

Bachelor in Food Technology | Courses syllabus

1st curricular year

Biologia I / Biology I (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

To understand the diversity of living organisms through knowledge of their basic components (cells) and through biochemical and biophysical mechanisms that make life possible; To know the diversity of microorganisms through their structure, metabolism and ecology. To recognize the role of microorganisms at various levels, particularly on terrestrial, aquatic and aerial environments.

Syllabus:

Study methods, e.g. microscopy; Comparative study of prokaryotic and eukaryotic cells; Heredity and Evolution; Molecular Genetics; Microbial taxonomy and systematics; Nutrition and growth; Factors that affect microbial growth; Used methods to study microorganisms; Applied microbiology.

Describe the cellular organization at ultrastructural and functional levels and know how to use some techniques in Cell Biology studies; explain the major biochemical processes that occur in the cell; describe the phases of the cell cycle and the control mechanisms; solve problems of heredity; explain the Hardy-Weinberg law and the mechanisms that contribute to the evolution and biodiversity; compare the structure and organization of the genome in prokaryotes and eukaryotes; describe the mechanism of replication, transcription and translation; distinguish the regulation of gene expression in prokaryotes.

Identify the major landmarks of microbiology; describe the systematic diversity of living things and the microbial world diversity; explain processes of reproduction, dissemination, survival, adaptation and mutation; describe the nutritional types, levels of heterotrophy, saprofitism relationships, symbiosis and parasitism; define microbial growth in closed and open systems, methods of quantitative evaluation and of microbial populations control; identify the effect of nutritional factors, environmental and antimicrobial agents on growth; explain the role of microorganisms in their natural environments and their impact on society, in particular with an agrarian, food industries, environmental point of view and in various biotechnological processes; perform microbiological laboratory protocols; prepare a scientific report.

Bibliography:

- Azevedo, C. *Biologia Celular e Molecular*. 4ª ed. Lidel, Lisboa. 2005.
Brock, T.D. e Madigan, M.T. *Biology of Microorganisms*. 6ª edition. Prentice - Hall International, UK, Limited, London, 1991.
Pelczar, M., Chan, E. e Krieg, N. *Microbiology: Concepts and Applications*. McGraw-Hill Book Company. New York. 1993.
Purves, W.K., Sadava, D., Orians, G.H. e Heller, H.C. *Life: The Science of Biology*. 7ª ed., Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts. 2004.

Física I / Physics I (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Mechanical solids and Fluid mechanics

Syllabus:

Mechanical solids: Vector Calculus; Physical Quantities and Units; Newton's Laws; Kinematics; Work and Energy; Linear Impulse and Momentum; Mechanical Waves and Sound

Fluid mechanics: Fundamental Principle of Hydrostatic; Principles of Archimedes and Pascal; Equations of continuity and Bernoulli; Laws Poiseuille and Stokes

Bibliography:

- CUTNELL, J. e K. JOHNSON – *Physics*. 4th edition. New York, John Wiley & Sons Inc. 1998.
YOUNG, H. e R. FREEDMAN – *Física I-Mecânica*. 1ª edição, São Paulo, Pearson/Wesley. 2003.
YOUNG, H. e R. FREEDMAN – *Física II- Termodinâmica e Ondas*. 1ª edição, São Paulo, Pearson/Wesley. 2003.
TIPLER, P. – *Física*. 3ª edição, Vol. 1, 2 e 3. Rio de Janeiro, Livros Técnicos e Científicos Editora S.A. 1995.
DEUS, J.; M. PIMENTA, A. NORONHA, T. PENNA, P. BROGUEIRA – *Introdução à Física*. Lisboa, McGrawHill. 1998.
ÍNDIAS, M. – *Curso de Física*. Vol I e II. Lisboa, McGrawHill. 1992.
RAMALHO, F.; G. F. NICOLAU, P.A. TOLEDO – *Os Fundamentos da Física*. 6ª edição, Vol. 2 e 3. São Paulo, Editora Moderna. 1997
EWEN, DALE; SCHURTER, NEILL; GUNDERSEN, P. ERIK – *Applied Physics*, 10ª Edition, Prentice Hall, 2012.

Análise Matemática / Mathematical analysis (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

To master the basic concepts of differential and integral calculus and its applications; To identify and solve 1st order differential equations

Syllabus:

Derivatives; antiderivative; definite integrals; areas and volumes by applying definite integrals; improper integrals; differential equations of separable variables; linear differential equations; Bernoulli differential equations.

Bybliography:

Foulis, D.; Munem, M.- O Cálculo. Guanabara Dois, S.A.:Volume I, Cop. 1978.
Leithold - O Cálculo Com Geometria Analítica. Dinalivro, 1994.
Ross, S. - Differential Equations. McGraw-Hill, 1984.
Saraiva, M.A; Silva, M. - Primitivação. Edições ASA, 1995.
Swokowsski, E. W.; - Cálculo com Geometria Analítica. McGraw-Hill, 1983.

Química e Bioquímica I / Chemistry and Biochemistry I (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

To know: the properties of the solutions; laws of the Chemical Equilibrium considering the different types of equilibrium: acid base, oxidation-reduction, poorly soluble salts and complexation; structure of the main classes of organic compounds; the nomenclature of the main classes of organic compounds; the physical properties of the organic compounds; the main functional groups of the organic biomolecules

Syllabus:

Interaction forces between molecules and sites of action. Properties of the solutions. Chemical Equilibrium: acid-base, oxidation-reduction, poorly soluble salts and complexation. Structure, nomenclature and physical properties of the organic compounds. Functional groups of the organic biomolecules

Bybliography:

Atkins, P. W; Beran, J.A. - General Chemistry, Sci. Am. Books, 1992
Allinger, N.L.; Stevens, C.L. - Organic Chemistry, Worth Publishers, Inc. 1998
Stryer, L. - Biochemistry, The Molecular Basis of Cell Structure and Function, Worth Publishers, 1979
Vidal, M.M.; Filipe O.; Costa, M.C. - Química no laboratório, 100Luz, 2ª Edição, 2010

Língua Inglesa e Comunicação / English Language and Communication Skills (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Uses the English language in oral and written expression as well as in reading and listening comprehension; Conducts bibliographic research on specific topics; Recognizes the specifics of scientific-technical discourse; Develops the ability to communicate in an academic context.

Syllabus:

1) Review of general vocabulary and main grammatical structures of the English language. 2) Bibliographic research on specific topics: - Writing texts of varying levels of difficulty; 3) The concept of English for Specific Purposes: the language at the service of the subject it conveys: - The technical-scientific discourse: characteristics and application; -Types of scientific-technical texts: laboratory protocol, technical report, research paper, critical review, scientific poster, monograph, etc.; - Exercises in reading and analysis of various types of texts; 4. Communication practices in an academic context: - The fundamentals of oral presentations; - Research: concept, types and procedures for locating and retrieving written and online information; - Structuring of reports and technical-scientific posters.

Bibliography:

Answers.com – Online Dictionary, Encyclopedia and much more. URL:http://www.answers.com_.
BASTOS, Lilia da Rocha [et al.] – Manual para a elaboração de projetos e relatórios de pesquisa, teses, dissertações e monografias. 4ª ed. rev. e ampl. Rio de Janeiro: Guanabara Koogan, 1995.
DUDLEY-EVANS, T.; ST. JOHN, M. - Developments in English for Specific Purposes. Cambridge: Cambridge University Press, 1998 [2011].
MURPHY, Raymond – English Grammar in Use. Cambridge: Cambridge University Press, 2004.
NP 405-1.1994, Informação e documentação - Referências bibliográficas: documentos impressos. Instituto Português da Qualidade (IPQ).
NP 405-3.2000, Informação e documentação – Referências bibliográficas: documentos não publicados. IPQ.
NP405.4.2002, Informação e documentação – Referências bibliográficas: documentos electrónicos. IPQ.
SINCLAIR, J. M. – Collins English Dictionary. Millennium Edition. Glasgow: Harper Collins, 1998.

Introdução à Tecnologia Alimentar I / Introduction to Food Technology I (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

o1. Distinguishes milk from different animal species and the type of heat treatment applied to milk; o2. Describes the different stages in the manufacture of cheese, yogurt and butter; o3. Measures and expresses in various forms, concentrations of soluble solids, salt and acidity of food products derived from fruit and vegetables using techniques and equipment appropriately; o4. Describes the different stages in the manufacture of sweets, fruit confits and nectars.

Syllabus:

c1. Dairy technology: production of milk, cheese, butter and yogurt. c2. Horticultural Technology: candy production, fruit confits, drying, and nectars.

Bibliography:

Leche y Productos Lácteos: Tecnología, Química y Microbiología. Zaragoza. Editorial Acribia. (1991).
ROUX, J. L.; Conserver les Aliments, Lavoisier Tec Doc 1994
EARL, R. L. 1983. Unit Operations in Food Processing. Pergamon Press. Inglaterra
SINGH, R.P. and HELDMAN D.R. 1984. Introduction to Food Engineering. Academic Press.
USAAnon. Dairy Handbook. Alfa Laval AB. Dairy and Food Engineering. Lund. Sweeden. (s.d.).
LUQUET, F. O leite. Mem-Martins. Publicações Europa América. (1990).
SÁ, F.V., BARBOSA, M. O leite e os seus produtos. Lisboa. Clássica Editora. (1987)

Biologia II / Biology II (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. To know plant diversity taking into account the morphological characteristics of the major taxonomic groups of vascular plants and taxonomic categories, with special emphasis on plant with food interest. 2. To identify the structure and the internal organization of the plant body and to relate it with the function of the plant organs.

Syllabus:

INTRODUCTION. Evolution of green algae until more evolve Magnoliophyta. Adaptation of terrestrial plants. PLANT SYSTEMATICS. Botanical characterization of the main families of vascular plants with food industry interest. PLANT MORPHOLOGY. Seed. Root, Stem, Leaf, Fruit. PLANT HISTOLOGY AND ANATOMY. Structure of higher plants. Embryogenesis, germination and seed development. Development processes: growth, differentiation, and morphogenesis. Internal organization of plant body: tissues and different cell types. CONCEPTS OF VEGETABLE PHYSIOLOGY. Movement of saps in xylem and phloem (translocation). Photosynthesis: its manipulation. Regulating growth and development of plants: hormones. External factors that influence plant growth.

Bibliography:

IZCO, J. et al. 1998. Botânica. 2ª Edição Mc GRAW-HILL- Interamericana de España. S.AU.
RAVEN, et al. 1999. Biology of Plants. 6nd Edition. W.H. Freeman and Company. Nova Iorque.
TAIZ, L. & ZEIGER, E. 1998. Plant Physiology. 2nd Edition. Sinauer Associates. Massachusetts.
VASCONCELOS, J.C. 1969. Noções sobre a morfologia externa das plantas superiores. 3.ª Edição. Direção-Geral dos Serviços Agrícolas. Lisboa.
LIDON, F.J.C; H.P. GOMES e A.C.S. ABRANTES. 2001. Anatomia e morfologia externa das plantas superiores. Lidel. Lisboa.

Física II / Physics II (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Electrostatics; electro kinetic; electromagnetism; optics; thermodynamics; radiation

Syllabus:

Electrostatics, Electrokinetics and Electromagnetism: Strength and electric charge; Field and Electric Potential; DC and AC; Resistance, Capacitance, inductance and impedance; Ohm's Law; Joule effect and electric power; Kirchhoff's Laws; Magnetic Field and Magnetic Force; Electromagnetic induction. Faraday's Law and Lenz's Law; transformers; generators; Electromagnetic waves. Characterization, Energy and Polarization

Optics: Reflection, refraction, diffusion, dispersion and diffraction ; Mirrors and lenses; Optical instruments; Thermodynamics; Temperature and Heat; Heat transfer; Thermal properties; Laws of Thermodynamics

Radiation: Emission of Radiation; Law of radioactive decay

Bibliography:

CUTNELL, J. e K. JOHNSON – Physics. 4th edition. New York, John Wiley & Sons Inc. 1998.
YOUNG, H. e R. FREEDMAN – Física II- Termodinâmica e Ondas. 1ª edição, São Paulo, Pearson/Wesley. 2003.

YOUNG, H. e R. FREEDMAN – Física III- Eletromagnetismo. 1ª edição, São Paulo, Pearson/Wesley. 2003.
YOUNG, H. e R. FREEDMAN – Física IV- Ótica e Física Moderna. 1ª edição, São Paulo, Pearson/Wesley. 2003.
TIPLER, P. – Física. 3ª edição, Vol. 1, 2 e 3. Rio de Janeiro, Livros Técnicos e Científicos Editora S.A. 1995.
DEUS, J.; M. PIMENTA, A. NORONHA, T. PENNA, P. BROGUEIRA – Introdução à Física. Lisboa, McGrawHill. 1998.
ÍNDIAS, M. – Curso de Física. Vol I e II. Lisboa, McGrawHill. 1992.
RAMALHO, F.; G. F. NICOLAU, P.A. TOLEDO – Os Fundamentos da Física. 6ª edição, Vol. 2 e 3. São Paulo, Editora Moderna. 1997.
EWEN, DALE; SCHURTER, NEILL; GUNDERSEN, P. ERIK – Applied Physics, 10ª Edition, Prentice Hall, 2012.

Métodos numéricos e programação / Numerical Methods and Programming (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. Knows the concepts of both matrix and determinant and their applications for solving linear systems; 2. Uses numerical analysis techniques, to find zeros of functions, uses polynomial interpolation and numerical integration; 3. Uses structured programming and object-oriented languages; 4. Uses the main office software tools.

3.3.5. Syllabus:

1.1. Matrices; 1.2. Determinants; 1.3. Linear systems. 2.1. Zeros of functions; 2.2. Polynomial interpolation; 2.3. Numerical integration. 3.1. Programming functions; 3.2. Programming procedures. 4.1. Word processing; 4.2. Spreadsheet; 4.3 Other information technology.

Bibliography:

Magalhães, Luís T. - Álgebra Linear como Introdução à Matemática Aplicada. Texto Editora, 1996.
Ruggiero, M.; Lopes, Vera Lúcia - Cálculo Numérico Aspectos Teóricos e Computacionais. McGraw-Hill, 1988.
Strang, Gilbert - Linear Algebra and its Applications. Harcourt Brace Jovanovich, Inc., 1988.

Química e Bioquímica II / Chemistry and Biochemistry II (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

The student knows the reactivity of the main functional groups of the organic compounds; Knows the structure of the main classes of natural compounds; - Understands the metabolism of carbohydrates, lipids and proteins; Understands the mechanism of the catalytic activity of the enzymes

Syllabus:

Reactions of the main classes of organic compounds. Structure and properties of the main classes of natural compounds. Biological functions of carbohydrates, lipids and proteins. Metabolism of carbohydrates, lipids and proteins. General structure of enzymes and their action mechanism.

Bibliography:

Lehninger - Principles of Biochemistry, Worth Publishers inc, 1987
Morison, R.; Boyd, R. - Química Orgânica, Fundação Calouste Gulbenkian, 1998
Metzler, D. E. - Biochemistry: The Chemical Reactions of Living Cells, Academic Press, 1977

Inglês Técnico e Comunicação /Technical English and Communication skills (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1) Applies the syntax and rhetoric of scientific discourse in the production of technical written and oral texts: Prepares thematic glossaries; Uses technical vocabulary. 2) Masters the lexicon of specific terminologies: Develops techniques for characterization, classification and definition; - Writes abstracts and summaries. 3) Uses advanced techniques of communication to produce technical-scientific works in audiovisual media: Designs and prepares technical-scientific papers and reports using quotes; Masters oral presentations. 4) Collects, selects, analyzes and produces information: Applies techniques of written and oral communication for the world of work (curriculum, application and presentation letters, etc.).

Syllabus:

1) The technical-scientific discourse: characteristics and application: - Types of scientific-technical texts: laboratory protocol, technical report, research paper, critical review, scientific poster, monograph, etc.; - Reading and listening comprehension of texts in the field of Food Science and Technology; - Elaboration of thematic glossaries. 2) Expansion of the lexicon of specific terminologies: - Discursive features and linguistic patterns present in these types of texts: descriptions, definitions, classifications, comparisons, instructions, etc.; - Review of academic vocabulary for these operations. 3) Specialized written and oral production in the context of Food Science and Technology: - Using advanced techniques of communication. 4) Practice collection, selection, analysis and production of information: - Development of curriculum, application and presentation letters, and procedures for the job interview.

Bibliography:

Answers.com – Online Dictionary, Encyclopedia and much more. Disponível em WWW:URL:http://www.answers.com
BASTOS, Lilia da Rocha [et al.] – Manual para a elaboração de projetos e relatórios de pesquisa, teses, dissertações e monografias. 4ª ed. rev. e ampl. Rio de Janeiro: Guanabara Koogan, 1995.
DUDLEY-EVANS, T.; ST. JOHN, M. - Developments in English for Specific Purposes. Cambridge: Cambridge University Press, 1998 [2011].
MURPHY, Raymond – English Grammar in Use. Cambridge: Cambridge University Press, 2004.
NP 405-1.1994, Informação e documentação - Referências bibliográficas: documentos impressos. Instituto Português da Qualidade.
NP 405-3.2000, Informação e documentação – Referências bibliográficas: documentos não publicados. IPQ.
NP405.4.2002, Informação e documentação – Referências bibliográficas: documentos electrónicos. IPQ.
SINCLAIR, J. M. – Collins English Dictionary. Millennium Edition. Glasgow: Harper Collins, 1998.

Introdução à Tecnologia Alimentar II / Introduction to Food Technology II (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

o1. Perform energy and mass balances, including calculations of yields, of technological processes; o2. Identifies the main contents of different topics of food technology. o3. Sets out clearly to their peers the basics of a group of topics in food technology. o4. Works effectively in a group to meet the learning outcomes 2 and 3 while demonstrating ability to plan, divide tasks and establish agreements. o5. Perform self-assessment following four steps (observation, analysis, evaluation and planning).

Syllabus:

c1. Mass and energy balances in mixing operations. c2. Food technology: general notions and examples of raw materials, processing, production systems, preservation, food safety, packaging, marketing, new product development. c3. Organization of group work and steps in the development of groups. c4. Framework for self-evaluation.

Bibliography:

EVANGELISTA, J.; Tecnologia de Alimentos, Atheneu Editora 1992
TULL, Anita – Food Technology, Oxford University Press, 1998.
LOACKER, G. - Self Assessment at Alverno College , Jossey-Bss, 2000.
ROUX, J. L.; Conserver les Aliments, Lavoisier Tec Doc 1994
EARL, R. L. 1983. Unit Operations in Food Processing. Pergamon Press. Inglaterra
SINGH, R.P. and HELDMAN D.R. 1984. Introduction to Food Engineering. Academic Press.

2nd curricular year

Estatística / Statistics (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1) Understand the language and notation statistics; 2) Covers the key concepts and the necessary methods for summarization and the interpretation of data; 3) develops and implements statistical tests and interprets the results; 4) Applies statistical techniques to support decision making.

Syllabus:

1. Descriptive statistics in one dimension. 2. Probability distributions. 3. Discrete and continuous random variables. Common discrete and continuous distributions. 4. Confidence interval for a parameter of a population. 5. Hypothesis testing for a parameter of a population. 6. Nonparametric tests. Conditions of applicability. 7. Simple linear regression. Multiple linear regression.

Bibliography:

R. Guimarães e J. Sarsfield Cabral, "Estatística", McGraw-Hill, Lisboa (2007), 2ª ed.
B. Murteira, C.S. Silva, J.A. Silva e C.Pimenta, "Introdução à Estatística", McGraw-Hill, Lisboa (2001).
D. Montgomery e G. Runger, "Applied Statistics and Probability for Engineers", John Wiley and Sons, Nova Iorque (2003).

Microbiologia Alimentar/ Food Microbiology (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

The student must be able to relate the microorganisms' origin, incidence, growth and control with microbiological food safety. To apply identification and quantification methods of microorganisms (specific pathogens, hygiene indicators, metabolites and / or toxins) and to improve the final product microbiological or sensorial quality by controlling production

chain. To perform tasks related to food microbiological quality control or to develop methodologies leading to new or organoleptically more appealing products.

Syllabus:

Historical perspective of food microbiology; Origin / sources of food microbiological contamination; Factors influencing microbial growth in food; Methods of food preservation and stability; Concepts D, 12D, z and thermal death curve; most representative microorganisms in different food groups (dairy, canned, eggs, meat, fish, juice, wine, vinegar, bakery products) and their role concerning potential spoilage, food safety or sensorial characteristics; Main foodborne diseases; Preventive and corrective measures; Legislation and microbiological criteria; Fermented food control.

Bibliography:

ICMSF - Ecologia Microbiana de los Alimentos; vol 1:Factores que afectan a la supervivencia de los microorganismos en los alimentos . Vol 2 Productos Alimenticios - Zaragoza:Acribia,1980
ICMSF -Microorganismos de los Alimentos vol 1: Técnicas de Análisis microbiológicas.-2ªed. Zaragoza: Acribia 1983.
ICMSF Microorganisms in Foods 2: Sampling for microbiological analysis. Oxford: Blackwell Scientific Publication 1986.
ICMSF -Microorganisms in Foods. Vol 4: Aplicacion of the Hazard Analysis Critical Control Point (H.A.C.C.P.) 1992.
JAY, James Monroe - Modern Food Microbiology . - 5th. ed . - New York : Chapman & Hall, 1996.
FERREIRA, Wanda F. C.; SOUSA, J.C.F - Microbiologia , Vol 1. Lisboa: Edições Técnicas,Lda.1998
FERREIRA, Wanda F.C.; SOUSA, J.C.F. - Microbiologia , Vol 2. Lisboa: Edições Técnicas Lda.2000
PRESCOTT, Lansing e KLEIN J. H., D. - Microbiology, Lansing Prescott, John Harley, Donald Klein, 5th Edition McGraw-Hill, New York, 2002

Tecnologia dos Processos Alimentares I / Food Processing Technology I (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

o1. Defines and explains, critically, fundamental laws and physical properties involved in problems of heat transfer; o2. Identifies and comments with relevant situations of day-to-day and professional environment where there is heat transfer, taking into account the limitations of physical laws in their respective contexts; o3. Applies the laws of heat transfer to solve steady state and transient state; o4. Simulates situations of food processing using one term solutions of the applicable laws of heat transfer; o5. Comment with critical sense, the credibility and utility of these solutions; o6. Works effectively in a group to meet the remaining learning outcomes, while demonstrating the ability to plan, divide tasks and establish agreements.

Syllabus:

Fundamental laws of heat transfer and physical properties, and their limitations; heat transfer situations in day-to-day and professional environment; problems of steady state and transient state, the organization of group work and steps in the development of groups.

Bibliography:

ÇENGEL, Y.A. 1998. Heat Transfer : A Practical Approach, McGraw-Hill Series in Mechanical Engineering. [ESAC: Z02 - 20178/9] Capítulos: 1, 2, 3, 4, 6, 7 e 9
HARTEL, R.W., Howell Jr., T.A. e Hyslop, 1997. Math Concepts for Food Engineering, Technomic Publishing Company, Inc., Pennsylvania, U.S.A. [ESAC Q02 - 20147] Capítulos: 9, 10, 11, 12 e 13.
INCROPERA, F.P., DeWITT, D.P. 1998. Fundamentos de transferência de calor e de massa. 4ª edição, Livros Técnicos e Científicos, Rio de Janeiro.
Staff of Research and Education Association and Fogiel, M, 1993. The Transport Phenomena Problem Solver, REA, New Jersey. [ESAC: Q02 - 19732]

Processamento Geral de Alimentos /General Food Processing (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1.Knows the basis of food preservation techniques; 2.Knows the techniques, technological processes and equipment used in food preservation using low temperatures; 3.Knows the techniques, technological processes and equipment used in food preservation techniques based in water content reduction; 4.Knows the basis, process and equipment used on freeze-drying; 5.Knows the techniques, technological processes and equipment used on thermal processing of foodstuffs; 6.Evaluates and designs thermal processes (pasteurization and sterilization) using both the General Method and Mathematical Methods

Syllabus:

1-Introduction to food preservation – food changes and food preservation techniques; 2-Preservation of foodstuffs using low-temperatures (cold production, refrigeration and freezing); 3-Preservation techniques based in water content reduction (dehydration/drying); 4-Freeze-Drying preservation of foodstuffs; 5-Thermal processing preservation technologies (blanching, pasteurization and sterilization/canning); 6-Design and evaluation of thermal processes using the General Method and Mathematical methods; 7-New (non-thermal) preservation techniques (high-pressure, electrical pulses, irradiation, etc.)

Bibliography:

- BRENNAN, J.G. 2006. Food Processing Handbook. Weinheim, Germany:Wiley-vch.
CASP, A. e ABRIL, J. 1999. Procesos de conservación de alimentos. Madrid, Espanha: Coedición A. Madrid Vicente, ediciones e Ediciones Mundi Presa.
JEANTET, R et al. 2007. Science des Aliments (3 vol.). Paris, France: Lavoisier Tec & Doc, 2007.

Produção Agropecuária / Livestock and Agriculture Production (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. Knows the main crops used in the food industry; 2. Understanding the influence of some agricultural practices and soil and climate conditions; 3. Knows the general anatomy and physiology of livestock; the main production systems for milk and meat production in Portugal, including the identification of the main livestock breeds and the milking process. Understands the importance of nutrition, reproduction and sanitary practices in animal health, farm productivity and food quality.

Syllabus:

Identification of the main crops used in food industry; Soil and climate factors and agricultural practices and their influence in the production; Interrelation of soil and climate factors and agricultural practices with the quality of products and their uses; Identification of main livestock breeds explored for milk or meat production; General knowledge of major milk and meat production systems; Recognition of the importance of milking and slaughter process in the food quality; General sanitary practices promoting animal health, food quality and public health

Bibliography:

- AGUSTI, M. – Fruticultura. Madrid: Ediciones Mundi-Prensa, 2004.
ALMEIDA, D. – Manual de Culturas Hortícolas. Lisboa: Editorial Presença, 2006.
BRENT G. The pigmans hand book. London: Farming press Ltd., 1995.
GUERRERO, A. – Cultivos Herbáceos Extensivos. Madrid: Ediciones Mundi-Prensa, 1992.
FERREIRA, J.A., FERREIRA C. - Doenças infecto-contagiosas dos animais domésticos. Lisboa: Fundação Calouste Gulbenkian, 4ª ed. ISBN: 972-31-0539-X.
FRANDSON, R.D. - Anatomia e Fisiologia dos Animais Domésticos. Rio de Janeiro: Editora Guanabara Koogan S.A., 1979.
SLATER, K. - The Principles of Dairy Farming. Farming Press. 11th edition. Ipswich. 1991.
SOLTNER, D. - Alimentation des animaux Domestiques. Angers : Collection Sciences et Techniques Agricoles., Tome II, 19ª Édition, 1990.
URBANO TÉRRON, P. – Fitotecnia. Madrid: Ediciones Mundi-Prensa, 2002.
YUESTE PÉREZ, M. P. – Biblioteca de la Agricultura – Suelos, abonos y matéria orgânica. Los frutales.Barcelona: Idea Books, S.A, 1998.

Química Alimentar / Food Chemistry (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Acquire knowledge about the main components of food systems: water and carbohydrates amino acids, peptides, proteins and lipids. Relate the compositional structure of the food and chemical changes that occur during processing and storage.

Syllabus:

A. Water in foods: water activity (aw); adsorption and desorption isotherms of water in foods; reaction rates of the foods according to the law. B. Carbohydrates in foods: Structural characteristics; Properties of Carbohydrates, Starch: the phenomenon of gelatinization and retrogradation, pectin, cellulose, Dietary Fibers. C. Amino acids, peptides and proteins in foods: Formula Structure and composition of amino acids in foods; biological value protein; Structure and functional properties of proteins, collagen, myoglobin, structures and properties of milk proteins, plant proteins structure; Gluten , Methods for the determination of protein in food. D. Lipids in foods; composition and properties of the lipids in foods; Classification and structure of lipids, SFA, MUFA and PUFA; Physical, chemical and enzymatic transformations Major oils and fats; Lipid peroxidation, antioxidant activity - natural and synthetic antioxidant, Methods of assessing the degree of oxidation of fats; Steroids

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Gordon, M.H., Macrae, R. "Analytical Chemistry of Foods", Ed. Blackie Academic & Professional, 1987
James, C.S., "Analytical Chemistry of Foods", Ed. Blackie Academic & Professional, 1995
Weaver, C. The Food Chemistry Laboratory, CRC Press, Inc. 1996

Análises Físicas e Químicas de Alimentos / Physical and Chemical Analysis of Food (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Food analysis provides important information on a variety of characteristics, including composition, nutritional value and structure of food products. It also permits to determine the existence of hazards in raw materials and finished products. Therefore, food analysis plays an important role in assessment and maintenance of food quality and safety. The main goal of this course is teaching the most relevant chemical and physical properties of food products and to present the common analytical procedures and discussing their application to specific food products.

Syllabus:

1. Physical analysis of food products (theoretical concepts, equipment available, experimental procedures): i) Mass, volume and density; ii) Geometrical properties: size and shape; iii) Rheological and texture properties: elastic properties and viscous behavior, texture of solid food products. 2. Chemical analysis of food products in accordance with the official Portuguese methods: i) Care to observe in sampling, preparation and preservation of food samples; ii) Determination of the chemical composition of food products, namely content of water, protein, carbon hydrates, fat (saturated and unsaturated), fiber, ash, chlorides, potassium and calcium salts, nitrates, nitrites and sulfites; iii) Determination of the bromatological composition of food products; iv) Estimation of the energy content of food products.

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- Lewis, M. J. "Physical Properties of Foods and Food Processing Systems, Woodhead Publishing (1996).
- Ludger O. Figura, L. O. & Teixeira, A. A. "Food Physics: Physical Properties - Measurement and Applications", Springer, Berlin (2007).
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- Sahin, S. & Sumnu, S. G. "Physical Properties of Foods" Springer, (2006).

Análise Sensorial / Sensory analysis (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

To explain the physical-chemical and psychophysiological basis of sensory analysis. To Plan and execute sensory analysis tests, analyze sensory test data, report sensory tests.

Syllabus:

1 - Physical-chemical and psychophysiological basis of sensory analysis. 1.1. – The Visual system. Food color – chemical compounds. Color measurement. 1.2. Taste system. Chemical compounds responsible for taste. 1.3. Olfaction system. Chemical compound responsible for odor and flavor. Introduction to gas chromatography - olfactometry and electronic nose for the evaluation of volatiles. 1.4. Food Texture. Main texture attributes in food. 2 - 2.1 Controls for test room, product, and panel 2.2 Difference, Descriptive and Acceptance methods 2.3 Statistical evaluation of sensory tests 2.4 Reporting sensory results

Bibliography:

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- Noronha J. Análise Sensorial - Metodologia /Apontamentos de Análise Sensorial. Coimbra: ESAC, 2003.
- Richard H. e Moulton J.L. Les Arômes Alimentaires. Paris, França: TEC-DOC Lavoisier, 1992.
- Botelho G. Characterisation of the aroma components of clonal grapes and wines from Aragonez and Trincadeira Vitis vinifera L. cultivars. Tese de Doutoramento. 169 p. Universidade de Trás-os-Montes e AltoDouro, Vila Real, 2008.

Controlo e Gestão da Qualidade / Quality control and management (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

The main goal of this course is to make students understand the importance of quality in every step of the food chain (from producer to consumer). For that it is necessary a clear understanding of what quality and, more specifically, food quality are. It is also intended that students understand the importance of quality management and control systems as a

way to assure quality, clearly understanding what are their goals and how do they function. After completing the course the students should be able to select the more adequate tools to deal with quality related issues. This course will cover the basic quality control tools, control charts, capability indexes and sampling plans. The students should also be able to understand the results obtained by using these tools and, based on them, to propose corrections or improvements.

Syllabus:

Quality concepts and definitions. Food quality and its components. Fundamental principles of quality control and quality management. Quality management systems: the ISO 9000 norms and other relevant norms. Basic tools for quality control. Control charts by variables and by attributes. Capability indexes. Sampling plans by variables and by attributes.

Bibliography:

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Mitra, A., Fundamentals of Quality Control and Improvement, 2nd edition, Prentice Hall, New Jersey, 1998.
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Tecnologia dos Processos Alimentares II / Food Processing Technology II (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Food processing comprises several stages, from the selection of raw materials, the production itself, and finally the storage of finished products. These phases, with individual characteristics, bind to each other through several common steps that sometimes repeat in each one of them. The main goal of this course is teaching the basic principles of food processing technology, with emphasis on the processing steps which occur in most food processing industries. The course aims at developing the following skills: ability to project the appropriate equipment for a specific food processing step and calculation of the most convenient operating conditions. Some laboratory experiences will be performed in order to demonstrate some of the taught concepts.

Syllabus:

1. Mechanical analysis of the movement of a particle in a fluid. 2. Sedimentation: definition and general concepts, equipment, project of a continuous sedimentation tank, applications in food industry. 3. Centrifugation: definition and general concepts, equipment, efficiency of a centrifuge, separation of immiscible liquids, clarification, applications in food industry. 4. Filtration: definition and general concepts, equipment, general filtration equation, applications in food industry. 5. Distillation: definition and general concepts, liquid-vapor equilibrium, simple distillation, flash distillation, continuous rectification of binary mixtures, applications in food industry. 6. Adsorption: definition and general concepts, equilibrium relations, equipment, applications in food industry. 7. Extraction: definition and general concepts, liquid-liquid and solid-liquid extraction, applications in food industry.

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McCabe, W.L., Smith, J.C., Harriott, P., 2005, Unit Operations of Chemical Engineering, McGraw-Hill, USA.
Foust, A.S., Wenzel, L.A., Clump, C.W., Maus, L., Andersen, L.B., 1982, Princípio das Operações Unitárias, Guanabara Dois, Brasil.
Perry, J.H., et al., 1997, Chemical Engineer's Handbook, McGraw-Hill, USA.

Bioquímica Alimentar/ Food Biochemistry (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. Know and understand the concepts of Enzymes in Food Additives, Functional Food and Molecular Gastronomy; 2. Identify enzymes at the molecular level, food additives and functional ingredients for obtaining foods; 3. Knowing the potential of enzymes, food additives, functional ingredients and molecular gastronomy in obtaining new food products. 4. Run laboratory techniques for biochemical analysis of food related to the isolation, analysis of enzymes and other biomolecules functional

Syllabus:

1 Enzymes in food systems. Introduction, Nature and classification mechanism of action, enzyme kinetics, enzyme inhibition. Application of enzymes in food; enzymes important in the processing of fruits, vegetables, oil industry, bakery and meat; enzymes involved in the production of fermented beverages, use of immobilized enzymes and enzymes in analytical methods. Enzymatic browning reactions; 2. Food Additives: Classification, Identification and Listing chemistry.

European legislation; 3. Molecular Gastronomy: History, concepts and development, types of hydrocolloids, foams and emulsions; "Note by Note Cuisine". Organization of a Molecular Gastronomy workshop. 4. Functional Foods: History and Concepts; Biochemical classification; Classes of functional ingredients, Probiotics and Prebiotics and Sinbiotics; development of novel ingredients and functional foods; Regulation of Functional Foods in the European Union and other regions of the globe.

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Belitz, H.D.; Grosch, W.; 1999 Food Chemistry, Springer Verlag, S.A.,
Maria Gabriela Bello Koblitz. 2008. Bioquímica de Alimentos: Teoria e Aplicações Práticas. 1º Edição. Editora Guanabara Koogan. ISBN 9788527713849
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Moreira da Silva, Aida (2010) "Food Products that Help to Promote Human Health", Food, diet and health: past, present and future tendencies, Chapter 4, Nova Publishers, (ISBN: 978-1-60876-012-1)
Casimir, C. A. (2005) – Handbook of Functional Lipids. CRC Press, London
Hervé This,(2009) Building a Meal: From Molecular Gastronomy to Culinary Constructivism, Columbia University Press 2009 ISBN 978-0-231-14466-7
David Jukes, Food Additives in the European Union, Department of Food and Nutritional Sciences, University of Reading, UK consulta em linha
<http://www.foodlaw.rdg.ac.uk/additive.htm>

Oficinas Tecnológicas I / Pilot Plant Workshop I (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1- Demonstrates knowledge about the main features of this type of industry; 2- Demonstrates knowledge about the theoretical basis of food processing systems; 3- Produces and describes flow diagrams of food processing systems; 4- Applies the main principles of food conservation to products of animal origin.

Syllabus:

1- Dairy technology. 1.1-Milk production and processing-specific characteristics of the dairy industry; 1.2-Milk as raw material: biosynthesis and secretion, physico-chemical composition, intra and inter species variation, nutritional aspects, classification and specific legislation; 1.3-Thermal processing of milk; 1.4-Milk products processing; 1.5- Milk byproducts. 2-Meat technology. 2.1-Muscle composition and structure; meat characteristics; ante and post mortem factors which affect meat quality; 2.2-Meat processing systems: refrigeration, freezing, thermal treatments, drying, use of preservatives; 2.3-Meat products: raw ripened meat products, heat treated meat products, meat emulsions; 2.4-Meat byproducts.

Bibliography:

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Walstra P., Geurts T.J., Noomen A., Jellema A., van Boekel M.A. Ciencia de la leche y tecnología de los productos lácteos. Ed. Acribia: Zaragoza, 2001.
Varnan, A., Sutherland, J.P. Carne y Productos Cárnicos. Editorial Acribia.: Zaragoza. España, 1995.
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Prandl O. Tecnología y higiene de la carne. Ed. Acribia: Zaragoza, 1994.
Price J.S. Ciencia de la carne y de los productos cárnicos. Ed.Acribia: Zaragoza, 1994.

3rd curricular year

Gestão da água resíduos e efluentes na indústria alimentar / Water, Waste and Effluent Management in the Food Industry (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

To provide theoretical and practical knowledge on systems for water treatment and effluent disposal on food industries and catering services. Particular attention is given to water, energy and waste management systems.

Syllabus:

1.Water uses in the main sectors of the food industry; 2.Water recollection, treatment and distribution systems; 3.Pollutant materials related to the food industry and legislation; 4.Residue treatment processes and quality parameters of treated residues; 5.Treatment systems and environmental protection; 6.Water, energy, residue and effluent management systems; 7.Case studies of particular food industries.

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Waste treatment in the food processing industry. Edited by Lawrence K. Wang et al. CRC / Taylor & Francis. 2006.
Gary Laustsen. Reduce-recycle-reuse: guidelines for promoting perioperative waste management. AORN Journal, April, 2007
Frank M. White. Mecânica dos Fluidos. 4ª edição McGraw-Hill, 1999.
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Economia Alimentar / Food Economics (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. To know the concepts and methodologies used by the economic science; 2. To understand the mechanisms of price formation in market economy and the relationship between economic factors and technical production levels; 3. To understand the relationships between economic agents, regulatory bodies and the food system; 4. To understand the specificity of the economics of the food sector

Syllabus:

1. Introduction: 1.1. Fundamental problems facing the economy; 1.2. Main methodologies used in economic science; 1.3. The concepts of opportunity cost, willingness to pay and willingness to accept; 1.4. Production possibilities frontier. 2. Economic agents and food market: 2.1. Economic circuits and relations between agents. 2.2. The supply and demand for food. 2.3. Market imperfections. 2.4. Inputs markets. 2.5. Profit maximization using production and costs functions; 3. The national economy and the food sector: 3.1. The main results of national accounts; 3.2 The relationship between employment, inflation, exchange rate and interest rate. 3.3. The effects of macroeconomic policies on the food sector. 3.4. The main agro-food Portuguese subsectors and their development strategies. 4. Food international trade

Bibliography:

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FRANK, R. e BERNANKE, B. – Princípios de Economia. Lisboa: Mc Graw Hill, 2003.
LAGRANGE, L. – La commercialisation des produits agricoles et alimentaires. Paris: Lavoisier, 1995.
MALASSIS, L. e GHERSI, G. (coord.) – Initiation a l'Economie Agro-Alimentaire. Paris: Hatier, 1992.
SAMUELSON, P. e NORDHAUS, W. – Economia. 16ª ed. Lisboa: Mc Graw Hill, 1999.

Gestão Empresarial e Empreendedorismo / Enterprise Management and Entrepreneurship (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Meet the firm goals; distinguishes the different forms of legal and economic enterprises; Mastering the business concepts and principles for its management; Knowing marketing techniques to advertise and promote their products and their activity, acquire the technical skills and analytical skills for identifying and creating new business visibility and growth potential; Mastering the theoretical tools and analytical methodology that allows to investigate the issue of entrepreneurship in its multiple facets

Syllabus:

1. Companies. Organizational Structures. Organizational Behavior. 2. Management of Material Resources: basic variables of management and stock control - the ABC system and economic quantity. 3. Production Management: choice of production process, production planning and philosophy "just-in-time". 4. Management of Financial Resources: finance function and financial analysis, document-based financial analysis, methods and techniques of analysis - the method of ratios, analysis of financial stability and profitability. 5. Commercial Management: Strategic Marketing, Marketing Mix and the importance of market research. 6. Entrepreneurship: ideas and business opportunities, funding sources, procedures for business creation, business plan and criteria for evaluating investments. 7. Ethics and Ethics in Company.

Bibliography:

SOUSA, A. – Introdução à Gestão. Lisboa: Editora Verbo, 1990.
CHIAVENATO, I. – Introdução à Teoria Geral da Empresa. Editora McGraw Hill, 3ª ed., 1993.
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BERNARDI, L. – Manual de Empreendedorismo e Gestão: Fundamentos, Estratégias e Dinâmica. Editora Atlas, 2003

Instalações, Equipamentos e Instrumentação / Facilities, Equipments and Instrumentation for the Food Industry (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Provide students with a broad overview of the utilities and ancillary services needed for the operation of an industrial level food plant. By the end of the course the students should understand the importance of these services and utilities and how they influence the performance, both functional and economical, of a food plant. For this, the students should understand and describe the basic principles underlying the project of simple installations and equipment and the good practices of their operation. They should identify common technical terms, symbols and usual names used in the industrial practice. They should also be able to sketch equipment configurations and installations layouts, and to fill elementary requirements check lists for the selection of simple equipment. In general, the students should be able, in a systematical manner, propose solutions for low complexity problems regarding equipment, ancillary services and utilities for the food industry.

Syllabus:

Industrial facilities layouts. Electrical power networks (including command and protection); Actioning systems. Compressed air networks. Thermal fluids networks; Air compressors; Ventilation systems; Ventilators and thermo ventilators; Pumps and pumping networks; Refrigeration systems for the food industry; Boilers; Introduction to instrumentation and control; Pressure, temperature, level and flow measurement; Control systems; Control valves.

Bibliography:

Saravacos, G.D., A. E. Kostaropoulos. Handbook of Food Processing Equipment, Springer, 2002.
Broughton, J., Process Utility Systems: Introduction to Design, Operation and Maintenance, IChemE, 1994.
Liptak, B.G., K. Venczel (eds.), Instrument Engineer's Handbook, Volume 1 : Process Measurement And Analysis, 4th ed, CRC Press, 2003.
Liptak, B.G. (ed.), Instrument Engineer's Handbook, Volume 2 : Process Control and Optimization, 4th ed, CRC Press, 2005.

Oficinas Tecnológicas II / Pilot Plant Workshops II (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1 - Demonstrates awareness of the issues inherent in the production and processing of plant foods; 2 - Demonstrates the theoretical knowledge regarding processing of plant foods; 3 - Prepares/builds and analyzes diagrams of production; 4 - Apply the principles of conservation of food products of plant origin.

Syllabus:

Wine Technology. 1.1. Raw material, execution of harvesting, setting up a winery. Analytical and sensory control of grapes, musts and wines; 1.2. Alcoholic and malolactic fermentation in wine production. Performing practical work in the field, laboratory and cellar; 1.3. Operations, products and oenological equipment involved in the production of wine. Analysis of wine production diagrams .Interpretation of analysis reports of wines and comparison with the legislation values. Fruit and Vegetables Technology. 2.1 Application of the general principles of conservation and transformation of fruit and vegetable (F&V) products; 2.2-Preliminary Operations: harvest, transport, reception, sorting and preparation; 2.3- Classical technologies and new technologies of F&V processing; 2.4- F&V processing lines; 2.5-Implementation of practical workshop on pilot must complete the actual manufacture of a F&V product (canning foods, fruit juices, jams, etc.).

Bibliography:

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Nagy S., Chen C. S., Shaw P. E. Fruit Juice Processing Technology, Agscience Inc., Auburndale, Florida, 1992.

Planeamento Industrial / Industrial planning (1º semestre / Fall semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

Provide students with an overview of planning strategies in an industrial context, namely on how operations, and the necessary resources, should be managed and controlled. It is intended that students become familiar with and use the

basic tools of operations management, as well as adapt them to the different type of organizations and production systems, according to its characteristics and goals. It is also intended that students understand the limitations of using these methods in practice, whether due to model/process mismatch or the inevitable random factors. The ability to critically evaluate the results obtained with the methods studied during the course is also one of its goals.

Syllabus:

Introduction to operations management. Introduction to project management using CPM (critical path method), PERT (project evaluation and review technique) and time/cost models. Production systems characterization, according to operation modes and goals. Sequencing and scheduling in different production systems. Layout and load balancing of production/assembly lines. Forecasting techniques, including linear regression, time series decomposition and exponential smoothing. Introduction to material requirements planning.

Bibliography:

Chase Chase, R.B., F.R. Roberts, N.J. Aquilano, Administração da produção e das operações, 11.a ed., McGraw Hill Interamericana, 2006.

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Hillier, F.S., G.J. Lieberman, Introdução à Pesquisa Operacional, 8.a ed., McGraw Hill Interamericana, 2006.

Embalagem de produtos alimentares / Food Packaging (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1-facing practical situations is able to choose the most adequate packaging system; 2-Transmit to other professionals important information about his needs being able to communicate with experts of packaging materials and designers.

Syllabus:

Packaging materials and systems. 1.1.definition of main functions of packaging materials/legislation; 1.2.types of packaging (primary, secondary, tertiary); 1.3 World market of packaging materials; 1.4.Interdependency between stakeholders; 1.5. Environmental issues. 2. packaging materials: 2.1. glass; 2.2. metals; 2.3. paper; 2.4. plastic polymers; 2.5. composite materials. 3.Choice of a particular packaging system: 3.1.for solids; 3.2.for liquids; 3.3.for viscous products; 3.4.for canned products; 3.5.for aerosols.

4.Specific packaging systems: 4.1.asseptic packaging; 4.2.modified atmosphere. 5. Eligible packaging materials.

Bibliography:

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Aaron L. Brody. Envasado de alimentos en atmosferas controladas y modificadas y a vacio. Editorial Acribia: Zaragoza, 1996.

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Gomes de Castro A., Pouzada A.S. Embalagem para a indústria alimentar. Instituto Piaget, Lisboa, 2003.

Logística e Distribuição / Logistics and Distribution (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

The food distribution is one of the factors that can give competitive advantages. The economy internationalization calls for it that has a care increased not only in production but also in the service it provides for the consumer. This course was designed with the primary objective of providing the knowledge necessary for good management of strategic Supply Chain in Agro-Food System. A systemic form will be explored key concepts associated supply chains, logistics and trade to how to manage the information value chain and how to support decision-making throughout the logistics system of any organization. The objectives are: Knowing the basics of logistics distribution channels and their attributes. Know the basic techniques of merchandising and its relationship with production and understand consumer shop behaviour.

Syllabus:

1. Definition and functions of the food distribution industry. 2. Distribution channels and the formulas of sales. Influence of strategic action in the channel structure. Evolution of sales formulas. 3. Logistics concept. Logistics as a functional area. Integration of logistics activities. The logistics, relational marketing and other functional areas. Collaborative movements: QR / CR, ECR and CPFR. Logistics and fulfillment. Financial impacts of logistics. 4. Trade and retail marketing mix. Market Space Retail Store The economic potential of the shopping store. 5. The store and buyer behavior. The merchandising policy

Bibliography:

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ITSON, C., ALBISU, L.M.– Agro-food marketing. D. I. Cambridge, CAB International e CIHEAM, 1997

CARVALHO, J. – Logística comercial. Lisboa: Texto Editora, 1993

FILSER, M. Canaux de distribution: description, analyse, gestion, 1.ª Ed.. Paris, Vuibert gestion, 1986

CARVALHO, J. DIAS, E. – Estratégias Logísticas: Como servir o cliente a baixo custo. Lisboa: Edições SÍLABO, 2004

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Associação Portuguesa de Empresas de Distribuição: <http://www.aped.pt/>
Kent Business School: <http://www.kent.ac.uk/kbs/cscr/food.htm>
Food Marketing Institute: <http://www.fmi.org/supply/>
Organisation for Economic Co-operation and Development – OCDE: <http://www.ocde.org>

Nutrição e Dietética / Nutrition and Dietetics (2^o semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

1. Understands the food intake in its complexity and constant evolution. 2. Knows how to use the main anthropometric measurements. 3. Identifies and characterizes different groups of nutrients. 4. Understands the importance of food education. 5. Recognizes the value of nutrition and diet therapy at different stages of life. 6. Identifies differences between allergy and food intolerance and recognizes the main eating disorders. 7. Knows and applies the rules involved in nutrition labeling. 8. Understands the physiological benefits of consuming functional foods

Syllabus:

1. History and evolution of food and factors that determine food choice. 2. Concepts of basic human anatomy and physiology. 3. Concept of food, nutrition and nutrient. 3.1. Functions of nutrients. 3.2. Classification, sources, function and metabolism of various groups of nutrients. 4. Characterization of the main anthropometric measurements. 5. Food education and analysis of food education instruments. 6. Concept of diet therapy and dietetics. 7. Food and diet therapy at different stages and circumstances of life. 8. Allergies and food intolerances. 9. Major eating disorders. 10. Nutrition labeling: importance, implementation and legislation. 11. Functional foods. Interest in terms of physiological and nutritional point of view.

3.3.9. Bibliografia principal:

Cunha L. N. Anorexia, bulimia e compulsão alimentar. Ed. Atheneu., 2008. ISBN: 978-85-7379-964-4
Farré C. e Vilar P. La enfermedad celíaca paso a paso. Ed. Edebé, 2007. ISBN: 978-84-236-8300-0
Fernandes A., Guia para uma Educação Alimentar. Ed. Livros Horizonte, 2007. ISBN: 978-972-24-1557-6
Mahan L. K., Escott-Stump S. Krause - Alimentos, Nutrição e Dietoterapia. 12^a Ed., Elsevier Ed. Lda, 2010. ISBN: 978-1-4160-3401-8
Matsudo S. M. M. e Matsudo V. K. R., Atividade física e obesidade, prevenção e tratamento. Ed. Atheneu, 2007. ISBN: 978-85-7379-947-7
Pinto J. F., Nutracêuticos e alimentos funcionais. Lidel edições técnicas Lda., 2010. ISBN: 978-972-757-624-1
Schiff W. J. Nutrition for healthy living. Ed. McGraw-Hill International. 2008. ISBN 978-0-07-128347-2
Thomas B., Manual de prática dietética. Ed. Instituto Piaget, 2004. ISBN: 972-771-735-7

Higiene e Segurança Alimentar / Food Safety (2^o semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

The safe production and distribution of food is one of the major concerns of consumers, food industry and National and European authorities. It is of paramount importance for a Food Technologist to understand and use correctly the available tools available for safe food production. A special focus is given to law requirements and the correct implementation of HACCP (Hazard analysis and Critical Control Points) methodology. On successful completion of this curricular unit the student knows the legal framework regarding safe food production and will implement an HACCP system as part of a team.

Syllabus:

Food quality, food hygiene and food safety. Food hazards – Biological, physical and chemical. Food legislation – Portuguese and European Union. Good Hygiene and Manufacturing Practices: Facilities, personal hygiene, Cleaning and disinfection, Pest control. HACCP – History, principles and implementation.

Bibliography:

BAPTISTA, P. e SARAIVA, J. 2003. Higiene Pessoal na Indústria Alimentar. Guimarães: Forvisão.
NORONHA, J. e BAPTISTA, P., 2003. Segurança Alimentar em Estabelecimentos Agro- Alimentares: Projecto e Construção. Guimarães: Forvisão
NORONHA, J.F. [et al.] Boas práticas de fabrico em queijarias tradicionais. Coimbra Escola Superior Agrária de Coimbra. 2006 ISBN 972-99205-1-6
BAPTISTA, P., 2003. Higienização de Equipamentos e Instalações na Indústria Alimentar. Guimarães: Forvisão.
BAPTISTA, P., NORONHA, J., OLIVEIRA, J e SARAIVA, J., 2003. Sistemas Genéricos de HACCP. Guimarães: Forvisão.
REGULAMENTO (CE) 178/2002 de 28 de Janeiro de 2002 que determina os princípios e normas gerais da legislação alimentar
REGULAMENTO (CE) 852/2004 de 29 de Abril de 2004 relativo à higiene dos géneros alimentícios
REGULAMENTO (CE) 853/2004 de 29 de Abril de 2004 que estabelece regras específicas de higiene aplicáveis aos géneros alimentícios de origem animal

Projeto / Project (2º semestre / Spring semester)

Intended learning outcomes of the curricular unit (knowledge, skills and competences to be developed by the students):

This curricular unit contributes to the integration of all the C.U. of the study cycle and envisages specifically to deepen and to develop the role of the food technologist in the processes of food production and commercialization. The student will: (1) compare methodologies for the conception of food processing systems using appropriate techniques and vocabulary; (2) analyze and solve problems related to the installation of food processing units and systems; (3) analyze costs for particular processing options (4) analyze and formulate solutions for safety and environmental management of particular transforming activities; (5) present a proposal for the production of a particular food product.

Syllabus:

General information: the basic concepts for the development of food facilities and products are presented initially. In sequence it is defined a strategy for the development of a particular food product by each working group, taking in attention market studies simulation, process optimization and the legal framework. Project development: task developed by groups of students centered in the development of a plan for the facilities and processes for the production of a particular food product. Each group will also use the pilot plant to put in practice the operations related to the production of the target product.

Bibliography:

- Aguado J. Ed. et al. Ingeniería de la Industria Alimentaria. Vols: I,II,III. Editorial Sintesis, 1999.
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- Storm D.R. Winery Utilities. Chapman & hall. New York, 1997.
- Prandl O. Tecnologia y higiene de la carne. Ed. Acribia: Zaragoza, 1994.
- Arthey, D. e Ashurst. Fruit Processing. Marcel Dekker, London, 1996.
- Arthey, D. e Dennis, C. Procesado de hortalizas. Ed. Acribia: Zaragoza,1991.