Course outlines offered in English (and some in French) to incoming Erasmus+ students

BIOLOGY-GENETICS

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
EDUCATION LEVEL	PREGRADUATE		
CODE	276-190105	**SEMESTER**	1st
TITLE COURSE	BIOLOGY-GENETICS		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
Lectures	2 hours	3
Laboratories		
TOTAL	***2 hours***	

TYPE OF COURSE:	MANDATORY
PREREQUISITE COURSES:	
LANGUAGE OF TEACHING AND EXAMS:	GREEK, ENGLISH
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES
ΗΛΕΚΤΡΟΝΙΚΗ ΣΕΛΙΔΑ ΜΑΘΗΜΑΤΟΣ (URL)	

LEARNING RESULTS

Learning results
The aim of this course is to introduce students to basic concepts of Biology such as: macromolecules, prokaryotic and eukaryotic organisms, cell, cellular organelles, photosynthesis, respiration. Also the approach to certain basic mechanisms of Genetics such as mitosis, meiosis, DNA replication, transcription, translation of genetic information, mutations, is another objective of the course.
General Competences
• Work in an interdisciplinary environment • Generation of new research ideas • Promote free, creative and inductive thinking • Search, analyze and synthesize data and information using the necessary technologies • Independent work

COURSE CONTENT

- Origin and evolution of the cell. Properties of macromolecules - Lipids, vitamins, polysaccharides, proteins, nucleic acids.
- Energy - Forms of energy. ATP and cellular function. Enzymes - specificity of enzymes, factors affecting enzyme activity.
- Cellular theory. Differences of prokaryotic - eukaryotic cells. Cell membrane - structure and function. Mitochondria - electron transport chain, oxidative phosphorylation. Chloroplasts, photosynthetic reactions.
- Nucleus and genetic material - chromosomes, histones. Endoplasmic reticulum, Golgi complex, lysosomes, peroxidosomes, cell skeleton.
- Prokaryotic organisms - Eubacteria, archaeobacteria. Viruses - phages, plant viruses, animal viruses.
- DNA structure - DNA replication, paradox of C value. Central dogma of Biology.

- Genetic code. Transcription, translation of genetic information.
- Cell cycle. Mitosis, meiosis. Karyotype. Cell death.
- Mutations - point mutations, chromosomal mutations, gene mutations. Mutation repair mechanisms.

TEACHING AND LEARNING METHODS - EVALUATION

TEACHING METHOD	Teaching with Power point presentations
STUDENTS EVALUATION	Writing exams in the end of the semester

RECOMMENDED BIBLIOGRAPHY

Avice, J. C. (1994). Molecular markers, natural history and evolution, Kluwer Academic Publishers.

Benjamin, L. (2000). Genes VII. Oxford University Press.

Claus-Dieter P. (1997). Βιολογία. Ιωάννινα.

Darnell, J., Lobish, H. & Baltimore, D. (1986). Molecular cell biology. Scientific American Books.

Eiseltova, M. (1994). Restoration of Lake Ecosystems. IWRB, publ. 32.

Futuyma, D. J. (1995). Εξελικτική βιολογία. Πανεπιστημιακές Εκδόσεις Κρήτης.

Giler, P. S. (1998). The biology of streams and rivers. Oxford University Press.

Gopal, B., Junk, W. J. & Davis, J. A. (2000). Biodiversity in wetlands: assessment, function and conservation, volume I.

Gopal, B., Junk, W. J. & Davis, J. A. (2000). Biodiversity in wetlands: assessment, function and conservation, volume II.

Hickman, C. P., Roberts, L. S. & Larson, A. (1993). Integrated Principles of Zoology. Mosby, Boston.

Klein, R. M., MacKenzie, J. & McKenzie, J. C. (1999). Basic Concepts in Cell Biology: A Student's Survival Guide. McGraw-Hill Professional Publishing.

Pack, P. E. (2007). CliffsAP Biology. John Wiley and Sons.

Rothwell Norman, V. (1993). Understanding genetics. Wiley-Liss.

Simon E. J. (2016). Βιολογία, βασικές έννοιες. Επιστημονικές εκδόσεις Παρισιάνου Α. Ε.

Solomon, J., Horsfall, P., Hughes, R., O'Brien, P. & Reiss, M. (2000). Biology. Nelson Thornes.

Recommended scientific journals:

- *Biologia*
- *BMC Systems Biology*
- *Journal of Fish Biology*
- *Cahiers de Biologie Marine*
- *Journal of Environmental Protection and Ecology*
- *Biochemical Systematics and Ecology*
- *Journal of Zoology*

NUTRITION AND NUTRITIONAL VALUE OF FOODS

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**276-190106**	**SEMESTER OF STUDIES**	1st
COURSE TITLE	NUTRITION AND NUTRIONAL VALUE OF FOOD		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHINGHOURS**	**CREDIT UNITS**
Lectures	2	2.5
Laboratory Exercises		
Total	2	2.5

COURSE TYPE	Compulsory/ Special Foundation Course
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEBSITE (URL)	https://exams-geo.the.ihu.gr/login/index.php

LEARNING OUTCOMES

Learning outcomes

Upon completion of the course, the student is expected to be able to:

– Calculate the nutritional value of various foods

– Understand and critically interpret the role of nutrients in physiological function of the human body and reproduce the effects of excessive recruitment or lack of each category

– To correspond pathological conditions of the body with elements of nutrition

– Be able to argue and critically address various standards Diet

– To apply the above advanced knowledge in the development of nutritionally balanced Food

General Skills

Searching and analyzing information using information and communication technologies
Promotion of analytical, productive and inductive thinking
Working in an interdisciplinary environment
Autonomous work
Critical Thinking
Respect for diversity and multiculturalism
Teamwork

COURSE CONTENT

The course includes the following major contetnts:

1.Introduction to nutrition science
Human nutrition components-Nutrients. Dietary requirements Energy balance. The composition of foods from a dietary point of view-Determination of required energy intake

2. Carbohydrates
Uptake-Digestion-Absorption-Metabolism-Blood glucose concentration-Mellitus

diabetes-Glycemic effect of food-Dietary fibers
3.Oils and fats
Lipids-Uptake-Digestion-Absorption-Metabolism-Adipose tissue-Diseases (obesity, atherosclerosis)
4.Proteins
Role of proteins-Amino acids-Uptake-Digestion-Absorption-Metabolism-Recommended dietary intake-Diseases (kwarsiorkor-withering-phenylketonuria)
5.Water
Structure-Physical properties-Functions of water in the human body-Absorption-Excretion-Contaminants and purification of drinking water
6.Vitamins
7. Minerals
Calcium (sources-absorption-role-diseases from deficiency) Iron , Iodine
8. Current nutrition issues as covered by students' oral presentations

TEACHING and LEARNING METHODS - EVALUATION

TEACHING METHOD	Face to face: • Lectures in the classroom •
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures with PowerPoint slides using PC and projector • Notes in electronic format • Video projections • Posting course material and communicating with students on the Moodle online platform
TEACHING ORGANIZATION	
STUDENT EVALUATION	Language of Assessment: Greek or English. Evaluation methods: • Written final exams with short development and multiple choice questions(100% of the final grade). • Optional group (up to 3 people) presentation (20 Minutes)in cutting edge topics (20% increment in grade the written examinations of the theoretical part for grades >4.2) The evaluation criteria are presented and analyzed to the students at the beginning of the semester.

Activity	***Semester Workload***
Lectures	26
Optional oral presentation (20 Minute)s on cutting-edge topics	13
Independent Study	33
TOTAL	***72***

RECOMMENDEDBIBLIOGRAPHY

- Suggested Bibliography:

- Introduction to Nutrition, Bender D 2002, Taylor and Francis
- Food Chemistry by H.-D. Belitz, W. Grosch, P. Schieberle, Springer Verlag 2004
- Advances in Food and Nutrition Research , Taylor S.L. 1998, Academic Pres

- Related scientific journals:

- European Journal of Nutrition
- Journal of Nutrition Education and Behavior
- Journal of Nutrition

GENERAL MICROBIOLOGY

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
STUDY LEVEL	UNDERGRADUATE		
COURSE CODE	276-190203	**SEMESTER**	2nd, SPRING
COURSE TITLE	GENERAL MICROBIOLOGY		

TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Lectures	2	3
Laboratory Exercises	2	2
Total	4	5

COURSE TYPE	Compulsory/General Background
PREREQUISITE COURSES	-
TEACHING LANGUAGE & EXAMS:	Greek
COURSE OFFERED TO ERASMUS STUDENTS	YES (in English language)
COURSE WEB-PAGE (URL)	

LEARNING OUTCOMES

Learning outcomes

The course aims to achieve the following learning outcomes for students:

- to introduce students to the world of microbes: what are microbes, their role in the cycle of matter, the preparation of food, medicine and industrial products, spoilage of food, the genesis of diseases.

- for students to gain experience in microbiological techniques and methods used in food industry laboratories.

- with sufficient knowledge of General Microbiology to understand the specific topics of Special Microbiology, Food Microbiology, Biotechnology and Food Hygiene.

General Skills

- Analysis and interpretation of the properties of microbes regarding their morphological, physiological and biochemical characteristics as well as the taxonomic position of microorganisms in the world of living beings.
- Investigating and understanding the role and distribution of microbes in nature, the interactions between them, the effects with other living organisms as well as the physicochemical changes they cause in their environment, with the aim of promoting analytical, productive and inductive thinking.-
- Explanation of many biological phenomena that take place with the participation of microorganisms, which are the "material of choice" for solving basic problems of biology, with the aim of producing new research ideas.

COURSE CONTENT

Unit 1: Structure and evolution of organizations

- Common characteristics of living things: chemical composition, cell structure, cell types, metabolism, etc.

- Classification of microorganisms: Bacteria, Archaea, Eukaryota.

- Viruses: structure, morphology, multiplication, viral diseases. Bacteriophages: structure, morphology,

physiology of bacteriophages (infectious – non-infectious bacteriophages), lysogony. study of bacteriophages.

Unit 2: Metabolism of microbes

- Enzymes: nature, structure, properties, mechanisms of enzyme regulation.
- Bioenergetics: energy sources, biological oxidations, electron transporters, metabolic types of microorganisms, respiration, anaerobic respiration, fermentation, etc.

Unit 3: Microbial nutrition

- Principles of nutrition, food types, growth factors, macromolecules as nutrients, water, oxygen.
- Microbial interactions (synergy or symbiosis), microbial interactions in the food environment.

Unit 4: Growth of microbes – Effect of physicochemical factors on growth

- Development of unicellular microorganisms. Parameters of microbial growth (number of divisions, generation time, growth rate, etc.). Growth curve of unicellular microbes. Colony formation.
- Effect of physicochemical factors on the growth of microbes (temperature, pH, redox potential, radiation, pressure).

Unit 5: Survival of microbes

- Survival of microbes in nature. Effect of environment on microbial viability. Lethal agents: physical agents (heat, cold, desiccation, radiation), chemical antimicrobial agents, antibiotics.

Unit 6: Genetics of microbes – Germs and disease

- Mutations, genetic recombination (transformation, conjugation, transduction).
- Relationships between microbes and macroorganisms. Parasitic relationships. Human microbiota. Pathogenicity of microbes.

Titles of Laboratory Exercises

- Learning the operation, handling and maintenance of microbiology laboratory equipment: microscopes, incubators, colony counters, homogenizers, GasPak, etc.
- Study of the morphological characteristics of bacteria. Staining techniques for bacteria (simple staining, Gram staining). Bacterial motility (wet mount technique).
- Study of the culturing characteristics of bacteria. Substrate inoculation techniques. Morphological characteristics of bacterial colonies.
- Study of the physiological characteristics of bacteria: requirements for temperature, pH, water, oxygen, nutrients.
- Study of the biochemical characteristics of bacteria:
- - Catalase, oxidase tests,
- - Carbohydrate metabolism: sugar fermentation tests, MR- and VP-tests
- starch hydrolysis.
- - Protein metabolism: casein hydrolysis
- - Amino acid metabolism: test of indole
- - Lipid metabolism: lecithinase test..
- - Citrate utilization test

TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING MODE.	Face to face: • Lectures (theory and exercises) in the classroom • Individual and group laboratory exercises in the microbiological laboratory
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures on PowerPoint slides using PC and projector

<table>
<tr><td></td><td>

- Notes and solved exercises in electronic format
- Use of videos and online applications in teaching
- Post course material and communicate with students on the Moodle online platform

</td></tr>
<tr><td>TEACHING ORGANIZATION</td><td>

<table>
<tr><th>Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>26</td></tr>
<tr><td>Laboratory exercises</td><td>10</td></tr>
<tr><td>Processing results of laboratory exercises</td><td>10</td></tr>
<tr><td>Independent study</td><td>66</td></tr>
<tr><td>Total Course</td><td>112</td></tr>
</table>

</td></tr>
<tr><td>STUDENT EVALUATION</td><td>Evaluation Language: Greek.
Evaluation methods:
• Mandatory attendance at (at least) 80% of the laboratory exercises.
• Written final exams in the theoretical part of the course and solving exercises.
• Written final exams in the laboratory part of the course with short development questions and critical questions.
The evaluation criteria are presented and analyzed to the students at the beginning of the semester.</td></tr>
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RECOMMENDED-BIBLIOGRAPHY

- Παπαντωνίου Δ.. ΓΕΝΙΚΗ ΜΙΚΡΟΒΙΟΛΟΓΙΑ – Οδηγός Εργαστηριακών Ασκήσεων, Τμήμα Εκδόσεων ΑΤΕΙ-Θεσσαλονίκης, 2008.
- BROCK ΒΙΟΛΟΓΙΑ ΤΩΝ ΜΙΚΡΟΟΡΓΑΝΙΣΜΩΝ, Έκδοση: 1η/2018, Συγγραφείς: Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A. Stahl, Διαθέτης (Εκδότης): ΙΔΡΥΜΑ ΤΕΧΝΟΛΟΓΙΑΣ & ΕΡΕΥΝΑΣ-ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ, ISBN: 978-960-524-523-8.
- Γενική Μικροβιολογία, Κύρτσου-Καραγκούνη Δ. Αμαλία, 1η έκδοση 2012, Εκδότης, UNIBOOKS ΙΚΕ.
- Γενική Μικροβιολογία, Μπεζιρτζόγλου Ε., 1η έκδοση 2005, Εκδότης,Παρισιανού Ανώνυμη Εκδοτική Εισαγωγική Εμπορική Εταιρεία Επιστημονικών Βιβλίων
- Adams M.R. & Moss M.O. Food Microbiology, 3rd edition, 2008, Cambridge, UK RSC Publishing
- Wistreich, A. G., Microbiology Laboratory. Fundamentals and Applications, 2nd Ed., Pearson Education, New Jersey, 2003.

FOOD BIOCHEMISTRY

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
EDUCATION LEVEL	PREGRADUATE		
CODE	276-190204	**SEMESTER**	2nd
TITLE COURSE	FOOD BIOCHEMISTRY		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
Lectures Laboratories	2 hours	3
TOTAL	***2 hours***	

TYPE OF COURSE:	MANDATORY
PREREQUISITE COURSES:	
LANGUAGE OF TEACHING AND EXAMS:	GREEK, ENGLISH
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES
ΗΛΕΚΤΡΟΝΙΚΗ ΣΕΛΙΔΑ ΜΑΘΗΜΑΤΟΣ (URL)	

LEARNING RESULTS

Learning results
Introduction to the chemical and biochemical characteristics of food molecules. Chemical structure and function of proteins, carbohydrates and lipids. Enzymes and enzyme kinetics. Introduction to metabolism.
General Competences
• Work in an interdisciplinary environment • Generation of new research ideas • Promote free, creative and inductive thinking • Search, analyze and synthesize data and information using the necessary technologies • Independent work

COURSE CONTENT

Water, structure, hydrogen bonding and special properties, weak interactions in aqueous systems, weak acids and bases, buffers, the Henderson-Hasselbalch equation.

Amino acids, acid-base properties, characteristic titration curves, peptides. Proteins, protein structure, primary structure, secondary structure, a helix and β conformation, protein tertiary and quaternary structures, the role of proteins, protein denaturation, some special proteins, hemoglobin and myoglobin, myosin and actin.

Enzymes, catalytic power and specificity, classification by reaction, enzyme kinetics, the Michaelis-Menten equation, reversible and irreversible inhibition, regulatory enzymes.

The structure of carbohydrates, monosaccharides and polysaccharides, glycosidic bond, cyclic structure, hexose derivatives, starch and cellulose. Carbohydrate metabolism, glycolysis and

glyconeogenesis, pentose phosphate pathway.

The structure of lipids, triacylglycerols, glycerophospholipids, sphingolipids, cholesterol and other lipids, lipid metabolism oxidation of fatty acids, β oxidation.

Nucleotides, and related molecules, principles of metabolism, electron carriers function in multienzyme complexes, adenine nucleotides as components of enzyme cofactors, ATP synthesis by photophosphorylation.

Reactions of the citric acid cycle, the energy of oxidations in the cycle, oxidative phosphorylation.

Vitamins, their structure, classification and function as cofactors and antioxidants.

TEACHING AND LEARNING METHODS - EVALUATION

TEACHING METHOD	Teaching with Power point presentations
STUDENTS EVALUATION	Writing exams in the end of the semester

RECOMMENDED BIBLIOGRAPHY

- Berg J., L. Stryer, J. Tymoczko and G. Gatto (2019), Biochemistry, 9th ed., W.H. Freeman & Company.
- Nelson D.L., and M.M. Cox (2013) , Lehninger, Principles of Biochemistry, W.H. Freeman & Company.

FOOD ENGINEERING I– MASS AND ENERGY BALANCE

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	276-190301	**SEMESTER OF STUDIES**	3rd FALL
COURSE TITLE	FOOD ENGINEERING I		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
Lectures	3	
Practical Exercises	2	
Laboratory Exercises	1	
TOTAL	***6***	***7.5***

COURSE TYPE	Compulsory/Scientific Area
PREREQUISITE COURSES:	Physics
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://exams-geo.the.ihu.gr/course/view.php?id=178

LEARNING OUTCOMES

Learning outcomes

The course aims to achieve the following learning outcomes for students:

- acquiring knowledge in the basic engineering principles that govern the physical processes during food processing

- recognizing, understanding and interpreting the physical phenomena govern these processes

- the ability to describe mathematically and evaluate the contribution of each phenomenon or parameter to the evolution of the process

- acquiring experience in applying the above knowledge and analytical skills to industrial-scale processes

General Skills

Analyzing, interpreting and synthesizing empirical data obtained from experimental setups
Searching and analyzing information using information and communication technologies
Promotion of analytical, productive and inductive thinking
Working in an interdisciplinary environment
Autonomous work
Teamwork
Decision making

COURSE CONTENT

Unit 1: Mass and Energy Balances

- The concept of balance on steady-state or transient system. The principles of mass and energy conservation.
- Formulation and solution of mass balances in simple and complex processes with or without reactions.
- Phase diagrams and phase equilibria. Gibbs rule.
- Humidity and psychometric charts.

- Internal energy, enthalpy, heat and work. Steam tables. Energy balances.

Unit 2: Fluid Mechanics
- Hydrostatic equilibrium. Absolute and manometric pressure
- Flow phenomena. Viscosity and Newton's law. Types of rheological behavior. Laminar and turbulent flow, Reynolds number. Boundary layers in walls.
- Flow equations. Average velocity, momentum and energy in unidirectional flow. Continuity, momentum and mechanical energy (Bernoulli) equations. Flow from orifice.
- Incompressible flow in pipes. Wall friction, friction coefficient Fanning. Non-circular pipes. Velocity profiles in laminar and turbulent flow. Equation Hagen-Poiseuille. Calculation of friction coefficients in smooth and rough pipes. Friction due to cross section reduction or enlargement and the presence of valves etc. Pump power.
- Types and categories of pressure, flow and tank level sensors.

Unit 3: Heat Transfer
- Heat transfer mechanisms. Conduction and Fourier's law. Themal conductivity. Convection, Newton' law. Heat transfer coefficients.
- Steady-state Conduction. Unidirectional conduction in planar, cylindrical and spherical geometry. Conduction through multiple layers. Combined conduction-convection in fluids.
- Non-steady-state Conduction. The Biot number. Thermal Diffusivity. The Fourier Number. Lumped capacity analysis. Charts for transient heating/cooling in planar, cylindrical, spherical and complex geometries.
- Forced Convection. The Nusselt and Prandtl numbers. Thermal boundary layer. Heat transfer equations for laminar and turbulent flow over slabs and through pipes. Natural convection. The Grashof number. Convection with phase change: condensation and evaporation.
- Heat transfer devices: heat exchangers and their types. Heat transfer equation for double-pipe heat exchangers. Correction factor for composite heat exchangers. NTU method. Heated tanks: calculation of heating/cooling time.
- Types and categories of temperature sensors. Steam networks and steam traps.

Titles of Laboratory Exercises
- Non-steady state heating of a can.
- Flow meters – Pressure drop.
- Heat exchangers
- Spray Dryer

TEACHING and LEARNING METHODS - EVALUATION

TEACHING METHOD.	Face to face: • Lectures (theory and exercises) in the classroom • Laboratory exercises in groups in a pilot plant laboratory
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures with PowerPoint slides using PC and projector • Notes, solved and unsolved problems in electronic format • Use of videos and web-applications in lectures • Posting course material and communicating with students on the Moodle online platform • Use of electronic devices for retrieving and recording experimental data (data logging) in the laboratory
TEACHING ORGANIZATION	

Activity	***Semester Workload***
Theory and practical exercises	65
Laboratory exercises	13
Independent study	156

	TOTAL	***234***
STUDENT EVALUATION	Language of Assessment: Greek or English. Evaluation methods: • Compulsory attendance at (at least) 80% of the laboratory exercises. • Written final exams in the theoretical part of the course with problem solving (80% of the final grade). • Final written exams in the laboratory part of the course with multiple choice, short essay and problem-solving questions (20% of the final grade). • Optional written assignments in laboratory exercises. The evaluation criteria are presented and analyzed to the students at the beginning of the semester and are available at the course website.	

RECOMMENDED BIBLIOGRAPHY

-Suggested Bibliography:

- McCabe W., Smith J., Harriott P.: Fundamental Physical Processes of Engineering. 6th Edition, Tziola edition for Greek translation, 2003
- Pitts D., Sissom L., heat Transfer, Schaum Series, 2nd Edition, Tziolas Publishing for Greek translation, 2001
- Himmelblau D.M., Riggs J.B., Basic Principles and Calculations in Chemical Engineering, 7th Edition, Tziolas Publishing for Greek translation, 2006
- Fryer P.J, Pyle, D.L., Reilly C.D., Chemical Engineering for the Food Industry, Chapman & Hall, 1997
- Earle R.: Unit Operations in Food Processing (https://nzifst.org.nz/resources/unitoperations/index.htm)

-Related scientific journals:

- Journal of Food Engineering
- Journal of Food Processing & Technology

FOOD MICROBIOLOGY

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
STUDY LEVEL	UNDERGRADUATE		
COURSE CODE	276-190302	**SEMESTER**	3rd, AUTUMN
COURSE TITLE	FOOD MICROBIOLOGY		

TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Lectures	2	3
Laboratory Exercises	4	3
Total	6	6

COURSE TYPE	Compulsory/Special Background
PREREQUISITE COURSES	General Microbiology
TEACHING LANGUAGE & EXAMS:	Greek
COURSE OFFERED TO ERASMUS STUDENTS	YES (in English language)
COURSE WEB-PAGE (URL)	

LEARNING OUTCOMES

Learning outcomes

The course aims to achieve the following learning outcomes for students:

- acquiring basic knowledge about microorganisms that are important in food
- familiarity with the methodology applied to microbiological food testing and the choice of food sampling plan and food analysis techniques
- the evaluation of the results of the analyses which must be done with accuracy and based on the applicable microbiological standards
- the consolidation of all the above knowledge in order to assess the microbiological quality of food on the one hand and to ensure the health of the consumer on the other

General Skills

- Interpretation and evaluation of results obtained from experimental analyses
- Search for further relevant information with the use of information technologies for the purpose of thorough knowledge and understanding of the subject
- Promotion of analytical, productive and inductive thinking
- Work in an interdisciplinary environment
- Autonomous work
- Teamwork
- Decision making

COURSE CONTENT

Unit 1: The most important food microorganisms

- Fungi and Yeasts: Morphological, cultural and physiological characteristics of fungi and yeasts. Sexual and asexual reproduction. Classification and identification. Importance of fungi and yeasts in Microbiology and Food Hygiene.
- Bacteria: Morphological, cultural and physiological characteristics of bacteria.

Description of the most important bacteria in food:

I) Gram-negative bacteria, rods or coccobacilli: *Pseudomonas*, *Acetobacter*, *Gluconobacter*, *Brucella*, *Escherichia*, *Salmonella*, *Shigella*, *Yersinia*, *Vibrio*, *Aeromonas* etc

II) Gram-positive bacteria, spherical or cocci: *Micrococcus*, *Staphylococcus*, *Lactococcus*, *Streptococcus*, *Enterococcus*, *Pediococcus*, *Leuconostoc*.

III) Gram-positive bacteria, sporulating rods: *Bacillus*, *Clostridium*, *Desulfotomaculum*

IV) Gram-positive bacteria, sporulating rods or irregular in shape: *Lactobacillus*, *Listeria*, *Propionibacterium*, *Bifidobacterium*

V) Probiotic microorganisms – Prebiotics

Unit 2: Sources of food contamination

- Microbiota of the soil
- Water microbiota
- Microbiota of the air
- Plant microbiota
- Human and animal microbiota
- The animals' environment, utensils and equipment

Unit 3: Preservation of food

- Food preservation principles. The death of microorganisms.
- Heat: Mechanism of thermal death of microbes. Survival curve – value D. Curve of thermal death times – Z value. Factors affecting the heat resistance of microbes. Heat preservation methods (pasteurization – sterilization).
- The cold: Interaction of the cold with other factors. Mechanisms of action of cold and freezing on microbes. Factors affecting the action of cold. Food preservation methods at low temperatures.
- The preservation of food and the model of obstacles.

Unit 4: Food spoilage

- General principles governing alterations. Factors affecting food spoilage. Changes in the color, structure, smell and taste of food.
- Microbiology and alterations of milk and its products.
- Microbiology and spoilage of meat and poultry.
- Microbiology and spoilage of fish.
- Microbiology and spoilage of grains and their products.
- Microbiology and spoilage of fruits and vegetables.
- Microbiology and spoilage of fruit and vegetable beverages.
- Microbiology and spoilage of fermented foods.
- Microbiology and spoilage of canned foods.

Unit 5: Food and disease

- Food poisoning: Causes of food poisoning. Dominant bacteria. Food vehicles. Places of occurrence of food poisoning. Types of food poisoning.
- Food poisoning: Staphylococcal food poisoning. Botulism. Mycotoxicosis.
- Food infections: Salmonellosis. Listeriosis. Gastroenteritis from *Escherichia coli*. Campylobacteriosis. *Vibrio parahaemolyticus* gastroenteritis.
- Infections: Gastroenteritis from *Clostridium perfringens*. *Bacillus cereus* gastroenteritis.

Titles of Laboratory Exercises

Groups of microbes important to food

• Moulds and Yeasts: Study of morphological and physiological characteristics. Growth substrates. Isolation. Identification.

• Enterobacteriaceae family: Morphological, culturing characteristics of bacteria, physiological and biochemical characteristics. Isolation - selective substrates. Identification. Coliforms. *E. coli*.

Salmonella spp.
• Micrococcaceae family: Micrococcus spp., Staphylococcus spp. Isolation and identification. Differentiation of *S. aureus* from other staphylococci. Isolation of *S. aureus* from the nasal cavity. Selective substrates.
• Bacillus: Taxonomic position. Morphological, culturing characteristics of bacteria. Identification. Endospore formation and staining.
• Enumeration techniques of the microbial load of food and water.
• Standard plate colony enumeration method
• Most probable number method (MPN-method)
• Membrane filtration method - Microbiological analyzes of food
• Microbiological analysis of milk (sampling, microbiological tests-techniques, evaluation of results, microbiological standard)
• Microbiological analysis of cheeses (sampling, microbiological tests-techniques, evaluation of results, microbiological standard)
• Microbiological analysis of meat (sampling, microbiological tests-techniques, evaluation of results, microbiological standard)
• Microbiological analysis of drinking water (sampling, technical microbiological tests, evaluation of results, microbiological standard)

TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING MODE.	Face to face: • Lectures (theory and exercises) in the classroom • Individual and group laboratory exercises in the microbiological laboratory
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures on PowerPoint slides using PC and projector • Notes and solved exercises in electronic format • Use of videos and online applications in teaching • Post course material and communicate with students on the Moodle online platform
TEACHING ORGANIZATION	
STUDENT EVALUATION	Evaluation Language: Greek. Evaluation methods: • Mandatory attendance at (at least) 80% of the laboratory exercises. • Written final exams in the theoretical part of the course and solving exercises. • Written final exams in the laboratory part of the course with short development questions and critical questions. The evaluation criteria are presented and analyzed to the students at the beginning of the semester.

Activity	***Semester Workload***
Lectures	26
Laboratory exercises	40
Processing results of laboratory exercises	39
Independent study	63
Total Course	**168**

RECOMMENDED-BIBLIOGRAPHY

- Παπαντωνίου Δ., Μικροβιολογία Τροφίμων, ΑΤΕΙ-Θεσσαλονίκης, 2013.
- Montville, T. J. and Matthews, K. R., Μικροβιολογία Τροφίμων, επιμέλεια: Β. Σπηλιώτης και Ι. Γιαβάσης, Εκδόσεις ΙΩΝ, Αθήνα, 2010.
- BROCK ΒΙΟΛΟΓΙΑ ΤΩΝ ΜΙΚΡΟΟΡΓΑΝΙΣΜΩΝ, Έκδοση: 1η/2018, Συγγραφείς: Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A. Stahl, Διαθέτης (Εκδότης): ΙΔΡΥΜΑ ΤΕΧΝΟΛΟΓΙΑΣ & ΕΡΕΥΝΑΣ-ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ, ISBN: 978-960-524-523-8
- Adams M.R. & Moss M.O. Food Microbiology, 3rd edition, 2008, Cambridge, UK RSC Publishing
- Μικροβιολογία Τροφίμων, Μπαλατσούρας Γ., 1η Έκδοση, 2006, Εκδόσεις Βασιλειάδης Στυλιανός

Wistreich, A. G., Microbiology Laboratory. Fundamentals and Applications. 2nd ed., Pearson Education, 2003.

QUALITY ASSURANCE AND CONTROL (ONLY OFFERED IN FRENCH)

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	276-190303	**SEMESTER OF STUDIES**	3rd
COURSE TITLE	QUALITY ASSURANCE AND CONTROL		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
Lectures	1	4
Practical Exercises	1	
Laboratory Exercises	3	2
TOTAL	5	**6**

COURSE TYPE	Compulsory/Special Background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes (in French)
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes

The course aims to achieve the following learning outcomes for students:
- understanding the importance of food quality and safety
- familiarity with the various quality control methods and quality and safety assurance systems applied in the food industry
- knowledge and application of organoleptic control methods.

General Skills

Search, analysis and synthesis of data and information, using the necessary technologies
Decision making
Autonomous work
Teamwork
Work in an international environment
Work in an interdisciplinary environment
Promotion of free, creative and inductive thinking

COURSE CONTENT

- The terminology of quality

Quality, quality control, quality assurance, quality management, quality system.

- Quality control

Objectives, stages, methods and organization of quality control, quality characteristics of food, organoleptic characteristics, control of food texture by instrumental methods, control of food color by instrumental methods, correlation of results between organoleptic and instrumental methods.

- Statistical Process Control (SPC)

Methodology, case studies.

- Good Manufacturing Practice – Good Hygienic Practice (GMP – GHP)

Introduction to the GMP – GHP system, recommended international code of practice–general principles of food hygiene of the Codex Alimentarius, food hygiene according to EU directives, case studies.

- Hazard Analysis and Critical Control Points (HACCP)

Introduction, principles, methodology, case studies.

Titles of Laboratory Exercises (Organoleptic Tests)

- Organoleptic control organization
- Pairwise comparison test
- Triangular and duo-trio testing
- Tetrahedral test
- Ranking test
- Multiple comparison testing
- Dilution tests and difference threshold
- Grading tests
- Quantitative descriptive analysis tests
- Taste profile analysis and evaluation with multi-axis plots
- Likeability tests.

TEACHING and LEARNING METHODS - EVALUATION

TEACHING METHOD	Face to face: • Lectures (theory and exercises) in the classroom • Laboratory exercises in groups in the Organoleptic Control Laboratory
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures with PowerPoint slides using PC and projector • Notes in electronic format • Post course material and communicate with students on the Moodle online platform
TEACHING ORGANIZATION	

Activity	***Semester Workload***
Theory and practical exercises	39
Laboratory exercises	39
Writing assignments for laboratory exercises	20
Independent study	100
TOTAL	***198***

STUDENT EVALUATION	Language of Assessment: Greek or French. Evaluation methods: • Compulsory attendance at (at least) 80% of the laboratory exercises. • Written final exams in the theoretical part of the course with essay development and problem solving questions. • Final written exams in the laboratory part of the course with short development and problem solving questions. • Optional written assignments in the laboratory exercises (20% of the grade of the laboratory part of the course if submitted). The evaluation criteria are presented and analyzed to the students at the beginning of the semester.

RECOMMENDED BIBLIOGRAPHY

-Suggested Bibliography:

• Arvanitoyannis I.S., Tzouros N.H., The New ISO 22000 Food Quality and Safety Standard, Stamouli Publishing, Athens, 2006.

• Karipidis F., Special Issues of Quality: Application to Agriculture and Food, Ziti Publications, Thessaloniki, 2008.

• Lawless H.T., Heynmann H., Sensory Evaluation of Food: Principles and Practices, Chapman & Hall, New York, 1998.

• Meilgaard M.C., Civille G.V., Carr B.T., Sensory Evaluation Techniques, Fourth Edition, CRC Press

LLC, Boca Raton, 2006.
• Stauffer J.E., Quality Assurance of Food: Ingredients, Processing and Distribution, Food & Nutrition Press Inc., Westport, Connecticut, 1988.
-Related scientific journals:
• Food Control

FOOD CHEMISTRY

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF EDUCATION	UNDERGRADUATE		
COURSE CODE	276-190305	**SEMESTER OF STUDY**	3rd AUTUMN
COURSE TITLE	FOOD CHEMISTRY		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
Lectures	3	
Laboratory exercises	2	
TOTAL	***5***	***5.5***

COURSE TYPE	Compulsory/Special Background
PREREQUISITE COURSES:	-
LANGUAGE OF TEACHING AND EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEBSITE (URL)	https://exams-geo.the.ihu.gr/course/view.php?id=180

LEARNING OUTCOMES

Learning outcomes

The course aim is the convergence of the knowledge from previous courses of Physical Chemistry, Organic Chemistry, Inorganic Chemistry and Biochemistry to describe food, as well as the changes that they undergo during storage/processing from a chemical point of view.

- Combining the knowledge of the students to describe the food at a molecular level.
- Application of knowledge of chemistry to understand the structure and function of food.
- Composition of new texts focusing on specific topics of food chemistry
- Analysis and understanding of the role of ingredients in food
- Understanding the effects of chemical composition on the macroscopic/functional/technological dimension of a food material.

General Skills

- Searching, analyzing, and synthesizing of data and information, also using the necessary technologies
- Promotion of free, creative, and inductive thinking
- Project planning and management
- Working in an interdisciplinary environment
- Adaptation to new situations- Independent and group work and decision making

COURSE CONTENT

Theory

1. Flavor and kinaesthesis
2. Water in foods
3. Proteins: Structure/Function relations
4. Lipids in foods
5. Browning reactions.
6. Color in foods.
7. Autoxidation and antioxidants.

8. Food additives.
9. Food contaminants.
10. Vitamins and trace elements
11. Introduction to food structure.
12. Food constituents:Case study I.
13. Food constituents:Case study II.

Laboratory Exercises

1. Lipids, Proteins, ascorbic acid and in food, color reactions, detection tests.
2. Sugars: Detection of direct reducing sugars (Fehling method), inversion method and detection of non-reducing sugars, iodine test for starch-cellulose detection
3. Nutritional components of milk: Milk composition, separation of casein and whey proteins, determination of reducing sugars (lactose), phosphates and calcium.
4. Histochemical analysis of products with cellular organization: microscopic observation of wheat and corn grains. Detection test for: a) Cellulose b) Starch c) Proteins d) Fatty substances e) Peroxidase f) Lignin.
5. Browning reactions, non-enzymatic browning: Maillard reaction – Caramelization – Oxidation of ascorbic acid. Experimental ways to prevent non- enzymatic browning.
6. Browning reactions, enzymatic browning: General (enzyme, action, natural food substrates). Methods of preventing enzymatic browning in food pulps using physical-chemical means (heating, addition of citric acid, ascorbic acid, sugar, sodium chloride, calcium chloride, EDTA, cysteine, sodium bisulfite)
7. Emulsions: Categories of emulsifiers – Types of emulsions. Experimental identification of the type of emulsions Effect of heat on the stability of natural emulsions (milk, margarine). Evaluation of the emulsifying capacity of various additives
8. Starch Gelatinization: Starch structure (Gelatization stages, gelatinization temperature) Determination of the gelatinization temperature of starch by polarizing microscope. Effect of sugar, citric acid and amylase on gelatinization temperature and gel consistency.
9. Protein gels - Gelatin: Gels - hydrocolloids. Gelatin Effect of sugar and papain on gelatin gels (diurea reaction, gel consistency)
10. Malolactic fermentation in wine

TEACHING and LEARNING METHODS - EVALUATION

TEACHING METHOD	Face to face: • Lectures (theory) in the classroom and supplementary, online • Laboratory exercises in equipped laboratory
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures with PowerPoint slides using PC and projector • Notes in electronic format • Use of videos and online applications • Post course material and communicate with students on the Moodle online platform
TEACHING ORGANIZATION	

Activity	***Semester Workload***
Lectures	39
Laboratory exercises	20
Writing laboratory reports	10
Independent Study	26
TOTAL	***95***

STUDENT EVALUATION	Language of Assessment: Greek Evaluation methods: • Student are required to attend 80% of scheduled laboratories. To participate in this course, students must complete a compulsory safety induction. • Final written exams in the theoretical part (50%) and the laboratory part (50%) of the course with short development

	questions, critical questions and solving exercises. The evaluation criteria are presented and analyzed to the students at the beginning of the semester.

RECOMMENDED BIBLIOGRAPHY

- Akoh C.C., Min D.B. Food Lipids: Chemistry,. Nutrition and Biotechnology (2nd edition, 2002) Maercel Dekker, Inc, New York, Basel.
- Belitz H.-D. Grosch W., Schieberle P. 4th Edition (2009)
- Belton P. (ed) The Chemical Physics of Food (2007) Blackwell Publishing Ltd, Oxford.
- Coultate T. Food: The chemistry of its components (5th edition, 2008) RSC, Oxford.
- Damodaran S., Parkin K., Fennema O.R. Fennema's Food Chemistry (4th edition, 2007) CRC Press, Boca Raton, Florida
- Dickinson E. An introduction to Food Colloids (1994) Oxford University Press, Oxford.
- Friberg S.E., Larsson K., Sjöblom J. (ed) Food Emulsions. 4th ed. (2004) Marcel Dekker Inc., New York.
- Garti N., Sato K. (eds) Crystallization Processes in Fats and Lipid Systems (2001) Marcel Dekker, New York.
- McClements D.J. Food Emulsiosn. Principles, Practice and Techniques (2nd ed 2004) CRC Press, Boca Raton.
- McClements D.J. (ed) Understanding and controlling the microstructure of complex foods (2007) CRC Press, Boca Raton.
- Newton D.E. Food Chemistry (2007) Facts on File, Inc, New York.
- Silbery R.J., Alberty R.A., Bawendi M.G. Physical Chemistry (4th ed, 2005) Wiley, NY.
- Ritzoulis C., Introduction to the Physical Chemistry of Foods, (2013), CRC Press, Boca Raton, Florida.
- Walstra P. Physical Chemsitry of Foods (2003) Marcel Dekker, NY.
- *-Related Scientific journals:*
- Food Chemistry
- Food Hydrocolloids
- Langmuir
- Trends in Food Science and technology
- Current Opinion in Colloid and Interface Science

FOOD ENGINEERING II

SCHOOL	SCHOOL OF GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	276-190401	**SEMESTER OF STUDIES**	4th
COURSE TITLE	FOOD ENGINEERING II		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
Lectures	2	
Practical Exercises	1	
Laboratory Exercises	2	
total	***5***	***6.5***

COURSE TYPE	Scientific Area
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEBSITE (URL)	https://exams-geo.the.ihu.gr/course/view.php?id=174

LEARNING OUTCOMES

Learning outcomes

The course aims to achieve the following learning outcomes for students:

- acquiring knowledge in the basic engineering principles that govern the physical processes during food processing and in particular liquid transport, mechanical separations (sieving, filtration, sedimentation, and centrifugation), homogenization, fractionation, mixing and fluidization

- recognizing, understanding and interpreting the physical phenomena govern these processes

- mathematically describing and evaluating the contribution of each phenomenon or parameter to the evolution of the process

- combining of the aforementioned learning outcomes with the aim of designing these processes according to the requirements and specifications of industrial applications

- acquiring experience in applying the above knowledge and analytical skills to industrial-type processes and machines

General Skills

Analyzing, interpreting and synthesizing empirical data obtained from experimental setups
Searching and analyzing information using information and communication technologies
Promotion of analytical, productive and inductive thinking
Working in an interdisciplinary environment
Autonomous work
Teamwork
Decision making

COURSE CONTENT

Unit 1: Fluid Mechanics

- Pumping: Bernoulli's theorem, typical pump quantities, suction lift and cavitation, criteria for selecting a pump, types of pumps, applications of pumps, principle of operation and efficiency of

steam ejectors.
- Fluidization. Fluidization theory, fluidization applications.

Titles of Laboratory Exercises
- Study of fluidization characteristics of gas/solid system.

Unit 2: Mechanical Separations
- Sieving: Particle size analysis, sieving applications
- Filtration: Darcy's law, relationships between filtration parameters, constant flow filtration, constant pressure filtration, filter media, filtration devices, filtration applications.
- Sedimentation: Stokes and Newton's laws and equations, calculation of sedimentation surface, applications of sedimentation.
- Centrifugation: Centrifugal separation of immiscible liquids, centrifugal clarification, centrifugal sludge removal, centrifugal filtration, centrifugal devices, cyclones, centrifugal applications.
- Fractionation: Selection criteria for fractionation devices, fractionation devices, energy requirements of fractionation, fractionation applications.

Titles of Laboratory Exercises
- Study of Factors Affecting the Performance of a Ball Mill – Determination of Particle Size Distribution of a Granular Food.
- Study of the operating parameters of a laboratory filter press.
- Study of the parameters affecting the performance of a laboratory centrifugal disc separator during the separation of two immiscible liquids and a centrifugal disc clarifier.

Unit 3: Mixing and Homogenization
- Mixing: Mixing of solids, mixing of liquids and slurries, mixing applications.
- Homogenization - Emulsification: Interfacial tension, emulsifiers, emulsification - homogenization methods and devices, applications of emulsification - homogenization.

Titles of Laboratory Exercises
- Energy requirements during stirring/mixing of liquid foods.
- Homogenization

TEACHING and LEARNING METHODS - EVALUATION

TEACHING METHOD.	Face to face: • Lectures (theory and exercises) in the classroom • Laboratory exercises in groups in a pilot plant laboratory
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures with PowerPoint slides using PC and projector • Notes, solved and unsolved problems in electronic format • Posting course material and communicating with students on the Moodle online platform • Use of electronic devices for retrieving and recording experimental data (data logging) in the laboratory
TEACHING ORGANIZATION	

Activity	***Semester Workload***
Theory and practical exercises	39
Laboratory exercises	26
Independent study	104
TOTAL	***169***

STUDENT EVALUATION	Language of Assessment: Greek or English. Evaluation methods: • Compulsory attendance at (at least) 80% of the

	laboratory exercises. • Written final exams in the theoretical part of the course with problem solving and comprehension/judgment questions (70% of the final grade). • Final written exams in the laboratory part of the course with multiple choice, short development and problem-solving questions (30% of the final grade). • Optional written assignments in laboratory exercises. The evaluation criteria are presented and analyzed to the students at the beginning of the semester.

RECOMMENDED BIBLIOGRAPHY

-Suggested Bibliography:

- McCabe W., Smith J., Harriott P.: Fundamental Physical Processes of Engineering. Editions Giola, 2003
- Marinou-Kouri D., Parliarou-Tsami E.: Physical Processes Exercises. Editions Papasotiriou, 1994.
- Kastrinaki E.: Mechanical Physical Processes. Editions Giola, 2004
- Darby R.: Chemical Engineering Fluid Mechanics. Editions Marcel Dekker, 2001.
- Earle R.: Unit Operations in Food Processing (https://nzifst.org.nz/resources/unitoperations/index.htm)

-Related scientific journals:

- Journal of Food Engineering
- Journal of Food Processing & Technology

FOOD PLANT SANITATION AND SAFETY

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
STUDY LEVEL	UNDERGRADUATE		
COURSE CODE	276-190402	**SEMESTER**	4th, Spring
COURSE TITLE	FOOD PLANT SANITATION AND SAFETY		

TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Lectures	2	
Total	2	3

COURSE TYPE	Compulsory / General Background
PREREQUISITE COURSES	-
TEACHING LANGUAGE & EXAMS:	Greek
COURSE OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEB-PAGE (URL)	

LEARNING OUTCOMES

Learning outcomes

The course aims to educate students in issues related to the hygiene of industrial food processing and production units as well as in issues related to the safety of workers in workplaces within these units. The topics covered in this course are:

- Good hygienic practice in food industries. Healthy design of building facilities, healthy design of mechanical equipment. Work instructions for personal hygiene. Working instructions for cleaning food processing equipment with Clean in Place and Clean out of Place systems. Categories, properties and uses of detergents and disinfectants used in the food industry.
- Safety in the workplace. Definition of occupational accident and disease. Hazard categories, electric shock, noise, slips, dust explosion, etc. Process Hazard Analysis Methodologies: What if?, HAZOP (hazard analysis & Operability), FMEA (failure mode – effect analysis), FTA (fault tree analysis). Case studies

General Skills

1. Search, analysis and synthesis of data and information using the necessary technologies.
2. Adaptability to new situations and decision making.
3. Autonomous work and Team work.
4. Working in an international context.
5. Planning and project management.
6. Respect for the natural environment.
7. Promoting free, creative and causative thinking.
8. Acquisition of skills in problem solving, combining the knowledge acquired from previous courses and personal/group research.
9. Decision making in unpredictable environments manage and work in groups to solve problems, create strategy and organize project management.

COURSE CONTENT

Thematic sectors covered by this course are:

- Good hygienic practice in food industries.
- Healthy design of building facilities
- Manufacturing materials for mechanical equipment for food industries.

- Corrosion of food industry mechanical equipment manufacturing materials and methods of limitation.
- Sound design of mechanical equipment.
- Work instructions for observing personal hygiene.
- Working instructions for cleaning food processing devices with Clean in Place and Clean out of Place systems.
- Categories, properties and uses of detergents and disinfectants used in the food industry
- Safety in the workplace. Definition of occupational accident and disease.
- Hazard categories, electric shock, noise, slips, dust explosion, etc.
- Laboratory safety, chemical handling and general principles of safe work in a food testing laboratory.
- Process Hazard Analysis.
- Methodologies: What if?, HAZOP (hazard analysis & operability), FMEA (failure mode – effect analysis), FTA (fault tree analysis).
- Case studies

TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING MODE.	Face to face: Lectures in the classroom using PC and projector
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures on PowerPoint slides using PC and projector • Notes in electronic format • Post course material and communicate with students on the Moodle online platform and email.
TEACHING ORGANIZATION	
STUDENT EVALUATION	Evaluation Language: Greek. Evaluation methods: Written Exams

Activity	***Semester Workload***
Lectures	26
Independent study	64
Total Course	**90**

RECOMMENDED-BIBLIOGRAPHY

Stranks, J. (2016) Health and Safety at Work. 10th edn. Kogan Page. https://www.koganpage.com/product/health-and-safety-at-work-9780749478179 (Accessed: 25 September 2022).

FOOD PROCESSING I (ONLY IN FRENCH LANGUAGE)

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	276-190404	**SEMESTER OF STUDIES**	4th
COURSE TITLE	FOOD PROCESSING I		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
Lectures	2	4
Practical Exercises	1	
Laboratory Exercises	1	1
TOTAL	4	5

COURSE TYPE	Compulsory/Special Background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes (in French)
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes

The course aims to achieve the following learning outcomes for students:
- understanding the principles and methods of food processing and preservation
- application of the theory in the food industry in the form of computational exercises.

General Skills

Search, analysis and synthesis of data and information, using the necessary technologies
Decision making
Autonomous work
Teamwork
Work in an international environment
Work in an interdisciplinary environment
Promotion of free, creative and inductive thinking

COURSE CONTENT

• Heat treatment of food
Definitions, methods of measuring the thermal resistance of microorganisms, survival curve-parameter D, curve of thermal destruction times-parameters F and z, factors affecting the thermal resistance of microorganisms, factors affecting the speed of heat penetration into food, ways of heat penetration, spoilage enzymes, classification of foods in relation to pH, spoilage microorganisms, heat treatment applied to the food industry, destruction of microorganisms at constant and variable temperature, killing rate at constant and variable temperature, heating and cooling curves, heat treatment calculation methods, devices heat treatment, aseptic packaging, effect of heat treatment on food.
• Microwave food processing
Generalities, factors affecting microwave heating speed, microwave applications, advantages and disadvantages of microwave application.
• Food irradiation processing
Generalities, irradiation actions, effects of irradiation on food, methods of limiting unwanted effects, applications of irradiation, packaging of irradiated foods.

• Cold production
Generalities, cold production by liquid venting, mechanical compression refrigerating machines, calculation of mechanical vapor compression refrigerating machine.
• Preservation of food at low temperatures
Effect of low temperatures on microorganisms and enzymes, cooling and freezing method, food preservation conditions during cooling and freezing, changes in food during cooling and freezing preservation.
• Cooling load calculation
Definitions, cooling load analysis, total cooling load and cooling capacity, cooling load calculation examples.
• Mechanism of freezing
Freezing curve, freezing speed and ice crystal formation in food, calculation of initial freezing point, calculation of percentage of non-crystallizable water, calculation of freezing time.
• Water activity and food preservation
Definitions, sorption isotherms, importance of sorption isotherms in food technology, factors that reduce water activity, microbial growth and food spoilage in relation to water activity, intermediate moisture foods.

Titles of Laboratory Exercises:
• Static sterilizer
• Rotary sterilizer
• Microwaves
• Freezing

TEACHING AND LEARNING METHODS - EVALUATION

TEACHING METHOD	Face to face: • Lectures (theory and exercises) in the auditorium • Laboratory exercises in groups in the Industrial Laboratory
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures with PowerPoint slides using PC and projector • Notes in electronic format • Post course material and communicate with students on the Moodle online platform
TEACHING ORGANIZATION	

Activity	***Semester Workload***
Theory and practical exercises	39
Laboratory exercises	39
Writing assignments for laboratory exercises	20
Independent study	100
TOTAL	***198***

STUDENT EVALUATION	Language of Assessment: Greek or French. Evaluation methods: • Compulsory attendance at (at least) 80% of the laboratory exercises. • Written final exams in the theoretical part of the course with essay development and problem solving questions. • Final written exams in the laboratory part of the course with short development and problem solving questions. • Optional written assignments in the laboratory exercises (20% of the grade of the laboratory part of the course if submitted). The evaluation criteria are presented and analyzed to the students at the beginning of the semester.

RECOMMENDED BIBLIOGRAPHY

-*Suggested Bibliography:*
• Bloukas I.G., Food Processing and Preservation, Stamouli Publications, Athens, 2004.
• Rodis P.S., Food Preservation Methods, Stamouli Publications, Athens, 1995.
• Decareau R.V., Microwave Foods: New Product Development, Food & Nutrition Press Inc., Trumbull, Connecticut, 1992.
• Fellows P.J., Food Processing Technology: Principles and Practice, Third Edition, Woodhead Publishing Limited and CRC Press LLC, Cambridge, Boca Raton, 2009.
• Reuter H., Aseptic Packaging of Food. Technomic Inc., Lancaster, 1988.
• Singh R.P., Heldman D.R., Introduction to Food Engineering, Fifth Edition, Elsevier-Academic Press, Amsterdam, 2014.
• Thorne S., Food Irradiation, Elsevier Applied Science, London, 1991.
-*Related scientific journals:*
• Journal of Food Engineering

SCIENTIFIC REPORT WRITING (SEMINAR)

SCHOOL	SCHOOL OF GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF EDUCATION	UNDERGRADUATE		
COURSE CODE	276-190405	**SEMESTER OF STUDY**	4th
COURSE TITLE	SCIENTIFIC REPORT WRITING (SEMINAR)		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
Laboratory Exercises	2	
TOTAL	***2***	***3***

COURSE TYPE	Compulsory/Skill Development
PREREQUISITE COURSES:	-
LANGUAGE OF TEACHING AND EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEBSITE (URL)	https://exams-geo.the.ihu.gr/course/view.php?id=177

LEARNING OUTCOMES

Learning outcomes

The course aims to achieve the following learning outcomes for students:

- acquiring knowledge about literature search
- acquiring knowledge about the evaluation and utilization of literature sources
- acquiring the ability to format and present the acquired material
- acquiring knowledge for the appropriate use of the material and writing of a scientific paper

General Skills

- Searching, analyzing and synthesizing data and information, using the necessary technologies
- Adapting to new situations
- Decision making
- Autonomous work
- Working in an interdisciplinary environment
- Exercising criticism and self-criticism
- Promotion of free, creative and inductive thinking

COURSE CONTENT

Section 1: Information and directions for writing a scientific paper

- Copyright
- Directions for literature search
- Directions for writing a scientific paper
- Directions for writing a thesis
- Directions for power point presentation

Module 2: Presentations of scientific reports by the students

- Presentation of a scientific report, via power point
- Writing a scientific report

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>TEACHING METHOD</td><td>Face to face:
Lectures (theory and exercises) in the classroom</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES</td><td>Lectures with PowerPoint slides using PC and projector
Notes in electronic format
Posting course material and communicating with students on the Moodle online platform</td></tr>
<tr><td>TEACHING ORGANIZATION</td><td><table><tr><th>Activity</th><th>Semester Workload</th></tr><tr><td>Laboratories</td><td>26</td></tr><tr><td>Paper preparation</td><td>26</td></tr><tr><td>TOTAL</td><td>52</td></tr></table></td></tr>
<tr><td>STUDENT EVALUATION</td><td>Language of Assessment: Greek or English.
Evaluation methods:
Compulsory attendance at (at least) 80% of the laboratory exercises.
Report presentation (50% of the final grade)
Report writing (50% of the final grade)
The evaluation criteria are presented and analyzed to the students at the beginning of the semester.</td></tr>
</table>

RECOMMENDED -BIBLIOGRAPHY

-Suggested Bibliography:

- All international acclaimed scientific journals

ORGANIZATION AND MANAGEMENT OF FOOD INDUSTRIES

Course outline pending.

FOOD PROCESSING II

SCHOOL	SCHOOL OF GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	276-190505	**SEMESTER OF STUDIES**	5th
COURSE TITLE	FOOD PROCESSING II		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
Lectures	2	
Practical Exercises	2	
Laboratory Exercises	2	
total	***6***	***8***

COURSE TYPE	Scientific Area
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEBSITE (URL)	https://exams-geo.the.ihu.gr/course/view.php?id=172

LEARNING OUTCOMES

Learning outcomes

The course aims to achieve the following learning outcomes for students:

- acquiring knowledge in the basic processes utilized at industrial scale for the production of food including mass and heat transfer such as extraction, distillation, crystallization, drying etc;

- understanding the mechanisms and the operation principles of the various devices used in different processes in food industries, in order to be able to identify and select the appropriate equipment depending on the characteristics and the properties of the raw materials and the final products;

- combining of the aforementioned learning outcomes with the aim of designing these processes according to the requirements and specifications of industrial applications;

- acquiring experience through laboratory exercises at pilot scale, in applying the above knowledge and analytical skills to industrial-type processes.

General Skills

Analyzing, interpreting and synthesizing empirical data and information obtained from experimental setups;
Adaptation to existing conditions;
Advancing analytical, productive and inductive thinking;
Working in an interdisciplinary environment;
Autonomous work;
Work in teams;
Decision making.

COURSE CONTENT

Fundamentals, design and operation principles, industrial scale equipment and applications, troubleshooting of the following processes:

- Evaporation and condensation;
- Crystalization;
- Distillation;

- Extraction;
- Membrane separations;
- Drying and dewatering;
- Heat and mass transfer.

Laboratory Exercises

- Mass and heat transfer calculation and yield calculation of a two stage evaporator;
- Study of the operation of a rotating drum dryer;
- Examination of parameters affecting the performance of a fluidized layer dryer;
- Investigation of drying stages in a disk dryer;
- Study of the operation of a fractional distillation column for the separation of a binary feed;
- Investigation of the operation of a lyophilizer;
- Examination of the performance of a microwave oven;
- Evaluation of thermal intrusion in a metal container, in a static autoclave sterilizer;
- Study of the parameters affecting heat transfer in a metal container, in a rotary autoclave;
- Examination of the factors affecting the freezing rate of food products in a fluidized layer freezer;
- Process control in food processing; · on/off (two position) controllers; proportional controllers (P-controllers); proportional integral controllers (PI controllers); proportional integral derivative controllers (PID controllers). Mechanical, pneumatic, electric, electronic automatic control systems;
- Study of heat transfer under unsteady state using electronic processor.

TEACHING and LEARNING METHODS - EVALUATION

TEACHING METHOD.	Face to face: • Lectures (theory and exercises) in the classroom; • Laboratory exercises in groups in pilot scale devices
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures with PowerPoint slides using PC and projector; • Notes, solved and unsolved problems in electronic format; • Posting course material and communicating with students on the online platform; • Use of electronic devices for retrieving and recording experimental data (data logging) in the laboratory.
TEACHING ORGANIZATION	

Activity	***Semester Workload***
Theory and practical exercises	52
Laboratory exercises ands reporting	78
Independent study	122
TOTAL	***252***

STUDENT EVALUATION	Language of Assessment: Greek or English. Evaluation methods: • Compulsory attendance at (at least) 80% of the laboratory exercises. • Written final exams in the theoretical part of the course with problem solving and comprehension/judgment questions (80% of the final grade). • Final written exams in the laboratory part of the course with multiple choice, short development and problem-solving questions (20% of the final grade). • Optional written assignments in laboratory exercises.

	The evaluation criteria are presented and analyzed to the students at the beginning of the semester.

RECOMMENDED BIBLIOGRAPHY

-Suggested Bibliography:

- McCabe W., Smith J., Harriott P.: Fundamental Physical Processes of Engineering. Editions Giola, 2003
- Kastrinaki E.: Mechanical Physical Processes. Editions Tziola, 2004
- Darby R.: Chemical Engineering Fluid Mechanics. Editions Marcel Dekker, 2001.
- Earle R.: Unit Operations in Food Processing (https://nzifst.org.nz/resources/unitoperations/index.htm)

-Related scientific journals:

- Journal of Food Engineering
- Journal of Food Processing & Technology

FOOD LEGISLATION

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**276-190506**	**SEMESTER OF STUDIES**	6th
COURSE TITLE	FOOD LEGISLATION		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHINGHOURS**	**CREDIT UNITS**
Lectures	2	3
Laboratory Exercises		
Total	2	3

COURSE TYPE	Compulsory/ Special Foundation Course
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (in Emglish)
COURSE WEBSITE (URL)	https://exams-geo.the.ihu.gr/login/index.php

LEARNING OUTCOMES

Learning outcomes

Upon completion of the course, the student is expected to

1.Have advanced knowledge , involving a critical understanding of the legislation on composition, labelling and advertishment of foodstuffs and products sold for human consumption within the EU

2. Identify and assess the responsibilities and obligations of food producers, manufacturers and suppliers of food and food products

3. Manage complex technical or professional activities or projects, taking responsibility for decision-making of the course context and in particular compliance with the food legislation.

4. Solve complex and unpredictable problems on issues of food legislation in a working environment

General Skills

Searching and analyzing information using information and communication technologies
Promotion of analytical, productive and inductive thinking
Working in an interdisciplinary environment
Demonstrate social, professional and ethical responsibility
Respect for diversity and multiculturalism
Teamwork

COURSE CONTENT

The course includes the following major contetnts:

11&2 Mandatory food labeling - identity, chemical composition, nutrition information, origin declaration (2 lectures)
3. Approaches to allergenic ingredient labeling
4. Health and nutrition claims according to European Legislation
5. Claims and misrepresentations
6&7.Fraud, false description, fraud - recent cases (2 lectures)
8&9. Non-compulsory labelling practices for food products (2 lectures)
10. Legislation on Food Contact Materials
11. The British approach to food labelling (QUID)

12. The role of food consumer associations in shaping food labelling strategy

Practice exercises will be case studies assigned to students to
examine the effectiveness of the European and international legislative framework for
Food labelling

TEACHING and LEARNING METHODS - EVALUATION

TEACHING METHOD	Face to face: • Lectures in the classroom • In class practice exercises
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures with PowerPoint slides using PC and projector • Notes in electronic format • Video projections • Posting course material and communicating with students on the Moodle online platform
TEACHING ORGANIZATION	***Activity*** | ***Semester Workload*** Lectures | 26 Independent Study | 64 TOTAL | ***90***
STUDENT EVALUATION	Language of Assessment: Greek or English. Evaluation methods: • Written final exams with short development and multiple choice questions(100% of the final grade). The evaluation criteria are presented and analyzed to the students at the beginning of the semester.

RECOMMENDEDBIBLIOGRAPHY

- Suggested Bibliography:

Food labelling - general EU rules - Your Europe (europa.eu)

Labelling and nutrition (europa.eu)

EFSA | Science, safe food, sustainability (europa.eu)

- Related scientific journals:

- Food Policy

TECHNOLOGY AND QUALITY CONTROL OF OILIVE OIL AND LIPIDS

Course outline pending.

TECHNOLOGY AND QUALITY CONTROL OF MILK AND DAIRY PRODUCTS

SCHOOL	SCHOOL OF GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**276-15-5002**	**SEMESTER OF STUDIES**	5th AUTUMN
COURSE TITLE	TECHNOLOGY AND QUALITY CONTROL OF MILK AND DAIRY PRODUCTS		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
Lectures	3	4.5
Laboratory Exercises	3	3
Total	6	7.5

COURSE TYPE	Compulsory Elective / Specialized
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEBSITE (URL)	https://exams-geo.the.ihu.gr/login/index.php

LEARNING OUTCOMES

Learning outcomes
The course provides the necessary information and methodology to: understand the physicochemistry and technology of milk and milk products; understand the mechanisms that undergo the different phenomena that take place at dairy technology; be able to access the quality control of the products; understand the impact of rheological and textural properties of dairy products to their quality; interpretation and evaluation of the results of an analysis regarding the safety and quality; acquiring experience in applying the above knowledge and analytical skills to industrial-type processes
General Skills
Analyzing and interpreting empirical data obtained from experimental measurements Searching and analyzing information using information and communication technologies Promotion of analytical, productive and inductive thinking Working in an interdisciplinary environment Autonomous work Teamwork Decision making

COURSE CONTENT

The course includes the following major units:

Unit 1. Milk: Chemical composition and physicochemical properties of milk, factors that affect chemical composition of milk, effect of heat treatment on the physicochemical properties and chemical composition of milk, microbiology of milk and dairy products, quality control of raw milk.

Titles of Laboratory Exercises

- Determination of dry matter content and acidity of milk.
- Fat content and specific gravity determination of milk-Milk adulteration.

Unit 2. Thermal processing of milk-Different types of milk: Effect of heat treatment on the

physicochemical properties and chemical composition of milk, pasteurization, sterilization, condensed milk, milk powder, quality control of heat-treated milk.

Titles of Laboratory Exercises

- Phosphatase, albumin and stability tests.

Unit 3. Fermented milk products: Yoghurt and kefir-technology and quality control, other fermented milks.

Titles of Laboratory Exercises

- Manufacture of yoghurt and kefir.
- Quality control of fermented milks.

Unit 4. Cheese: Rennet induced gel formation, factors that affect the gel formation, technology and quality control of different kinds of cheeses (rennet coagulated, acid coagulated, heat/acid coagulated cheeses), processed cheeses-technology and quality control, cheese ripening.

Titles of Laboratory Exercises

- Manufacture of white brined and pasta-filata cheeses.
- Manufacture of whey cheeses.
- Quality control of cheeses.

Unit 5. Other dairy products: Cream, butter and ice-cream-Technology and quality control.

Unit 6. Innovative methods in dairy technology: Membrane filtration, ultrasound application, high pressure processing, carbon dioxide processing, modified atmosphere packaging, active packaging, functional foods.

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>TEACHING METHOD</td><td>Face to face:
Lectures in the classroom
Laboratory exercises</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES</td><td>Lectures with PowerPoint slides using PC and projector
Notes in electronic format
Posting course material and communicating with students on the Moodle online platform</td></tr>
<tr><td>TEACHING ORGANIZATION</td><td><table><tr><th>Activity</th><th>Semester Workload</th></tr><tr><td>Lectures</td><td>39</td></tr><tr><td>Laboratory exercises</td><td>39</td></tr><tr><td>Written assignments</td><td>26</td></tr><tr><td>Independent Study</td><td>112</td></tr><tr><td>TOTAL</td><td>216</td></tr></table></td></tr>
<tr><td>STUDENT EVALUATION</td><td>Language of Assessment: Greek or English.
Evaluation methods:
Compulsory attendance at (at least) 80% of the laboratory exercises.
Written final exams in the theoretical part of the course with short development and multiple choice questions (60% of the final grade).
Written final exams in the laboratory part of the</td></tr>
</table>

	course with short development and problem-solving questions (40% of the final grade). • Optional written assignments in the laboratory exercises (20% of the grade of the laboratory part of the course if submitted). • Optional written work in the theoretical part of the course on a topic of the students' choice, which will be presented during the semester (30% of the grade of the theoretical part of the course if submitted). The evaluation criteria are presented and analyzed to the students at the beginning of the semester.

RECOMMENDED BIBLIOGRAPHY

- Suggested Bibliography:

- Fox P. F., McSweeney P. L. H., Dairy Chemistry & Biochemistry: Blackie Academic & Professional, Weinheim, 1998.
- Fox P. F., Guinee T. P., Cogan T. M., McSweeney P. L. H. Fundamentals of Cheese Science: Aspen Publishers, Inc., Gaithersburg, 2000.
- Goff H.D., Hartel R.W. Ice cream, 7nd edition: Springer Science & Business Media, New York, 2013.
- Tamime A.Y., Robinson R.K., Tamime and Robinson's Yogurt, Science and Technology: Pergamon Press, Boca Raton, Boston, New York, Washington, DC, 2007.
- Walstra P., Jennes R.: Dairy Chemistry and Physics: Wiley, New York, Chichester, Brisdane, Toronto, Singapore, 1984.
- Walstra, P., Wouters, J. T. M., & Geurts, T. J. (2006). Dairy Science and Technology, 2nd Edition. Taylor & Francis, CRC Press: Boca Raton.

- Related scientific journals:

- International Dairy Journal
- International Journal of Dairy Technology
- Journal of Dairy Research
- Journal of Dairy Science

TECHNOLOGY & QUALITY CONTROL OF CEREALS

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**276-15-6001**	**SEMESTER OF STUDIES**	6th
COURSE TITLE	TECHNOLOGY AND QUALITY CONTROL OF CEREALS		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHINGHOURS**	**CREDIT UNITS**
Lectures	3	4.5
Laboratory Exercises	3	3
Total	6	7.5

COURSE TYPE	CompulsoryElective/ Specialized
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEBSITE (URL)	https://exams-geo.the.ihu.gr/login/index.php

LEARNING OUTCOMES

Learning outcomes
Upon completion of the course, the student is expected to be able to: 1 – Appreciate the importance of cereals as tasty food and for their nutritional value. 2 – Critically select appropriate handling methods and grain storage conditions. 3 – Recognize and apply botanical, physical and chemical wheat quality criteria for the selection of the appropriate treatment. 4- Acquire advanced knowledge of the individual components of cereals in terms of their content, and Their functional role cereal foods as well as their methods of analysis. 5 – Understand the dry milling processes of soft and durum wheat, as well as the husking and parboiling processes of rice. 6-Understand the stages of wet grain milling 7–Understand and interpret biochemical, chemical and technological processes during bread preparation as well as identify the parameters involved in the evaluation the quality of the final product 8- To apply the above advanced knowledge and analytical skills to solve complex and unpredictable problems in laboratory and industrial environment
General Skills
Analyzing and interpreting empirical data obtained from experimental measurements Searching and analyzing information using information and communication technologies Promotion of analytical, productive and inductive thinking Working in an interdisciplinary environment Autonomous work Teamwork Decision making

COURSE CONTENT

The course includes the following major contetnts:

1. Introduction to cereals, importance and storage.
Cereals in general. Importance of cereal grains for nutrition. Storage of grains.
2. Structure and composition of grains.
Morphology of cereal grains. Cereal components: content, chemical, biochemical and mechanical properties .
3. Dry milling of cereals.
Dry milling of wheat: cleaning, sorting, grinding (types and importance of each), general arrangement in flour mills, principles of operation of basic machinery. Commercial types of wheat flour. Fine grinding, air classification of flour. Dry milling and flour of other cereals.
4, Hulling of grains
Rice: Milling and parboiling
Description of stages of rice cleaning and hulling. Parboiling: purpose of the process, stages, and properties of parboiled rice. Grinding oats. Cleaning, Bleaching, Hulling, and Polishing of Barley.
5. Wet milling of cereals.
Description of wet milling process of maize. Peculiarities wet milling of wheat. Products of wet milling: starch syrups
6. Various types of grain foods.
Food from whole , crushed or ground grain. Puffing, flaking, extrusion products (pasta).
7. Wheat flour preparation (dough).
Dough rising -Baker's Yeast: Necessary Ingredients and Process. Stages of baking, physical, chemical and enzymatic actions occurring involved. Chemical rising (baking powder) or by air and steam. Common mistakes during preparation of bakery products expanded by yeast or other ways.
8. Bakery ingredients.
Role of different ingredients in bakery products. Characteristics of flour for various uses. Improving the properties of flour (grinding, flour mixing, additives and improvers). Staling process of bakery goods

TEACHING and LEARNING METHODS - EVALUATION

TEACHING METHOD	Face to face: • Lectures in the classroom • Laboratory exercises
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures with PowerPoint slides using PC and projector • Notes in electronic format • Video projections • Posting course material and communicating with students on the Moodle online platform
TEACHING ORGANIZATION	

Activity	***Semester Workload***
Lectures	39
Laboratory exercises	30
Optional oral presentation (20 Minute)s on cutting-edge topics	20
Presentation sheet Of laboratory results/ Exercises	13
Independent Study	105
TOTAL	***207***

STUDENT EVALUATION	Language of Assessment: Greek or English. Evaluation methods: • Compulsory attendance at (at least) 80% of the laboratory exercises. • Written final exams in the theoretical part of the course with short development and multiple choice

	questions(60% of the final grade). • Written final exams in the laboratory part of the course with short development and problem-solving questions (40% of the final grade). • Optional group (up to 3 people) presentation (20 Minutes)in cutting edge topics (20% increment in grade the written examinations of the theoretical part for grades >4.2) The evaluation criteria are presented and analyzed to the students at the beginning of the semester.

RECOMMENDEDBIBLIOGRAPHY

- Suggested Bibliography:

- H.-D. Belitz, W. Grosch, P. Schieberle: Food Chemistry, Third Edition
- The ICC handbook of Cereals, Flour, Dough & Product Testing. , DEStech Publications, Inc. 2009
- Principles of Cereal Science and Technology, AACC 1986---International Association For Cereal Chemistry, ICC-Standards

- Related scientific journals:

- Cereal Chemistry
- Cereal Foods World
- Journal of Cereal Science

TECHNOLOGY AND QUALITY CONTROL OF WATER

SCHOOL	SCHOOL OF GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	276-190604	**SEMESTER OF STUDIES**	6th
COURSE TITLE	TECHNOLOGY AND QUALITY CONTROL OF WATER		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
Lectures and Practical Exercises	3	
Laboratory Exercises	3	
total	***6***	***7.5***

COURSE TYPE	Compulsory Elective / Specialized
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEBSITE (URL)	https://exams-geo.the.ihu.gr/course/view.php?id=184

LEARNING OUTCOMES

Learning outcomes

The course aims to achieve the following learning outcomes for students:

- acquiring theoretical and applied knowledge for the design, installation, operation, monitoring and optimization of systems used for the treatment of water with emphasis on the specific requirements of food industries;

- understanding the techniques utilized for the examination of water quality;

- understanding the mechanisms and the operation principles of the processes used in wastewater treatment;

- being able to evaluate operation problems of these units and adoption of appropriate measures to address them;

-- acquiring knowledge in the operation and evaluation of the performance of water treatment systems.

General Skills

Analyzing, interpreting and synthesizing empirical data and information obtained from experimental setups;
Adaptation to existing conditions;
Advancing analytical, productive and inductive thinking;
Working in an interdisciplinary environment;
Autonomous work;
Work in teams;
Decision making.

COURSE CONTENT

Water resources; Water cycle and water management;
Physical and chemical characteristics of water; organic matter, hardness, alkalinity, and solids content;
Design of water treatment processes;

Solids separation principles: sedimentation, filtration;
Design of sedimentation tanks;
Desing of filtration units: filter beds;
Coagulation and flocculation: Mechanisms of action, organic and inorganic coagulants, stages of operation, parameters affecting performance;
Removal of organic pollutants: activated carbon adsorption, batch and column operation, activated carbon beds and filters;
|Hardness removal;
Membrane separation for drinking water treatment;
Ion exchange processes: resins and design of resin filters;
Water disinfection: disinfection principles, conventional and advanced methods of water disinfection.
Laboratory exercises:
Water quality parameters: pH, hardness, alkalinity, organic matter -total organic carbon.
Coagulation flocculation: selection of suitable coagulant; evaluation of process performance and identification of parameters effect: pH, coagulant dose.
Activated carbon adsorption: adsorption isotherms; kinetic of adsorption, activated carbon column performance;
Sedimentation principles: estimation of sedimentation rate and solids removal rate;
Water disinfection: ozone treatment.

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>TEACHING METHOD.</td><td>Face to face:
Lectures (theory and exercises) in the classroom;
Laboratory exercises in groups in pilot scale devices</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES</td><td>Lectures with PowerPoint slides using PC and projector;
Notes, solved and unsolved problems in electronic format;
Posting course material and communicating with students on the online platform;
Use of electronic devices for retrieving and recording experimental data (data logging) in the laboratory.</td></tr>
<tr><td>TEACHING ORGANIZATION</td><td><table><tr><th>Activity</th><th>Semester Workload</th></tr><tr><td>Theory and practical exercises</td><td>39</td></tr><tr><td>Laboratory exercises ands reporting</td><td>130</td></tr><tr><td>Independent study</td><td>47</td></tr><tr><td>TOTAL</td><td>216</td></tr></table></td></tr>
<tr><td>STUDENT EVALUATION</td><td>Language of Assessment: Greek or English.
Evaluation methods:
Compulsory attendance at (at least) 90% of the laboratory exercises.
Written final exams in the theoretical part of the course with problem solving and comprehension/judgment questions (70% of the final grade).
Final written exams in the laboratory part of the course with multiple choice, short development and problem-solving questions (20% of the final grade).
Written assignments in laboratory exercises (10% of the final grade).
The evaluation criteria are presented and analyzed to the students at the beginning of the semester.</td></tr>
</table>

RECOMMENDED BIBLIOGRAPHY

-Suggested Bibliography:

- *Crittenden, J. C., Trussell, R. R., Hand, D. W., Howe, K. J., & Tchobanoglous, G. (2022). Stantec's Water Treatment: Principles and Design. John Wiley & Sons.*
- *Faust, S. D., & Aly, O. M. (2018). Chemistry of water treatment. CRC press.*
- *Gray, N. (2017). Water Science and Technology: An Introduction. CRC Press.*
- *Wetzel, R. G. (2000). Water Technology: an Introduction for Environmental Scientists and Engineers London: Arnold Publishers, 1999. Environmental Conservation, 27(2), 216-222.*

-Related scientific journals:

- *Desalination and Water Treatment;*
- *Water (Switzerland);*
- *Water Research;*
- *Journals of Water Process Engineering.*

FOOD INDUSTRY WASTEWATER MANAGEMENT AND TREATMENT

SCHOOL	SCHOOL OF GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	276-15-6005	**SEMESTER OF STUDIES**	6th
COURSE TITLE	FOOD INDUSTRY WASTEWATER MANAGEMENT AND TREATMENT		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
Lectures	2	
Practical Exercises		
Laboratory Exercises		
total	***2***	***3***

COURSE TYPE	Scientific Area
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEBSITE (URL)	https://exams-geo.the.ihu.gr/course/view.php?id=181

LEARNING OUTCOMES

Learning outcomes

The course aims to achieve the following learning outcomes for students:

- acquiring theoretical and applied knowledge for the design, installation, operation, monitoring and optimization of systems used for the treatment of food industry wastewater;

- understanding the mechanisms and the operation principles of the processes including biological, physical and chemical, used in wastewater treatment;

- being able to evaluate operation problems of these units and adoption of appropriate measures to address them;

-- acquiring knowledge in the implementation of suitable operation modes for energy and nutrients recovery;

- understanding the advanced processes utilized for the valorization of byproducts and residues.

General Skills

Analyzing, interpreting and synthesizing empirical data using information and communication technologies;
Adaptation to existing conditions;
Advancing analytical, productive and inductive thinking;
Working in an interdisciplinary environment;
Autonomous work;
Work in teams;
Decision making.

COURSE CONTENT

Analysis of water cycle and determination of volumetric and physical and chemical parameters used for the assessment of wastewater characteristics from food industries;

Experimental techniques used in the measurement of pollutants and wastewater properties;
Estimation of wastewater volumetric flows and methods used for flow and loading equalization;
Physical and chemical processes used in wastewater treatment: screening, grit and fats removal, sedimentation, coagulation;
Biological processes in wastewater treatment: suspended systems-activated sludge, fixed bed systems-biofilters, rotating disks;
Advanced biological systems: membrane bioreactors;
Identification of basic design and monitoring operation parameters for each process;
Sludge production and basic treatment processes;
Water reclamation and reuse, nutrients and energy recovery.

TEACHING and LEARNING METHODS - EVALUATION

TEACHING METHOD.	Face to face: • Lectures (theory and exercises) in the classroom;
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures with PowerPoint slides using PC and projector; • Notes, solved and unsolved problems in electronic format; • Posting course material and communicating with students on the online platform.
TEACHING ORGANIZATION	***Activity*** — ***Semester Workload*** Theory and practical exercises — 26 Independent study — 100 ***TOTAL*** — ***122***
STUDENT EVALUATION	Language of Assessment: Greek or English. Evaluation methods: • Written final exams with problem solving and comprehension/judgment questions. • Optional written assignments for the study of case studies. The evaluation criteria are presented and analyzed to the students at the beginning of the semester.

RECOMMENDED BIBLIOGRAPHY

-Suggested Bibliography:

- Eckenfelder W.W., 1989, Industrial Water Pollution Control, McGraw - Hill Books, Co.
- • Green J.H and Kramer A., 1979, Food Processing Waste Management, AVI Inc.
- • Hobson P.N. and Robertson, 1977, Waste Treatment in Agriculture. Applied Science Publications Ltd.
- • Metcalf and Eddy Inc., 1991, Wastewater Engineering, Treatment, Disposal and Reuse, McGraw-Hill Inc.

-Related scientific journals:

- Desalination and Water Treatment Journal.
- Desalination.

NANOTECHNOLOGY - BIOMATERIALS

SCHOOL	SCHOOL OF GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF EDUCATION	UNDERGRADUATE		
COURSE CODE	276-190606	**SEMESTER OF STUDY**	6th
COURSE TITLE	NANOTECHNOLOGY – BIOMATERIALS		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
Lectures	2	
TOTAL	***2***	***3***

COURSE TYPE	Compulsory / Scientific Area
PREREQUISITE COURSES:	-
LANGUAGE OF TEACHING AND EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEBSITE (URL)	https://exams-geo.the.ihu.gr/course/view.php?id=176

LEARNING OUTCOMES

Learning outcomes

The course aims to achieve the following learning outcomes for students:

- acquiring knowledge in the basic principles of nanotechnology in the food sector
- introduction to biomaterials and their applications in food and health sciences
- reading, understanding and critical evaluating the international scientific literature

General Skills

Searching, analyzing and synthesizing data and information, using the necessary technologies
Promotion of analytical, productive and inductive thinking
Working in an interdisciplinary environment
Autonomous work
Teamwork
Generating new research ideas

COURSE CONTENT

Unit 1: Nanotechnology

- Introduction: Natural Nanostructures in Food. Potential Benefits and Market Drivers for Consumer Acceptance of (Bio)Nanotechnology in the Agriculture and Food Sector. The Psychology of Food Choice: Implications for Emerging Food Technologies.
- Public Perception of Nanotechnology : Public Perception of Nanotechnology in Food. Quantitative Public Opinion Surveys. Qualitative Public Opinion Surveys. Equivocal and Adverse Stances to Nano(bio)technology. Public Consultation, Dialogue, Involvement, Engagement etc. Regulatory Issues. Possible Way Forward.
- Engineered Nanomaterials (ENPs): Inorganic Engineered Nanomaterials. Organic Engineered Nanomaterials . Surface Functionalized Engineered Nanomaterials.
- Applications of Nanotechnology for Food Ingredients, Additives and Supplements: Current Status of Nanotechnologies and Future Trends. Current and Projected Applications. Nanomaterials for (Health) Food Applications. Nanoencapsulation . Polymeric nanoparticles . Transport of bioactive substances.
- Nanotechnologies in Food Packaging: Improvement of Mechanical Properties through

Nanocomposites. Improvement of Barrier Properties. Improving the Performance of Bio-based Polymers. Surface Biocides . Active Packaging Materials. Intelligent Packaging Concepts. Nanosensors for Food Quality. Edible nanocoatings . Potential Migration of Nanoparticles from Food Contact Materials

- Other Applications of Nanotechnology in Food: Analytical Nanotechnology. Nanoemulsions. Bionanotechnology in the Food Industry. Nanofilters .
- Potential Risks of Nanofoods to Consumers: Knowledge Gaps for Risk Assessment of Nanotechnologies in Food. Consequences for Risk Analysis of ENPs.

Unit 2: Biomaterials

- Biomaterials: Materials Science. Surface properties. Polymers. Hydrogels. Natural materials. Metals. Ceramics. Complex materials. Biological applications: Organism responses to biomaterials. Assessment of biocompatibility. Degradation of materials in a biological environment. Applications, Tissue Engineering.

Unit 3: Bioethics

Genetically modified food. Animal experiments. Use of fetal cells. Cloning. Eugenics. Diagenetic animals. Patent protection. Public acceptance. Ethical, social and cultural issues. Legal framework.

TEACHING and LEARNING METHODS - EVALUATION

TEACHING METHOD	Face to face: • Lectures (theory and exercises) in the classroom • Laboratory demonstrations
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures with PowerPoint slides using PC and projector • Notes in electronic format • Using video and online applications in teaching • Posting course material and communicating with students on the Moodle online platform
TEACHING ORGANIZATION	

Activity	***Semester Workload***
Lectures	22
Laboratory demonstrations	4
Independent Study	44
TOTAL	***70***

STUDENT EVALUATION	Language of Assessment: Greek or English Evaluation methods: • Mid-term exam on a scientific article from the international literature (25% of the final grade). • Written final exams with true-false questions, multiple choice test, short answer questions and problem solving (75% of the final grade). The evaluation criteria are presented and analyzed to the students at the beginning of the semester.

RECOMMENDED -BIBLIOGRAPHY

-Suggested Bibliography:

- Anandharamakrishnan C., Parthasarathi S.: Food Nanotechnology: Principles and Applications. Taylor & Francis Group, 2019
- Chaudhry Q., Castle L., Watkins R.: Nanotechnologies in Food. RSC Publishing, 2010
- Jafari SM: Handbook of Food Nanotechnology: Applications and Approaches. Elsevier Science & Technology, 2020
- National Research Council: Nanotechnology in Food Products: Workshop Summary. The National Academies Press, 2009
- Ratner B., Hoffman A., Schoen F., Lemons J.: Biomaterials Science: An Introduction to

Materials in Medicine. Elsevier Academic Press, 2004

-Related scientific journals:

- Journal of Food Chemistry & Nanotechnology
- Nano Research & Applications
- Food Hydrocolloids
- Carbohydrate Polymers
- Food Chemistry
- Journal of Food Processing & Technology
- Journal of Biomaterials and Nanobiotechnology
- Biomaterials

QUALITY MANAGEMENT (ONLY OFFERED IN FRENCH)

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	276-190607	**SEMESTER OF STUDIES**	6th
COURSE TITLE	QUALITY MANAGEMENT		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
Lectures	1	3
Practical Exercises	1	
Laboratory Exercises	-	-
TOTAL	2	3

COURSE TYPE	Compulsory/Special Background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes (in French)
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes

The course aims to achieve the following learning outcomes for students:
- understanding of the theories and standards of quality and safety management
- familiarity with the application of quality and safety management systems in the food industry.

General Skills

- Search, analysis and synthesis of data and information, using the necessary technologies
- Decision making
- Autonomous work
- Teamwork
- Work in an international environment
- Work in an interdisciplinary environment
- Promotion of free, creative and inductive thinking

COURSE CONTENT

- Total quality management (TQM)

Principles of total quality management, theories of Deming, Juran, Crosby, Imai and Taguchi.

- Quality management according to ISO 9000

Analysis of the ISO 9000, ISO 9001 and ISO 9004 standards, case studies.

- Food safety management according to ISO 22000

Analysis of the standard, case studies.

- Audit of management systems according to ISO 19011

Audit program management, audit execution, qualification and evaluation of auditors.

TEACHING and LEARNING METHODS - EVALUATION

TEACHING METHOD	Face to face: • Lectures (theory and exercises) in the classroom
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures with PowerPoint slides using PC and projector • Notes in electronic format • Post course material and communicate with students on the Moodle online platform

TEACHING ORGANIZATION	***Activity***	***Semester Workload***
	Theory and practical exercises	39
	Independent study	100
	TOTAL	***139***
STUDENT EVALUATION	Language of Assessment: Greek or French. Evaluation method: • Written final exams with essay development and problem solving questions. The evaluation criteria are presented and analyzed to the students at the beginning of the semester.	

RECOMMENDED BIBLIOGRAPHY

-Suggested Bibliography:

• Arvanitoyannis I.S., Tzouros N.H., The New ISO 22000 Food Quality and Safety Standard, Stamouli Publishing, Athens, 2006.

• Karipidis F., Special Issues of Quality: Application to Agriculture and Food, Ziti Publications, Thessaloniki, 2008.

• Logothetis N., Total Quality Management: From Deming to Taguchi and SPC, TQM Hellas-Interbooks, Athens, 1993.

-Related scientific journals:

• Food Control

COMPUTER APPLICATIONS IN FOOD TECHNOLOGY

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	276-190608	**SEMESTER OF STUDIES**	6th SPRING
COURSE TITLE	COMPUTER APPLICATIONS IN FOOD TECHNOLOGY		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
Lectures	2	
TOTAL	***2***	***3***

COURSE TYPE	Compulsory Elective/Scientific Area
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEBSITE (URL)	https://exams-geo.the.ihu.gr/course/view.php?id=203

LEARNING OUTCOMES

Learning outcomes

The course covers subjects related to modeling and simulation of phenomena and processes with the help of specialized software. Its objective is for students to become familiar with the procedure and challenges of mathematical simulation and to learn the use of simulation software tools with emphasis in Computational Fluid Dynamics (CFD).

More specifically, the course aims to achieve the following learning outcomes for students:

- acquiring knowledge related to the formulation, solution and evaluation and mathematical models developed for describing physic-chemical phenomena and processes in food technology

- recognizing, understanding and interpreting the physical phenomena govern these processes

- familiarization with computer-aided simulation tools in transfer phenomena, microbiology and integrated processes

- acquiring practical experience in the use of CFD software packages such as Fluent

General Skills

- Use of IT for scientific purposes
- Promotion of analytical thinking
- Working in an interdisciplinary environment
- Autonomous work
- Teamwork
- Decision making

COURSE CONTENT

- The role and significance of mathematical modeling.
- CFD: definition and applications.
- Numerical methods for the solution of partial differential equations.
- The process of developing a CFD model:
  - Defining the flow domain
  - Development of mesh
  - Defining the phenomena present and developing the mathematical model
  - Solution of the model, extraction of results and model validation
- Learning the use of CFD software Fluent through the ANSYS Workbench environment

- Examples for the use of CFD in food engineering and processing
- Process design and simulation of integrated processes
- Predictive Microbiology
- Life Cycle Assessment, LCA

TEACHING and LEARNING METHODS - EVALUATION

TEACHING METHOD.	Face to face: • Lectures (theory and software demonstration) in the PC-lab
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures with PowerPoint slides using PC and projector • Notes, solved and unsolved problems in electronic format • Use of scientific software • Posting course material and communicating with students on the Moodle online platform
TEACHING ORGANIZATION	

Activity	***Semester Workload***
Theory and practical exercises	26
Development of CFD model	51
Term project	13
TOTAL	***90***

STUDENT EVALUATION	Language of Assessment: Greek or English. Evaluation methods: • Report and oral presentation of a journal article related to the use of CFD for modeling a selected food process (30% of the final grade). • Final written exams with multiple choice, right/wrong and short essay questions (70% of the final grade). The evaluation criteria are presented and analyzed to the students at the beginning of the semester and are available at the course website.

RECOMMENDED BIBLIOGRAPHY

-Suggested Bibliography:

- Computational Fluid Dynamics in Food Processing, Da-Wen Sun Editor, CRC Press (2007)
- Textbook on Quantitative Tools for Sustainable Food and Energy in the Food Chain, Valdramidis V.P., Cummins E. J., Van Impe J.F.M. editors, Eurosis (2017)

TECHNICAL ENGLISH

Course outline pending.

FOOD STRUCTURE AND FUNCTIONALITY

Course outline pending.

MOLECULAR ANALYSIS TECHNIQUES

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
EDUCATION LEVEL	PREGRADUATE		
CODE	276-190704	**SEMESTER**	7th
TITLE COURSE	MOLECULAR ANALYSIS TECHNIQUES		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
Lectures	2 hours	5
Laboratories	2 hours	
TOTAL	***4 hours***	

TYPE OF COURSE:	MANDATORY
PREREQUISITE COURSES:	BIOLOGY - GENETICS
LANGUAGE OF TEACHING AND EXAMS:	GREEK, ENGLISH
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES
ΗΛΕΚΤΡΟΝΙΚΗ ΣΕΛΙΔΑ ΜΑΘΗΜΑΤΟΣ (URL)	

LEARNING RESULTS

Learning results

The aim of the specific course is a first familiarization of the students with the Science of Genetic engineering and Biotechnology, as well as with the applications of these Sciences in various sectors. Students will also be taught the new genetic methodologies used today in the genetic analysis, as DNA extraction, agarose gel electrophoresis, PCR and sequencing analysis. Finally, they will learn how to use the results of their experiments as well as bioinformatics tools.

General Competences

- Work in an interdisciplinary environment
- Generation of new research ideas
- Promote free, creative and inductive thinking
- Search, analyze and synthesize data and information using the necessary technologies
- Independent work

COURSE CONTENT

- Genetic Engineering-Biotechnology
- Structure and function of nucleic acids
- Central dogma of Molecular Biology
- DNA denaturation - renaturation
- Fine structure of the gene, biological definition of the gene
- Gene regulation in prokaryotes and eukaryotes
- Restriction endonucleases, formation and cloning of recombinant DNA, cloning vectors
- Genetic modification techniques. Genetic modification in plants, genetic modification in fish, genetically modified products and the European Union, Bioethics.
- DNA libraries
- Genetic identification lab equipment
- DNA extraction
- Agarose gel electrophoresis.
- Polymerase Chain Reaction (PCR)
- Restriction Fragment Length Polymorphism (RFLPs) analysis
- Sequencing analysis
- Random Amplified Polymorphic DNA (RAPDs) analysis

- Real Time PCR
- Variable Number of Tandem repeats (VNTRs) analysis
- Allozyme analysis

TEACHING AND LEARNING METHODS - EVALUATION

TEACHING METHOD	- Teaching with Power-Point presentations - Laboratory exercises
STUDENTS EVALUATION	Writing exams at the end of the semester

RECOMMENDED BIBLIOGRAPHY

- Babiuk, L., Phillips, J. & Moo-Young, M. (1989). Animal Biotechnology. Pergamon Press Oxford.
- Barnum, S. R. (1998). Biotechnology: An Introduction. Wadsworth Publishing Company. Belmont, CA.
- Beaumont, A. R. & Hoare, K. (2003). Biotechnology and Genetics in Fisheries and Aquaculture. Blackwell Science.
- Dillon, J., Nasim, A. & Nestmann, E. (1985). Recombinant DNA. Methodology. J. Wiley & Sons. N. York.
- Holland, A. & Johnson, A. (1998). Animal Biotechnology and Ethics. Springer.
- Imsiridou Anastasia (2018). Genetic analysis techniques – Applications in the Food Sector Sofia Publications, Thessaloniki
- Lou, B., (1988). The recombination of genetic material. Academic Press Inc.
- Mustafa, S., (1999). Genetics in sustainable fisheries management. Fishing News Books. A division of Blackwell Science Ltd.
- Rollin, B. E. (1995). The Frankenstein syndrome. Ethical and social issues in the genetic engineering of Animals. Cambridge University Press.
- Russell P.J. (2009). iGenetics: A Molecular Approach (3rd Edition). Pearson Education Inc. - Benjamin Cummings. Boston, New York
- Sambrook, J. (2001). Molecular cloning. CSHL Press.
- Smith, G. P. (1993). Bioethics and the Low

Recommended scientific journals:

- *Journal of Heredity*
- *Aquaculture Research*
- *Mediterranean Marine Science*
- *Food Control*
- *Journal of Nutrition, Food and Lipid Science*

MEASUREMENTS AND PROCESS CONTROL IN THE FOOD INDUSTRY

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	276-190803	**SEMESTER OF STUDIES**	8th SPRING
COURSE TITLE	MEASUREMENTS AND PROCESS CONTROL IN THE FOOD INDUSTRY		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
Lectures	2	
Practical Exercises	1	
TOTAL	***3***	***4.5***

COURSE TYPE	Compulsory/Scientific Area
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://exams-geo.the.ihu.gr/course/view.php?id=204

LEARNING OUTCOMES

Learning outcomes

The course covers subjects related to measurement devices and process control techniques in the food process industry. The course aims to achieve the following learning outcomes for students:

- recognition of the necessity for measurements and control of processes in industry
- acquisition of knowledge on industrial sensors and transducers
- recognition of the dynamic character of phenomena/processes and the methods for its mathematical description
- acquisition of knowledge for automatic process control systems and corresponding mathematical formulations aiming at the manipulation of the dynamic behavior of systems
- familiarization on the control systems used in industry and acquisition of practical skills on their use

General Skills

- Analysis, interpretation and synthesis of information collected in scientific bibliography using information and communication technology
- Understanding of the need for action in dynamic conditions
- Comparative and multi-criteria analysis of proposed solutions
- Working in an interdisciplinary environment
- Autonomous work
- Decision making

COURSE CONTENT

Unit 1: Dynamic behavior of systems

Basic principles. Process characteristic times. Dynamic analysis of linear systems. Laplace transforms.

Unit 2: Measurement devices

Transducers and their types. Sensors (flow, temperature, pH, humidity, viscosity etc.). Actuators. Analog and digital signals and analog/digital transformation.

Unit 3: Process control
Basic principles. Feedforward and feedback systems. Closed-loop transfer function. Closed-loop transient behavior. Loop stability. Frequency analysis. SISO and MIMO systems.

Unit 4: Industrial process control systems
On/Off controllers. PID controllers. PLC and SCADA systems. Advanced control systems. Examples of food processes under control.

TEACHING and LEARNING METHODS - EVALUATION

TEACHING METHOD.	Face to face: • Lectures (theory and practical exercises) in the PC-lab
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures with PowerPoint slides using PC and projector • Notes and in electronic format • Posting course material and communicating with students on the Moodle online platform • Use of scientific software
TEACHING ORGANIZATION	

Activity	*Semester Workload*
Lectures	26
Practical Exercises	13
Independent study	105
TOTAL	***144***

STUDENT EVALUATION	Language of Assessment: Greek or English. Evaluation methods: • Final written exams with multiple choice, short essay questions and problem solving exercises The evaluation criteria are presented and analyzed to the students at the beginning of the semester and are available at the course website.

RECOMMENDED BIBLIOGRAPHY

-Suggested Bibliography:

- Process Control, 1st Edition, Daoutidis P., Mastrogeorgopoulos S., Papadopoulou S., Tziolas Publishing (2012), ISBN: 978-960-418-390-6 (in Greek)
- Modern Control Systems, Richard D. Dorf, Robert H. Bishop, Tziolas Publishing (2010), (for Greek translation) ISBN: 978-960-418-704-1
- Process Control Systems, 1st Edition, Raymond T. Stefani, Bahram Shahian, Clement J. Savant, JR, Gene H. Hostetter, Epikentro Publishing (2012) (for Greek translation) ISBN: 978-960-458-334-8

EPIDEMIOLOGY-MICROBIOLOGICAL FOOD SAFETY-PUBLIC HEALTH

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
STUDY LEVEL	UNDERGRADUATE		
COURSE CODE	276-190806	**SEMESTER**	8th, SPRING
COURSE TITLE	EPIDEMIOLOGY, MICROBIOLOGICAL FOOD SAFETY, PUBLIC HEALTH		

TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Lectures	2	3
Laboratory Exercises		
Total	2	3

COURSE TYPE	Compulsory
PREREQUISITE COURSES	-
TEACHING LANGUAGE & EXAMS:	Greek
COURSE OFFERED TO ERASMUS STUDENTS	YES (in English language)
COURSE WEB-PAGE (URL)	

LEARNING OUTCOMES

Learning outcomes
The aim of this course is to train students in basic concepts of Epidemiology and the relationship of foodborne infections to public health. In addition, they will delve into basic scientific concepts of food safety, such as food hazard assessment through hazard identification, hazard characterization, hazard exposure assessment, and hazard probability characterization.
General Skills
The students will be familiarized with the use of mathematical models and formulae form the prediction of the behaviour of pathogenic microorganisms under different conditions and processes.

COURSE CONTENT

Epidemiology

Etiological factors of foodborne diseases. The various microorganisms that cause foodborne illness and their relationship with food.

Introduction to epidemiology. What is epidemiology and what is the purpose of epidemiological studies. The history of epidemiology. Terminology. The basic principles of descriptive and analytical epidemiology.

Epidemiology of foodborne diseases. Analysis and comparison of epidemiological data from Greece, Europe and the rest of the world. The investigation of temporal and geographical changes in the incidence of foodborne diseases.

Factors affecting the incidence of foodborne illness. Causes of real and apparent changes in incidence.

Foodborne disease surveillance systems. How epidemiological data are collected. Who are the relevant bodies at local, national and international level? Laboratory diagnosis and identification of the causative agent.

The investigation of outbreaks. How to detect a cluster of cases. The phases and methods of the investigation. Control measures. Case studies of real outbreaks.
Public health
Water in the context of public health. Gastrointestinal diseases transmitted by drinking, recreational and environmental water. Legionnaires' disease.
The destruction of pathogens in food. Heat treatment, radiation, antimicrobial substances.
The inhibition of the growth of pathogens in food. The combination of physicochemical conditions.
The prediction of growth and death of foodborne pathogens. The use of mathematical models and formulas to predict the behavior of pathogenic microorganisms under various conditions and treatments.
Microbiological food safety
Overview of the European Union Food Safety Legislation and System. Basic scientific concepts of food safety, history and principles of food safety isk assessment, data collection and processing. Hazard identification, Hazard characterization, Exposure Assessment, Risk Assessment. Introduction to microbiological risk assessment (MRA). Identification and hazard characterization of pathogenic microorganisms in food and water. Exposure assessment and risk characterization in microbiological risk assessment. Risk management and risk communication using print and electronic media.

TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING MODE.	• Lectures (theory and exercises) in the classroom
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures on PowerPoint slides using PC and projector • Notes and solved exercises in electronic format • Use of videos and online applications in teaching • Post course material and communicate with students on the Moodle online platform
TEACHING ORGANIZATION	

Activity	*Semester Workload*
Lectures	24
Total Course	

STUDENT EVALUATION	Evaluation Language: Greek. Evaluation methods: Written final exams of the course with short development, critical and multiple choice questions. The evaluation criteria are presented and analyzed to the students at the beginning of the semester.

RECOMMENDED-BIBLIOGRAPHY

- Γενική & Κλινική Επιδημιολογία, 2η Έκδοση/2011, Συγγραφείς: Τριχόπουλος Δημήτριος, Λάγιου Παγώνα Δ., Διαθέτης (Εκδότης) ΠΑΡΙΣΙΑΝΟΥ ΑΝΩΝΥΜΗ ΕΚΔΟΤΙΚΗ ΕΙΣΑΓΩΓΙΚΗ ΕΜΠΟΡΙΚΗ ΕΤΑΙΡΙΑ ΕΠΙΣΤΗΜΟΝΙΚΩΝ ΒΙΒΛΙΩΝ. ISBN: 978-960-394-727-1.
- LECTURE NOTES: Επιδημιολογία και Ιατρική Δημόσιας Υγείας, 5η Έκδοση/2010, Συγγραφείς: Farmer R., Lawrenson R. Miller D., Διαθέτης (Εκδότης) ΠΑΡΙΣΙΑΝΟΥ ΑΝΩΝΥΜΗ ΕΚΔΟΤΙΚΗ ΕΙΣΑΓΩΓΙΚΗ ΕΜΠΟΡΙΚΗ ΕΤΑΙΡΙΑ ΕΠΙΣΤΗΜΟΝΙΚΩΝ ΒΙΒΛΙΩΝ. ISBN: 978-960-394-739-4.
- Γενική Μικροβιολογία, Έκδοση: 1η έκδοση/2012, Συγγραφείς: Κύρτσου-Καραγκούνη Δ.Αμαλία, Διαθέτης (Εκδότης): UNIBOOKS ΙΚΕ, ISBN: 9786185304614
- Μικροβιολογία Τροφίμων, Έκδοση: 1η έκδ/2010, Συγγραφείς: Montville Thomas J., Matthews Karl R., Διαθέτης (Εκδότης): ΣΤΕΛΛΑ ΠΑΡΙΚΟΥ & ΣΙΑ ΟΕ. ISBN: 978-960-411-713-0.

- BROCK ΒΙΟΛΟΓΙΑ ΤΩΝ ΜΙΚΡΟΟΡΓΑΝΙΣΜΩΝ, Έκδοση: 1η/2018, Συγγραφείς: Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A. Stahl, Διαθέτης (Εκδότης): ΙΔΡΥΜΑ ΤΕΧΝΟΛΟΓΙΑΣ & ΕΡΕΥΝΑΣ-ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ, ISBN: 978-960-524-523-8.Μικροβιολογία Τροφίμων, Μπαλατσούρας Γ., 1η Έκδοση, 2006, Εκδόσεις Βασιλειάδης Στυλιανός

  Wistreich, A. G., Microbiology Laboratory. Fundamentals and Applications. 2nd ed., Pearson Education, 2003.

FOOD PROCESS DESIGN

SCHOOL	GEOSCIENCES		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	276-190901	**SEMESTER OF STUDIES**	9th FALL
COURSE TITLE	FOOD PROCESS DESIGN		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
Lectures	5	
Practical Exercises	2	
TOTAL	***7***	***12***

COURSE TYPE	Compulsory/Scientific Area
PREREQUISITE COURSES:	Food Processing II
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEBSITE (URL)	https://exams-geo.the.ihu.gr/course/view.php?id=205

LEARNING OUTCOMES

Learning outcomes

The course covers subjects related to the design and operation of integrated industrial processes and how to deal with them in practice by performing an original techno-economic analysis (capstone project) of a selected food production process. The project is executed by groups of three students. The course aims to achieve the following learning outcomes for students:

- constructive synthesis of knowledge and skills acquired during the curriculum in solving a 'real' problem
- Recognition, understanding and analysis of the physical phenomena exploited by the industrial processes and the ability to describe them mathematically
- acquisition of practical experience in the use of computer-aided design and simulation software such as SuperPro Designer
- acquisition of practical experience in the use of the above knowledge and analytical skills in the design of an industrial-scale process and its comprehensive analysis with technological, environmental and economic criteria
- working knowledge on how to perform a technical study, develop a report and make an oral presentation
- recognition of the basic parts in a technical report
- practice in technical report write-up and the evaluation methods for best representation of content

General Skills

- Analysis, interpretation and synthesis of information collected in scientific bibliography using information and communication technology
- Design and synthesis of innovative solutions
- Comparative and multi-criteria analysis of proposed solutions
- Use and processing of incomplete and/or conflicting information
- Write-up of technical reports and their defense in oral presentations
- Working in an interdisciplinary environment
- Autonomous work

- Team work
- Decision making

COURSE CONTENT

Unit 1: Design of food industrial units

- Flowcharts and flow symbols. Continuous and batch processes. Flowsheet synthesis. Evaluation criteria.
- Phases of design process. Preliminary feasibility report. Detailed technical and economic report. Final construction report.

Unit 2: Simulation as design tool

- Process modeling. Mass and energy balances. Equipment sizing.
- Formulation and solution of design equations. Degrees of freedom analysis. Processes with recycle streams. Equation solution methods.
- Simulation software. Development of a simulation model in SuperPro Designer: registration of components, specification of processes and their operating parameters. Model solution.

Unit 3: Environmental Assessment

- Estimation of process waste flows (solids, liquids and gases). Best practices in minimizing waste with recycling, reuse and valorization of by-products.
- Evaluation of quantity and environmental load of liquid wastes. Preliminary design of a liquid waste processing facility.

Unit 4: Economic Analysis

- Calculation of equipment cost and overall capital investment. Use of Marshall&Swift indices for time adjustment of equipment cost.
- Calculation of annual operating costs. Feasibility study with the use of economic indices (POT, ROI, internal interest, NPV)

Unit 5: Technical Reporting

- Goal and objective of a technical report. Basic structural elements.
- First part of a technical report: front pages, titles, study group, accompanying letter, abstract and table of contents. Catalog of abbreviations. Page and chapter numbering.
- Second part of a technical report: introduction, main part, chapter presentation.
- Presentation of figures, tables and equations. Use of citations. Catalog of bibliographical references – sources of references. Addendums. Differences between technical reports, scientific articles and theses.

TEACHING and LEARNING METHODS - EVALUATION

TEACHING METHOD.	Face to face: • Lectures (theory and practical exercises) in the classroom • PC-lab: software training, electronic literature search, technical report write-up
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	• Lectures with PowerPoint slides using PC and projector • Notes and literature in electronic format • Posting course material and communicating with students on the Moodle online platform • Use of scientific software
TEACHING ORGANIZATION	

Activity	***Semester Workload***
Lectures	65
Practical Exercises	26
Techno-economic Study	242
Independent study for oral presentation and examination	81

	TOTAL	***414***
STUDENT EVALUATION	Language of Assessment: Greek or English. Evaluation methods: • Group report (techno-economic study) (50% of the final grade) • Final oral examination (50% of the final grade) • Compulsory oral presentation of the report in interim stages The evaluation criteria are presented and analyzed to the students at the beginning of the semester and are available at the course website.	

RECOMMENDED BIBLIOGRAPHY

-Suggested Bibliography:

- Peter M.S., Timmerhaus K.D., Plant Design and Economics for Chemical Engineers, McGraw-Hill, 1990
- McCabe W., Smith J., Harriott P.: Fundamental Physical Processes of Engineering. 6th Edition, Tziola edition for Greek translation, 2003
- Maroulis Z., Saravacos G., Food Process Design, Marcel Dekker, NY, 2003
- Himmelblau D.M., Riggs J.B., Basic Principles and Calculations in Chemical Engineering, 7th Edition, Tziolas Publishing for Greek translation, 2006
- Douglas J., Conceptual Design of Chemical Processes, McGraw-Hill, 1988
- Tchobanoglous G., Leverenz H., A GUIDEBOOK ON THE PREPARATION OF TECHNICAL REPORTS, PAPERS, AND PRESENTATIONS, NY, 2010