist of three questions each of which will be evaluated using a score ranging from 0 to 10 points. The degree of 30 “cum laude” is attributed to students which demonstrate a particular smart and clever exposure.

Recommended reading

M. Gomarasca : *Elementi di Geomatica*, Associazione Italiana di Telerilevamento, 2004.

G. Fangi : *Note di Fotogrammetria*, CLUA, Ancona

K. Kraus (trad. S. Dequal): *Fotogrammetria - vol. 1 e vol. 2*, Levrotto & Bella, Torino, 1994.

A. Dermanis, L. Biagi: *Telerilevamento. Informazione territoriale mediante immagini da satellite*, con CD-ROM, Casa Editrice Ambrosiana, 2002.

Slides and digital books related to the lessons of the course.

Tutorial session

Every Tuesday from 11.00 to 13.00 directly at the teacher's office. An appointment via email is recommended.

GEOMATICS FOR LANDSCAPE ANALYSIS

ANDREA GALLI

Seat Agraria
A.A. A.A. 2015-2016
Credits 12
Hours 108
Period 1^ semestre

Prerequisites

Basics of Mathematics, Physics, Computer Science.

Course contents

The teaching method is based on theoretical lectures, seminars and by laboratory activities using software GIS and IP (7.5 CFU). Learning will be supported by readily accessible material such as Power Point slides or pdf. The Lab traineeship will involve single applicants or small groups. Learning will be also supported through a set of e-learning tools placed on the Virtual Learning Environment (VLE) Moodle. Tools comprise: a) learning units; b) laboratory materials; c) self-assessment tests provided with the list of correct answers; d) suggestions of readings.

Objectives of the course

Knowledge and understanding. The course enables students to: gain the fundamental knowledge of Geomatics (focusing on: Cartography, Geographic Information Systems, Remote Sensing), design a data collection, interpret and create maps, analyze the physical components, vegetation, and human elements of the landscape. At the end, attendees will be able to combine traditional or innovative monitoring techniques to assess spatial and temporal changes on the landscape.

Applying knowledge and understanding. The main aim of this course is to provide the students with a solid skill on the methods and tools of Geomatics in order to: design, manage and make a monitoring of the natural and anthropic landscape components, design a flow-chart of procedures, choose and assess maps and remotely sensed data, build geo-database, produce new thematic information, use geoprocessing tools and finally report the results. These competences will be useful in both scientific and professional context.

Cross-expertise. a) decision-making ability: choose materials, procedures and technological tools accordingly with the object being studied paying a special attention to the working scale;

b) communication skills: clear and exhaustive report of chosen methodological and technical solutions, delivering results at both practitioners, scholars or other endeavors involved in the analysis and the management of natural and anthropic resources (engineers, architects, biologists, urban planners, administrators, decision makers, citizens); c) learning ability: perform analyses of real study cases throughout Geomatics methods and tools.

Program

1. *Introduction*: Geomatics background, definitions, fields of application. Analysis and discussion of applied geomatics peer reviewed works (0.5 ECTS).

2. *General Cartography*: principles of Geodesy, elements of history of Cartography, language of cartography, classification of cartographic products, elements of cartographic production process, features and information within topographic and thematic maps, projection systems, cartographic datum, scale, symbols and legends, analogical interpretation of topographic and thematic maps, included practical experiences (2 ECTS)

3. *Digital Cartography*: benefits, vector and raster format, structure and organization of spatial information, visualization ad interpretation of maps through software tools, examples and practical experiences (1 ECTS).

4. *Italian official cartography*: national products, regional products, access at cartographic information on the web and web-GIS services (0.5 ECTS).

5. *Geographic Information Systems*: background and operational purposes, general architecture, models and data organization, spatial operators, logical-mathematic operators, selections and queries, principles of 3D modelisation, fields of application, basic training with a GIS software through practical experiences stand-alone or in small working groups (5 ECTS).

6. *Remote Sensing*: principles of radiometric theory, remote sensing systems, photographic sensors, not photographic sensors, data types, data quality, visual interpretation (photo-interpretation), principles of digital image processing, fields of application, basic training with a IP software through practical experiences stand-alone or in small working groups (3 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion includes the presentation of a work done by the student. In order to provide the students with useful information on personal acquaintances, self-evaluation tests (e-learning) are available during the course.

Learning evaluation criteria

In the oral discussion, the student will have to demonstrate: a) knowledge on general cartography, digital cartography, Italian official cartography; b) architecture and functions of Geographic

Information Systems; c) Remote Sensing techniques, d) concerning the presentation of an original work, the candidate has to clearly report the chosen method, opting for the most efficient geoprocessing method, selecting good quality materials and delivering an exhaustive communication of results. To pass the exam, the student must demonstrate an overall understanding of contents, using an appropriate technical terminology. He also has to be able to design, execute and manage a methodological and technological analysis and monitoring of a reporting area describing contained natural and anthropic systems, by applying Geomatics' tools.

Learning measurement criteria

The final mark has attributed in thirtieths.

Final mark allocation criteria

The oral examination consists of two steps: a) discussion of the methodological and technological solutions and of the results shown in the presentation; b) three questions concerning the topics listed in the teaching program; each of the two parts has evaluated in a range 0-30, the final mark comes from the average calculation. The mark of 30 “cum laude” will be conferred to all those who demonstrates a complete mastery of the subject.

Recommended reading

1. Burrough P.A. & McDonnell R.A., 1998. **Principles of Geographical Information Systems**, Oxford University Press, 1998

2. Dessena M.A., Melis M.T., 2006. **Telerilevamento applicato**, Mako Edizioni.

3. Gomarasca M.A., 2004, **Elementi di Geomatica**, Edizioni AIT

4.Gomarasca M.A, 2009, **Basics of Geomatics**, Springer.

5.Heywood H., Cornelius S., Carver S., 1997. **An Introduction to Geographical Information Systems**, Longman, New York.

Tutorial session

Tuesday from 3 pm to 5 pm.

HERBACEOUS CROPPING SYSTEMS

RODOLFO SANTILOCCHI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge of agronomy.

Course contents

The teaching method includes both lectures (4 CFU) and practicals (2 CFU), performed as room exercises and field visits.

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge on the issues related to the planning of cropping systems. Emphasis will be put on the practices to be adopted for the main crops, in order to understand the need to make correct choices to strike the best economic aspects to the environmental and rural land protection.

Applying knowledge and understanding. The course has as main objectives the acquisition of the ability to apply the knowledge to the crops, with the necessary flexibility resulting from the unpredictability of the site-specific conditions.

Cross-expertise: (i) making judgements: ability to identify the information needed to manage the main agronomic issues of each herbaceous crop; (ii) communications: ability to clearly and exhaustively communicate notions, ideas, problems and technical solutions to interlocutors, either professional or not, representative of the various and specific competencies involved in the management of the cropping systems (farmers, engineer, architect, biologist, administrator).

Program

1. Presentation of the course. Importance of herbaceous cropping systems in the Italian and world contexts. Most important issues affecting the crops choice (1 ECTS).

2. Cereals: durum wheat, barley, oat, rye, triticale, rice, sorghum, minor species (2 ECTS).

3. Legumes: faba-bean, pea, chickpea, lentil, bean, soybean, minor species (1 ECTS).

4. Industrial crops: sacharated (sugar beet), oily (sunflower, colza, minor species), aromatic (tobacco), textile (hemp) (1 ECTS).

5. Forage crops: pastures, meadows, permanent and temporary grasslands (1 ECTS).

For each crop, the following characteristics will be analysed: importance in Italy and in the world, origin, botanical aspects, biology, ecological needs (climate and soil), aims of the genetic improvement, cropping techniques, harvest, and utilization.

Development of the course and examination

Learning evaluation methods

Final assessment will focus on an oral interview.

Learning evaluation criteria

In the oral classwork, the student will have to demonstrate the knowledge in each of the areas covered in the program.

Learning measurement criteria

The final mark is attributed in thirtieths.

Final mark allocation criteria

The oral examination consists of four main questions that will be quantified in the range 0 – 7.5. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

Bonciarelli F., Bonciarelli U., 2001. Coltivazioni erbacee. Edagricole scolastico.

Baldoni R., Giardini L., 2000-2002. Coltivazioni erbacee, I, II e II volume. Pàtron editore.

Tutorial session

Monday to Friday, from 11 am to 1 pm.

HORTICOLTURE

STEFANO CANALI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Students attending the course should have developed scientific and technical skills in agronomy and arable crop production.

Course contents

The course is based on lessons (ppt lectures) in which the teacher will provide basic information on the topics of the course and will stimulate discussions among the students (4 ECTS). Field visits to experimental stations and vegetable farms located in the vacated territories for vegetable productions of the Marche Region will be part of the training activities (2 ECTS).

Objectives of the course

The course is aimed to develop the specific skills needed for vegetable cropping system management according to the sustainable agriculture principles and to provide an introduction to the vegetable market analysis and opportunities evaluation.

The main aim of this course is to improve the ability of the students in developing a systemic approach to the factors involved in vegetable crop management and adopting coherent and appropriate technical. Additionally, 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 vegetable crops management.

Program

The course is composed of two main parts:

1. basic principles for vegetable crop production (3 ECTS);
2. monographic chapters, regarding the most widespread and economically relevant crops in Italy and in the Marche Region (3 ECTS).

In the frame of the first part the following information are provided:

- relevance of the vegetable sector in the Italian agriculture in term of growing areas and values;
- main characteristic of the vegetable market at National, European and global level; market strategies;
- quality criteria for vegetable productions;
- systems design for vegetable production; open field and greenhouse cultivation techniques;
- strategies for sustainable fertilisation, weed management, pest and disease control;
- organic vegetable production.

In the monographic section, the different crop/species will be considered in terms of their relevance in the Italian and in the local scenario, botanical characteristics and ecological needs, cultivation techniques, breeding, quality parameters, harvest technology, postharvest management and processing.

Development of the course and examination

Learning evaluation methods

Oral discussion on the topics presented during the course.

Learning evaluation criteria

During the oral exam, the students should be able to demonstrate their knowledge of the topics presented during the course, use appropriate technical terminology and apply the learnt information to solve practical problems about the vegetable cropping systems management in an integrate and coherent way.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

- Tesi R. - Orticoltura Mediterranea Sostenibile - Patron Editore, Bologna, 2010
- Tesi R. - Colture protette - ortoflorovivaismo. Edagricole, Bologna, 1994.
- Bianco V.V. e Pimpini F. - Orticoltura. Pàtron Editore, Bologna, 1990.
- Slides, technical and scientific articles on specific topic relevant to the course and other source materials will be provided by the teacher.

Other information

Wednesday 4.30 pm - 6.30 pm

HORTICULTURAL LAB (Module 2 C.I.)

MARTINA PERUGINI

Seat Agraria
A.A. A.A. 2015-2016
Credits 3
Hours 27
Period 2^ semestre

Prerequisites

Basic knowledge of agronomy, horticulture and field crops.

Course contents

The didactic method is based on ppt lectures (3 ECTS) (provided in copies to the students), technical experiences and visit excursions at facilities that make horticultural activities with social purposes for children, people with disabilities, or elderly. The technical visits will be organized in order to put into practice what the students have learned in class (1 ECTS).

Objectives of the course

Knowledge. The course aims to introduce students to the problems that they face in designing vegetable gardens for social purposes, counseling or health, education etc.; to know the state of the art of therapeutic gardens in international research and know the case studies of the major vegetable crops used in the production of gardens with different purposes.

Applying knowledge and understanding. The main aim of this course is to provide a fully development ability of the students on the design of a vegetable garden with a social purpose.

Cross-expertise. The student will understand the importance of a design that will support an interdisciplinary work of the staff: medical, nursing, administrative, psychologists, sociologists, and educators. Besides the theoretical study and practical activities will highlight the value of a participatory design that actively involves all stakeholders (employees, partners, customers, citizens and end users) in the design process to ensure that the product designed meets their needs and is usable.

Program

1. Course presentation. Classification of vegetable garden: urban, educational, social, counseling or healing gardens etc. The benefits of horticultural therapy and therapeutic gardens in international research. Knowing the disability to design gardens therapeutic purposes: Italian legislation (0.5 ECTS).
2. The importance of planning and use participative and integrated approaches in a team of professionals (doctors, psychologists, educators, teachers, etc.). Specificity of the therapeutic horticultural rehabilitation. The group and the horticultural approach. Alternative therapies and / or complementary to horticulture. Case study of the major vegetable crops used in the production of gardens with social purposes (1 ECTS).
3. Design phase: the garden as a place for recreation and fun combinations. Choice of the most suitable crops. Choice of the method of cultivation (synergistic, biodynamic, organic, conventional and integrated). Walkways. Plots. Other areas of service. Exercise: designing a garden with a social purpose. Practical tests of embodiment of a vegetable garden (1.5 ECTS).

Development of the course and examination

Learning evaluation methods

Final assessment will be unique for the entire integrated course and it will consist on an optional writing test and/or oral discussion on three of the subjects listed in the teaching program.

Learning evaluation criteria

To pass the exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The written test (optional) consists of 20 open-ended questions about the topics, for each one questions will be evaluated with score maximum of 10 point. The final result of the written test will be expressed out of thirty.

The oral examination consists of three questions concerning the subjects listed in the teaching

program, each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

If the student wants to perform both tests (written and oral), the final grade will result from the average of the two results expressed in thirtieths.

Recommended reading

1. A.A.V.V., 2011. “Manuale per l’approccio orticolturale nella ri/abilitazione della Disabilità Intellettiva” a cura di Alessandro Castellani. Legnano (VR).

2. Tesi R. 2010. “Orticoltura mediterranea sostenibile”. Pàtron editore, Bologna.

3. Marcus C. C., Sachs N. A., 2014. “Therapeutic Landscapes. An Evidence-Based Approach to Designing Healing Gardens and Restorative Outdoor Spaces”. JohnWiley & Sons, Inc., Hoboken, New Jersey.

4. Adil J.R., 1994. “Accessible Gardening for People with Physical Disabilities. A Guide to Methods, Tools, and Plants”. Idyll Arbor. Woodbine House, 6510 Bells Mill Road, Bethesda, MD 20817. 800/843-7323.

5. Hewson M.L., 1994. “Horticulture As Therapy. A Practical Guide to Using Horticulture as a Therapeutic Tool”. Greenmor Printing Company Limited, Guelph, ON, Canada.

6. Moore B., 1989. “Growing with gardening. A twelve-Month Guide for Therapy, Recreation, and Education”. The University of North Carolina Press.

Tutorial session

Monday from 12.30 to 14.30 by appointment.

HYIGIENE

FRANCESCA CLEMENTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge concerning the biology of microorganisms, the food microbiology and the food hygiene are propaedeutic to the comprehension of the topics treated in the present course.

Course contents

The course consists of: a) theoretical lectures (4 ECTS = 36 hours), b) other theoretical-practical activities carried out individually or in groups and at least a guided visit (2 ECTS = 18 hours). An e-learning course (on the Moodle platform) is available in parallel with the lectures and the practical activities carried out in presence. The e-learning course provides: a) the educational material organised in learning units; b) self-evaluation tests; c) guided visits information and reservations; d) interactive forum and other tools.

Objectives of the course

Knowledge and understanding:

(a) proper theoretical knowledge related to the issues of food safety, with respect to national and international legislation; (b) adequate knowledge of the principles of hygiene in food industries.

Applying knowledge and understanding:

(a) ability to properly apply the knowledge about the topics included in the program for understanding and managing the aspects related to food quality and safety and to consumer safety and health; (b) capacity to perform the risk analysis and to design and implement a H.A.C.C.P. system in food industry and in mass catering.

Cross-expertise:

(a) independent judgment: ability to integrate the specific knowledge of the Hygiene with those already acquired in other disciplines and to understand the value of this knowledge in the

perspective of the entire curriculum; (b) communication skills: ability to transfer in a clear and comprehensive way the information obtained using an appropriate scientific vocabulary and to communicate the results of the study and the work carried out.

Program

-Principles and aims of health promotion and disease prevention -Epidemiology: definition and aims -Applications of epidemiology (Enter-net). (0.5 ECTS)

-Legislation regarding hygiene in the food industry: from Reg. CE 178 to Hygiene Package 2004 – The supervision of official authorities in the field of the food industry hygiene; microbiological criteria for food safety and hygiene of processes. (2.5 ECTS)

-Risk assessment: risk factors (chemical, biological and physical agents); mode of expression of the risk; the quantitative risk assessment. -Hygiene and self-control procedures: the HACCP system in food processing and catering (with particular emphasis to mass catering). -Accreditation of the laboratories. (2.5 ECTS)

-Drinking water (hygiene and legislation). (0.5 ECTS)

Development of the course and examination

Learning evaluation methods

During the course, not-mandatory self-evaluation tests (e-learning mode) are provided.

Final exam is an oral exam during which the student will be required to answer to three main questions on topics included in the program.

Learning evaluation criteria

During the oral exam the student should demonstrate proper knowledge of the topics treated and listed in the program and capacity to make links and to discuss these topics, always using a proper scientific-technical language.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 with honors.

Final mark allocation criteria

The capacity to discuss about the three questions will be evaluated by attributing to each answer a mark in the range 0–10 (thirtieths). The degree of 30 “cum laude” is attributed when the student demonstrates complete, deep mastery of the subject and the fluent use of a proper technical-scientific lexicon.

Recommended reading

-Hygiene in food processing: Principles and practice, Edited by H. L. M. Lelieveld, Formerly Unilever R&D, M A Mostert, Unilever R&D, The Netherlands, B White and J Holah, Campden BRI, UK 2003; ISBN 1 855734664

-Other educational material is available on the e-learning web platform.

INTEGRATED PEST MANAGEMENT OF STORED PRODUCTS

SARA RUSCHIONI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

The following topics are propaedeutic to the teaching: basic knowledge of general biology and chemistry.

Course contents

The course consists of a balance of theoretical lectures (4 ECTS, 36 hours) and other activities, such as classroom practicals, carried out individually or in small groups, visits to local and national factories (2ECTS, 18 hours, in all).

Objectives of the course

Knowledge and understanding:

the course enables students to acquire the integrative knowledges about the integrated pest management in stored products, prevention and monitoring of pests, entomological analysis on food, pest control methods.

Applying knowledge and understanding:

the main objective of the course is the development of the student's ability to recognize the main stored products infestation and to develop integrated pest management strategies.

Cross-expertise:

(a) making judgements: ability in the identification of the information to improve the efficiency of the processes and the quality of the final products; (b) communications: communication skills, being able to 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 agro-food supply chain (engineers, biologists, chemists, administrators).

Program

1. Spread of store product pests. Arthropods. Insects: morphology (head, thorax, abdomen) and anatomy (nervous, digestive, circulatory, respiratory, excretory, secretory and reproductive systems; embryonic and post-embryonic development). Mites: morphology, anatomy and post-embryonic development. Rodents, Muridae: morphology and development. (1.5 ECTS)

2. Systematic of the main storage products pests (Insects, Mites, Muridae). (1.5 ECTS)

3. Biocenosis in production departments and in stored products. Pest related disease and pathogens (non-allergic disorders, allergic disorders, ingestion of arthropods or their parts, toxins ingestion, vector-borne diseases). Integrated pest management: prevention, monitoring, defense. Pest control: cockroaches, moths, diptera, beetles, wasps, mites, murids. (2 ECTS)

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the teaching program.

Learning evaluation criteria.

The student will have to demonstrate: (a) sound knowledge of the morphological and anatomical pests structures; (b) sound knowledge of the main stored products pests, their damages and pests identification; (c) sound knowledge of prevention, monitoring and control strategies of stored products pests.

Learning measurement criteria

The final mark is attributed in thirtieths. The exam will be considered passed with a final mark ranging from 18 to 30 with honors.

Final mark allocation criteria

The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10.

In order to pass the examination, the student will have to demonstrate: (a) overall understanding of the subjects; (b) appropriate use of technical terminology. In order to obtain the best evaluation, the student will have to demonstrate: (a) in-depth knowledge and understanding of the subjects; (b) Appropriate use of the technical lexicon; (c) ability to solve simple problems concerning modifications of process parameters or single unit operations.

Recommended reading

- Süssi L., Locatelli D.P. *I parassiti delle derrate: riconoscimento e gestione delle infestazioni nelle industrie alimentari.* Calderini Edagricole, 2002.

- Trematerra P., Gentile P., *Gli animali infestanti in molini e pastifici e loro gestione*. Chirotti Editori, 2008.

- Pagani M., Savoldelli S., Schiaparelli A. *Manuale pratico per il monitoraggio e riconoscimento degli insetti infestanti le industrie alimentari. Diptera, Coleoptera, Hymenoptera : Cenni sugli acari delle derrate.* Sinergitech, 2010.

LABORATORY OF MICROBIOLOGY

BANDO BANDO

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Biology of Microorganisms or Agriculture microbiology

Course contents

The course deals with the theoretical and practical aspects of the microbiological techniques

Objectives of the course

The students will learn the procedures applied in the microbiology lab

Program

~~-Definitions concerning the Microbiology Lab
-Microscopy
-Sterilisation
- Preparation of substrates
-Isolation of microorganisms
- The measurement of microbial growth
-Preservation of microbial cultures
-Study of microbial physiology and metabolism
Practical examples of the above cited practices applied to environmental and food microorganisms

Development of the course and examination

Oral exam with exercises

Recommended reading

LABORATORY OF MICROBIOLOGY 2

VESNA MILANOVIC

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

The basic knowledge of chemistry, biology and biochemistry.

Course contents

The course consists in ppt lectures provided in copies to the students (4 ECTS), laboratory experiments (group and individual) and educational visits (2 ECTS).

Objectives of the course

Knowledge

Appropriate knowledge and understanding of the molecular methods used by research institutes and companies for the identification, typing and monitoring of microorganisms of food and environmental interest.

Applying knowledge and undersytanding.

The main educational objective of the course is the development of the student's a) ability to understand the utilization and potential applications of the techniques used for the molecular identification; b) expertise with the instruments commonly used in microbiology research laboratories; c) ability to manipulate biological preparations in a safe and sterile conditions.

Cross-expertise

a) making judgments: identifying the information which are necessary for the application of molecular methods in microbiological laboratory as the evaluation of experimental results obtained

in the laboratory through the use of a suitable technical and scientific language b) communications: capability of clearly and exhaustively communicate information, ideas, problems and technical solutions to interlocutors, either professional or not, representative of the various and specific skills involved in the agro-food supply chains and in the improvement and conservation of forest resources and the environment.

Program

1. Presentation of the course. Prokaryotic and eukaryotic cell. Laboratory of microbiology: sterilization methods, culture media, isolation of microorganisms, evaluation of microbial growth (1 ECTS).

2. Nucleic acids (structure, replication, translation). Extraction and manipulation of nucleic acids (DNA and RNA). Spectrophotometric determination of the yield and purity of DNA and RNA extracted from pure cultures and from the food and environmental matrices. In vitro amplification: PCR (Polymerase Chain Reaction) and quantitative PCR (RT-PCR). Design of the PCR primers by the specific software (2.5 ECTS).

3. Methods for microbial identification: PCR species-specific, ARDRA (Amplified Ribosomal DNA Restriction Analysis), RFLP (Restriction Fragment Length Polymorphism). Microbial typing by RAPD (Randomly Amplified Polymorphic DNA). Analysis of mixed microbial populations by DGGE (Denaturing Gradient Gel Electrophoresis). Sequencing (2.5 ECTS).

Development of the course and examination

Learning evaluation methods

Learning evaluation will be assessed through a final written exam based on three open-ended questions.

Applying knowledge and understanding

During the written exam, the student will have to demonstrate the knowledge of the entire program of the course.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18-30 with honors.

Final mark allocation criteria

The written exam will consist of three questions, each of which will be evaluated using a score ranging from 0 to 10 points. The written test is passed if it is achieved a minimum grade of 18/30. The honors will be given to students who, having achieved the highest rating, have demonstrated a thorough understanding of the content.

Recommended reading

- A. Vaughan, P. Buzzini, F. Clementi “Laboratorio didattico di microbiologia” Casa Editrice Ambrosiana.

- M.T. Madigan, J.M. Martinko, D.A. Stahl, D.P. Clark “Brock Biologia dei microrganismi. 1. Microbiologia generale” Pearson.

- B.R. Glick, J. J. Pasternak “Biotecnologia molecolare, principi e applicazioni del DNA ricombinante” Zanichelli Editore.

- M.G. Marin “Diagnostica di laboratorio, tecniche di amplificazione genica dal laboratorio alla pratica clinica” Sorbona.

- A. Scialpi, A. Mengoni “La PCR e le sue varianti” Firenze University Press.

Tutorial session

Tuesday from 1.00 pm to 3.00 pm.

LAND AGRONOMY

MARCO TODERI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Knowledge on Agronomy and normal distribution and Mathematics

Course contents

The course consists of theoretical lectures (4 ECTS) and computer exercises (2 ECTS). The didactic method is based on ppt slides provided in copies to the students.

Objectives of the course

Knowledge. With this course the students will acquire knowledge and expertise related to control the factors that can affect agri-environment at landscape scale.

Applying knowledge and understanding. The student will acquire the following skills: capacity to i) identify the most appropriate indicators, biophysical monitoring and mathematical models for spatial analysis; ii) design and facilitate a landscape analysis, also with the involvement of stakeholders, for the definition of solutions; iii) structuring an experimental design and analyze data.

Cross-expertise. Ability to communicate with other professionals (engineers, botanists, biologists, etc.), policy makers and local stakeholders for land management.

Program

Definition of Land Agronomy. Definition of non-point source pollution. Definition of Resource dilemma. Indicators for landscape analysis. Definition of an indicator. Nutrient budget, USLE, rotation, land cover indicators (1 ECTS).

Mathematical models for landscape analysis. Classification of mathematical models: Deterministic vs. probabilistic (stochastic); Discrete vs. continuous; Explicit vs. implicit (1 ECTS).

Stakeholders involvement for land analysis. Definition of stakeholder. Stakeholder analysis. Participatory approach. Mathematical models and indicators as dialogical tools. Management vs. co-management, decision making vs. problem solving. Command and control approach. Capacity

building. Adaptive building (1 ECTS).

Statistical data analysis. Analysis of variance (ANOVA). Experimental design: Completely randomized design Randomized block design split-plot, Latin square. Factorial design. LSD (1 ECTS).

Computer exercises (2 ECTS).

Development of the course and examination

Learning evaluation methods

A written classwork for statistical analysis and an oral discussion for landscape analysis.

Learning evaluation criteria

The student will have to demonstrate to have acquired: i) knowledge of experimental designs and statistical data analysis; ii) knowledge of the spatial analysis tools. To pass the oral exam, the student have to demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths by summing to the evaluation of the written classwork the evaluation of the oral discussion.

Final mark allocation criteria

The oral discussion will consist of one question regarding the landscape analysis, evaluated with a score ranging from 0 to 15 points. The written classwork will be divided into two questions related LSD and ANOVA with a score ranging from 0 to 7.5 points each. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

Landi R., 1999. Agronomia e ambiente. Edagricole, Bologna.

Camussi A., Moeller F., Ottaviano E., Sari Gorla M., 1995 Metodi statistici per la sperimentazione biologica. II Edizione, Zanichelli

Pellizzoni L., Osti G., 2008. Sociologia dell’ambiente. Il Mulino Manuali.

Tutorial session

Tuesday and Wednesday from 11 am to 1 pm

LANDSCAPE MANAGEMENT

ANDREA GALLI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basics of Geomatics, Agronomy, Ecology, Soil Sciences, Rural Policies and Programs.

Course contents

The teaching method is based on lectures, supported by Power Point slides and seminars (4 ECTS). Besides, a set of interactive exercises, involving all students as single or in small working groups, are carried out. Students are led in structured activities and discussions for thinking at an integrated management project of the landscape chosen as "case study", where they were brought around during previous guided tours (2 ECTS). The course is supported by a set of e-learning tools trough the Moodle platform. Within this platform: a) teaching materials composed by different learning units; b) materials for the interactive exercises; c) self-assessment tests and right answers; d) suggestions of readings.

Objectives of the course

Knowledge and understanding. The course enables students to acquire: a landscape vision based on international scientific framework and principles claimed in the European Landscape Convention, methodologies for landscape design inspired at holistic approach and active participation of stakeholders, qualitative and quantitative methods for the chain analysis-diagnosis-prognosis with the aim to understand criticisms and then design integrated landscape projects, also taking in account Italian norms and plans.

Applying knowledge and understanding. The main aim of this course is to provide the students with a solid skill to design and realize integrated projects of landscape management, from the methodological approach to technical solutions adopted, integrating their curricular knowledge, in particular of Geomatics, with specific knowledge acquired in this course. Collection and treatment of data/information available from cartography, remote sensing techniques, bureau of census, for analyzing the landscape context and do the landscape characterization; to evaluate the main critical conditions of the landscape using diagnostic methods; to define the objectives of the project in order to design an integrated project aiming to solve the critical points, also taking in account the values and the preferences that stakeholders, directly involved, have underlined.

Cross-expertise. a) making judgements: identify methods, materials and technical solutions in line with topics to face up to through the project, giving special attention at the different working scales; b) communications abilities: clearly and exhaustively communicate, both in writing and verbal form and by using images also, the methodology and technical solutions adopted in the project at interlocutors, either professional or not or other competences, which are involved in the landscape management (engineers, architects, biologists, urban planners, administrators, decision makers, citizens); c) learning ability: able to perform the analysis-diagnosis-prognosis chain in real cases of study by using an autonomous and creative way of work, by interacting with local stakeholders also.

Program

1. Course introduction. Description of some projects selected from students' works of the previous course. Introduction at the landscape to be studied during the course. Indications about cartographies and other data available for that area (0.5 ECTS).

2. *Landscape*: Evolution of the landscape concept in Italy and Europe. The European Landscape Convention principles, objectives and practical implications. The landscape as scientific object in the Landscape Ecology discipline: complex system, landscape components, spatial arrangements, functions, reference models, dynamics of transformations, measuring the landscape, metrics, qualitative indicators and quantitative indicators. New Rurality: definitions, urban-rural landscape systems, dynamics of change, analysis and measures of critical aspects. Seminar for deepening (1.5 ECTS).

3. *Landscape management*: Italian legislation, plans and programs (Code of Cultural and Landscape Heritage, regional landscape plans (PPR), plans at regional or provincial level (PIT-PTC-PGT), municipal plans; CAP (Pillar I and II). Initiatives at European level. Reference methodologies: Landscape Character Assessment (LCA); Italian experiences: approaches, methods, operational techniques, examples; participative methodologies. Seminar for deepening (2 ECTS).

4. *Landscape as a project*: guided tour around the study area, interacting with local stakeholders; working groups constitution; collection and treatment of data and information; interactive analysis with the working groups; interactive diagnosis with the working groups; interactive prognosis with the working groups; series of reviews to verify the groups' works in progress (2 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion, which includes the presentation of a project done by the student. During the course, are also available self-evaluation tests (e-learning mode), in order to provide the students with useful information about their skill level.

Learning evaluation criteria

In the oral discussion, the student will have to demonstrate: a) knowledge of approaches and

methods to study and to characterize the landscape b) knowledge of laws, plans, policies and programs affecting the management of landscape at national and European level; c) knowledge of reference methodologies and techniques used in the landscape management; d) for what concerns the presentation of his project: a clearly defining of objectives and methodologies used in the work, use of appropriate materials and adequate elaboration techniques, an exhaustive and clear communication of results. To pass the exam, the student must demonstrate an overall understanding of the contents, using an appropriate technical terminology; to be able to design, perform and manage correctly, from the methodological and technical point of view, the analysis-diagnosis-prognosis of a landscape.

Learning measurement criteria

The final mark has attributed in thirtieths.

Final mark allocation criteria

The oral examination consists in two steps: a) discussion of the methodological and technical solutions adopted in all phases of the project (analysis-diagnosis-prognosis) and about the results shown in the presentation; b) some questions concerning the topics listed in the teaching program. Each of the two parts has evaluated in a range 0-30, the final mark comes from the average value. The degree of 30 “cum laude” is attributed when the student demonstrates a complete mastery of the subject.

Recommended reading

1. Colombo L., 1998. **Il metodo in urbanistica**. Masson S.p.A., Milano.

2. Fabbri P., 1997. **Natura e Cultura del Paesaggio Agrario**. Città Studi edizioni, Milano.

3. Farina A., 2010. **Ecology, Cognition and Landscape**. Springer, Landscape Series

4. Ingegnoli V. 2015.**Landscape Bionomics, Biological-Integrated Landscape Ecology**, Springer

Tutorial session

Wednesday from 1 pm to 3 pm.

LINGUA STRANIERA - LIV. INTERMEDIO INGLESE

Language Assistant C.S.A.L.

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Program

~~Dipartimento di Scienze Agrarie, Alimentari ed Ambientali
UNIVPM a.a.2014-2015
Programma per il I° Anno Livello Intermedio Inglese
Dott.ssa Elena Delfina Agnelli e Dott. Michael Lacey-Freeman (CSAL)
Prof. Cristiano Casucci (D3A)
Required materials in class:
English File Digital Third Edition – Pre-intermediate
by Christina Latham-Koening , Clive Oxenden, Paul Seligson, Oxford University Press
Study pack with student's book, workbook, workbook key and CD ROMs (c. Euro 35)
A personal notebook
Program
Chapters 1-12
Workbook (with answer key) including all exercises related to the above.
Recommended materials:
(ALL of the following materials are available for students studying in the Mediateca of the CSAL)
A grammar text: Essential Grammar in Use by Raymond Murphy ed. Italiana con soluzioni, Cambridge Università Press.
A bilingual dictionary (e.g. Zanichelli or Hoepli) and a monolingual dictionary (e.g. the Macmillan English Dictionary, Collins COBUILD Dictionary, Longman Active Study Dictionary, Oxford Advanced Learner's Dictionary or equivalent with CD-ROM)
Test di Livello Intermedio Lingua Inglese Agraria
A description of the test is available on our CSAL website
http://www.csal.univpm.it/en-test
and a demo is available at the "Aula Informatica" of the "Dipartimento di Scienze Agrarie, Alimentari ed Ambientali" and the "Dipartimento di Scienze della Vita e dell'Ambiente" .

LIVESTOCK FARMING SYSTEM AND ANIMAL PRODUCTIONS

BANDO BANDO

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Program

BB

MACHINERY AND PLANTS FOR INDUSTRY AND ENERGY 1

DANIELE DUCA

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basics on mathematics, physics and chemistry are propaedeutic to this course

Course contents

The course is structured in lectures (4 CFU, 36 ore) supported by blackboard, projector, lessons on laptop and in exercises applications in lecture room and didactic trips (2 CFU, 18 ore). The didactic material is available on the web platform.

Objectives of the course

Knowledge and understanding

a) understanding of the physical, chemical and technological elements related to the main processes used in the food industry;

b) knowledge of the main plant and machinery used in the food industry and its operation;

c) understanding of the main processes used in the food industry: structure, dimensional, construction and design aspects, related mass and energy flows.

Applying knowledge and understanding

a) the ability for horizontal integration of the basic information acquired (technological, mathematical, physical, chemical) and vertical integration of information in the agro-food industry processes;

b) the ability to correctly interpret the main dimensional, construction and design aspects of the food industry and evaluate the mass and energy balance of processes by identifying critical points and improvement strategies.

Cross-expertise

a) autonomy of judgment: the ability to use information on the technological process to implement optimization strategies; the ability to compare different technologies, conventional and innovative, to evaluate the technical suitability and identify interventions aimed at improving the efficiency of food production;

b) communication skills: the ability to transfer, in a clear and comprehensive manner, information, ideas, problems and related technical solutions to both specialists and not-specialist, representative of the different skills involved in agro-food chains.

Program

1. Energy and systems for the production of energy in the food industry: basics of energy and power, fuels and combustion. Heat and steam generators and related mass and energy balance, p-H diagram, use of energy sources, heat exchange. 1 ECTS

2. Production and use of electricity and safety aspects. 0.5 ECTS

3. Materials used in plants and their main features, the problem of contact with food. 0.5 ECTS

4. Main auxiliary machinery: pumps, compressors and fans, relevant background information: power, efficiency, characteristic curve. 0.5 ECTS

5. Evaporation: calculation of the amount of water to be evaporated, calculation of mass and energy balances of an evaporator and methods to increase the process efficiency. 1 ECTS

6. Refrigeration and freezing: refrigeration cycle, refrigerators and refrigerants, refrigeration cells, their size and related mass and energy balance. 0.5 ECTS

7. Drying equipment: calculation of the amount of water to be removed, the psychrometric diagram, air-drying, the main types of dryers and relative mass and energy balance. 1 ECTS

8. Distillation plants: basics of distillation, the main types of systems, mass and energy balance. 1 CFU

Development of the course and examination

Learning evaluation methods

Examination is based on an oral examination regarding three subjects of the syllabus. Blank sheets and scheme projected during the course are made available to the student for supporting the examination.

Learning evaluation criteria

The student during the examination shall show: a) knowledge of definitions and technical language associated to course contents; b) knowledge and understanding of machinery and plant used in agro-food industry; c) the ability to carry out considerations on the various aspects dealt with in the course, in particular mass and energy balance of processes. The ability to support arguments in an orderly and understandable manner will also be appreciated. This could be done with diagrams, charts, simple numerical calculations on sheets and schemes made available to the candidate.

Learning measurement criteria

The vote is expressed as thirtieths.

Final mark allocation criteria

The oral exam will be based on three main questions, each evaluated using a score ranging from 0 to 10 points.

The oral test is deemed passed if the student demonstrates that he has an appropriate knowledge of the contents, presented sufficiently clearly and correctly using the appropriate technical terminology. The highest rating is achieved by demonstrating a thorough understanding of the contents through a presentation that shows the complete mastery of the technical language and the ability to apply the knowledge to solve simple practical problems (simple numerical evaluations, mass and energy balances, plant dimensioning).

Recommended reading

D. Friso - Ingegneria dell'industria alimentare. Operazioni unitarie del food engineering. Macchine e impianti. Edizioni CLEUP, Padova, 2013

R.L. Earle, M.D. Earle, Unit operations in food processing, (http://www.nzifst.org.nz/unitoperations)

R.P. Singh, D.R. Heldman, Introduction to Food Engineering, Edition, Academic Press, London

The didactic material is available on the web platform.

MANAGEMENT AND CONSERVATION OF BIODIVERSITY AND LANDSCAPE

EDOARDO BIONDI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

General Botany, Systematic Botany, principles of Ecology, GIS basic concepts and Environmental Economy.

Course contents

The didactic method is based on ppt lectures (4 ECTS), classroom practical (involving all students individually) and visits to natural environments and institutions dedicated to the environmental conservation and management (2 ECTS).

Objectives of the course

Knowledge. The course enables students to acquire the theoretical and practical knowledge on the principles related to the functions and the management of natural environments that can be also seen as an economic and social resource from sustainable development viewpoint.

Applying knowledge and understanding. The main aim of the course is to provide an integration ability of the agronomic knowledge, already acquired by students, in the management and conservation application in the context of European standards that also affect the agricultural management of the funds. This is a new vision of agronomy both in its narrow sense and in a broader vision of the value and meaning of recovering in a modern way also extensive agriculture for which abandonment resulted in very serious economic and social liabilities.

Agronomists will be able to relate especially to the Habitats Directive 92/43/EEC through complete understanding of these complex regulations in order to inform farmers and farms on how to operate in this convenient area.

Cross-expertise. The cross connections that the program and the educational visits can give, will allow students to orient their choices even on that fields not yet connected to a professional role for the agronomist. Environmental management is undoubtedly a transversal activity in which the agronomists will be working with different professionals in a fully integrated environment to achieve

the desired aims. Examples include the recovery of vegetation after the construction of infrastructure, the recovery of biotopes and habitats, preservation of secondary grasslands, the use of indigenous germplasm activities, the application in the management of funds of the PSR for a respectful agriculture of the environmental good.

Program

1. Introduction: meaning of biodiversity, different levels of biological and ecological organization: genetic level, species, ecosystemic level and landscape. Values of anthropogenic landscapes: the man and the environment (0.5 ECTS).

2. Value of Biodiversity: with specific reference to the value of biodiversity the main methodologies are processed that lead to such recovery through *in situ* and *ex situ* actions. A special chapter refers to monitoring of the species and habitats in order to assess whether the management of habitat types were effective in the conservation (0.5 ECTS).

3. Basic knowledge of Geobotany and Landscape Ecology: necessary to understand what is the field of action of Habitats Directive and, in particular, to evaluate the conservation status of habitats, and the correct conservation measures to implement (1 ECTS).

4. Habitats Directive: Directive 92/43/EEC and its implementations. The most part of the course will focus on these concepts: the Habitats Directive allows the identification of biodiversity at different levels and at the same time puts them into practice in safeguard measures. Among these, the Impact Assessment is one of the practices mentioned explicitly in the Directive, which are periodically performed by professionals related to the Agronomist and Forest professional Bar. Another important aspect to assess habitat quality over time is the monitoring of them that it is run periodically in accordance with Community rules. (2 ECTS).

5. European Landscape Convention: a special chapter regards organization and management of the landscape through the "European Landscape Convention", which presents remarkable points of contact with European legislation on biodiversity. Among these will be highlighted issues regarding environmental correlations with the principles of ecological networks that are then explicitly covered in the application stage as well as design planning type (0.5 ECTS).

6. Stages of application: Stages of application in land management are also regularly highlighted in specific projects related to environmental recovery after the passage of fire, recovery and restoration of habitats, with particular emphasis on those mountains, river and coastal (0.5 ECTS).

7. Forest and grassland habitats: A specific study dealt specifically with the recovery of forest and grassland habitats in the light of connections of flora and fauna (1 ECTS).

Development of the course and examination

Learning evaluation methods

Final assessment is carried out through an oral discussion at the end of the course. The teacher is available to perform the oral exam according to the dates indicated by students only if they do not contravene the Department rules.

Learning evaluation criteria

To pass the exam, the student must demonstrate knowledge of all the issues discussed in the course.

Learning measurement criteria

The final mark is attributed in thirtieths.

Final mark allocation criteria

The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

PowerPoint used for lessons.

Publications and books as .pdf files

EU websites on environmental management and the Habitats Directive.

Biondi E., 2012. Cap. XIII: pag. 507 and pag. 533-544; Cap. XIV: pag. 547-567 and pag. 602-617 In: Taffetani F. (Ed.) Herbaria. Il grande libro degli erbari italiani. Nardini Editore, Firenze

Tutorial session

Monday and Tuesday from 3.30 pm to 4.30 pm

MANAGEMENT OF AGRO-PASTORAL SYSTEMS

PARIDE D'OTTAVIO

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge of Agronomy, Plant biology, Crop science.

Course contents

The teaching method includes lectures (4CFU) adopting power point presentations (provided in copies to the students), room practical exercises and teamwork activity (involving all the students) and field visits to agro-pastoral farms and mountain areas (2 CFU). The course will be also available through an e-learning version using the Moodle platform. Within this platform, the course will be divided into: (i) teaching materials composed by different learning units; (ii) additional didactic material (e.g., documents, videos, web links, presentations of seminars, …); (iii) self-assessment tests; (iv) information on practicals, field trips, procedures and materials for the teamwork activity.

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge about the tools for the analysis of agro-pastoral systems and for the planning of forage resources management at farm and landscape scale.

Applying knowledge and understanding. The main aim of this course is to provide the students the skills for a systemic, integrated and participative analysis of complex situations concerning the agronomic issues in agro-pastoral systems in order to identify site-specific management strategies and options adapted to farm and landscape scale.

Cross-expertise. (i) making judgements: ability to identify the information needed to the management of the agro-pastoral resources and systems in mountain areas; (ii) communications: ability to 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 mountain agro-pastoral systems (engineer, architect, biologist, administrator).

Program

1. Elements of system analysis of agro-pastoral systems. Classification of pastoral, agro-pastoral and agro-forestry systems (2 ECTS).

2. Tools for the analysis of agro-pastoral systems. Principles of system and participatory analysis.

Analysis of case studies (2 ECTS).

3. Classification of the crops, with particular regard to cereals, temporary and permanent forage crops. Classification and management of permanent grasslands. Grazing management. Methods for the assessment of the stocking rate. Forage chains (2 ECTS).

Development of the course and examination

Learning evaluation methods

Final evaluation will consist of two tests: teamwork activity and oral discussion. (i) The teamwork (teams of 4 students) will analyse a subject shared with the students and, in generally, to be referred to the following topics: analysis of a agro-pastoral system, drafting of a pastoral management plan, planning of the management of mountain permanent grasslands. The project can be started from the beginning of May and will be reported by a team-power point presentation (by the end of the course) and by a final report (personal drafting) to be presented at the exam. (ii) Oral exam will be based on two main questions concerning the main subjects listed in the teaching program. Oral discussion on three of the subjects listed in the teaching program. During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

The student, throughout the teamwork will have to demonstrate the knowledge of the criteria used for: (i) the application of the tools for the analysis of the agro-pastoral systems; (ii) the planning of the site-specific strategies and management options adapted at different (farm and landscape) scale.

In the oral classwork, the student will have to demonstrate the knowledge of the main criteria used for: (i) the classification and management of pastoral systems; (ii) the classification and management of crops, with particular regard to the permanent grasslands; (iii) the systemic,

integrated and participative analysis of agro-pastoral systems. To pass the oral exam, the student must demonstrate both an overall understanding of the contents using appropriate technical terminology.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The teamwork gives a score from 0 to 10. The oral examination consists of two main questions concerning the subjects listed in the teaching programme; each of ones will be quantified in the range 0 - 10. The score of the teamwork and those obtained in the oral exam are added together to determine the final grade. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

Baldoni R, Giardini L, 2000. Coltivazioni erbacee. Cereali e proteaginose. Pàtron ed., Bologna.

Baldoni R, Giardini L, 2000. Coltivazioni erbacee. Foraggere e tappeti erbosi. Pàtron ed., Bologna.

Pearson CJ, Ison RL. 1997. Agronomy of grassland systems. Cambridge Univ. Press.

Tutorial session

Tuesday from 3 pm to 5 pm.

MARKETING AND EUROPEAN POLICIES

FRANCESCO SOLFANELLI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic skills in mathematics.

Course contents

The course consists of a balance of theoretical lectures (4 ECTS) and other activities, such as classroom experiments and seminars (2 ECTS). The course is also supported by the e-learning Moodle platform. The Moodle platform provide: (i) teaching materials specific for each learning units; (ii) self-assessment tests; (iii) forums for feedback and discussion on selected issues.

Objectives of the course

Knowledge and understanding. The course enables students to acquire adequate knowledge and understanding of the characteristics of the agro–food market (food marketing), as well as of the basic knowledge of theory of firm and market structure, with particular reference to the agricultural and agro-industrial sector. The course also aims to provide students with the theoretical, methodological and applied for the analysis of agro–food sector policies (common market organizations, rural development policy, international trade policies).

Applying knowledge and understanding. Students will learn how to identify strategies for proper management of the agro-food business, and business consulting and services related to them; to develop an integrated business perspective, using marketing tools to understand and manage the enterprise's position on the market; to develop the ability to work in a collaborative and cooperative arrangements in teams, managing conflicts in a constructive and negotiating way.

Cross-expertise. Participation in all learning activities will help student to: (i) making judgements: capability of identify the information needed to understand the economic environment of the agro-food business; (ii) communications: 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 agro-food business.

Program

Part I Microeconomics (1.5 ECTS)

- Demand theory: budget constraint; Demand curves from the Engel curves.
- Supply theory: the production function; cost function; profit and revenue; various market structures (perfect competition, competitive markets, oligopoly, monopoly).

Part II Marketing (3 ECTS)

- Introduction to agricultural marketing.
- The agro-food system and competitor analysis.
- Marketing management theories.
- Demand analysis and consumer behaviour.
- Strategic marketing for the agro-food sector.
- Segmentation and positioning.
- Marketing mix: the 4 p's of marketing (product, price, place, promotion).

Part III Communitarian policies (1.5 ECTS)

- Agro-food policy and regulatory constraints.
- Common Market Organisation and Wine Regulatory Issues.
- EU agricultural product quality policy: Protected Designation of Origin – PDO; Protected Geographical Indication – PGI.

Development of the course and examination

Learning evaluation methods

Students can choose to take a thorough oral examination on all the issues of the course, or whether to proceed with a gradual process of writing related to different parts of the course. In the latter case, the examination comprises of three written test (multiple choice test):

- One is related to the first part of the course: microeconomics;
- The next is related to the second part of the course: marketing;
- The final is related to the third part of the course: communitarian policies.

As for the learning evaluation method of the second part (marketing), students can choose to take the written test (multiple choice test), or whether to produce a written report related to a business case study (marketing plan). In the latter case, the teacher will provide students with a marketing plan template. The template will specify the various sections to be undertaken and the relative minimum and maximum characters.

Optional verification of ongoing self-assessment, in the form of exercises compiled with spreadsheets and questionnaires published in the Moodle platform, will be provided during the course.

Learning evaluation criteria

The examination is aimed at verifying that the student possesses a comprehensive knowledge of the topics of the course, a sufficiently correct exposure capacity with the use of appropriate technical terminology, and the ability to face deductive reasoning to enable he/she to implement appropriate connections within the matter and to have acquired a complete mastery.

Learning measurement criteria

With regard to the oral examination, this will be structured with in depth questions on all topics of the course, and the compilation of practical exercises may be requested. The written part of the examination is structured as follows: there will be about ten questions for each test with four response options for each question, of which there is only one correct option. The correct option generates a positive score (3 points), wrong options generate a negative point (-1), 0 point for questions left blank. There is a time limit of (about 30 minutes). Each test will be evaluated with a score from 0 to 30. As for the report (business case), the teacher will assess the completeness of the information collected, the data processing capabilities and the exposure ability.

Final mark allocation criteria

The oral examination evaluation: the final vote is commensurate with the quality of the students preparation, his/her analytical skills, and command of the language. The oral examination consists of three questions concerning the subjects listed in the teaching programme, each one will be quantified in the range 0 - 10. The final grade is on a scale of 30.

The written examination evaluation: the final vote is based on the weighted average of the scores of the three written tests (credit number of each part is used as a weighting parameter). The score of each written test must be sufficient (minimum 18) to pass.

The report mode evaluation: (only for second part), the vote is based on the quality of the report, considering the data collection and processing and the exposure ability.

It is possible to have an optional and supplementary oral test to edit the written test score (max +/- 3 points from the score of the written test).

Recommended reading

J.P. Peter e J. H. Donnelly jr. - Marketing. McGrawHill, Milano, ultima edizione.

R. Pastore – Il marketing del vino e del territorio: istruzioni per l'uso. Franco Angeli, Milano.

All other educational material is available on the e-learning web platform.

Tutorial sessions: Wednesday 2.30-4.00 pm

MATHEMATICS

LUIGI FERRANTE

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic knowledge of algebra, analytic geometry and trigonometry.

Course contents

The course relies on frontal lectures supplemented with smaller discussion sections and tutorials.

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge about differential and integral calculus and the ability to solve scientific problems using simple mathematical modeling.

Applying knowledge and understanding. The main aim of this course is to provide a fully development ability of the students in using differential and integral calculus to study graphs of functions and to solve simple scientific problems which derive from a variety of application areas, such as biology, economics and physics.

Cross-expertise. (i) ability to identify mathematical tools suitable to solve the problems arising from agricultural research. (ii) ability to learn and interpret the mathematical models used in the scientific studies in agronomy.

Program

Course contents: The theory of real functions of a real variable. Function algebra. Elementary functions (the first- and the second-degree polynomials, the exponential, the logarithm and the goniometric functions). Bounded functions, supremum, infimum, maximum and minimum of a function. Monotone functions. Composite and inverse functions. Limits of real functions of real variable. Calculus of elementary limits. Continuous functions and their fundamental properties.

Continuous functions on intervals. Introduction to derivative: growth rate. Geometric meaning of derivative. Derivative formulas. Successive derivatives. Derivative and monotonicity. Relative maximum and minimum of derivable function. Convex functions. Asymptotes of a planar curve. The de L'Hopital's theorems. The study of the graphs of functions. Applications of the theory of real functions to natural and biological sciences. An outline to the Integration Theory. Definite Integral and its properties. Geometric meaning of Definite Integral. Definition of Indefinite Integral and its properties. Indefinite Integral of elementary functions. Fundamental theorem of the Integral Calculus. Indefinite integral and integration methods: sum decomposition, by parts and substitution. Improper Integrals.

Principles of probability theory. Random Variables, Distribution Functions, and Expectation of a random variable. Normal Distribution.

Development of the course and examination

Learning evaluation methods. The learning evaluation of the students is carried out by a written test.

Learning evaluation criteria. To pass successfully the examination, the student must demonstrate that he/she has fully understood the mathematical concepts presented in the course, is able to use them in solving simple scientific problems, and has ability of synthesis and clarity in written communication.

Learning measurement criteria. Attribution of the final mark up to thirty.

Final mark allocation criteria. The oral examination consists of five questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 6. The degree of 30 "cum laude" is attributed when the student demonstrates complete ability of synthesis and clarity in written communication.

Recommended reading

Lecture notes on elementary probability theory

Heinbockel J.H., 2012. "**Introduction of calculus vol.1**". free ebook.

Villani V., Gentili G., 2012. "**Matematica. Comprendere e interpretare fenomeni delle scienze della vita**". McGraw-Hill Education.

Tutorial session

Only upon appointment by email.

MCROBIOLOGY OF FERMENTED FOODS

ANDREA OSIMANI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

The following topics are propaedeutic to the teaching: biology, chemistry, biochemistry, microbiology, food microbiology and food hygiene.

Course contents

The course consists of a balance of theoretical lectures (4 ECTS, 36 hours) and other activities, such as classroom and laboratory practicals, carried out individually or in small groups (1 ECTS, 9 hours), seminars and visits to local and national food plants and factories (1 ECTS, 9 hours, in all).

All other support material, included international scientific literature articles, will be given along the course.

Objectives of the course

Knowledge and understanding:

(a) adequate knowledge and understanding about biotechnological processes (monitoring, managing and control) that foresees the use of microorganisms in national and international fermented foods for the production of novel fermented foods; (b) knowledge of scientific and technological aspects of the use of microorganisms in fermented foods; (c) knowledge of the biochemical processes that guide fermented foods production.

Applying knowledge and understanding:

(a) developing the capability to use microorganisms in traditional and novel fermented foods; (b) application of specific analytical techniques for the monitoring and control of fermented foods production; (c) capability of evaluate the potential exploitation on microorganisms in novel foods.

Cross-expertise:

(a) making judgements: ability of identify the information be needed to improve the quality of food productions and to suggest proper technological and microbiological practices; (b) communications: 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 agro-food supply chain (engineers, biologists, chemists, nutritionists, administrators); (c) learning expertise: ability to use language and web-based skills for the consultation of scientific database and scientific literature.

Program

General issues

- Autochthonous microorganisms and commercial cultures; Classification of the commercial cultures: starter cultures, adjunctive cultures, and functional/probiotic cultures, Which cultures for which products? (0.5 ECTS)

- Monitoring and control of microorganisms in food processes and products (0.5 ECTS)

Special issues

- Microbiology of fermented beverages of plant origin:

vinegar (0.5 ECTS);

beer (0.5 ECTS);

non conventional beverages (boza) (0.5 ECTS).

- Microbiology of fermented beverages of animal origin: non conventional fermented milks (kefir) (0.5 ECTS).

- Microbiology of non conventional fermented foods:

olives (0.5 ECTS),

cocoa and tempeh (0.5 ECTS).

Practical activities

- Production (development) of non conventional fermented foods at a laboratory scale (0.5 ECTS);

- Monitoring of the microbiota of fermented foods/beverages (0.5 ECTS);

- Guided visits in factories and/or research centre or laboratories operating in the food sector (0.5 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion based on the analysis of scientific papers, published in international journals, which will be provided to the students. The scientific papers will be inherent to the topics studied along the course. The discussion will be carried out on the topics listed in the program, one of which will be chosen by the student.

During the course, there are also going to be available self-evaluation tests.

Learning evaluation criteria

The student will have to demonstrate: (a) sound knowledge on microbial dynamics of fermented foods studied along the course; (b) knowledge of the microbial species involved in fermented foods transformation; (c) sound knowledge of microbial metabolic processes of the studied fermented foods; (d) appropriate usage of the technical lexicon.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 with honors.

Final mark allocation criteria

The oral examination consist of three questions on the topics listed in the teaching program, each of ones will be quantified in the range 0 - 10.

In order to pass the examination, the student will have to demonstrate: (a) overall understanding of the subjects; (b) appropriate usage of technical terminology. In order to obtain the best evaluation, the student will have to demonstrate: (a) in-depth knowledge and understanding of the topics; (b) fluency in the usage of the technical lexicon; (c) ability to solve simple problems about fermented foods production.

Recommended reading

Modern Food Microbiology. James M. Jay, Martin J. Loessner, David A., Golden. Springer, 2011

ISBN 0-387-23180-3

All other educational material is available on the e-learning web platform.

MECHANIS AND FORESTRY MECHANIZATION

GIUSEPPE TOSCANO

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge of physics.

Course contents

The course is carried out through lectures integrated by some technical-economic analysis of a case studies. The lectures are provided, together with some other documents for support the study, by means pdf files downloaded from Moodle platform. For each lesson the most important topics to discuss during the examination are highlighted.

Objectives of the course

Knowledge. The course enables students to acquire basic knowledge of mechanical systems employed in the forestry in order to enhance the products value of the forest-based industry. The student is able to understand the main technical and economic aspects for the management of forest machineries.

Applying knowledge and understanding. Ability to articulate a discussion on issues related to the characteristics of forestry machines, its operation and the selection criteria of the mechanical equipment for the different operating environments.

Cross-expertise. The specificity of the content of this course demands that the student acquire flexibility in learning the basic concepts and the ability to combine the knowledge with what he has learned in other courses, to develop a better overview of forest management. The student develops a critical and analytical ability of the issues and opportunities in the chain forest-wood-energy.

Program

General concepts of mechanics and physics. Engines and tractors (2 ECTS). Machinery for tree harvesting, processing and logging. Systems for wood extraction and transport. Main forestry operations: felling, limbing and transportation (2 ECTS). Forest road planning. Safety in forestry operations. Operating costs. Primary wood processing systems (2 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion.

Learning evaluation criteria

The student will have to demonstrate the knowledge of the concepts proposed in the course, be able to have an overview of the topics and the ability to connect the different aspects dealt with in the course using appropriate terminology.

Learning measurement criteria

The final mark is expressed in thirtieths.

Final mark allocation criteria

Depending on the topics and methods of their development from the students, the oral examination will consist of three questions.

Recommended reading

Recommended readings

Lecture notes and pdf documents provided by Moodle platform.

Tutorial session

Wednesday from 9 am to 11 am.

MECHANIZATION IN VITICULTURE AND ENOLOGY

ESTER FOPPA PEDRETTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic knowledge of general mathematics, physics, viticulture and oenology.

Course contents

The teaching method is based on ppt lectures (4 CFU) and visits to farms and wineries or workshops (2 CFU). The course material will be available during class.

Objectives of the course

Knowledge. The course enables students to acquire adequate basic knowledge of vineyard mechanization and of plant design. The machines used in the vineyard are studied in their construction and operation aspects highlighting the aspects linked to the mechanical work quality in relation to the machine settings. For plants, the construction features are defined in relation to the processes developed in order to understand the possibilities of use and control.

Applying knowledge and understanding. The main aim of this course is to provide the ability to identify for vineyards and wineries the most suitable work sites, making choices based on the construction characteristics of machines and plants. For machines and types of plants, the innovations of interest were reported.

Cross-expertise. a) Autonomy of student to identify the information useful to a proper selection of the farm machinery; b) Communication skills: clear and comprehensive transfer of information, ideas, problems and techniques to stakeholders involved in manufacturing solutions, i.e. farmers and winery managers.

Program

1 Presentation of the course. Design and operating characteristics of the machines used in the vineyard. Machines used for: vineyard planting; pesticide treatments; inter row management; canopy management; harvester; grape transport from the field to the winery (3CFU).

2 Winery plants: receipt of grapes; production of grape must; fermentation and winemaking; filtration, sedimentation and clarification; bottling; machines for fluids and solid transport (3 CFU).

Development of the course and examination

Learning evaluation methods. Oral discussion on three of the subjects listed in the teaching program.

Learning evaluation criteria. During the oral examination, the student will have to demonstrate: a) knowledge of technical and operational characteristics of vineyard machines; b) knowledge of biomass production technology; c) design and construction characteristics knowledge of winery plants. To pass the oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and be able to deal with deductive reasoning that enables him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria. The vote is expressed in thirtieths. The examination will be considered passed with a note from 18 to 30 “cum laude”.

Final mark allocation criteria. The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will count for 10 points. The degree of 30 “cum laude” is attributed when the student demonstrates complete ability of the subject.

Recommended reading

1.Bodria L, Pellizzi G., Piccarolo P., Meccanica agraria, 2012, Edagricole

2.Gardin G., Gaudio A., Antonel G., Simeoni P., 2006, Impiantistica enologica, Edagricole

3.Jacquet P., Capdeville C., 2007, Installazioni vinicole, vol. 1 e 2, EnoOne

Recommended readings during class

Tutorial session

By appointment

MOUNTAIN AGRONOMY

PARIDE D'OTTAVIO

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge of plant biology, chemistry, physics and mathematics.

Course contents

The teaching method includes lectures (4CFU) adopting power point presentations (provided in copies to the students), computer room practical exercises and field visits to farms and mountain areas (2 CFU). The course will be also available through an e-learning version using the Moodle platform. Within this platform, the course will be divided into: (i) teaching materials composed by different learning units; (ii) self-assessment tests; (iii) field trip information and reservations.

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge about the characteristics and the relations between the main factors (climatic, edaphic and biological) of the crop production and of the cropping techniques, with particular regard to the mountain environment. Furthermore, the course provides the basic principle for the classification of the main crops used in mountain areas.

Applying knowledge and understanding. The main aim of this course is to provide a fully development ability of the students to adopt an integrated analysis of the production factors in order to identify strategies and tools for the management of the main crops used in the uplands.

Cross-expertise. (i) making judgements: ability to identify the information needed to manage the crops in mountain areas; (ii) communications: ability to 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 mountain agro-pastoral systems (engineer, architect, biologist, administrator).

Program

1. Course presentation. Classification of the main upland crops with particular regard to cereals, temporary and permanent forage crops (1 ECT).

2. Crop production factors: characteristics, effect on the plants and management strategies. The relation between climate and crop production: solar radiation, temperature, rainfall, wind. Analysis of the main climatic parameters, building and use of climodiagrams. Soil: texture, structure, soil hydrology and other properties (3 ECTS).

3. Agronomic management practices. Soil tillage: aims, functions, tools, classification, new orientations. Soil water management: runoff management, dryland farming, irrigation. Soil fertility management: organic matter, organic and mineral fertilizers, fertilization techniques. Crop rotation and mixtures: aims, functions, classification, new orientations (2 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the teaching program. During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

In the oral classwork, the student will have to demonstrate the knowledge: (i) of the main crop production factors (climatic, edaphic and biological), with particular regard to the mountain environment; (ii) of the main crops management practices; (iii) of the principles used for the agronomic classification of the crops. To pass the oral exam, the student must demonstrate both an overall understanding of the contents using appropriate technical terminology, and the ability to perform an integrated analysis of the different issues.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of three questions concerning the subjects listed in the teaching

programme; each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

F. BONCIARELLI, U. BONCIARELLI, Agronomia. Edagricole, Milano, 2003.

L. GIARDINI, A come agronomia. Pàtron editore, Bologna, 2003.

R. BALDONI, GIARDINI L., 2000. Coltivazioni erbacee. 3 volumes. Pàtron editore, Bologna.

Tutorial session

Tuesday from 3 pm to 5 pm.

NURSERY PRODUCTION AND BIOTECHNOLOGY IN ARBORICULTURE

BRUNO MEZZETTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge of arboriculture, plant genetic, physiology and biotechnology.

Course contents

Introduction to the major aspects of fruit nursery production, including in vivo and in vitro propagation techniques, breeding and biotechnology techniques for the production of new patent varieties.

Development of the course

The teaching method is based on lectures supported by slides in digital format (4 ECTS), supplied in copies to the students, and experiences in laboratories and fields (2 ECTS). The course is also available in e-learning using the Moodle platform. Within this platform are available: a) teaching materials composed by learning units; b) self-assessment tests and their results; c) information and reservations for field trips educational visits.

Objectives of the course

Knowledge. This course is aimed to give an overview of the major aspects of fruit nursery production, including in vivo and in vitro propagation techniques, breeding and biotechnology techniques for the production of new patent varieties.

Applying knowledge and understanding. The aim of the course is to develop the student ability to know and develop traditional and modern techniques for plant propagation, certification breeding and biotechnology.

Cross-expertise: (i) making judgements: identifying the information needed to know and apply plant propagation systems and breeding and biotechnology tools; (ii) communications: communicate clearly and comprehensively information, ideas, problems and related technical solutions to interlocutors, either professional or not, representative of the various and specific competencies in

the nursery and breeding sectors.

Program

1. Nursery production system and organization. Sources of the genetic material, variety identification and certification, sanitary control system (1 ECTS).
2. Genetic and physiology of agamic propagation system including cuttings, grafting, bulbs, apomixes, stolons. Factors affecting the rooting process (1 ECTS).
3. Quality control of clonal plant propagation related to genetic (chimeric variations), physiological (phenotypic variations) and sanitary factors. Plant in vitro culture and micropropagation (1 ECTS).
4. Genetic resources, breeding and biotechnology for new fruit varieties. Biotechnology and breeding: aim, technique and selection methods used for the major fruit crops. Patenting and plant variety rights (1 ECTS).
5. Breeding methods and applications to fruit trees. Molecular markers and DNA recombinant technologies as integrative tools for creating new fruit varieties. In vitro morphogenesis and application to genetic transformation. Agrobacterium genetic transformation in fruit varieties (1 ECTS).
6. Rules for patenting new varieties and licences for nursery production. Biosafety rules and risk assessment for the experimental trials and commercial release of transgenic trees (1 ECTS).

Development of the course and examination

Learning evaluation methods

The final examination includes a oral exam on the arguments developed by the program. The examination is designed to evaluate the ability to identify and learn to manage a nursery production system, breeding, and biotechnology programs. During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

The student, during the oral test, will have to prove deep knowledge of the different arguments developed by the course. To pass the written or oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him/her to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

- AA.VV., 2012. Arboricoltura generale, Patron Editore

- Hartmann H.T. e Kester D.E. Propagazione delle piante. Edagricole
- Hartmann H.T., Kester D.E., Davies F.T., Geneve R.L., 1997. Ed. 6. Plant propagation: principles and practices. 770 pp.; PB: Prentice-Hall Inc.; Upper Saddle River; USA
- George E.F., Plant propagation by tissue culture. Technology. Exegetics Limited
- De Paoli G., La micropropagazione. Edagricole.
- J. Tromp, Webster A.D. e Wertheim, 2005. Fundamentals of Temperate Zone Fruit Production. Bachuys Publishers BV.
- Journals: Frutticoltura, Informatore agrario, Colture Protette.

Web Links:

http://www.fruitbreedomics.com/index.php/media-center/learning-material-training-sessions/161-phenotypin

http://www.fruitbreedomics.com/index.php/media-center/contents-of-project-meetings-and-conferences/162-

http://www.inea.it/ispave/target/231087.html

http://www.fondazioneminoprio.it/formazione/

http://www.cpvo.fr/

http://www.sib.it/

http://www.efsa.eu.int/science/gmo/gmo_opinions/384_en.html

http://www.minambiente.it/Sito/settori_azione/scn/ogm/anc_ogm.asp

http://www.isaaa.org/kc/

http://bch.biodiv.org/

Tutorial session

Wednesday 10 am – 1 pm

OLIVE TREE CULTIVATION

ENRICO MARIA LODOLINI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic knowledge of general biology, botany and tree physiology.

Course contents

The didactic method is based on ppt lectures (4 CFU) (provided in copies to the students). Class and open-field experiences and guided tours in significant productive farms will be organized in order to put into practice what the students have learned during the classroom teaching (2 CFU). The course will be also available through an e-learning version using the Moodle platform. Within this platform, the course will be divided into: (i) teaching materials composed by different learning units; (ii) self-assessment tests; (iii) field trip information and reservations.

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge about the olive biology and the proper olive orchard design and cultivation management.

Applying knowledge and understanding. The main aim of this course is to improve the ability of the students in developing a systemic approach to the factors involved in the olive orchard management and adopting coherent and appropriate technical solutions according to the socio-economical and pedo-climatic conditions.

Cross-expertise. (i) making judgements: capability of identify the information needed to manage the factors involved in the olive orchard management; (ii) communications: 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 olive orchard management.

Program

1 Course presentation. Origin and olive tree diffusion. National and international production, consumption and markets. Main cultivars for table and olive oil production (0.5 CFU).

2 Growing habit, morphology and architectural models, physiology and water relations, floral and fruit biology (2 CFU).

3 Propagation and nursery technology, planting systems, pruning and training, cultivation techniques, irrigation, plant nutrition and pest management (2 CFU).

4 Fruit growth and oil accumulation, fruit maturation, harvest technology and mechanization (1 CFU).

5 Cultivation factors affecting olive fruit quality and processing attitude. Techniques and technologies for olive oil processing and oil sensory evaluation (0.5 CFU).

Development of the course and examination

Learning evaluation methods

Written test and oral discussion on the topics presented during the course. Self-evaluation tests () will be also available on the e-learning platform (Moodle) during the course in order to provide the students useful information about their skill level.

Learning evaluation criteria

During the written test and oral exam, the students should be able to demonstrate their knowledge of the topics presented during the course, use appropriate technical terminology and apply the learnt information to solve practical problems about the olive orchard management in an integrate and coherent way.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The 20-short-answers written test and the oral examination both contribute to the final mark. The

degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

1 **Olea**. 2003. Fiorino P., - Ed agricole, Bologna.

2 **Olivicoltura di qualità.** 2005. Alfei B., Pannelli G., Ricci A., Ed agricole, Bologna

3 **El cultivo del olivo**. 2008. Edito da Fernandez Escobar R., Barranco D. S.A. Mundi-Prensa, Madrid.

4 **L’ulivo e l’olio.** 2009. Edito da Pisante P., Inglese P., Lercker G. Coltura e cultura, Bayer Crop Science Milano.

Tutorial session

Tuesday 9:00 - 11:00

ORNAMENTAL AND FRUITCULTURE (Module 1 C.I.)

FRANCO CAPOCASA

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Useful for this course basic knowledge of Arboriculture, Agronomy and Fruitculture.

Course contents

The course is organized on powerpoint lectures (available in the e-learning system before each lesson) (4 ECTS), laboratory exercises and guided tours at social farms (2 ECTS).

The course will be also available on e-learning system, using the Moodle platform. Within this platform will be available: teaching materials composed by different learning units, the results of evaluation test and various information.

Objectives of the course

Knowledge and understanding. The course enables students to acquire adequate knowledge on the analytical capabilities of the choices affecting the production chain of fruit, floriculture and nurseries within farms with a social orientation.

Applying knowledge and understanding. The aim of the course are to introduce students to the problems of cultivation of small fruit species (soft fruits and strawberry), floriculture cultivation and ornamental nurseries.

Cross-expertise. (i) making judgements: capability of identify the information needed to manage the main decision in the organization of horticultural productions, floriculture and nursery; (ii) communications: 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 involved in the management a farm that operates in the social (psychologists, social operators etc.).

Program

The course explains the basic characteristics of the fruit growing and nurseries gardening examining some case studies related to fruit and flower species grown in greenhouse and / or open field.

Production cycles and cultivation technique of small berry fruits (strawberry, raspberry, blueberry, blackberry etc.) in the open field and under greenhouse will be showed (2 ECTS).

Furthermore, production cycles regarding certain species of flowers (*Chrysanthemum* L., *Lilium* etc.) and nursery plants (*Laurus nobilis*, *Nerium oleander*, *Pittosporum tobira*, etc.) most cultivated in the Marche Region will be explained (3 ECTS).

Management of irrigation and fertigation in soil, greenhouse and pots culture will be described (1 ECTS).

Practical tutorials on the propagation of the treated species will be also planned.

Guided visits to fruit farms and nurseries in the Marche Region will be available.

Development of the course and examination

"Social horticultural, ornamental and fruitculture" is an integrated course consisting of two modules: Ornamental and fruitculture (6 ECTS) and Horticultural lab (3 ECTS). Each module is independently evaluated, but with a unique final grade, resulting from the weighted average of the grades obtained in the two modules (weights results from the respective number of ECTS for each module).

Learning evaluation methods

Test final examination will be based a written test (optional) and/or oral examination.

Learning evaluation criteria

The student in the course will have to possess the following knowledge i) the fruit tree species explained during the course ii) identify the species most suitable for fruitcultural and horticultural interest cultivation, including the choice of varieties that corresponds to the soil and climate, the corporate structure and destination of the product.

The students, during the oral test, will have to demonstrate an overall knowledge of the contents, using appropriate technical terminology and to be able to handle with deductive reasoning that enable him to create links within matter, and to have acquired a complete mastery of discipline.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The written test (optional) consists of 20 open-ended questions about the topics, for each one questions will be evaluated with score maximum of 10 point. The final result of the written test will be expressed in thirtieths.

The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

If the student wants to perform both tests (written and oral), the final grade will result from the average of the two results expressed in thirtieths.

Recommended reading

1. Autori Vari (1991). Frutticoltura Speciale. Reda – Edizioni per l’agricoltura

2. Tesi R. (2008) Colture Protette. Ed. Edagricole

3. Accati E. (1993) Trattato di Floricoltura. Ed. Agricole

4. Tesi R. (2002) Colture fuori suolo in orticoltura e floricoltura.

Tutorial session

Tuesday from 01:30 pm to 03:30 pm.

ORNAMENTAL, WOOD AND FRUIT TREE CULTURE AND PHYSIOLOGY

BRUNO MEZZETTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 9
Hours 81
Period 2^ semestre

Prerequisites

Basic knowledge of chemistry, physics, botany, plant biology, genetics, agronomy

Course contents

Course contents:

The course provides elements of biology, physiology and plant genetics applied to arboriculture and the applications of modern arboriculture for the realization and management of orchards for quality productions and for the designing and sustainable management of ornamental and wood systems.

Development of the course

The teaching method is based on lectures supported by slides in digital format (6 ECTS), supplied in copies to the students, and experiences in arboriculture systems (3 ECTS). The course is also available in e-learning using the Moodle platform. Within this platform are available: a) teaching materials composed by learning units; b) self-assessment tests and their results; c) information and reservations for field trips educational visits.

Objectives of the course

Knowledge. The course provides elements of biology, physiology and plant genetics applied to arboriculture and the applications of modern arboriculture for the realization and management of orchards for quality productions and for the designing and sustainable management of ornamental and wood systems.

Applying knowledge and understanding. The aim of the course is to develop the student ability to know and develop modern perennial plant cultivation systems for the environment and high production efficiency and product quality.

Cross-expertise: (i) making judgements: identifying the information needed to know plant reproduction, development, management, cultivation and quality of perennial plants and products; (ii) communications: communicate clearly and comprehensively information, ideas, problems and

related technical solutions to interlocutors, either professional or not, representative of the various and specific competencies in the arboriculture sector.

Program

1. Life Cycle: Stages and phases of ontogenesis. Plant growth and development. Propagation principles and methods (1 ECTS).
2. The above-ground structures: functional organization and morphology. The phenotype of the plant and its balance. The root. Types of buds and branch. Development of the foliage (1 ECTS).
3. Manipulation of the aerial part: Getting pruning (crown and root). Period intervention. Types of training systems. Canopy formation and pre-training in the nursery. Production pruning. Pruning of reform. Pruning of rehabilitation and rejuvenation. Green pruning and thinning (1.5 ECTS).
4. Floral biology and fruit (growth, harvesting, aging and storage) (1 ECTS).
5. Setting up of the arboretum. Criteria for site selection, species to be cultivated and the cultivation methods. Pre-planting operations, methods of planting. Plant care. Case studies: Olive, Grape, Peach (1.5 ECTS).
6. Soil, water and nutrition: Soil management of an orchard (machining and grassing). Fundamentals of management of nutrition and irrigation (timing, dose and plants) of woody plants. The management of the arboretum (1 ECTS).
7. Water relations in woody plants: Water movement in the plant. Plant response to water stress (1 ECTS).
8. From the leaf to the plant: Allocation and distribution of carbon. Measurements of photosynthesis. Photosynthesis/transpiration balance (1 ECTS).

Development of the course and examination

Learning evaluation methods

The final examination includes a oral exam on the arguments developed by the program. The examination is designed to evaluate the ability to identify and learn to manage a cultivated plant tree. During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

The student, during the oral test, will have to prove deep knowledge of the different arguments developed by the course. To pass the written or oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him/her to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades

ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

- AA.VV., 2012. Arboricoltura generale, Patron Editore
- Baldini E., 1986. Arboricoltura generale - Ed. Coop. Libraria Univ., Bologna
- Zucconi F., 2003. Nuove tecniche per i fruttiferi – Edagricole, Bologna
- Journals: Frutticoltura, Informatore agrario, Colture Protette

Tutorial session

Wednesday 10 am – 1 pm

PARKS AND GARDENS

ALBERTO MINELLI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Good knowledge of biology.

Course contents

The didactic method is based on lectures with ppt presentations and discussion of case studies. Visit to public gardens, nursery and urban parks will also help the students learn to approach the landscape and its assessment.

Objectives of the course

Knowledge.

The course enables students to acquire basic knowledge about landscape, historical gardens, private and public gardens and parks, to outline a project, approaching different management techniques such irrigation, noise control, weeds control.

Applying knowledge and understanding.

The student will be able to understand landscape structure, recognise historical gardens, public and private parks, to get basic skills to plan, realize and manage a project.

Cross-expertise.

The student will be able to design a green area, develop a masterplan, appraise the landscape.

Program

1. Analysis of area, climate, natural vegetation. Lanscape, definition, analysis and evolution. (1 ECTS)
2. Function and evolution of historical gardens. (1 ECTS)
3. Landscape design of green areas: phases, rules and criteria of green design. Preliminary study, survey of area. Definition of different type of gardens and parks and different design

criteria. Proportions, spaces, colors, shapes, volumes, visual and surround. Private gardens, public green areas, children gardens, wood gardens, rock gardens, green wall. Plants in urban areas. Street furniture. Restoration of historical gardens. Defense and protection of climate. Selection of species for different cases (tree, shrubs and herbaceous plants). The noise barrier. The bio-architecture and healing gardens. Plan redaction. (2 ECTS)
4. Knowledge and use of ornamental plants. Growth and shape of plants. Plants in urban areas. (1 ECTS)
5. The maintenance. Pruning techniques, tree stability evaluation. Maintenance and restoration of green areas. (1 ECTS)

Development of the course and examination

Learning evaluation methods

Oral discussion.

Learning evaluation criteria

During the course discussions on course topics will be used to test the students preparation and for preliminary evaluation.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral discussion is based on in three main questions. To each question a maximum of 10 points is attributed.

Recommended reading

CHIUSOLI A., La Scienza del Paesaggio, CLUEB Editrice Bologna 1999.

Other readings

BADIALI G., MARCHETTI M., ZECCHINI D’AULERIO A., Le principali avversità delle piante ornamentali, Edagricole, 1993

CHIUSOLI A., Il progetto del vostro giardino, Edagricole, 1996.

CHIUSOLI A., Progetto giardino, BE-MA Editrice, 1989.

CHIUSOLI A., Il giardino nella natura, Edagricole, 1980-1989.

CHIUSOLI A., Progettare giardini, Edagricole, 1983.

ERIKSSON E.L., BLANCHETTE R.A., ANDER P., Microbial and enzymatic degradation of wood and wood components, Springer-Verlag 1990

URBAN JAMES, Up by the roots, ISA 2008

Office hours

By appointment via e-mail

PEDOLOGY

STEFANIA COCCO

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Knowledge of mathematic, physic, chemistry, soil chemistry and plant physiology are required.

Course contents

The didactic method is based on ppt lectures (4 ECTS) (provided in copies to the students) and laboratory experiences and guided field trips (2 ECTS).

Objectives of the course

Knowledge. The course deals with the basic knowledge of pedogenic processes occurring in soils. so as to preserve them and improve environmental conditions.

Applying knowledge and understanding. The main aim of this course is to provide a fully development ability of the students in soil descriptions and management.

Cross-expertise: making judgements: capability of identify the information needed to manage soil, 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 like planner, administrator.

Program

Principal concepts of geomorphology and petrography- soil definition, FAO resolution about soil preservation, concept of pedosphere, history of soil science, Jenny equation, soil morphology (profile and horizons O,E,A,B,C,R) (1 ECTS).

Main horizon characteristics: color, texture, structure, consistence, presence of roots, mottling, concretions, clay skins, silt caps, slickensides (1 ECTS).

Pedogenic factors: rocks: major cycle of rocks and petrography; climate; topography; plants and microbial population; time: modern and ancient soils; biota: vegetation, micro animals; anthropic factor (1 ECTS).

Soil composition: organic matter; minerals classification; organic matter: genesis and evolution of humic substances; soil formation; enrichment of organic matter; weathering of rocks and minerals; rhizosphere (1 ECTS).

Soil evaluation; principal agrarian soil horizons description: anthropic, ochric, argillic, calcic, petrocalcic, natric; water in soil (1 ECTS).

Genesis of saline soils, anthropic soils, pastures, terraced soils, urban soils, mine soils, dump soil heavy metal soil pollution; soil erosion; Entisols, Inceptisols, Vertisols, Andosols (1 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the teaching program.

Learning evaluation criteria

In the oral classwork, the student will have to demonstrate knowledge of all the program. To pass the oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

1) M. PANIZZA (1992). Geomorfologia. Pitagora Editrice Bologna.

2) A. GIORDANO (1999). Pedologia. UTET.

3) C. CIAVATTA e G. VIANELLO (1989). Bilancio idrico dei suoli: applicazioni tassonomiche, climatiche e cartografiche. Editrice CLUEB Bologna.

4) P. VIOLANTE (1998). Chimica del suolo e nutrizione delle piante. Edizioni Calderini, Edagricole

5) BRADY N.C., WEIL R.R., 2002. The Nature and Properties of Soil. Macmillan Publishing Company Incorporated, 2008. ISBN-13: 978-0132279383, ISBN-10: 013227938X

6) Soil Survey Staff. 2015. Illustrated guide to soil taxonomy, version 2.0. U.S. Department of Agriculture, Natural Resources Conservation Service, National Soil Survey Center, Lincoln, Nebraska.

7) Appunti delle lezioni.

Tutorial sessions

Wednesday 3 pm to 5 pm.

PESTICIDES CHEMISTRY AND BIOCHEMISTRY

COSTANTINO VISCHETTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Sono propedeutiche a questo corso le conoscenze delle discipline collegate quali la Chimica inorganica e organica e la biologia generale.

Course contents

Vengono effettuate lezioni in ppt (di cui si fornisce copia agli studenti) (6 CFU) ed esercitazioni di laboratorio con postazioni singole (di cui si fornisce descrizione scritta e spiegazione in aula) (3 CFU).

Il metodo utilizzato cerca di mettere in grado lo studente di acquisire le nozioni fondamentali per la comprensione della materia e di effettuare i dovuti collegamenti concettuali e pratici all'interno di essa.

Il Corso viene impartito anche in modalità e-learning utilizzando la piattaforma Moodle. Nella parte introduttiva sono presenti le informazioni generali (presentazione del Corso e Programma), il Forum per le comunicazioni tra studenti e per la richiesta di interventi del docente ed il Forum news per la divulgazione immediata di qualsiasi tipo di notizia e comunicazione docente/studenti. Nelle Unit settimanali vengono forniti: il materiale didattico, test di autovalutazione, test con componimento, allegati di approfondimento, collegamenti a siti di interesse.

Objectives of the course

Conoscenza e comprensione. L'obiettivo formativo principale del corso è quello di trasferire agli studenti le conoscenze di base sulla chimica del suolo e sulla biochimica vegetale, sulle metodologie di laboratorio per la determinazione di alcune caratteristiche chimico-fisiche del suolo e dei metaboliti primari delle piante. Le conoscenze acquisite si rivelano utili alla migliore comprensione di altri processi e fenomeni legati alla fisiologia ed alla produzione vegetale.

Capacità di applicare le conoscenze. Lo studente dovrà anche acquisire la seguente abilità professionalizzante: capacità di effettuare semplici analisi chimiche di laboratorio per la determinazione delle principali caratteristiche chimiche e chimico-fisiche di suoli e piante, inclusa la fase di prelievo di campioni in campo. L'interpretazione dei dati delle analisi di laboratorio potrà permettere la redazione di piani di concimazione e di interventi ammendanti e correttivi dei principali difetti dei terreni agrari.

Competenze trasversali: a) scelta dei principali interventi di fertilizzazione e correzione dei terreni agrari in accordo con le altre figure professionali coinvolte; b) individuazione delle migliori strategie di conduzione aziendale sia ai fini produttivi che di salvaguardia ambientale.

Program

Ambiente della pedogenesi. Struttura e proprietà dei silicati. Fattori fisici e chimici di pedogenesi (0,4 CFU).

Costituzione fisico-meccanica del suolo. Stato strutturale del suolo (0,2 CFU).

Proprietà dello stato colloidale del suolo. Struttura e proprietà degli ossidi ed idrossidi di ferro ed alluminio, delle argille del gruppo delle miche, della montmorillonite e della caolinite (0,7 CFU).

Humus: composizione chimica, carica elettrica, estrazione e frazionamento (0,5 CFU).

Potere adsorbente del suolo. Assorbimento meccanico, biologico e chimico. Adsorbimento di scambio (anionico e cationico). Capacità di scambio cationico e anionico. Equazioni di scambio (Kerr e Gapon) (0,6 CFU).

Reazione e potere tampone del suolo. Fattori che influenzano il pH. pH e assimilabilità degli elementi nutritivi. Potere tampone della fase liquida e della fase solida (0,5 CFU).

Suoli calcarei. Trattamento dei suoli calcarei con potere clorosante. Caratteristiche dei suoli acidi, sodici ed alcalini, e loro correzione (0,5 CFU).

Concimazione: Stato degli elementi nutritivi nel suolo. Determinazione degli elementi nutritivi assimilabili. Concimi: concimi azotati, fosfatici potassici, composti, liquidi (0,6 CFU).

Rischio ambientale da pratiche agricole: agrofarmaci, fosforo e azoto, metalli pesanti (0,4 CFU).

Bioenergetica: reazioni esorgoniche ed endoergoniche. Ciclo dell'ATP. Reazioni di ossido-riduzione. Potenziali ossido-riduttivi standard (0,3 CFU).

Enzimi: classificazione, caratteristiche, composizione, coenzimi, cofattori, gruppi prostetici. Cinetica enzimatica: equazione di Michaelis-Menten e sue elaborazioni. Fattori che influenzano l'attività enzimatica: pH e temperatura. Inibizione enzimatica (0,3 CFU).

Fotosintesi: fattori esogeni ed endogeni che influenzano la fotosintesi. I pigmenti fotosintetici. Struttura della membrana tilacoidale. Meccanismo di intrappolamento della luce. Fase luminosa della fotosintesi: formazione dell'ATP. Fase oscura della fotosintesi: cicli C2, C3, C4. Efficienza fotosintetica (1,2 CFU).

Respirazione cellulare: glicolisi, fermentazione anaerobica, ciclo di Krebs, ciclo dei pentosofosfati, catena del trasporto elettronico (0,5 CFU).

Lipidi: Generalità e classificazione. Biosintesi degli acidi grassi e dei trigliceridi. Catabolismo degli acidi grassi e dei trigliceridi. Ciclo del gliossilato e gluconeogenesi (0,3 CFU).

Ciclo dell'azoto: azoto-fissazione, organicazione dell'azoto, biosintesi della glutammina. Ammino-acidi e proteine. Mineralizzazione dell'azoto proteico, transaminazione e deaminazione, nitrificazione e denitrificazione (0,4 CFU).

Pigmenti vegetali, vitamine. Fitormoni: auxine, giberelline, citochinine, acido abscissico ed etilene (0,2 CFU).

Esercitazioni di laboratorio: Determinazione della tessitura mediante Levigatore di Andreasen e/o di Esenwein. Determinazione del contenuto di carbonio organico del suolo. Determinazione del calcare e del calcare attivo del suolo. Determinazione del pH e della conducibilità elettrica del suolo. Determinazione del contenuto di clorofilla dei tessuti verdi (1,4 CFU).

Development of the course and examination

Metodi di valutazione dell'apprendimento. L'esame consiste in una prova orale composta di quattro domande (due sulla Chimica del suolo e due sulla biochimica vegetale).

Sono anche previste prove facoltative di auto-valutazione *in itinere*, attraverso test e questionari pubblicati sulla piattaforma Moodle, il cui scopo è quello di fornire allo studente indicazioni sulla progressione del proprio grado di preparazione

Criteri di valutazione dell'apprendimento. Durante la prova d'esame lo studente dovrà dimostrare: a) conoscenza delle principali reazioni chimiche e biochimiche che avvengono nel suolo e nei tessuti e organi vegetali; b) conoscenze acquisite ai fini dell'esecuzione di semplici analisi di laboratorio sulle caratteristiche chimico-fisiche del suolo e chimiche e biochimiche dei vegetali. Per il superamento della prova orale lo studente dovrà saper esporre i contenuti della materia con adeguata terminologia specifica ed essere in grado di effettuare i necessari collegamenti con completa padronanza.

Criteri di misurazione dell'apprendimento. Il voto finale è attribuito in trentesimi. L'esame si intende superato quando il voto è maggiore o uguale a 18. È prevista l'assegnazione del massimo dei voti con lode (30 e lode).

Criteri di attribuzione del voto finale. Il voto finale viene attribuito come media dei voti in trentesimi riportati nelle risposte a ciascuna delle quattro domande d'esame. La lode viene attribuita quando lo studente abbia dimostrato piena padronanza della materia.

Recommended reading

- Appunti dalle lezioni e materiale didattico presente sulla piattaforma Moodle

- AUTORI VARI, Fondamenti di Chimica del suolo, Patron Editore, 2005.

- M. BUSINELLI, Chimica del suolo, Morlacchi Editore, 2009

- L. SCARPONI, Biochimica Agraria, Galeno Editrice, 1996

- M. MAFFEI, Biochimica Vegetale, Piccin Nuova Libraria, 1999.

Ricevimento studenti

Mercoledì 9-11

Giovedì 11-13

PHYSICS

ADRIAN MANESCU

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

A basic knowledge of mathematics (elementary algebra and trigonometry) is highly recommended.

Course contents

The teaching method is based on direct lectures, presented to the students in ppt format, downloadable from the teacher's website, for a total of 6 ECTS. The 54 hours are divided between the theoretical aspects of physics (4 ECTS) and practical exercises in the classroom and laboratory (2 ECTS). On the teacher website there are available, in addition to the lessons in the classroom, also several exercises for self-assessment tests and all the information regarding the physics course.

Objectives of the course

Knowledge and understanding. The course enables students to acquire the basic tools (interpretation of phenomena, presentation of the physics laws and principles) to address and solve practical physics problems. Ability to use the specific language of this discipline.

Applying knowledge and understanding. Ability to expose the accumulated physics knowledge also to non-specialists and ability to find practical solutions to problems arising in the context of his professional activity. Ability to explain the importance and highlight the application outcomes of the issues addressed.

Cross-expertise. a) independent judgment: ability to assess independently the implications and the practical results of the various problems to be solved or situations to be interpreted; b) develop the ability to solve complex problems starting from "packages" of base knowledge that can be put together and matched with other information to get to a higher knowledge level.

Program

The discipline provides basic information concerning the chapters of classical mechanics, fluid mechanics and thermodynamics. The discipline aims to make the student be able to quantitatively solve many practical problems on the studied topics, with examples of applications in the agricultural sector.

1. Measurements. Measurement units. Forces. Newton’s Laws I and III. Force of gravity. Weight force. Normal force. Frictional force. Tension force. Elastic force. Measurements of the forces (1 ECTS).

2. Position and displacement. Speed. Acceleration. Newton's Law II. Trajectory. Uniform motion. Rectilinear uniformly accelerated motion. Falling bodies. The motion in two dimensions. The motion of the projectile. The circular motion (1 ECTS).

3. Work and energy. Conservation of mechanical energy. Non-conservative forces. Impacts. Momentum. Conservation of momentum. Center of mass. Balance of a rigid body. Moment of a force. Equilibrium of a material point. Rotational dynamics (notes) (1 ECTS).

4. Fluid Mechanics: definition of ideal fluid. Properties of fluids. Definition of pressure. Stevin’s law. Archimedes’ principle. Pascal's Law. Continuity equation. Bernoulli’s equation. Real fluids (notes) (1 ECTS).

5. Thermodynamics: Zero law of thermodynamics. Definition of absolute temperature. Specific heat. Heat capacity. State transformations. Latent heat. Thermodynamic systems. Perfect gases. Heat, work and internal energy. First law of thermodynamics. Thermodynamic processes. Cyclic transformations. Second law of thermodynamics. Entropy (1.5 ECTS).

6. The climate machine. Radiation. Electromagnetism. Microscopy (notes) (0.5 ECTS).

Development of the course and examination

Learning evaluation methods

At the end of the course there will be two partial tests with multiple answers (mechanics and thermodynamics), which include both theoretical questions and exercises, followed by an oral test, where the students can discuss the laboratory report, in order to improve their final physics exam mark.

All students also have the option to make a written examination, followed by an oral test and, possibly, the presentation of a laboratory report.

Learning evaluation criteria

The student, during the written and oral tests, will have to demonstrate that they: a) have understood the principles and fundamental laws of the studied arguments; b) are able to demonstrate with practical examples the application of the laws studied during the course; c) are able to solve exercises, applying the laws and principles of mechanics or thermodynamics. To pass the physics exam, the student must demonstrate an overall understanding of the content, present it in a sufficiently correct way, with the use of appropriate technical terminology, and to be able to deal

with deductive reasoning that allow to create appropriate links between the studied arguments and to prove that he has acquired a good mastery of them.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

Students who get at the two partial tests (mechanics and thermodynamics, theoretical questions and exercises) an average vote higher than 18/30 (with a minimum score of 15/30 in each partial test), may decide whether to take the oral test, only discuss the laboratory report to improve their marks, or just accept the average of the two partials as the final mark of the physics exam.

For students who do the written exam, it consists of 3 exercises (mechanics, fluids and thermodynamics). The oral examination, mandatory after the written exam, consists of three questions (mechanics, fluids, thermodynamics), on any subject covered during the physics course. The laboratory report may increase by 1-2 points (in thirtieths) the exam mark.

The “cum laude” will be given to students who, having achieved the highest mark, have demonstrated the complete mastery of the subjects.

Recommended reading

1) General Physics: Principles and Applications - Giambattista, Richardson, Richardson, McGraw-Hill 2008/2012

2) Fundamentals of Physics - Halliday, Resnick and Walker - CEA – 6th edition.

Tutorial sessions

Monday 3 pm - 4 pm

Tuesday 11 am - 12 am

PHYSICS

ADRIAN MANESCU

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

A basic knowledge of mathematics (elementary algebra and trigonometry) is highly recommended.

Course contents

The teaching method is based on direct lectures, presented to the students in ppt format, downloadable from the teacher's website, for a total of 6 ECTS. The 54 hours are divided between the theoretical aspects of physics (4 ECTS) and practical exercises in the classroom and laboratory (2 ECTS). On the teacher website there are available, in addition to the lessons in the classroom, also several exercises for self-assessment tests and all the information regarding the physics course.

Objectives of the course

Knowledge and understanding. The course enables students to acquire the basic tools (interpretation of phenomena, presentation of the physics laws and principles) to address and solve practical physics problems. Ability to use the specific language of this discipline.

Applying knowledge and understanding. Ability to expose the accumulated physics knowledge also to non-specialists and ability to find practical solutions to problems arising in the context of his professional activity. Ability to explain the importance and highlight the application outcomes of the issues addressed.

Cross-expertise. a) independent judgment: ability to assess independently the implications and the practical results of the various problems to be solved or situations to be interpreted; b) develop the ability to solve complex problems starting from "packages" of base knowledge that can be put together and matched with other information to get to a higher knowledge level.

Program

The discipline provides basic information concerning the chapters of classical mechanics, fluid mechanics and thermodynamics. The discipline aims to make the student be able to quantitatively solve many practical problems on the studied topics, with examples of applications in the

agricultural sector.

1. Measurements. Measurement units. Forces. Newton’s Laws I and III. Force of gravity. Weight force. Normal force. Frictional force. Tension force. Elastic force. Measurements of the forces (1 ECTS).

2. Position and displacement. Speed. Acceleration. Newton's Law II. Trajectory. Uniform motion. Rectilinear uniformly accelerated motion. Falling bodies. The motion in two dimensions. The motion of the projectile. The circular motion (1 ECTS).

3. Work and energy. Conservation of mechanical energy. Non-conservative forces. Impacts. Momentum. Conservation of momentum. Center of mass. Balance of a rigid body. Moment of a force. Equilibrium of a material point. Rotational dynamics (notes) (1 ECTS).

4. Fluid Mechanics: definition of ideal fluid. Properties of fluids. Definition of pressure. Stevin’s law. Archimedes’ principle. Pascal's Law. Continuity equation. Bernoulli’s equation. Real fluids (notes) (1 ECTS).

5. Thermodynamics: Zero law of thermodynamics. Definition of absolute temperature. Specific heat. Heat capacity. State transformations. Latent heat. Thermodynamic systems. Perfect gases. Heat, work and internal energy. First law of thermodynamics. Thermodynamic processes. Cyclic transformations. Second law of thermodynamics. Entropy (1.5 ECTS).

6. The climate machine. Radiation. Electromagnetism. Microscopy (notes) (0.5 ECTS).

Development of the course and examination

Learning evaluation methods

At the end of the course there will be two partial tests with multiple answers (mechanics and thermodynamics), which include both theoretical questions and exercises, followed by an oral test, where the students can discuss the laboratory report, in order to improve their final physics exam mark.

All students also have the option to make a written examination, followed by an oral test and, possibly, the presentation of a laboratory report.

Learning evaluation criteria

The student, during the written and oral tests, will have to demonstrate that they: a) have understood the principles and fundamental laws of the studied arguments; b) are able to demonstrate with practical examples the application of the laws studied during the course; c) are able to solve exercises, applying the laws and principles of mechanics or thermodynamics. To pass the physics exam, the student must demonstrate an overall understanding of the content, present it in a sufficiently correct way, with the use of appropriate technical terminology, and to be able to deal with deductive reasoning that allow to create appropriate links between the studied arguments and to prove that he has acquired a good mastery of them.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

Students who get at the two partial tests (mechanics and thermodynamics, theoretical questions and exercises) an average vote higher than 18/30 (with a minimum score of 15/30 in each partial test), may decide whether to take the oral test, only discuss the laboratory report to improve their marks, or just accept the average of the two partials as the final mark of the physics exam.

For students who do the written exam, it consists of 3 exercises (mechanics, fluids and thermodynamics). The oral examination, mandatory after the written exam, consists of three questions (mechanics, fluids, thermodynamics), on any subject covered during the physics course. The laboratory report may increase by 1-2 points (in thirtieths) the exam mark.

The “cum laude” will be given to students who, having achieved the highest mark, have demonstrated the complete mastery of the subjects.

Recommended reading

1) General Physics: Principles and Applications - Giambattista, Richardson, Richardson, McGraw-Hill 2008/2012

2) Fundamentals of Physics - Halliday, Resnick and Walker - CEA – 6th edition.

Office hours

Monday 11 am - 12 am

Tuesday 11 am - 12 am

PHYSICS

RAFFAELE SINIBALDI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic mathematical concepts (representation on the Cartesian space, direct and inverse proportion, first and second order equations and systems, exponential and logarithmic functions, simple geometrical functions, elementary trigonometry); knowledge of basic concepts in Chemistry (atom, molecule, chemical bond).

Course contents

The course includes theoretical lectures (4 credits, 36 hours), classroom exercises (2 credit, 18 hours). The materials and instructions for the classroom practicals, self-evaluation tests and results are also available on the e-learning web site.

Objectives of the course

Knowledge and understanding:

The course focuses on the study of matter, energy, forces, and their interaction in the world and universe around us. The course enables students to acquire the necessary competences on the physical basic laws and concepts (both theoretical and experimental), useful to describe and to understand the physical properties of the matter in the framework of the life and environmental sciences. The course presents the fundamentals of theoretical and experimental Physics (mechanics, fluid properties, thermodynamics, electric and specialties magnetic properties) necessary for graduate study in interdisciplinary disciplines requiring a strong scientific background.

Applying knowledge and understanding:

Students must acquire a rigorous, quantitative and analytic way of thinking and dealing with physical phenomena. In particular, students have to learn the laws of General Physics and to appropriately apply them to interpret the basic phenomena involving movement, energy and thermal, electrical

and magnetic properties of matter. Also students have to know how properly use the units of the common physical quantities and know the conversion factors between homogeneous units.

Students have to be able to apply the laws of Physics to solve numerical exercises and to communicate the method used to obtain their solution. Finally, students should be able to show understanding of the scientific method used to measure and critically interpret the physical phenomena observed during practical laboratories.

Cross-expertise:

The activities carried on during the practical laboratories and laboratory reports' compilation, developed in a working group, will stimulate and improve student's autonomy and communication skills. Moreover, the analysis of data collected during the experimental activities and the exercises performed to solve the physical problems will help the students to exploit the mathematical and statistical concepts learned in previous courses.

Program

Lectures (4 ECTS, 36 hours)

Scientific method. Base quantities, derived quantities and dimensions. Systems of units. Scalars and vectors. Vector operations. Position and displacement vectors. Average velocity and instantaneous velocity. Average acceleration and instantaneous acceleration. Straight uniform motion. Uniformly accelerated motion. Uniform circular motion. Non-uniform circular motion and angular velocity. Centripetal and tangential acceleration. Parabolic motion. Concept of force. Principle of inertia. Second law of dynamics. Third principle of dynamics. Weight force. Hooke's Law. Composition of forces. Contact forces. Tension of an ideal chord. Gravitational force. Other forces in nature. Static and dynamic friction. Examples of motions in the presence of friction. Non-inertial reference frame and apparent forces. Many-particles systems. Center of mass. Position, velocity and acceleration of the center of mass. Internal and external forces. Momentum. Principle of conservation of momentum. Basic examples for the conservation of momentum. Impulsive forces. Work. Kinetic energy theorem. Power. Scalar and vector fields. Conservative field. Potential energy. Principle of conservation of mechanical energy. Dissipative forces. Gravitational and elastic potential energy. Elastic and inelastic collisions. Moment of force. Static equilibrium. Basic examples of static equilibrium. Angular momentum and inertia. Principle of conservation of the angular momentum. Density and viscosity of a fluid. Pressure and Pascal's Principle. Stevin's law. Archimedes' principle. Fluids in stationary motion. Law of continuity. Bernoulli's theorem. Real fluids. Laminar motion. Poiseille's law. Thermal equilibrium. Temperature and temperature units. Thermodynamic coordinates. Thermodynamic states. Equation of state of perfect gases. Quasistatic process. Heat and work. Opposition pressure and work of expansion-compression. Specific heat at constant pressure and volume. Joule's experiment. First law of thermodynamics. Isochoric, isobaric and isothermal transformations. Adiabatic reversible transformation. Poisson's laws. Statements of the second law of thermodynamics. Carnot cycle. Efficiency of a Carnot cycle. Entropy. Inequality of Clausius. Free expansion of a gas. Entropy and disorder. Notable examples of thermodynamic cycles. Electric charge, electric field and electric potential. Gauss's law. Charged particles in an electric field. Conductors and insulators. Capacitors. Electricity and Ohm's law. Magnetic field and

its properties. Charged particles in a magnetic field.

Laboratory Practicals (2 ECTS, 18 hours):

The aim of the practical laboratories is to teach students the principles and methods of measurement using the most common laboratory instruments, basic statistical processing, and data graphical representation. In particular, students will perform the following experiments: elongation of a helical spring and verification of Hooke's law; elongation of an elastic body; quantitative relationships between the physical quantities describing a uniformly accelerated motion; forces on a sloping plane; determination of liquids' or solids' mass densities; action of atmospheric pressure; Archimede's force as a function of the volume and the mass of a body. Each experiment will be carried out by groups of 5 students. At the end of the laboratory practice, each group will have to prepare a report on all the activities carried out in the laboratory, describing for each experiment the set-up and the data obtained, the executed calculations, the calculated analytical results (expressed with the correct number of significant digits) and the final discussion / interpretation.

Development of the course and examination

Learning evaluation methods

The exam consists of a written test and an oral examination. The written test consist of 2 exercises, one of them concerning mechanic, the other one pertaining to thermodinamycs). The oral examination consists on a discussion about three of the subjects listed in the teaching program, one of which will be chosen by the student.

During the course, there are also going to be available self-evaluation tests, in order to provide the students useful information about their skill level.

Learning evaluation criteria

The student will have to show: (a) sound knowledge of definitions and meanings of physical quantities; (b) ability to demonstrate physical laws. Besides, laboratory practicals workgroup report will be evaluate.

Learning measurement criteria

The final mark is awarded out of thirty. The exam is passed when the grade is equal or greater than 18. It is possible to be awarded with the highest marks with honors (30 *cum laude*).

Final mark allocation criteria

The final mark is mainly attributed evaluating the oral test and taking into account in a non-quantitative manner of the written test mark. The honour mark is given when the student has demonstrated full mastery of the subject.

Recommended reading

A. Giambattista, B. McCarthy Richardson, R. C. Richardson, "Fisica Generale. Principi e applicazioni", McGraw-Hill, second edition, 2012.

P. Pavan, F. Soramel, “Problemi di Fisica Risolti e Commentati”, Casa Editrice Amborsiana, third edition, 2007

Any physics text for university courses.

PLANT BIOLOGY

SIMONA CASAVECCHIA

Seat Agraria
A.A. A.A. 2015-2016
Credits 12
Hours 108
Period Corso annuale

Prerequisites

Basic knowledge of general biology and chemistry.

Course contents

The didactic method is based on ppt lectures (8 ECTS) and laboratory experiences (involving all students individually) and guided excursions in natural environments and/or research structures for direct observations or deepening on topics dealt with the course (4 ECTS). The ppt files of lectures are available and downloadable on the Moodle platform. Within this platform, in addition to teaching materials structured by main topics (introduction, cell biology, histology, anatomy, physiology, evolution and systematics, bryophytes, vascular cryptogams, spermatophytes), the pdf file of the three volumes of Flora d'Italia (S. Pignatti) are available and downloadable which are useful to practice the classification of plants.

Objectives of the course

Knowledge. The course enables students to acquire theoretical and practical knowledge on the main macroscopic and microscopic characteristics of plant organisms as well as on the most important physiological functions of plants, on the evolution of land plants and the methods of classification of living organisms.

Applying knowledge and understanding.

The main aim of this course is to provide a fully development ability of the students in correlate microscopic and macroscopic shape in order to reach a comprehensive understanding of the system plant-environment. In addition, through the study of evolution of land plants and the classification methods, the student must acquire the necessary skills for the recognition of the plants belonging to the main families of agronomic interest.

Cross-expertise. The student acquires the basic skills on the morphology and physiology of plants, on methods of reproduction (life cycles etc.) that will enable him to approach more specialized topics of agronomic character. The skills acquired in the classification and recognition of plants are also very useful in the exercise of the profession of agronomist.

Program

1. Introduction to plant biology: history of botany, interest fields and methodologies. Plants in the biosphere. Concepts of environment and ecosystem, biotope and biocoenosis. The autotrophic and heterotrophic organisms. Prokaryotes and eukaryotes. Thallophytes and cormophytes (0.2 ECTS).

2. Cell Biology. Introduction to cell biology. The cell theory. The general structure of cell. Prokaryote and eukaryote cells. Main differences between plant cell and animal cell. Methods for the cell study. The eukaryote cell: structure, ultrastructure and functions. The plasma membrane. Cytoplasm and cell organelles. Plastids: Chloroplasts, Leucoplasts and Chromoplasts. Mitochondrion. The endomembrane system. Endoplasmic Reticulum. Golgi Apparatus. Vacuole and cell sap. Oxalate crystals. Lysosomes. The nucleus. Cytoskeleton. The cell wall: middle lamella, primary wall, secondary wall. Secondary modifications of the cell wall. The cell cycle. Mitosis and cytokinesis. Meiosis. Water and solutes absorption: diffusion, active and facilitated transport, osmosis, cell turgor and plasmolysis. Cell elongation (2.5 ECTS).

3. Plant Histology. Cell differentiation theories. Cell aggregate and pseudotissues. General characteristics of the tissues. Primary and secondary meristematic tissues. Primary and secondary mature tissues: dermal tissues, ground tissues (parenchyma, collenchyma and sclerenchyma), vascular tissues, glandular tissues. The external forms and plant life cycles. Embryogenesis (1.3 ECTS).

4. Plant anatomy. General plant anatomy of the three principal organs. Steam anatomy: meristematic, elongation and differentiation zones, primary and secondary structure zones. Cambium activity. Homoxylous and heteroxylous wood. The bark. The phellogen activity. Modifications and adaptations of the stem. Root anatomy: vegetative apex, root hair region, primary and secondary structure zones. Lateral roots. Modifications and adaptations of the root. Leaf anatomy: Monocotyledonous, Dicotyledonous and Coniferous. Leaf morphology and structure. Phyllotaxis and connections of the steam conducting system with the leaf's one. Modifications and adaptations of the leaf (2.6 ECTS).

5. Outlines of plant physiology: water balance. The cuticle and stomatal transpiration. Apoplast and symplast. Movement of Water and Inorganic Nutrients through the Plant Body. Assimilate Transport. Organic solution carriage. Plant adaptation to soil aridity. The seed: general characteristics, origin and structure. Maturation and germination (0.9 ECTS).

6. Evolution and Systematics. The origin of diversity of living organisms. The natural selection. The concept of population. The agents that modify the gene pool of a population. Evolutionary mechanisms that lead to adaptation. Processes that maintain or generate the genetic variability within a population. The biologic, morphologic and phylogenetic concept of species. Speciation. Modalities of speciation. Allopatric and sympatric speciation. Micro and macroevolution. Systematics and Taxonomy. Nomenclature and classification of living organisms. Phylogenesis and Cladistics. The origin of land plants (0.9 ECTS).

7. Tracheophyta. The transition from water to land. Phylogenies of land plants. The green Algae and Bryophytes. Morphology and evolution of the gametophyte and sporophyte. Life cycles. Reproduction. Ecology of bryophytes. Phylogenesis of bryophytes. Systematic classification: phylum *Hepatohyta*, phylum *Briophyta*, Phylum *Anthocerotophyta*. The seedless Vascular Plants. Phylogenesis of seedless vascular plants. Systematic classification: phylum *Rhyniophyta*, *Zosterophyllophyta*, *Trimerophytophyta*, *Lycopodiophyta*, *Monilophyta* (0.6 ECTS).

8. Spermatophyta. General description. The ovule evolution. From ovule to seed. Systematics and evolution. Gymnosperms. Origin of gymnosperms. Morphology and evolution of gametophyte and sporophyte. Life cycles. Sexual reproduction. Ecology of gymnosperms. Phylogenesis and systematics: phylum *Coniferophyta*, phylum *Cycadophyta*, phylum *Gingkophyta*, phylum *Gnetophyta*. Ecology, distribution and interests of the following families: *Taxaceae*, *Pinaceae* and *Cupressaceae*.

Angiosperms. General description. Origins of angiosperms. Morphology and evolution of gametophyte and sporophyte. The flower and the fruit. Life cycles. Sexual reproduction. Ecology of angiosperms. Phyologenesis of angiosperms. Classification, description, distribution and interests of the following families of major agronomic importance: *Rosaceae*, *Brassicaceae*, *Fabaceae*, *Apiaceae*, *Lamiaceae*, *Asteraceae*, *Liliaceae*, *Poaceae* (3 ECTS).

Development of the course and examination

Learning evaluation methods

Final assessment is based on a multiple-choice test that consists of 60 questions. The student can choice to divide the examination into two parts (each of 30 questions) to be held at the conclusion of each semester. Furthermore, the preparation of a herbarium of at least 10 plants is optional (1 species for each family treated within the course and 3 specimens for one chosen family among them).

Learning evaluation criteria

To pass the test, the student must demonstrate knowledge of all the issues discussed in the course.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

In the test, each correct answer is awarded 1 point. Wrong and/or invalid answers are worth 0 points. The examination is passed if it reaches the score of 18 equivalent to 36 correct answers out of 60 (or 18 correct answers out of 30 in each partial examination). The realization of the herbarium can be evaluated maximum 3 points to be added to the test vote.

Recommended reading

Evert R., Eichhorn S.– Biologia delle piante di Raven. Settima edizione italiana condotta sull’ottava

edizione americana. Ed. Zanichelli, Bologna. 2013.

Tutorial session

Tuesday and Thursday from 10 am to 1 pm

PLANT BIOLOGY

MARINA ALLEGREZZA

Seat Agraria
A.A. A.A. 2015-2016
Credits 12
Hours 108
Period 2^ semestre

Prerequisites

General knowledge of Biology

Course contents

The didactic method is based on ppt lectures **(8 ECTS**) (provided in copies to the students) and laboratory exercitations and field excursions (**4 ECTS**).

Objectives of the course

Knowledge and understanding.

The course enables the acquisition by the student of theoretical and practical knowledge on the structural and functional characteristics of the plant organisms: from cell level to those of organism and species

Applying knowledge and understanding.

The course develops the ability to apply the main methods for the study of plant biology useful in order to provide students with a comprehensive understanding of plant-environment system. The acquired basic knowledge initiate students to the study of systematic botany and facilitate the understanding of plant ecology content.

Cross-expertise.

The knowledge therorical and methods acquired foster integration with other biological disciplines.

Program

Introduction the Plant Biology. The levels of organization of the plant organisms.

1. Cell biology. The cell theory. The general structure of cell. Prokaryote and eukaryote cells. Main differences between plant cell and animal cell. Methods for the cell study. The eukaryote cell: structure and ultrastructure. The plasma membrane. Cytoplasm and cell organelles. Plastids: Chloroplasts, Leucoplasts and Chromoplasts. Middle lamella. Primary wall. Secondary wall. Secondary modifications of the cell wall. Vacuole and cell sap. Oxalate crystals. Water and solutes absorption: simple and facilitated diffusion, active transport, osmosis, cell turgor and plasmolysis. Cell elongation. (**2ECTS**)

2. Plant tissues . Cell differentiation theory. Cell aggregate and pseudotissues. General characteristics of the tissues. Primary and secondary meristematic tissues. Primary and secondary mature tissues: tegumental, parenchymatic, supporting, conducting, glandular tissues. (**1ECTS**)

3. Plant anatomy. General plant anatomy of the three principal organs. The metamorphosis. Plat life cycles. Steam anatomy: meristematic, elongation and differentiation zones, primary and secondary structure zones. Cambium activity. Omoxilo and eteroxilo wood. The bark. The phellogen activity. Root anatomy: radical apex, root hair region, primary and secondary structure zones. The lateral roots. Leaft anatomy: Monocotyledonous, Dicotyledonous and Coniferous. Leaf morphology and structure. Connections of the steam conducting system with the leaf's one. (**4 ECTS**)

4. Plant physiology. Evaporation and transpiration. The cuticular and stomatic transpiration. Water potential concept. Apoplast and symplast. The water and mineral salts carriage. Water balance . Plant adaptation to soil aridity. Organic solution carriage. The seed: structure, maturation and germination. (**1 ECTS**)

5. Evolution, diversity and classification of plants organisms. Speciation: new genomes origin. Species: meaning, variability and definitions. Individual and populations. Overview on the evolution of the classification methods. Systematics and taxonomy. Nomenclature. The terrestrial plants: water emersion and alternation of generation. Sporophyte and gametophyte. Tallophytae and Cormophytae. Tracheophyta. General characteristics. Systematics and phylogeny. Pteridophyta. Morphological caracteristichs. Vegetative organs origin. Reproduction. Overview on the phylogeny and systematic of the principal *phyla*. Spermatophyta. Description. Ovule. Pollen. Seed. Systematic and evolution. Gymnosperma. General characteristics. Overview on the phylogeny and systematic of the principal *phyla*. *Coniferophyta*: morphological caracteristichs. Reproductive system. Pollination and fertilization, seed. Cycle. Identification of some species by use dichotomous keys. Angiosperma. Morphological characteristcs of the vegetative and reproductive organs. Trunk. Root. Leaf. Flower. Inflorescence. Pollination and fertilization. Seed. Fruit. Dissemination. Cycle. Overview on the phylogeny and systematic. Dicotiledoni and Monocotiledoni. Identification of some species by the use of dichotomous keys. (**4ECTS**).

Development of the course and examination

Learning evaluation methods

Oral examination . The student can still choose whether to support a partial written during the process of the course on the first two parts of the program: the cell (15 multiple choice questions) and plant tissues (12 multiple choice questions and one open) and then complete the examination with oral examination

Learning evaluation criteria

Knowledge on the subjects listed in the teaching program, clear and correct exposition of the content with an adequate technical and scientific language, ability to achieve appropriate connections within matter and to have a complete mastery of the subject.

Learning measurement criteria

The final vote is attributed in thirtieths.

Final mark allocation criteria

The oral test will be divided into five main questions, each of which will be evaluated using a score ranging from 0 to 30 points. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject. For the partial written will be worth the following criteria below. For the cell: 2 points for each correct answer. To the plant tissues: 2 points for each correct answer and between 0 and 6 points for the open question.

Recommended reading

Raven P. H., Evert R. F., Eichhorn S. E., 2002.Biologia delle piante.Zanichelli editore.

Tutorial session

Wednesday from 3 pm to 5 pm.

PLANT BIOLOGY AND ETHNOBOTANY

SILVIA ZITTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 9
Hours 81
Period 1^ semestre

Prerequisites

Basic knowledge of general biology is propaedeutic to the teaching.

Course contents

The course consists of a balance of theoretical lectures (6 ECTS, 54 hours) and laboratory activities and field trips (3 ECTS, 27 hours). During the laboratory activities the students will observe at the optical microscope, anatomical sections of plants. It will also be made one or two educational trips to observe the plants in their natural environment with a focus on wild species of food interest.

Objectives of the course

Knowledge and understanding:

(a) adequate basic knowledge of the structure and functions of cells, with particular attention to the plant cell, plant tissue, anatomy and function;

(b) proper knowledge of systematics and taxonomy of the main families of food-related plants;

(c) knowledge of the aims and methodology of ethnobotanical studies and some of the main uses of wild plants.

Applying knowledge and understanding:

(a) fill any gaps of previous learning experiences in the field of plant biology; (b) understanding the nature of the principal plant foods (anatomical part of the plant to which correspond, by which tissues are formed e presence of main secondary metabolites); (c) ability to assess the recovery potentiality of traditional uses of wild plants in the food sector.

Cross-expertise:

Ability to use the knowledge gained in the field of plant biology to understand the characteristics of different foods, evaluating the selection of raw materials and sourcing environments, recover traditional uses of plants in order to improve the quality and efficiency of food production.

Program

Introduction. The Botany: general characteristics, indagine sectors and methodologies. The plants in the biosphere. The autotrophic and heterotrophic organisms. Prokaryote and eukaryote. Thallophyte and cormophyte.

Cell biology. The cell theory. The general structure of cell. Prokaryote and eukaryote cells. The eukaryote cell: structure and function. Water and solutes absorption. Secondary metabolites: importance for the plant and use by man. Cell elongation. (1 ECTS).

Plant Histology
Cell differentiation theory. Cell aggregate and pseudotissues. General characteristics of the tissues. Primary and secondary meristematic tissues. Primary and secondary mature tissues: tegumental, parenchymatic, supporting, conducting, glandular tissues. (1 ECTS).

Plant anatomy
Plat life cycles. General plant anatomy of the three principal organs. The metamorphosis. Steam anatomy: meristematic, elongation and differentiation zones, primary and secondary structure zones. Cambium activity. Omoxilo and eteroxilo wood. The bark. The phellogen activity. Root anatomy. Leaf anatomy: Monocotyledonous, Dicotyledonous and Coniferous. Leaf morphology and structure. Connections of the steam conducting system with the leaf's one. Leaf metamorphosis.

The flower. Structure and functions. The inflorescences.
The seed: general characteristics, origin and structure. Maturation and germination.

The fruit. Origin, structure and classification. (2 ECTS).
Outlines of plant physiology
Water balance . The cuticular and stomatic transpiration. Apoplast and symplast. The water and mineral salts carriage. Organic solution carriage. Plant adaptation to soil aridity. (0.5 ECTS)

Outlines of plant systematic. Systematics and taxonomy of Angiosperma and characteristics of families important for human diet. (0.5 ECTS).

Mycology

Main morphological characteristics of the fungi (Ascomycota and Basidiomycota), with particular reference to macrofungi with applicative interest.

Ethnobotany. The ethnobotany: general characteristics, fields of investigation and methodologies. Examples of wild food plants and eco physiological bases of their use by man. Wild plants such as vegetable rennet. Medicinal plants. Environments of collecting wild plants. (1 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion on the subjects listed in the teaching program; written examination on the anatomical sections of plants

During the first exam session, at the end of the course, students can choose to take a written test multiple choice, instead of the oral exam.

Learning evaluation criteria

Knowledge of the topics discussed and propriety of scientific language used.

Learning measurement criteria

The final mark is attributed in thirtieths.

Final mark allocation criteria

The examination will be evaluated with a mark in thirtieths.

To get a positive final mark students must demonstrate an overall understanding of the content and express themselves with a proper scientific language.

To get the maximum final mark, the student must demonstrate an excellent understanding of the topics and express themselves with proper scientific language.

Recommended reading

G. PASQUA, G. ABBATE, C. FORNI – Botanica generale e diversità vegetale. Piccin Nuova Libraria S.p.A., Padova.

P.H. RAVEN, R.F. EVERT, S.E. EICHHORN – Biologia delle piante. Zanichelli, Bologna

PLANT ECOLOGY AND GEOBOTANY

MARINA ALLEGREZZA

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge in Plant Biology and Systematic Botany

Course contents

The didactic method is based on ppt lectures (4 ECTS) (provided in copies to the students) and field excursions (2 ECTS).

Objectives of the course

Knowledge and understanding.

The course enables students to acquire and organize knowledge on integrated analyses of plant biodiversity, at species, community and landscape scale.

Applying knowledge and understanding.

The course develops skills to apply methods of floristic and vegetation analysis , useful for identifying ecological bio-indicators useful to assess the relationship between environmental factors and plant cover (at the species, community and plant landscape level); these analyses are basic tools for monitoring, biodiversity conservation and management in applied sciences.

Cross-expertise

The ability to draw an integrated environmental assessment will facilitate the communication with specialists from different disciplines, fundamental for multipurpose environmental studies.

Program

Introduction. The levels of organization of the vegetation cover: species, communities and plant landscape. Ecosystem and plant community. Ecological factors and ecological value. Ecological limiting factors. Plants as bio-indicators. Ecological abiotic and relations with the distribution and adaptation of species and plant communities. Geological-geomorphological, edaphic and climate ecological factors. The bioclimatic classification. The ecological biotic and coexistence between species. Intra- and interspecific competition. Habitat and ecological niche. (**2 ECTS**)

The study of the flora: floristic *analysis.* Richness and floristic diversity. Biological forms. The distribution areal and chorological types. The floristic monitoring (**1 ECTS**).

The study of vegetation. Analysis of plant communities: concepts and methods. The physiognomic-structural method and the floristic-ecological (or phytosociological) method. Plants formation and plant associations. Classification of vegetation. The syntaxonomy. The habitats of Community interest. The main forest formations in the Mediterranean, subMediterranean and Apennine areas. Vegetation dynamics: actual potential vegetation and dynamic succession. Primary and secondary grasslands. The role of the ecotone vegetation. The plant landascape: series and geoseries. Geobotany and Landscape Ecology. Sustainable management and biodiversity conservation. (**3 ECTS**)

Development of the course and examination

Learning evaluation methods

Oral examination

Learning evaluation criteria

Knowledge on the subjects listed in the teaching program, clear and correct exposition of the content with an adequate technical and scientific language, ability to achieve appropriate connections within matter and to have a complete mastery of the subject.

Learning measurement criteria

The final vote is attributed in thirtieths.

Final mark allocation criteria

The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

Biondi E., Ecologia. In: Enciclopedia delle Scienze, De Agostini, Novara

Pedrotti F. & Venanzoni R., Geobotanica, in Enciclopedia delle Scienze. De Agostini, Novara.

Biondi E. et al., 2010. Le serie di vegetazione della Regione Marche. In “La vegetazione d’Italia” C. Blasi ed., Palombi Editori

Pignatti S., Ecologia vegetale. Zanichelli, Bologna.

Pignatti S., Ecologia del paesaggio. Zanichelli, Bologna

Tutorial session

Wednesday from 3 pm to 5 pm.

PLANT GENETICS

STEFANO TAVOLETTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 9
Hours 81
Period 1^ semestre

Prerequisites

The following topics are propaedeutic to the teaching: basic knowledge of chemistry and plant biology.

Course contents

The course consists of a balance of theoretical lectures(6 ECTS, 54 hours) and other activities, such as classroom practicals, carried out individually or in small groups, seminars and visits to local and national food plants and factories (3 ECTS, 27 hours, in all).

Objectives of the course

Knowledge and understanding:

(a) adequate knowledge and understanding about plant genetics and its applications to the food sectors; (b) knowledge of genetic structure of raw materials used to obtain foods directly or after industrial processing; (c) Mendelian genetic analysis and its application through new genetic technologies; (d) Molecular genetics applied to the food sector: genome and gene structure, cloning and DNA fragment analysis, gene isolation, molecular markers, genetic engineering.

Applying knowledge and understanding:

(a) developing the capability of identifying and interpreting applications of genetics to the food sector; (b) applying knowledge about the genetic structure of food and understanding of its relationship with agricultural, environmental and sanitary sustainability; (c) apply basic genetic principles to the food industry; (d) understand and critically apply recent knowledge in molecular genetics to biotechnological food industry, food traceability and genetic engineering.

Cross-expertise:

(a) making judgements: capability of identify the information be needed to improve the efficiency of food production system; (b) communications: capability of clearly and exhaustively communicate notions, ideas, problems and technical solutions involving genetics principles in food production.

Program

Section 1. Molecular Basis of Heredity (1 ECTS)

The structure of nucleic acids; DNA replication; Transcription, Traduction, the Genetic Code; Gene Structure; Chromosome Structure; Genic, Chromosomal and Genomic Mutations; Transposable Genetic Elements.

Section 2. Mendelian Analysis (4 ECTS)

Mitosis and Meiosis; Segregation and recombination; Mendelian analysis: single gene, two or three genes; Linkage mapping in autogamous and allogamous species; Chi-square test applied to two point and three point linkage mapping; Multiple allelism; Epistasis, Complementary Gene Action, Lethal Alleles, Pleiotropy, Penetrance and Expressivity; Population Genetics and Quantitative genetics (principles).

Section 3. Molecular Genetics (4 ECTS)

Genome organization; Regulation of gene expression; The extranuclear genome; Cloning vectors; DNA probes; PCR and Real Time PCR; Molecular Markers and their application to Food science; Mendelian Analysis using Molecular Markers; Fingerprinting and Analysis of Genetic Diversity using Molecular Markers; Molecular markers in Food traceability systems; Principles of Quantitative Genetics and QTL mapping. Genetic control of gluten proteins and their relationship with Coeliac and Gluten Sensitivity diseases; Genetic Engineering in agriculture.

Development of the course and examination

Learning evaluation methods

Oral exam.

Learning evaluation criteria

The student will have to demonstrate: (a) sound knowledge of basic genetics covered in Section 1 of the course; (b) ability to perform genetic linkage analysis based on morphological and molecular markers; (c) knowledge of molecular genetics methods and their application to gene characterization, fingerprinting and traceability systems; (d) knowledge of aspects related to genetic uniformity, gluten proteins and GMO and their consequences on food production system.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 with honors.

Final mark allocation criteria

The oral examination consist of at least three questions concerning the subjects listed in the three Sections of the teaching program, each one being quantified in the range 0 - 10.

In order to pass the examination, the student will have to demonstrate: (a) overall understanding of the subjects; (b) appropriate usage of technical terminology. In order to obtain the best evaluation, the student will have to demonstrate: (a) in-depth knowledge and understanding of the subjects; (b) fluency in the usage of the technical lexicon; (c) ability to solve simple problems.

Recommended reading

Lorenzetti F., Ceccarelli S., Veronesi F., 1996. Genetica Agraria. Patron Editore, Bologna.

Barcaccia G., Falcinelli M., 2005. Genetica e Genomica – Volume I Genetica Generale. Liguori Editore.

Barcaccia G., Falcinelli M., 2006. Genetica e Genomica – Volume III Genomica e Biotecnologie Genetiche. Liguori Editore.

Handouts and publicationsprovided by the teacher..

PLANT PATHOLOGY

GIANFRANCO ROMANAZZI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic knowledge of plant biology and chemistry.

Course contents

The didactic method is based on ppt lectures (6 ECTS) (provided in copies to the students), in addition laboratory experiences and guided tours inside farms will be organized in order to put into practice what the students have learned in class (3 ECTS). The course will be also available through an e-learning version using the Moodle platform. Within this platform, the students will find teaching materials, organized in learning units, supplemental literature material, guided tour information and reservations.

Objectives of the course

Knowledge. The course enables students to acquire appropriate knowledge about the main pre and postharvest plant diseases induced by fungi, bacteria, virus and phytoplasma.

Applying knowledge and understanding. The main aim of this course is to provide a fully development ability of the students to identify the diseases of main Mediterranean crops.

Cross-expertise. (i) making judgements: identifying the information needed to detect and manage plant diseases; (ii) communications: communicate clearly and comprehensively information, ideas, problems and related technical solutions to interlocutors, either professional or not, representative of the various and specific competencies in the plant protection sector (winemakers, growers, administrators, journalists, lawyers, biologists, engineers, architects, etc.). In order to improve the independent development and the communication skills of students, it is proposed the study of specific topics carried out in a teamwork with a final delivery report.

Program

Concept of diseases in plants, symptoms (morphological and physiological changes in infected plants), evaluation of losses induced by plant diseases (1.5 ECTS).

Detection of plant pathogens: classical (humid chamber, microscope identification, isolation on agar media), serological (ELISA, Lateral Flow Test) and molecular (PCR, qRT-PCR, RAPD, RFLP, IC-PCR, nested PCR, PCR-ELISA, molecular hybridization, microarray, barcoding, LAMP, RNA-Seq) tools (2.5 ECTS).

Development of diseases in plants: disease cycle, host, pathogen and environmental effects on the development of plant diseases; plant-pathogen interactions, recognition mechanisms between host and pathogen; susceptibility and resistance. Plant disease epidemiology. Agronomic, legislative, physical, genetic, biological and chemical means to control plant diseases. Control methods in organic and integrated pest management (1.5 ECTS).

Characteristics and classification of the causal agents of diseases of main crops of Mediterranean area (fungi, bacteria, viruses, viroids, phytoplasma). Plant diseases caused by fungal-like organisms and fungi (downy mildews, powdery mildews, gray mold, brown rot, apple scab, sour rot, secondary rots, Esca disease, black rot, Eutypiosis, Verticillium wilt, root rots, rusts), bacteria (olive rapid decline complex, crown gall, olive knot, fire blight), viruses (fanleaf, leafroll, rugose wood, fleck, asteroid mosaic, main viral diseases of stone fruits, olive, and vegetables) and phytoplasma (Flavescence dorée, Bois noir, European Stone Fruit Yellows) (3.5 ECTS).

Development of the course and examination

Learning evaluation methods

The final exam will be based on an oral discussion.

Learning evaluation criteria

During the oral exam, the student will have to demonstrate: (i) knowledge of the disease symptoms, the life cycle and the control means of plant pathogens; (ii) knowledge of the main diagnostic tools for plant pathogens; (iii) knowledge of the main plant diseases caused by fungi, bacteria, virus, viroids, and phytoplasma. To pass the oral exam, the student need to demonstrate an overall understanding of the content using appropriate technical terminology; in addition, the student have to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of four main questions, each of ones will be quantified in the range 0 – 7.5. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

Belli G., 2012. Elementi di Patologia Vegetale. Piccin editore

Agrios G.N., 2004. Plant Pathology - 5th Edition. Elsevier Academic Press

Bautista-Baňos S., Ed., 2014. Postharvest decay – Control Strategies. Academic Press

Muccinelli M., 2011. Prontuario degli agrofarmaci - XIII edizione. Edagricole

Savino V., Amenduni T., Bazzoni A., Boscia D., Pollastro S., Saponari M. Validazione e trasferimento alla pratica agricola di norme tecniche per l'accertamento dello stato sanitario di specie ortofrutticole per patogeni pregiudizievoli alla qualità delle produzioni vivaistiche. Atti Progetto POM A32, Volumi I e II, 2001. www.agr.uniba.it/poma32

Giunchedi L. 2003. Malattie da virus, viroidi e fitoplasmi degli alberi da frutto. Edagricole, 2003

Conti M., Gallitelli D., Lisa V., Lovisolo O., Martelli G.P., Ragozzino A., Rana G.L., Vovlas C., 1996. I principali virus delle piante ortive. Edagricole

Tutorial sessions

Tuesday and Wednesday, from 5 pm to 7 pm

PRESERVED FOODS AND FOOD ADDITIVES

MASSIMO MOZZON

Seat Agraria
A.A. A.A. 2015-2016
Credits 12
Hours 108
Period Corso annuale

Prerequisites

The following topics are propaedeutic to the teaching: basic knowledge of food chemistry, biochemistry and microbiology; basics on the technologies and energy management of the agro-food factories; knowledge of the unit operations of the food processing.

Course contents

The course consists of a balance of theoretical lectures (8 ECTS, 72 hours) and other activities, such as classroom practicals, carried out individually or in small groups, seminars and visits to local and national food plants and factories (4 ECTS, 36 hours, in all). The educational material, organised in learning units, is also available on the e-learning web platform.

Objectives of the course

Expected learning outcomes

Knowledge and understanding:

(a) adequate knowledge and understanding about the strategies of food preservation processes in order to both ensure safety and prolong shelf-life; (b) knowledge of regulatory and technological aspects of the main sorts of preserves and semi-preserves obtained from animal and vegetable raw materials; (c) knowledge of regulations, characteristics and uses of the main functional categories of “food improvement agents” (food additives, food enzymes and food flavourings).

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 unit operation) and in vertical way (reasonable sequence of unit operations along the production chain); (b) capability of carry out strategies for the optimization of a technological or biotechnological process for the production of food and beverages; (c) capability of evaluate the potentiality of innovative technologies in food

processes.

Cross-expertise:

(a) making judgements: capability of identify the information be needed to improve the efficiency of the processes and the quality of the final products; (b) communications: 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 agro-food supply chain (engineers, biologists, chemists, nutritionists, administrators).

Program

1. Overview about national and worldwide food industry (credits: 0.5 ECTS).

2: Strategies of food preservation: (2a) thermal treatments (blanching, pasteurization, heat sterilization); (2b) techniques and technologies founded on the control and manage of temperature, water activity, pH, oxygen level: concentration, drying and freeze-drying, salting and pickling, addition of sugars, acidifying, smoking, refrigeration and freezing, modified atmosphere packaging (2 ECTS).

3. Food additives, food enzymes and food flavourings: definitions, requirements, functions and range of applications. Main functional classes of food additives: preservatives, colours, emulsifiers. Food hydrocolloids: rheologic properties and uses of hydrophilic polymers of vegetable, animal, and microbial origin (starch, pectin, galactomannans, carrageenans, alginates, xanthan gum) and of animal proteins (collagen, milk proteins, plasma proteins) (3.5 ECTS).

4. Common preliminary steps in the preparation of raw fruits and vegetables: receiving, washing, sorting, removal of inedible parts (peeling, coring, de-stoning), blanching (1 ECTS).

5. Fruit and vegetable processing: tomato based products (peeled, concentrated, dehydrated); pulses processing (canning, drying, freezing); pickled and fermented vegetables (baby onions, gherkins, peppers, olives, sauerkraut; fruit juices (grapes, apple, cherry, soft fruits, pineapples, carrots) and nectars (pear, peach, apricot); citrus products (juices, essential oils); sweet fruit preserves (jams and jellies, canned fruits, candied fruits) (3 ECTS).

6. Meat and fish processing: cured ham, cooked ham, meat emulsions, tuna processing (2 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the teaching program, one of which will be chosen by the student.

Learning evaluation criteria

The student will have to demonstrate: (a) sound knowledge of definitions and regulatory aspects of food preserves and semi-preserves; (b) knowledge and understanding of the reasons for the technical and technological choices that characterize the process flow-sheets; (c) sound knowledge of definitions, requirements, functions and range of applications of the main functional classes of food additives; (d) appropriate usage of the technical lexicon.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 with honors.

Final mark allocation criteria

The oral examination consist of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10.

In order to pass the examination, the student will have to demonstrate: (a) overall understanding of the subjects; (b) appropriate usage of technical terminology. In order to obtain the best evaluation, the student will have to demonstrate: (a) in-depth knowledge and understanding of the subjects; (b) fluency in the usage of the technical lexicon; (c) ability to solve simple problems about modifications of the process parameters or the sequence of unit operations.

Recommended reading

Carlo Pompei - La trasformazione industriale di frutta e ortaggi. Edagricole-Il sole 24 ore. Bologna. 2005.

Y. H. Hui, E. Özgül Evranuz. Handbook of Vegetable Preservation and Processing, Second Edition. 2015, by CRC Press.

Y. H. Hui. Handbook of Meat and Meat Processing, Second Edition. 2012, by CRC Press.

Cerutti G. Residui, additivi e contaminanti degli alimenti. II edizione. Tecniche Nuove, Milano, 2006.

All other educational material is available on the e-learning web platform.

PRINCIPLES OF ECONOMICS (Module 1 C.I.)

MATTEO BELLETTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

High school algebra and basic geometry

Course contents

In this module, you will learn the major concepts in microeconomics, macroeconomics and financial markets. Moreover, these concepts will be focused with particular regard to the political economy of natural resources and sustainable development. At an organizational level, the present module is based on 36 hours (4 ECTS) of lectures complemented by 18 hours (2 ECTS) of practice and an ongoing e-learning activity using the *Moodle* open source platform. The e-learning activity will include: (i) teaching materials composed by different learning units; (ii) Self-assessment tests; (iii) Cooperating and community-based activities aimed to leverage the training process on communication and e-learning feedback; (iv) e-assessment.

Objectives of the course

Knowledge. In this module, firstly you will acquire the fundamental knowledge about the behaviour of three key economic agents: consumers, firms and government. Analyzing the choices made by these economic agents is one of the main subjects of *microeconomics*. Secondly, you will study a basic framework for understanding of the macroeconomy. In this regard, a comprehensive outline of the most important *macroeconomics* concepts such as recession, unemployment, inflation and national accounts will be provided during the module. Finally, the functioning of the *financial markets* will be afford for understanding origin and development of the current global financial crisis.

Applying knowledge and understanding. The first aim of this module is to provide the aptitude to understand an integrated outline of the world economy with particular regard to the current socio-economic crisis and the climate change. The second aim is to provide a training activity effective in boosting the economical thinking applied to the dilemma of sustainable development in the XXI century. Finally, an essential toolbox to read how the financialization of the globalized economy affects both individuals and society will be provided.

Cross-expertise. (i) Capability in contextualizing a theoretical framework with the aim to read the hidden structure of a complex empirical problem; (ii) Systems thinking: capability in developing the skills to look for the large picture beyond individual perspectives. Systems thinking has been defined as an approach to problem solving that attempts to balance holistic (diffuse) thinking and focused

(reductionistic) thinking; (iii) Communication: capability in clearly and exhaustively communicating notions, ideas, problems and technical solutions to interlocutors, either professional or not, representative of the various and specific competencies in the forestry environment (engineer, architect, biologist, administrator).

Program

INTRODUCTION TO MICROECONOMICS (2 ECTS)

The principles of economics, comparative advantage; supply and demand; market efficiency and government intervention; elasticity; production and costs; competitive output; firms with market power; public goods, common resources, and externalities.

INTRODUCTION TO MACROECONOMICS (2 ECTS)

An overview on modern macroeconomics; macroeconomic data and the economics of free trade; gross domestic product; national income identity; inflation; unemployment; exchange rate; macroeconomic equilibrium in the long run.

INTRODUCTION TO FINANCIAL MARKETS (2 ECTS)

Basic principles of finance and risk management; introduction to derivatives; saving-investment balance; Ponzi scheme; global financial crisis.

Development of the course and examination

"Principles of Economics and Statistics" is an integrated course consisting of two modules: Principles of Economics (6 ECTS) and Principles of Statistics (3 ECTS). Each module is independently evaluated, but with a unique final grade, resulting from the weighted average of the grades obtained in the two modules (weights results from the respectivenr of ECTS for each module).

Learning evaluation methods

WRITTEN TEST: (i) multiple choose; (ii) four optional answers for each question; (iii) true/false answers present candidates with a binary choice: a statement is either true or false.

ORAL EXAM: the oral exam is optional for those students who have passed the written test.

E-ASSESMENT: assessment in Moodle can takes different shapes. However, in the present module the Moodle assignment submission will be the type of e-exam utilized.

Learning evaluation criteria

WRITTEN TEST: (i) twenty questions, which concern the whole program developed during the module; (ii) each correct answer scores 1.5 point.

ORAL EXAM: three questions selected by the examiner from the whole program.

E-ASSESMENT: the e-assessment will be used in order to integrate the student evaluation criteria. The student participation in the e-exam is optional.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

WRITTEN TEST: 20 (correct answers) * 1.5 (points) = 30/30. The minimum grade to pass the written test is 18/30 (12 correct answers).

ORAL EXAM: if you passed the written test, you can freely decide to take also the oral exam for integrating the score obtained in the written test. On the other hand, if you did not pass the written test you have to take the oral exam. The oral examination consists of three questions concerning the subjects listed in the teaching program; each of ones scores up to 10 points. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

E-ASSESMENT: the e-assignment submission scores up to 5 point to the overall evaluation.

Recommended reading

1. Mankiw, N.G. and Taylor, M.P. *Principi di economia.* Zanichelli;
2. Frank, R.H. and Bernanke, B.S. *Principi di economia*. McGraw-Hill;
3. Samuelson, P.A., Nordhaus, W.D. and Bollino, C.A. *Economia.* McGraw-Hill;
4. Chatnani, N. *Commodity Markets: operations, instruments and applications*. McGrawHill.

Tutorial session

Wednesday from 12.30 pm to 14.30 pm.

PRINCIPLES OF ECONOMICS (Module 1 C.I.)

DANILO GAMBELLI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic skills in mathematics

Course contents

The course provides basic principles of economic theory, and is structured in three parts: microeconomics, basic accountancy principles for farms, macroeconomics. Lecturing (4 ECTS) is integrated with practical session (business simulation, forest valuation and land appraisals) based on spreadsheet and other software (2 ECTS). The course is also supported by the e-learning Moodle platform. This web tool provides: (i) teaching materials specific for each learning units; (ii) self-assessment tests; (iii) forums for feedback and discussion on selected issues.

Objectives of the course

Knowledge. The course provides a thorough degree level education in economics with the focus on economic theory and its applications. The course enables students to acquire the fundamental knowledge about general economic issues, and to provide basic knowledge and competences for the economic management of farms; it also aims to provide basic knowledge and competences for next economic courses.

Applying knowledge and understanding. The main aim of this course is to provide students with capabilities to understand and interpret the main economic issues and their practical effects on the management of a farm and of agricultural markets. Economic policy and analysis modules further focus on the application of economic theory and tools to the analysis of key societal and policy challenges

Cross-expertise. (i) making judgements: capability of identify the information needed to understand the economic environment of the agro-food business; (ii) communications: 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 agro-food business.

Program

Part I - Microeconomics (3.5 ECTS)

- Theory of demand: needs and goods; individual and aggregate demand, determinants of demand functions, indifference curves, budget constrain; demand elasticity and goods classification, consumers' surplus.
- Theory of production: production function, efficiency concepts, law of diminishing returns; cost functions in short and long-term perspectives, conditions for profit maximisation.
- Main market models: perfect competition markets, monopolistic competition markets, oligopolistic markets, and monopolistic markets.
- An introduction to public and natural goods, externalities, and market failures.

Part II - Basic accountancy principles for farms (1 ECTS)

- Basic principles of financial mathematics
- An introduction to farm accountancy with a microeconomic perspective.

Part III – Macroeconomics (1.5 ECTS)

- Key concepts from macroeconomics: GDP, growth and development, money, inflation and interest.
- A short overview on the main financial markets and instruments and on the main actors in the international economic and financial context.

Development of the course and examination

Final assessment methods

"Principles of Economics and Statistics" is an integrated course consisting of two modules: Principles of Economics (6 ECTS) and Principles of Statistics (3 ECTS). Each module is independently evaluated, but with a unique final grade, resulting from the weighted average of the grades obtained in the two modules (weights results from the respective number of ECTS for each module).

Learning evaluation methods

Written test and oral tests, both throughout the whole course program. Written test are based on multiple-choice tests are aimed to test the learning of the concepts discussed in the course, and in particular the aspects relating to economic competitiveness conditions.

Learning evaluation criteria

Students are required to demonstrate competences and knowledge on all the three parts of the course contents; they also must demonstrate an overall understanding of the course content using appropriate technical terminology, and should be be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

Multiple-choice tests are structured as follows: approximately thirty questions each with three response options, of which only one correct option. The test is structured so as to be able to select only one option for each question. The correct option generates a positive unit score, wrong options generate a negative fractional score (ranging between -0.3 and -1 depending on the severity of the issue). For the completion of the test is given a time limit within which the applicant may enter, modify or cancel the options for each question.

The oral test is only accessible to those who obtain a passing grade for the written test.

Final mark allocation criteria

The final grade is based on the written test score and the evaluation of the oral test; passing the written test is not in itself sufficient condition for passing the exam. It may be arranged during the course some practical sessions in the form of processed spreadsheet that may contribute to the definition of the final vote (in an amount of not more than 3/30).

Recommended reading

Recommended readings:

Textbook:

Sloman J., Garratt, D., Elementi di economia, Il Mulino, 2010.

Additional texts and scientific papers will be available from the Moodle website of the course.

Tutorial sessions: Wednesday 3-5 pm

PRINCIPLES OF STATISTICS (Module 2 C.I.)

ROBERTO PAPA

Seat Agraria
A.A. A.A. 2015-2016
Credits 3
Hours 27
Period 2^ semestre

Prerequisites

None

Course contents

Students will be guided through the course by structured lectures (2 ECTS) and relevant practical classes (1 ECTS) to acquire the principles of statistics and their most common applications. In parallel, an e-learning version of the course using the Moodle platform will be available, including teaching materials organized in learning units, exercises, self-evaluation tests and results.

Objectives of the course

Knowledge and skills. The aim of the course is to provide a basic information on statistical methods and biometry, for understanding the main features of data analysis and their proper application.

Applying knowledge and understanding. The aim of the course is to provide a basic information on statistics, for the understanding of the main applications and concept in order to enable a basic tool for experimental design, data analysis and data presentation. Moreover, the course will provide the tools to understand the most common statistical applications utilized in scientific and technical literature.

Cross-expertise: (i) acquisition of skills related to the sampling, experimental design and data analysis of various type of data; (ii) capability of understanding the meaning of the results of statistical analysis reported in the scientific and technical literature.

Program

Introduction and descriptive statistics: The scientific method, Measurements of natural phenomena, Empirical distributions, Descriptive statistics, Variability and graphical representation of data (1 ECTS).

Inferential statistics: Populations and samples, Probability and hypothesis testing, Distribution of probabilities, Confidence intervals and mean comparisons, t test and Analysis of Variance (ANOVA), Correlation and regression analysis, Non-Parametric methods (2 ECTS).

Development of the course and examination

Final assessment methods

"Principles of Economics and Statistics" is an integrated course consisting of two modules: Principles of Economics (6 ECTS) and Principles of Statistics (3 ECTS). Each module is independently evaluated, but with a unique final grade, resulting from the weighted average of the grades obtained in the two modules (weights results from the respective number of ECTS for each module).

Learning evaluation methods

Final assessment will consist of a written test based on exercises on of the subjects listed in the teaching program. During the course, will be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

In the written test the student will have to complete successfully at least 3/5 of the exercises that will be designed to evaluate: a) the ability to utilize the most common descriptive statistics for data analysis (including graphical representation) applied to various types of data; b) understanding of the principles of probability and hypothesis testing; c) ability to use and understand the results of inferential statistical applications and d) the ability of designing simple statistical experiments.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The written test consists of five exercises concerning the subjects listed in the teaching program,

each one will be evaluated within the range 0 - 6. The maximum grade 30 “cum laude” is attributed to students demonstrating complete mastery of the subject.

Recommended reading

Michael C. Whitlock, Dolph Schluter, 2008. The Analysis of Biological Data, Roberts and Company Publishers

Tutorial session

Thursday from 3 pm to 5 pm.

PRINCIPLES OF STATISTICS (Module 2 C.I.)

ROBERTO PAPA

Seat Agraria
A.A. A.A. 2015-2016
Credits 3
Hours 27
Period 2^ semestre

Prerequisites

None

Course contents

Students will be guided through the course by structured lectures (2 ECTS) and relevant practical classes (1 ECTS) to acquire the principles of statistics and their most common applications. In parallel, an e-learning version of the course using the Moodle platform will be available, including teaching materials organized in learning units, exercises, self-evaluation tests and results.

Objectives of the course

Knowledge and skills. The aim of the course is to provide a basic information on statistical methods and biometry, for understanding the main features of data analysis and their proper application.

Applying knowledge and understanding. The aim of the course is to provide a basic information on statistics, for the understanding of the main applications and concept in order to enable a basic tool for experimental design, data analysis and data presentation. Moreover, the course will provide the tools to understand the most common statistical applications utilized in scientific and technical literature.

Cross-expertise: (i) acquisition of skills related to the sampling, experimental design and data analysis of various type of data; (ii) capability of understanding the meaning of the results of statistical analysis reported in the scientific and technical literature.

Program

Introduction and descriptive statistics: The scientific method, Measurements of natural phenomena, Empirical distributions, Descriptive statistics, Variability and graphical representation of data (1 ECTS).

Inferential statistics: Populations and samples, Probability and hypothesis testing, Distribution of probabilities, Confidence intervals and mean comparisons, t test and Analysis of Variance (ANOVA), Correlation and regression analysis, Non-Parametric methods (2 ECTS).

Development of the course and examination

Final assessment methods

"Principles of Economics and Statistics" is an integrated course consisting of two modules: Principles of Economics (6 ECTS) and Principles of Statistics (3 ECTS). Each module is independently evaluated, but with a unique final grade, resulting from the weighted average of the grades obtained in the two modules (weights results from the respective number of ECTS for each module).

Learning evaluation methods

Final assessment will consist of a written test based on exercises on of the subjects listed in the teaching program. During the course, will be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

In the written test the student will have to complete successfully at least 3/5 of the exercises that will be designed to evaluate: a) the ability to utilize the most common descriptive statistics for data analysis (including graphical representation) applied to various types of data; b) understanding of the principles of probability and hypothesis testing; c) ability to use and understand the results of inferential statistical applications and d) the ability of designing simple statistical experiments.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The written test consists of five exercises concerning the subjects listed in the teaching program, each one will be evaluated within the range 0 - 6. The maximum grade 30 “cum laude” is attributed to students demonstrating complete mastery of the subject.

Recommended reading

Michael C. Whitlock, Dolph Schluter, 2008. The Analysis of Biological Data, Roberts and Company Publishers

Tutorial session

Thursday from 3 pm to 5 pm.

PRODUCTION OF FOOD CROPS

MARCO TODERI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Knowledge of plant biology

Course contents

The didactic method is based on ppt lectures (5 CFU) (provided in copies to the students) and guided tours in farms (1 CFU).

Objectives of the course

Knowledge and understanding

The course enables students to acquire the fundamental knowledge of agronomic and environmental factors affecting quantity and quality of crop production for human consumption.

Applying knowledge and understanding

The student will acquire the following skills : a) analyze the agri- environmental fertility; b) identify the best agronomic techniques to achieve a good quality of crops production for the food chain; c) knowledge of analysis techniques the quality of production

Cross-expertise

a) capability of identify the information needed to manage the environmental fertility; b) ability for individuate the information on the base of which it is possible improve the crops production for the food quality; c) capability of clearly communicate notions, ideas, problems and technical solutions to representative of the various and specific competencies in the food chain production (farmers, biologist, chemists)

Program

1) Agrometeorology. Chemical-physical characteristics of soils. Grain-size, structure, porosity, inorganic and organic matter. (1 ECTS)

2) Soil tillage. Objectives, preparatory-complementary-consecutive tillage, minimum tillage, no tillage. (1 ECTS)

3) Irrigation. Objectives, technical elements, irrigation systems, quality of irrigation water. (1 ECTS)

4) Fertilization. Plant nutrients classification, mineral fertilization criteria (nitrogen, phosphorus potassium), organic fertilizer. (1 ECTS)

5) Crops: wheat, barley, pea, potato, tomato. (3 ECTS)

Development of the course and examination

Learning evaluation methods

Oral discussion.

Learning evaluation criteria

In the oral classwork, the student will have to demonstrate: (a) knowledge of the recognition of the main factors influencing crops production; (b) knowledge of the agronomic techniques for the crops production; (c) Knowledge of the qualitative parameters of the analyzed crops. To pass the oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths.

Final mark allocation criteria

The oral examination consists of two questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 15. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

1) F. Bonciarelli, U. Boncairelli, 2003. Fondamenti di Agronomia. Edagricole, Milano

2) Coltivazioni Erbacee. Patron Editore

RURAL APPRAISAL

ADELE FINCO

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge of Economics

Course contents

The didactic method is based on ppt lectures (4 ECTS) (provided in copies to the students) and laboratory experiences (2 ECTS). The course will be also available through an e-learning version using the Moodle platform. Within this platform, the course will be divided into: (i) teaching materials composed by different learning units; (ii) rural appraisal example

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge of rural appraisal methods necessary of professional skill.

Applying knowledge and understanding. The main aim of this course is to provide the knowledge of basic theory of rural appraisal and methods of valuation rural goods and agricultural land capital.

Cross-expertise. (i) making judgements: capability to identify the information useful in the professional side (ii) communications: capability of clearly and exhaustively communicate notions, ideas, problems and valuation solutions.

Program

Principles of Rural Appraisal theory and Assumptions and estimation procedures (1 ECTS)

- Concepts of financial mathematics and Land Cadastre

The market value of private goods in the agricultural context (1 ECTS)

- The land appraisal: characteristics of the land market, estimate for comparison analysis and identification market values
- Appraisal of farms and rural real estate

Legal context (1 ECTS)

- Appraisal of real property rights: Land expropriation compensation;
- Appraisals in succession and division of the estate

Cost accounting and concept of business plan (1 ECTS)

The evaluation methods will be investigated with the analysis of several case studies (2 ECTS)

Development of the course and examination

Learning evaluation methods

Written test (70%) and Oral discussion (30%)

Learning evaluation criteria

In the written test the student will have to demonstrate: (i) problem solving concerning the rural valuation; in the oral discussion the student will have to demonstrate: (ii) knowledge basic theory and technical terminology.

The admission to oral examination includes passing to written test. To pass the oral exam, the student must to have demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths between written and oral test. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The written test concerning estimation exercise of rural goods. The oral examination consists of questions concerning the subjects listed in the teaching program. Each of ones will be quantified in the range 1-30 by weighted average. The degree of 30 “cum laude” is attributed when the student

demonstrates complete mastery of the subject.

Recommended reading

Michieli I., Michieli M., 2002. Manuale di Estimo – Edagricole, Bologna

Gallerani V., Zanni G., Viaggi D., 2004. Manuale di Estimo, Mc Graw Hill, Milano.

Tutorial session

Tuesday from 3 pm to 5 pm.

RURAL BUILDINGS AND BASICS OF GEOMATICS

ERNESTO MARCHEGGIANI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basics of physics, computer science, animal science, agronomy and ecology.

Course contents

The course consists of theoretical lectures (4 ECTS) whose teaching material (slides and pdf) will be provided online. Lectures are integrated by lab exercises involving students in, individual and group, design activities (2 ECTS). The course is also given in blended mode (e-learning) by the faculty Moodle platform, where: (i) teaching units; (ii) the most valuable design works from previous years, (iii) self-assessment tests; (iv) reference books; (v) field trips grid and enrolling lists; (vi) forum and other e-learning tools, are made available.

Objectives of the course

Knowledge and understanding:

the course allows student become informed users and critical consumers of (i) Geomatics (cartography, GIS/CAD and remote sensing) and get acquaintance with (ii) the main stages characterising rural building and vernacular heritage strategic planning and design. Special attention will be drawn to the European union regulations.

Applying knowledge and understanding:

The course aims at two objectives: (i) applying the knowledge of Geomatics to manage geo-information at both territorial as well as local scale, being able to perform the monitoring of rural building and vernacular heritage patrimony and the changes of its surrounding rural territorial setting; (ii) being at the same time able to perform suitable and sound design essays to refurbish, preserve and valorize given rural buildings, delivering the main technical annexes (reports, drawings, maps, plans and 3D renderings).

Cross-expertise:

(i) independent judgment: ability to integrate the specific pieces of knowledge gained during the course with those acquainted in other basic disciplines, been able to understand its synergic added value in the broader context of the entire curriculum; (ii) communication skills: ability to transfer in a clear and comprehensive way the outcomes of his own work (reports, drawings, maps, plans and 3D renderings) using an appropriate scientific; (iii) team-building: ability to enhance social relations and define roles within teams, often involving collaborative design tasks.

Program

1. Introduction: origin, definitions, content and fields of application of Geomatics, relationships linkages between buildings and its territory (0.5 ECTS).

2. General cartography: elements of geodesy, introduction to the history of cartography, cartographic language, maps classification, basics of topographic mapping, features and contents of topographic and thematic maps, category of projections and cartographic coordinates systems, concept of datum and its applications, scale/information ratio, accuracy, interpretation of topographic maps, main applicative issues and exercises (1 ECTS).

3. Italian official cartography: national and regional mapping system, main sources of geo-information, online cartographic portals and web-GIS systems (0.5 ECTS).

4. Digital cartography and Geographic Information Systems (GIS): vector and raster formats, general architecture, models and data structures, spatial and logical-mathematical operators, fields of application, basis of Remote Sensing and its applications (1 ECTS).

5. Acquisition and interpretation of geo-information and context analysis: integrated survey of rural buildings, survey and data analysis; refurbishment and reuse of rural buildings; the design steeps, basics, approaches and methods (CAD), national legislation and examples of international references, , individual or group design essay (1 ECTS).

6. Valorization and functionalization of rural buildings and of rural vernacular heritage: definition of vernacular architecture, international cultural references, functional categories and technologies in relation to the local context and the evolution of the agricultural systems (1 ECTS).

7. Elements of building technology: building materials and their properties; main elements of a rural building. Buildings for livestock production: stables for cattle, pigs and Poultry (1 ECTS).

Development of the course and examination

Learning evaluation methods

The course concludes with an oral presentation of the group or individual design work, the oral essay continues with a discussion on two subjects among those listed in the program. During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

To pass the oral exam, the student must demonstrate proper knowledge of the topics covered in the course and listed in the program, showing his mastery over the discussed topics with a proper scientific-technical language.

Learning measurement criteria

The final mark is scored in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral discussion consists of two parts: (i) a critical review of the contents and the outcomes of the design work; (ii) questions concerning the subjects listed in the program. Each part will be quantified in the range 0 – 30, the final score is calculated on the average value. The pass mark of 30 “cum laude” is given when the student demonstrates a complete mastery of the subject.

Recommended reading

1. Gomarasca M.A., 2004. Elementi di Geomatica, Edizioni AIT

2. Burrough P.A. e McDonnell R.A., 1998. Principles of Geographical Information Systems, Oxford University Press, 1998

3. Chiumenti R., 2004. Costruzioni Rurali, Edagricole, Bologna.

4. Anselmi S., Volpe G., 1987. Architettura popolare in Italia: Marche, Editori Laterza, Bari.

5. Palombarini A., Volpe G., 2002. La casa di terra nelle Marche, Federico Motta Editore

6. Agostini S., Failla S., Godano P., 1998. Recupero e valorizzazione del patrimonio edilizio, Franco Angeli, Milano.

7. V. Ingegnoli, E. Marcheggiani et al., 2015. Landscape Bionomics Biological-Integrated Landscape Ecology, Springer-Verlag Mailand

Tutorial sessions

Wednesday 14 pm - 16 pm

SOIL EVALUATION AND MAINTENANCE (Module 1 C.I.)

GIUSEPPE CORTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Good knowledge of mathematics, physics, pedology, chemistry, biology, microbiology, hydrology

Course contents

The didactic method consists of front lessons with the help of ppt projections (provided in copy to the students) (4 ECTS), and field excursions (2 ECTS).

Objectives of the course

Knowledge. The main aim of the course is to give the basic knowledge of the land evaluating systems, emphasizing on the most important soil threats. Technical principles for soil protection and maintenance will be also given so to better understand the importance to preserve soil and its functions. These techniques include hydraulic land settings, drainage systems, and terracing.

Applying knowledge and understanding. The intent of the course is to provide knowledge and technical tools for properly evaluating the soil quality and recognize soil functions, vulnerabilities and strengths, but also the most appropriate remediation systems. The course also conveys technical knowledge and tools to be applied on soils degraded by erosion, salinity, pollution, organic matter decrease, and vertisolization so to restore the functions.

Cross-expertise. a) Ability to linking pedological issues to arguments of soil and environmental pollution given in the course of “Soil pollution and remediation” (heavy metal pollution, recover of contaminated sites, depuration of contaminated soils); b) development of an own judging capability when working on soil evaluation or recognizing of eventual threats, based on scientific and technic knowledge; c) ability to properly transfer information, ideas, problems and relative technical solutions to experts with different scientific and technical background involved in managing anthropic ecosystems such as cultivated and urban soils (agronomists, architectures, landscape experts, administrators and agency executives).

Program

- Main systems of Land Evaluation – strengths and weaknesses; main caused of soil degradation (water and wind erosion, organic matter decrease, salinization, vertisolization, sealing, pollution, fires, speculation) (2 ECTS)

- Land Capability – strengths and weaknesses; Land Suitability – strengths and weaknesses; Visual Soil Assessment (VSA) – strengths and weaknesses (1 ECTS)

- Form evaluation to conservation: principles and maintenance techniques; difficult soils (saline soils, mountain soils, skeletal soils); outline on hydraulic land settings, drainage systems, and terracing and their setting for soil conservation and functions (1 ECTS)

- Field excursions: application of VSA on soils under forest species, and writing of a soil evaluation technical report (2 ECTS)

Development of the course and examination

Soil Management and Conservation is an integrated course made of two units: *Soil Evaluation and Maintenance* (6 ECTS) and *Soil Pollution and Remediation* (6 ECTS). Each module is independently evaluated, but with one final grade, resulting from the weighted average (by ECTS of each unit) of the marks obtained in the two modules.

Learning evaluation methods

Final assessment will focus on an oral examination lasting 40-45 minutes.

Learning evaluation criteria

During examination the student has to demonstrate the knowledge of the topics treated during lessons and field excursions, and the capability to properly expose the arguments with an appropriate technical-scientific language. Particular attention will be given to the ability to deal with deductive reasoning and connections so as to demonstrate mastery of the discipline.

Learning measurement criteria

The oral exam consists of 2-3 questions on arguments treated during the course (30% of the final mark) and 2 queries dealing with reasoning on and connections among arguments that are typical of the soil evaluation and maintenance activities (remaining 70% of the grade).

Final mark allocation criteria

The assignment of the final mark will be out of thirty and will be determined by the weighted mean of the marks obtained in the two sets of questions. The *cum laude* will be given to the student who has achieved the highest mark and has also demonstrated the ability to connect course arguments and make deductive reasoning.

Recommended reading

1) M. PANIZZA (1992). Geomorfologia. Pitagora Editrice Bologna.
2) A. GIORDANO (1999). Pedologia. UTET.

3) VSA material (free download): http://www.fao.org/docrep/010/i0007e/i0007e00.htm

4) Predicting soil erosion by water: a guide to conservation planning with the Revised Universal Soil Loss Equation (RUSLE). Free download at:

http://www.ars.usda.gov/SP2UserFiles/Place/64080530/RUSLE/AH_703.pdf

5) Land Capability material (free download):

http://www.unirc.it/documentazione/materiale_didattico/598_2009_214_6447.pdf

6) Land Suitability material (free reading):http://www.fao.org/docrep/t0715e/t0715e06.htm

Office hours

On Wednesday from 3 to 5 p.m., or other day by appointment taken via email or telephone.

SOIL FERULITY AND PLANT NUTRITION

ELGA MONACI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge of agricultural chemistry.

Course contents

The didactic method is based on ppt lectures (4 ECTS) (provided in copies to the students) and laboratory experiences (2 ECTS). The course will be also available through an e-learning version using the Moodle platform. Within this platform, the student will be provided of teaching materials composed by different learning units.

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge about factors that regulate soil fertility and new strategies implemented for the restoration/conservation of agricultural soils, interpretation of soil chemical analysis, acquisition of basic analytical methods for the determination of chemical and biochemical properties of the soil.

Applying knowledge and understanding. The main aim of this course is to provide a fully development ability of the student in recognizing the main factors that mediate for macro and micro-nutrients availability to crops and use efficiency as well as strategies aimed at the restoration and conservation of fertility in agricultural soils.

Cross-expertise. (i) Judgement skills: identify the information needed to improve the status of soil fertility b) basic knowledge of chemical analysis and laboratory work, c) clear and comprehensive transfer of information, ideas, problems and solutions to technicians, specialists and general operators involved in soil management and crop production.

Program

1. Course introduction. Defining soil ecosystem and its functions. Physical and chemical agents of soil formation. Properties of agricultural soils. The concept of soil fertility (0.5 ECTS).

2. Soil Physical fertility. Soil texture and soil structure. Genesis of the soil structure: abiotic and biotic factors. Classification, grade and maintenance of the soil structure in an agricultural soil. Infiltration of soil water and air. Soil temperature (1.5 ECTS).

3. Soil Biological Fertility. Soil organic matter (SOM): composition, mean residence time and functions. Carbohydrates, nitrogen, phosphorus, sulfur and lipids compounds. Organic recalcitrant compounds to degradation and humic substances. Detritus chain: steps and degradation kinetics of SOM. Soil metabolic activity. Soil enzymes: hydrolase and oxidoreductase involved in the biogeochemical cycles of carbon, nitrogen, phosphorus, sulfur. Humification processes. Case studies Enzymatic assays and determination of humic fraction in soils under different agronomic management (2 ECTS).

4. Soil Chemical Fertility. Macro and micro-elements of nutrition. Nutrients conveyance in soil-plant system. Nutrients bioavailability. Knowledge and evaluation of soil chemical analysis report. Biostimulants. Determination of nitrates (2 ECTS).

Development of the course and examination

Learning evaluation methods

ORAL EXAM. Oral discussion on four of the subjects listed in the teaching program.

The student can optionally present an essay regarding one of the topic covered during the course.

Learning evaluation criteria

During the exam the student will have to demonstrate knowledge on: a) factors influencing formation of agricultural soil b) factors regulating soil texture, soil bulk density, formation of soil structure, the balance of soil air-water c) biogeochemical cycles of elements in soil d) the bioavailability of macro and micro-nutrient to crops.

The student has also to demonstrate an overall knowledge of the course contents and discuss them with appropriate and specific terms and to show a deductive comprehension of the discussed subjects and a critical approach.

Learning measurement criteria

The final grade is expressed in thirtieths. Successfull completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of four questions on the subjects listed in the teaching program. The

student keeps a score in the range of 0 – 8 points per question. The student who shows broad knowledge of each subject will reach the grade of 30 “cum laude”.

Recommended reading

1. Violante P., 2013 – **Chimica e Fertilità del Suolo** - Edagricole

2. Stevenson F.J. and Cole M.A., 1999 - **Cycles of Soil** — John Wiley and Sons, Inc.

3. Prasad R. and Power J F., 2000 - **Soil fertility Management for Sustainable Agriculture** – CRC Press Lewis Publishers.

Tutorial session

Monday from 11 am to 1 pm

SYSTEMATIC AND FORESTAL BOTANY

FABIO TAFFETANI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Propaedeutic to this course basic knowledge of Biology .

Course contents

The teaching method is based on lectures using Power Point presentations (4 CFU), supplied in copies to the students, and practical exercises in the educational workshop, along with essential educational tours in the natural environment (2 credits). The course is also given in e-learning using the Moodle platform. Within this platform are available: a) teaching materials exposed b) educational and integrative scientific material made available by the teacher (instructions for the preparation and the meaning of the herbarium, articles, insights, dissertations, etc ..) c) exchanging equipment.

Objectives of the course

Knowledge

Provide a foundation of knowledge and skills of interpretation of plant biodiversity by understanding the mode of analysis of the flora and plant landscape and for the identification of the most appropriate ways of reading and spatial complexity lecture.

Applying knowledge and understanding

Main educational goal is the development of the student's ability to learn about the diversity of the plant landscape. Through the theoretical activities and the student practices acquires the basis to recognize the plant biodiversity, use this knowledge to assess the overall environmental impact of the factors that determine the local combination, including direct and indirect anthropogenic ones.

Cross-expertise

Ability to identify the methods of analysis and environmental design through the knowledge of policies relating to agro-environmental measures and those of the areas and habitats of the Natura 2000 network interpretation.

Program

introductory aspects (1 CFU)

Flora, vegetation, landscape, biodiversity.

Species and habitats of plant landscape Italian and European (4 CFU)

Analysis of species (and habitats that house) of Italian and European flora on the basis of the principal families, ordered according to the morphological evolutionary significance: pteridophytes, gymnosperms, angiosperms.

Problems of knowledge and environmental management (1 CFU)

Rural landscape and woodland remnants of Italian Adriatic coast;

Monitoring, maintenance and management of biodiversity.

Final assessment methods

Development of the course and examination

Methods of assessment of learning

Final assessment will focus on an oral interview and discussion on personal herbarium.

The student will prepare a herbarium according to one of the suggested modes: General Herbarium (40 samples belonging to trees and shrubs and herbaceous species in 60 samples); Herbarium at the territorial issue (100 samples collected in an area well-defined as: Common, valley, mountain, etc.). Herbarium environmental theme (100 samples of a given environment, such as a type of forest or grassland); Herbarium themed taxonomic (100 dried dedicated to one big family, like *Poaceae, Asteraceae, Liliaceae* or *Lamiaceae*, or to a group of nearby families taxonomically, such as *Rosaceae, Ulmaceae, Moraceae* and *Rhamnaceae*, belonging to the order of *Rosales*); Ethnobotanical Herbarium theme (composed of plants known for the various forms of use handed down by popular culture in a given geographical area), addressing the description of the morphological, ecological characteristics and utilization of species belonging to a given taxonomic family.

Criteria for assessment of learning

The student, during the oral test, will have to prove: a) knowledge of plant biodiversity on morphological and ecological basis, b) knowledge of procedures for analyzing, monitoring and interpretation of biodiversity in environmental policies.

To pass the oral exam, the student must demonstrate an overall understanding of the content, set out sufficiently corrected with the use of appropriate technical terminology, and to be able to deal with deductive reasoning to enable it to implement appropriate connections within the matter and to

have acquired a complete mastery.

Criteria for measuring learning

Attribution of the final mark out of thirty.

Criteria for awarding the final grade

individual work which gives a score from 0 to 9. Oral examination divided 3 questions, each of which will be evaluated using a score ranging from 0 to 7 points. The honors will be given to students who, having achieved the highest rating, have demonstrated the complete mastery of the subject.

Recommended reading

1.PIGNATTI S., 1982, La flora d'Italia (3 Voll.), Edagricole, Bologna

2.TAFFETANI F. (a cura di), 2012 - Herbaria. Il grande libro degli erbari italiani. Per la ricerca tassonomica la conoscenza ambientale e la conservazione del patrimonio naturale. Società Botanica Italiana – Nardini Editore, Firenze; pp. 1-814

3.FINCO A. 2007, Ambiente, Paesaggio e Biodiversità nelle politiche di sviluppo rurale, ARACNE Ed. pp.155.

Tutorial session

Every day from 12.00 to 14.00, including the remaining working hours, directly at the teacher's office. An appointment via email and telephone is recommended.

TECHNOLOGY OF ALCOHOLIC BEVERAGES

EMANUELE BOSELLI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

The following topics are propaedeutic to the teaching: basic knowledge of inorganic and organic chemistry, biochemistry mathematics and physics.

Course contents

The course consists of a balance of theoretical lectures (6 ECTS, 54 hours) and other activities, such as classroom practicals, carried out individually or in small groups, seminars and visits to local and national food plants and factories (3 ECTS, 27 hours, in all). An e-learning course is available in parallel with the lectures. It includes the educational material organised in learning units.

Objectives of the course

Knowledge and understanding:

(a) adequate knowledge and understanding about the main processing technologies for the alcoholic beverages different than wine, taking into account innovative technologies; (b) adequate knowledge of the technical aspects related to the special winemaking technologies and their products.

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 unit operation) and in vertical way (reasonable sequence of unit operations along the alcoholic beverages production chain and the special winemaking technologies); (b) capability of carrying out strategies for the optimization of a technological process; (c) capability of evaluating the potentiality of innovative technologies.

Cross-expertise:

(a) making judgements: capability of identify the information needed to improve the efficiency of the special winemaking processes and the quality of the alcoholic beverages different than wine; (b) communications: 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 sector of special winemaking processes and alcoholic beverages different than wine (agronomists, engineers, biologists, chemists, nutritionists, administrators).

Program

Beer; classification, raw materials, processing technology, sensory analysis. Selected topics in special winemaking techniques and aging of wine. Production technology of vinegar, non-grape vinegars and balsamic vinegar (2 ECTS). Carbonic maceration. Wine refermentation. The production of barrels. Spumanti (sparkling wines): characteristics and production methods. Champenois, Charmat. Fortified and flavored wines. Vermouth. Dessert wines. Production technology of selected fortified and dessert wines: Marsala, Porto, Sherry and Sauternes. Vino cotto. Closure systems in enology. Bitter liquors (2 ECTS). Wine spirits and brandy: classification. Distillation principles and practices. Production of Grappa. Grape distillates. Cognac, Whisky, Sakè, Rum, Calvados. Alterations and defects of distilled beverages. Guided visit to processing plants and technical fairs (2 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the teaching program, one of which will be chosen by the student. During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

The student will have to demonstrate: (a) sound knowledge of definitions and regulatory aspects of the products obtained using special winemaking techniques and alcoholic beverages different than wine; (b) knowledge and understanding of the reasons for the technical and technological choices that characterize the process flow-sheets; (c) appropriate usage of the technical lexicon.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 with honors.

Final mark allocation criteria

The oral examination consist of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10.

In order to pass the examination, the student will have to demonstrate: (a) overall understanding of the subjects; (b) appropriate usage of technical terminology. In order to obtain the best evaluation, the student will have to demonstrate: (a) in-depth knowledge and understanding of the subjects; (b) fluency in the usage of the technical lexicon; (c) ability to solve simple problems regarding special winemaking techniques and alcoholic beverages different than wine.

Recommended reading

Ribéreau-Gayon P., Dubourdieu D., Donèche B., Lonvaud A. – Trattato di enologia –. Vol. I e II – Ed. Edagricole, Bologna

S. Buiatti, Birra, in Chimica degli Alimenti, P. Cabras, A Martelli, Piccin, 2004

International Oenological Codex, http://www.oiv.int/, publications

All other educational material is available on the e-learning web platform.

TURES MANAGEMENT

RODOLFO SANTILOCCHI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge of agronomy.

Course contents

The teaching method includes both lectures (4 CFU) and practicals (2 CFU), performed as room exercises and field visits.

Objectives of the course

Knowledge. The course enables students to acquire the fundamental knowledge on the planning and management of turfs.

Applying knowledge and understanding. The course has as main objectives the acquisition of fundamental knowledge on the turfs used for ornamental, recreational, sport and technical purposes by technicians able to manage the complex connected issues.

Cross-expertise: (i) making judgements: ability to identify the information needed to manage the main agronomic issues of each herbaceous crop; (ii) communications: ability to clearly and exhaustively communicate notions, ideas, problems and technical solutions to interlocutors, either professional or not, representative of the various and specific competencies involved in the management of turfs (turfs managers, farmers, engineer, architect, biologist, administrator).

Program

1. Presentation of the course. Expected benefits from turfs. Growth and turf management as affected by the environment (1 ECTS).

2. Species and varieties used for turfs: botanical aspects, environment adaptation, principles for the choice, criteria for the consociation (1 ECTS).

3. Cropping technique:

- Preliminary works. Criteria for irrigation and drainage planning (1 ECTS).

- Correcting of soil defects. Soil preparation. Sowing (period and modality), and/or vegetative propagation (period and modality) (1 ECTS).

- Management practices (mowing, fertilisation, irrigation, pest and disease management). Remediation of turf defects (1 ECTS).

4. Special techniques for the management of different types of turfs (1 ECTS).

Development of the course and examination

Learning evaluation methods

Final assessment will focus on an oral interview.

Learning evaluation criteria

In the oral classwork, the student will have to demonstrate the knowledge in each of the areas covered in the program.

Learning measurement criteria

The final mark is attributed in thirtieths.

Final mark allocation criteria

The oral examination consists of three main questions that will be quantified in the range 0 – 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

Panella A., Croce P., Falcinelli M., Modestini F.S., Veronesi F., 2006. Tappeti erbosi. Calderini Edagricole. Bologna.

Tutorial session

Monday to Friday), from 11 am to 1 pm.

UNIT OPERATIONS IN FOOD TECHNOLOGY

DEBORAH PACETTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 9
Hours 81
Period 2^ semestre

Prerequisites

Basic knowledge of chemistry, physics, food chemical composition and basics on energy management of the agro-food industries.

Course contents

The didactic method is based on ppt lectures (6 CFU) (provided in copies to the students) and laboratory experiences and visits to local and national food industries (3 CFU).

Objectives of the course

Knowledge and understanding:

The course enables students to acquire the adequate knowledge about unit operation technologies applied in the food industries by means of the recognition of the field of employment, advantages and limits of each technology.

Applying knowledge and understanding

(a) developing the capability of integration of information, both in horizontal way (technological, chemical) and in vertical way (technological operations management along the production chain);

(b) capability of evaluate the potentiality of the operation technologies taking into account the chemical and nutritional proprieties of raw materials and the processed foods;

(c) Ability to predict the effects of the technological process on the quality and shelf-life of the food.

Cross-expertise:

(a) making judgements: capability of identify the information be needed to improve the efficiency of the processes and the quality of the final products;

(b) communications: 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 agro-food supply chain (engineers, biologists, chemists, nutritionists, administrators).

Program

1. Stability of foods: biological, physical and chemical alteration of foods; water activity; the effect of water activity on reaction kinetics of food deterioration; relative humidity of food, adsorption isotherms; (1.5 ECTS)
2. Thermal stabilization of foods: mechanism for heat transfer in food; principles of the thermal destruction of microorganisms; thermal damage of foods. (0.5 ECTS)
3. Thermal treatment of foods: pasteurization, heat sterilization. Batch and continuous technological system for heat treatment of foods. Continuous-flow heat exchangers: plate and tubular heat exchangers. Examples of technological equipment for milk pasteurization and sterilization. (2 ECTS). Homogenization of milk. Membrane filtration.
4. Heat treatment to concentrate the liquid foods: evaporation. Single and multiple effect evaporation. Evaporation equipment: open pans, horizontal-tube evaporators, vertical-tube evaporators, plate evaporators, long-tube evaporators, forced-circulation evaporators, evaporation for heat-sensitive liquids. (0.5 ECTS)
5. Drying of foods: air and contact drying under atmospheric pressure, freeze drying. Dry equipment: tray dryers, tunnel dryers, roller or drum dryers, fluidized bed dryers, spray dryers, pneumatic dryers, rotary dryers, bin dryers, vacuum dryers. The stages of the lyophilization process. Influence of freezing conditions on the quality of freeze dried food. Advantages of lyophilization process. (1.5 ECTS)
6. Packaging of foods: protection of food; mass transfer through the packaging; passive and active packaging, intelligent packaging, and interactive packaging. Relationship between packaging and the shelf life of a food (1.5 ECTS)
7. Traditional and innovative technologies in olive oil production. Influence of technology on the quality of olive oil. (0.5 ECTS)
8. Technological process for seed oil extraction: pressing, extraction by solvent, and a combination of pressing and extraction by solvent. The steps of the refining process of the oil: degumming, chemical or physical refining, bleaching, deodorization and winterization (1 ECTS)

Development of the course and examination

Learning evaluation methods

Oral discussion on the subjects listed in the teaching program.

Learning evaluation criteria

The student will have to demonstrate knowledge of: (a) the effects of technological process on the

alteration and shelf-life of foods; (b) the technological treatments applied to the thermal stabilization, concentration and drying of foods; (c) appropriate food packaging solutions (d) technological process for vegetable oil production and refining; (e) appropriate usage of technical terminology.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 with honors.

Final mark allocation criteria

The oral examination consist of six questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10. In order to pass the examination, the student will have to demonstrate: (a) overall understanding of the subjects; (b) appropriate usage of technical terminology. In order to obtain the best evaluation, the student will have to demonstrate: (a) in-depth knowledge and understanding of the subjects; (b) fluency in the usage of the technical lexicon; (c) ability to evaluate the potentiality of each unit operation along the technological process

Recommended reading

1. Pompei C. “Operazioni Unitarie Tecnologia Alimentare” Ambrosiana Editore (2009)

2. P. J. Fellows “Food Processing Technology: Principles and Practice” Third edition (2009) - Woodhead Publishing Ltd, Cambridge England.

3. R. L. Earle “Unit Operations in Food Processing” – Free Web edition by Dick and Mary Earle, with the support of the NZIFST: http://www.nzifst.org.nz/unitoperations/index.htm

4. R.P. Singh, D.R. Heldman “Principi di tecnologia alimentare” Casa Editrice Ambrosiana (2015)

VALUATION OF FOREST RESOURCES AND ENVIRONMENTAL

DANILO GAMBELLI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Students should have attended the course: “Principles of Economics” and “Forest management and Silviculture”

Course contents

The course is organised in three parts:

- Economic and managerial aspects of the forestry farm;
- Environmental economics and environmental policies for carbon emission schemes and forestry;
- Forestry and environmental appraisal.
- The course will be supported by the Moodle E-learning web tool.

Objectives of the course

Knowledge. The course provides the theoretical and practical tools for the economic analysis and evaluation of agro forestry and environmental sectors, as well as the skills required for subsequent courses in economics and appraisal of the master's degree courses. Specific attention will be paid to the role of forestry and agriculture into the new scenarios for carbon emission management

Applying knowledge and understanding. Students will be provided with the following competences: a) assess the economic conditions of agro-forestry enterprises under various economic scenarios; b) evaluate the critical elements in the estimate of the value of forest funds; c) understand the implications of environmental and climate policies in the context of sustainable management of forest resources

Cross-expertise. The aim of the course is to provide knowledge, understanding and interpretation of forest economic and evaluation issues. In particular, the student will gain analytical skills to the

estimation of forest funds and public goods, environmental , instrumentation for the evaluation and economic management of companies agroforestry. They are also provided expertise to interpret the main theme of environmental policies and climate control, with particular reference to the connections with the forest environment

Program

Part I (2 CFU)

Basic concepts in micro and macro-economics: a review

Economic budget of an agro-forestry farm

Principles of financial mathematics

Part II (2,5 CFU)

Appraisal theory

Forestry appraisal: basic concepts

Forest evaluation

Evaluation of environmental and public goods and natural resources

Evaluation of investments

Part III (1,5 CFU)

Principles of environmental economics

Sustainable development and renewable resources economics

Environmental policy tools: emission trading schemes and environmental taxation

Forestry policies

Development of the course and examination

Learning evaluation methods

Students can choose to take a thorough oral examination of all the issues of the course, or whether

to proceed with a gradual process of writing occurs on different parts of the course . In this second case the test is structured as follows : three written tests (multiple choice tests on Moodle platform) on each of the three parts of the course ; exercises compiled with spreadsheets and related financial solvency of the company agro-forestry and forestry estimates and / or environmental conditions ; after agreement with the teacher you can supplement the written evaluation with in-depth work on specific topics of the course .

Learning evaluation criteria

The exam is aimed at verifying that the student possesses a comprehensive knowledge of the topics of the course, a sufficiently correct exposure capacity with the use of appropriate technical terminology, and the ability to face deductive reasoning to enable it to implement appropriate connections within the matter and to have acquired a complete mastery.

Learning measurement criteria

For what concerns the examination in the oral mode, this will be structured with depth questions on all topics of the course, and may provide for the compilation of graphs and short practical exercises.

For what concerns the examination by means of written tests, these are structured as follows: about thirty questions with three of each response options, of which only one correct option. The test is structured so as to be able to select only one option for each question. The correct option generates a positive unit score, wrong options generate a negative fractional score (ranging between -0.3 and -1 depending on the severity of the issue). For the completion of the test it is given a time limit within which the applicant may enter, modify or cancel the options for each question.

Final mark allocation criteria

The final grade is on a scale of 30.

In the case of evaluation with oral mode, the final vote is commensurate with the quality of the students preparation, his/her analytic skills, and command of the language.

As for the evaluation with written mode, the final vote is based on the sum of the scores (on a scale of 10) of three written tests. It will be provided during the course of the audits in the form of elaborate spreadsheet that will contribute to the definition of the final grade. The score of each written test must be sufficient to pass the exam. It 's possible to support an optional and supplementary oral test to edit the written test score (max +/- 3 points from the score of the written tests).

Recommended reading

Textbook:

Bernetti I., Romano D., (a cura di) Economia delle Risorse Forestali, Liguori Editore, 2007.

Additional readings:

Musu I., Introduzione all'economia dell'ambiente, Mulino, 2000.

Pearce D.W., Turner R.K, Economia delle risorse naturali e dell'ambiente, il Mulino, 1997

Additional texts and scientific papers will be available from the Moodle website of the course.

Office hours:

Tuesday 15-17.

VITICULTURE

ORIANA SILVESTRONI

Seat Agraria
A.A. A.A. 2015-2016
Credits 9
Hours 81
Period 2^ semestre

Prerequisites

Basic knowledge of general biology, botany and agronomy.

Course contents

The teaching method is based on lectures supported by slides in digital format (6 ECTS), supplied in copies to the students, and experiences in field vineyard and laboratory (3 ECTS). The course is also available in e-learning using the Moodle platform. Within this platform are available: a) teaching materials composed by learning units; b) self-assessment tests and their results; c) information and reservations for field trips educational visits.

Objectives of the course

Knowledge. The course enables students to acquire adequate basic knowledge on the biology and physiology of the grapevine, the genotypes used in viticulture and the establishing and management of the vineyard with special reference to adaptation to the new climate environment and sustainability.

Applying knowledge and understanding. The aim of the course is to develop the student ability to design new vineyards through the choice of rootstocks, scions, training and pruning systems adapted to specific environments, to manage the main vineyard operations by limiting the impact on the environment and ensuring health and safety of operators and to follow and regulate the evolution of berry ripening.

Cross-expertise: (i) making judgements: identifying the information needed to establish and manage vineyards in different environmental contexts; (ii) communications: communicate clearly and comprehensively information, ideas, problems and related technical solutions to interlocutors, either professional or not, representative of the various and specific competencies in the wine sector (winemakers, grape-growers, administrators, journalists, sommeliers, etc.).

Program

1. Presentation of the course. The Vitaceae family, the genus Vitis, the relevance of *Vitis vinifera*. A brief history of viticulture and its recent evolution. The spread of viticulture in the world, in Europe and in Italy. The interaction grapevine-environment-cultural techniques at the basis of the appellation of wines. Denomination of grapevine cultivars and of the related wines (national register of grapevine varieties, the wine appellation rules) (1 ECTS).

2. Anatomy and morphology of the vine: aerial apparatus during the winter rest and after the vegetative growth (canes, buds, shoots, inflorescences and flowers, clusters and berries). The life cycle of the plant, the yield components (1 ECTS).

3. The pruning of the vine (goals, time and intensity of intervention), the contrast of acrotony (shortening of the canes, cane positioning), long and short (cane and spur) pruning, fertility of the buds along the canes, balanced pruning and crop regulation. Relationship between trellis-training systems and grapevine winter pruning. Criteria for the choice of training systems and planting distances in relation to the environment, to the cultivars and the level of mechanization (1 ECTS).

4. The major trellis-training systems and the pruning of grapevines (bush system, free cordon, GDC, VSP systems such as Guyot, umbrella system, spur-pruned-cordon, sylvoz, casarsa, over-head systems and pergolas) (1 ECTS).

5. Viticulture and environment: Site selection and cultivar choice, bioclimatic indexes. Climate and viticulture in the Marche. The grapevine rootstocks and general selection criteria. The propagation of the vine and the clonal selection (technical and legal aspects) (1 ECTS).

6. The annual cycle of the vine: dormancy, bud-burst, shoot elongation, leaf fall, seasonal evolution of carbohydrate and mineral reserves of grapevine. Seasonal patterns of root growth and the absorption of minerals. The cycle of the buds: formation, correlative inhibitions, dormancy, quiescence (1 ECTS).

7. The bud differentiation, the formation of flowers, anthesis, pollination, fertilization, fruit set. Berry growth and seed development. Veraison and ripening inception and evolution. The maturation indices and the definition of the harvest date (1 ECTS).

8. Photosynthesis, Respiration, Translocation and Transpiration. Factors that affect the grapevine photosynthesis. Assessment of the assimilative capacity of the canopy and of the vineyards.

9. Ampelography and varietal recognition (1 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the teaching program. During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

The student, during the oral test, will have to prove: a) general knowledge of the grape and wine industry, viticulture evolution and genetic and environmental resources; b) knowledge of the biology

and physiology of the grapevine including the morphology of its organs and their anatomical structures; c) knowledge of the vineyard management techniques (pruning, trellis-training systems, canopy management, etc.). To pass the oral exam, the student must demonstrate an overall understanding of the content using appropriate technical terminology, and to be able to deal with deductive reasoning that enable him/her to create links within matter, and to have a complete mastery of the subject.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 “cum laude”.

Final mark allocation criteria

The oral examination consists of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10. The degree of 30 “cum laude” is attributed when the student demonstrates complete mastery of the subject.

Recommended reading

Palliotti, Poni, Silvestroni, 2015. La nuova viticoltura, Edagricole, Bologna - Codice ISBN-978-88-506-5453-6.

Autori Vari, 2004. Viticoltura ed enologia biologica, Edagricole, Bologna - Codice ISBN88-506-4966-5.

Sansavini, Costa, Gucci, Inglese, Ramina, Xiloyannis, 2012. Arboricoltura Generale, Patron Editore, Bologna p.536, ISBN 978-88-555-3189-4.

Coombe, Dry, 2004. Viticulture Volume 1– Resources – 2nd Edition, Winetitles, Australia, Codice ISBN 0975685007

Winkler, Cook, Kliewer, Lider, 1974: General viticulture. University of California Press, Berkley.

Autori vari, 2005: Manuale di viticoltura, Edagricole, Bologna - Codice ISBN-88-5064981-9

Tutorial session

Wednesday from 8:15 am to 10:15 am.

VITICULTURE AND ENVINRONMENT

VANIA LANARI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

The following topics are propaedeutic to the teaching: basic knowledge of botany, biochemistry, ecology.

Course contents

The teaching course includes lectures in ppt (4 ECTS) classroom exercises (group and individual) and visits in the vineyard (2 credits). The teaching system also takes advantage to use of e-learning through the procedure of the Moodle platform. This platform includes: a) teaching materials structured in learning units; b) self-evaluation tests and results; c) Information and booking for visits; d) material for exercises.

Objectives of the course

Knowledge and understanding:

The course aims to provide knowledge related to the vineyard in its relations with the landscape and the natural environment, as well as adequate knowledge of genotype interactions, environment, cultural practices and human factors that underlie the territory viticulture. The course also allows capturing important information on the scientific basis of the origin denominations.

Applying knowledge and understanding:

The course gives competences and abilities needed to use the viticultural areas and for environmental sustainability: 1) capacity to identify and develop climate parameters and indexes to characterize the climate of a wine-growing zone; 2) good understanding of the interactions 'viticulture and environment' and 'viticulture and landscape' in order to identify environmental (temperature, water and radiative) and soil requirements of the vine; 3) ability to analyze the production disciplinary of the origin denominations.

Cross-expertise:

a) making judgments: ability to identify the information and implement measures aimed at improving the quality and efficiency of wine production; b) communication: capability to transfer in a clear and comprehensive information, ideas, problems and technical solutions to interlocutors, either

professional or not, representative of the various and specific competencies involved in the valorization of viticultural environments, environmental sustainability and production disciplinary of the origin denominations (agro meteorologist, biologist, chemist, soil scientist, etc.).

Program

1. Course presentation. Preliminary information on the wine legislation (credits: 0.5 ECTS).

2 Viticulture and environment. Environment of cultivation, distribution of viticultural areas and environmental vocationality. The climate and climatic resources: Precipitation (useful rain calculating), temperature (normal hot hours, chilling units, GDH or growing degree hours, GG or growing degree-days) solar radiation (aspects related to photosynthesis), wind and air humidity. Vine environmental demands: thermal, radiative and water. Aspects of bioclimatic indices (Winkler, Gladstone and Huglin), net photosynthesis performance based on the needs of the vine, useful parameters for the calculation of a simplified water balance. Characterization of wine-growing areas. Adapting to the environment vines. Adaptation of cultivation techniques to the environment and to the vines (2 ECTS).

3. Viticulture and landscape: the soil morphology, tradition, evolution, seasonal variability and protection. Varietal wine growing. Viticulture of territory and the scientific basis of the origin denominations. Recognitions according to the Italian legislation. Definition and examples of DOP and IGT production. Zoning and precision viticulture. (2 ECTS).

4. The main wine-growing areas of the world, case studies on the viticulture of territory and analysis of the production disciplinary of the origin denominations (1 ECTS).

5. Climate change and viticulture. Prediction models (0.5 ECTS).

Development of the course and examination

Learning evaluation methods

The examination procedures will be an oral covering the topics developed in the course and practical exercises in the classroom and in the field.

During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

The student, during the oral test, will have to show: (a) knowledge and elaboration of the main climatic parameters used for the climatic characterization of a wine-growing zone; (B) knowledge and understanding of the interactions between the vineyard and the natural environment, so capacity to determine the environmental needs of the vine and ability in the definitions and functions of the main bioclimatic models used; (C) knowledge of the viticulture of territory and the scientific basis of the origin denominations.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 with honors.

Final mark allocation criteria

The oral examination consist of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10.

The student will have to demonstrate: a) sufficient knowledge of topics; b) appropriate usage of technical terminology; c) ability in dealing with deductive reasoning that can make connections within the matter.

The degree of 30 “cum laude” is attributed when the student demonstrates complete overall knowledge and depth of the contents, exposed with complete mastery of technical language.

Recommended reading

AA.VV., 2012. ‘Arboricoltura Generale’. Patron - Bologna

Palliotti A., Poni S., Silvestroni O., 2015. ‘La nuova viticoltura’. Edagricole - Edizioni Agricole di New Business Media Srl. Milano

Tutorial session

Monday and Tuesday 10-11 am

WATERSHED MANAGEMENT

ALBERTO TAZIOLI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 2^ semestre

Prerequisites

Basic knowledge of Mathematics, Physics, Surveying and Mapping. Correct use of symbols and units of measurement. Elementary Statistics.

Course contents

The course includes frontal lecture and practical exercises.

Objectives of the course

To provide, through the basics of hydraulics and hydrology, knowledge useful to understand the criteria for intervention in watershed management, torrent control and slope stability in mountain basins.

Program

Basic concepts of hydraulics: hydrostatics, hydrodynamics, fundamental laws and hydrometrics measurements in natural streams. Hydrology. Watershed and water balance. Design hydrograph. Bed dynamics and morphology. Erosion and solid transport. Dynamic equilibrium global equation. Check dams classification and design. Bank protection techniques. Slope control. Slope stability. Landslides and landslides restoring. Bioengineering techniques for slope stability control and river restoration. Exercise on hydrological analysis. Design hydrograph computation. Exercise on watershed management: design of a structure.

Development of the course and examination

Final written examination with open questions and simple exercises.

Recommended reading

Benini G.: Sistemazioni Idraulico-forestali, CLEUP, Padova.

Ferro V.: La sistemazione dei bacini idrografici, McGraw-Hill, Milano.

(in Italian)

WINE CHEMISTRY

EMANUELE BOSELLI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

The following topics are propaedeutic to the teaching: basic knowledge of inorganic and organic chemistry, biochemistry mathematics and physics.

Course contents

The course consists of a balance of theoretical lectures (4 ECTS) and other activities, such as classroom practicals, carried out individually or in small groups, seminars and visits to local and national food plants and factories (2 ECTS). An e-learning course is available in parallel with the lectures. It includes the educational material organised in learning units.

Objectives of the course

Knowledge and understanding:

(a) adequate knowledge and understanding about the chemical components of must and wines (desired and undesired), of the additives and coadiuvants used in enology; (b) specific knowledge on the role of the hexogenous and endogenous chemical components in the winemaking practices and in the quality of raw materials, intermediate products and finished products; (c) adequate knowledge of the technical aspects related to the wine chemical components.

Applying knowledge and understanding:

(a) developing the capability of integration of information, both in horizontal way (chemical, biological, and regulatory aspects of wine components) and in vertical way (influence of the wine components on the unit operations along the wine production chain); (b) capability of carrying out strategies for the decrease of the use of additives and ingredients in winemaking through the optimization of the processes; (c) capability of evaluating the potentiality of innovative technologies on the wine chemical composition.

Cross-expertise:

(a) making judgements: capability of identifying the correct information regarding the natural components, additives, ingredients and hexogenous components of the winery products in order to enhance the quality and efficiency of the winery productions; (ii) communications: 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 sector of natural and non-natural chemical compounds in the wine supply chain (agronomist, engineers, biologists, chemists, nutritionists, administrators).

Program

Grape acids; simple and complex grape sugars; phenolics; the pigments of the grapes and wines; endogenous and exogenous tannins; nitrogen compounds; enzymes and vitamins; exogenous enzymes in oenology (2 ECTS). Minerals; sulfites and sulfur dioxide; sulfur compounds; alcohols; sensory impact of the components of grapes and wine; chemistry of fermentation; evolution of natural components during the winemaking process (2 ECTS). Colloidal compounds; precipitation equilibria of wine components; haze formation and defects; redox equilibria in musts and wines; micro-oxygenation; additives used in oenology; other chemicals and products used in the making and the keeping of wines; xenobiotics (2 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the teaching program, one of which will be chosen by the student.

During the course, there are also going to be available self-evaluation tests (e-learning mode), in order to provide the students useful information about their skill level.

Learning evaluation criteria

The student will have to demonstrate: (a) sound knowledge of the evaluation of the composition and quality of the chemical products used in a winery; (b) knowledge and understanding of the reasons for the technical and technological choices aimed to decrease the exogenous and undesired components in the winemaking process; (c) appropriate usage of the technical lexicon.

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 with honors.

Final mark allocation criteria

The oral examination consist of three questions concerning the subjects listed in the teaching program, each of ones will be quantified in the range 0 - 10.

In order to pass the examination, the student will have to demonstrate: (a) overall understanding of the subjects; (b) appropriate usage of technical terminology. In order to obtain the best evaluation, the student will have to demonstrate: (a) in-depth knowledge and understanding of the subjects; (b) fluency in the usage of the technical lexicon; (c) ability to solve simple problems related to the use of exogenous compounds and to the modifications of the natural components in the wine supply chain.

Recommended reading

Ribéreau-Gayon P., Dubourdieu D., Donèche B., Lonvaud A. – Trattato di enologia –. Vol. I e II – Ed. Edagricole, Bologna

Raccolta dei metodi internazionali di analisi dei vini e dei mosti (2 vol.) http://www.oiv.int/

All other educational material is available on the e-learning web platform.

Tutorial session

Tuesday 11 am – 1 pm

WINE MICROBIOLOGY

FRANCESCA CLEMENTI

Seat Agraria
A.A. A.A. 2015-2016
Credits 6
Hours 54
Period 1^ semestre

Prerequisites

Basic knowledge of chemistry, biochemistry and microbiology are propaedeutic to the comprehension of the topics treated in the present course.

Course contents

The course consists of: a) theoretical lectures (4 ECTS) and practical activities carried out individually and/or in small groups in the laboratory (2 ECTS). An e-learning course is available in parallel with the lectures and practical activities carried out in presence. It includes: a) the educational material organized in learning units; b) guidelines and reports concerning the laboratory activities; c) self-evaluation tests; d) interactive forum and other tools.

Objectives of the course

Knowledge and understanding:

(i) a solid knowledge about the microbiological aspects of wine production, also with respect to the national and international regulatory framework; (ii) understanding of the relationship between the various topics covered in the program, as well as between them and the topics treated in the other disciplines of the Curriculum.

Applying knowledge and understanding:

(i) ability to apply knowledge of the topics included in the program by integrating them horizontally (with the topics of other disciplines) and vertically (in the produttive chain); ii) ability to make responsible choices concerning the microbiological aspects of production in compliance with regulations, as well as with the environment and consumer health, and the market rules; (iii) the ability to develop specific optimization strategies with particular reference to: choice and mode of use of selected yeasts (diversification of products), microbiological control of raw materials, must, premises and equipment (hygiene of the winery and of the process); microbiological monitoring and proper management of fermentation processes; (iv) ability to assess the potential of innovative (fermentation) technologies.

Cross-expertise:

(I) making independent judgment: ability to process and integrate the specific knowledge concerning Wine Microbiology translating them into actions aimed at improving process efficiency and product quality; (ii) communication skills: ability to clearly transfer information, ideas, problems and associated technical solutions and to work in collaboration with the various stakeholders (specialists and not) involved in the wine industry or related with it.

Program

- Microrganisms associated to the vineyard and the cellar environments. Ecology of wine yeasts. The spontaneous wine fermentation (0.5 ECTS).

- Microbiological techniques for the evaluation of the microorganisms involved in wine microbiology: microscopic observation, isolation, cultivation, identification and typing (1 ECTS).

- Yeast cell structure and functioning (*Saccharomyces cerevisiae*): C- and N-source transport and metabolism. Factors affecting the alcoholic fermentation. Stuck and sluggish fermentations (1 ECTS).

- Screening of yeasts for wine-making (primary and secondary characters); commercial yeasts, active dry yeasts (ADY). Controlled fermentations and monitoring. Yeasts for specific applications (mixed starter; FLOR yeasts); sparkling wines microbiology (2 ECTS).

- Lactic acid bacteria and malo-lactic fermentation; commercial starter for malolactic fermentation (0.5 ECTS).

- Microbiological spoilage of wines (by bacteria and yeasts). HACCP system and its application in wine-making (Outlines) (1 ECTS).

Development of the course and examination

Learning evaluation methods

Oral discussion on three of the subjects listed in the program.

During the course, self-evaluation tests (e-learning mode) are available.

Learning evaluation criteria

The student should demonstrate: proper knowledge of the topics treated and listed in the program, capacity to make links and to discuss these topics, always using a proper scientific-technical

language

Learning measurement criteria

The final mark is attributed in thirtieths. Successful completion of the examination will lead to grades ranging from 18 to 30 with honors.

Final mark allocation criteria

The oral exam consists of three questions concerning the subjects listed in the program (each one quantified in the range 0 – 10 thirtieths).

In order to pass the exam, the student should demonstrate: (a) sufficient understanding of the topics and proper use of the terms. In order to obtain the best evaluation, the student should demonstrate: (a) in-depth knowledge and understanding of the topics; (b) fluency in the use of the scientific/technical lexicon; (c) ability to solve simple problems concerning applied wine microbiology

Recommended reading

- Kenneth C. Fugelsang and Charles G. Edwards Eds. “Wine Microbiology” 2nd Edition-Springer 2007; ISBN 0-387-33341-X

- Ribereau-Gayon, D. Dubourdieu, B. Doneche and A. Lonvaud Eds. “Handbook of Enology” Volume 1: The Microbiology of Wine and Vinifications 2nd Edition 2006 John Wiley & Sons, Ltd ISBN: 0-470-01034-7

- Other educational material is available on the e-learning web platform.

Tutorial sessions

Wednesday: 13.00-14.00

Thursday: 11.00-12.00