



Food Technology International Programme (60 ECTS)

Coordination: Nuno Bartolomeu Mendes Godinho de Alvarenga (Ph.D.), Maria João Barata de Carvalho (Ph.D.) and Anabela Reis Pacheco de Amaral (M.Sc.).

Contact: bartolomeu.alvarenga@ipbeja.pt

Objectives: The professional qualified in Food Science and Technology will present a solid technological knowledge regarding the characteristics and composition of most food assuring them skills for applying these knowledge and learning to the activities that ensure safe food with quality, nutritional value and innovative throughout the food chain. The professional insertion of graduates in Food Science and Technology will extend from the control of food production, toxicological and hygiene and sanitary risk assessment, implementation of HACCP and traceability systems.

Acquire skills in specific areas such as technology of milk, meat and fish, wine, olive oil and vegetable oils and horticultural fundamental in National and international context. Present in the global and social context ethical and professional responsibilities for the development and sustainable production with respect for the environment. Learn to use the knowledge acquired to collect, select, analyse and interpret relevant information in order to substantiate the presented solutions or opinions.

FOS area: 2.11

Admission conditions: candidates must have at least 60 ECTS in food science or equivalent diplomas (or need curricular analysis)

Maximum number of students: 15 / **Minimum number of students:** 5

Target: i) Erasmus students (fee exemption); ii) Students of Food science and technology of IPBeja (fee exemption); iii) International students from other parts of the world, particularly from countries like India, China and other nationalities eligible under the Statute of the International Student of IPBeja; iv) Food Businesspersons and technicians

Winter semester (October – February):

Course	Total Working hours	Contact hours	ECTS
Meat and fish technology	162,5	90	6.5
Vegetable and fruit processing technology	137.5	60	5.5
Wine technology	150.0	75	6.0
Olive oil and vegetable oils technology	137.5	60	5.5
Dairy technology	162,5	90	6.5

Spring semester (March – July):

Course	Total Working hours	Contact hours	ECTS
Sensory analysis	125	72.5	5.0
Food rheology	125	72.5	5.0
Food quality and safety	125	56	5.0
Internship	225	103	9.0
Valorization of by-products	75	36	3.0
Innovation in food industry	75	36	3.0

Meat and fish technology (6.5 ECTS)

Silvina dos Anjos Pimenta Marques Maia Ferro Palma (Ph.D)

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

The student must know the meat and fish subsector in Portugal, highlighting the importance of quality control and traceability of meat and fish. (2) Being able to apply a verification procedure in meat and fish products, slaughter and fish industry, (3) and in processing and monitoring such products.

Syllabus

1. Meat and fish Subsector in Portugal,
2. Structure of consumption in Portugal and in European Union,
3. Meat, histological structure, chemistry and biochemistry,
4. Muscle Transformation in meat, Rigor mortis. DFD and PSE Meat,
5. Main factors that determine Meat Quality,
6. General meat Microbiology and its adulterations and putrefaction,
7. General Technology of sausage products,
8. Fish, concepts of refrigeration and freezing,
9. Fish, biochemical processes of alteration, freshness index,
10. Canned fish.

Bibliography

- Asdruboli, M.(1979) Los Mataderos - Editorial Acribia
- Bejarano,S.M.,(2001), Enciclopédia de la Carne y de los Productos Cárnicos, Ediciones Martín y Macias, Vol, I y II.
- Connel, J.J.; (1988) Control de la calidad del pescado, Editorial Acribia, Zaragoza
- Cheftel J. C. e H. Cheftel, 1976, Introducción a la bioquímica y tecnología de los alimentos, Vol. I, Acribia, Zaragoza
- Frasier,W.C.,(1999) Microbiología de los Alimentos, Editorial Acribia
- Genot,L. (2003),Congelación y Calidad de la Carne, Editorial Acribia
- López,V. y Vanoclocha,A. (2004),Tecnología de los Mataderos, Ed. Mundi-Prensa
- Price, D.F,(1994),Ciencia de la Carne y de los Productos Cárnicos, Ed.Acribia
- Warris,P.A.,(2003),Ciencia de la Carne - Editorial Acribia
- Centro Técnico de la salazón Charcutería y Conservas de la carne Paris. Métodos de analisis de la industriacharcutera, Editorial Acribia Zaragoza

Vegetable and fruit processing technology (5.5 ECTS)

Carlos Manuel Marques Ribeiro (Ph.D.)

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

1. Knowledge of vegetable and fruit properties important for their quality and preservation,
2. Knowledge and mastering the handling, preservation and processing fruit and vegetable technologies,
3. Ability to implement, modify and manage lines and facilities of treatment, storage and processing of fruits and vegetables,
4. Development of products based on fruits and vegetables,
5. Capacity to apply analytical techniques for quality evaluation, assurance and control of fruits and vegetables and their products,
6. Implementation and operation of water treatment systems to produce water with the quality necessary to fruit and vegetable processing,

Syllabus

1. Market, production and consumption of fruits and vegetables.
2. Chemical composition and structure of fruits and vegetables.
3. Biochemical phenomena associated with the maturation and postharvest.
4. Preservation by chilling and controlled atmosphere.
5. Minimal processed products.
6. Processed products. Raw materials and finished products quality. Production diagrams. Equipment and facilities. Fermented, frozen and thermally processed products. Tomato, pepper, beans, peas and fruits preserves. Juices, pulps and concentrates. Soft drinks. Jams and jellies. Dehydration of fruits and vegetables.
7. Water treatment processes and water quality to fruits and vegetable processing.
8. Characterization and treatment processes of wastewater from fruits and vegetables processing.

Bibliography

- Brousse,G.; Loussert,R. (1980). El olivo. Ed.Mundi-Prensa. Madrid.
- Golob P, Farrell G & Orchard JE (2002). Crop post-harvest: science and technology principles and Practice. Vol 1. Blackwell Science Ltd, Oxford, UK.
- Gould WA (1974). Tomato production, processing and quality evaluation. AVI. Westport. Connecticut.: 441.
- Hodges R & Farrell G (2004). Crop post-harvest: science and technology principles and Practice. Case studies in the handling and storage of durables commodities. Vol 2. Blackwell Science Ltd, Oxford, UK.
- Hui YH (2006). Handbook of fruits and fruit processing. Blackwell Publishing, Oxford, UK.
- Krammer A & Twigg BA (1973). Quality control for the food industry. Vol 1 e 2 . AVI. Westport, Connecticut.
- Sinha NK (2011). Handbook of vegetables and vegetable processing. Wiley-Blackwell.

Wine technology (6.0 ECTS)

Anabela Reis Pacheco de Amaral (M.Sc.)

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

Being able to define how important is Portugal in Europe and the world for the production, export and consumption of wine. Identify the major wine producing areas in the world and Portugal. Acquiring basics of viticulture. Understanding the phenomenon of grape maturation and learning how to control it. Explain the various phenomena and sequences of operations involved in the elaboration, conservation, clarification and stabilization, bottling stage of white wines, red wines, rosé or obtained by special vinifications. Learn to control the physicochemical and sensory quality of wines preventing the occurrence of any unfavourable changes.

Syllabus

1. The vineyard and the wine in the world. Portugal's position in relation to the world and the European Union.
2. Wine production in Portugal: official designations
3. Introduction to viticulture
4. The raw grape: formation, maturation.
5. Biochemical transformations in winemaking: by alcoholic and malo lactic fermentation.
6. Vinifications: white wines, rosé wines and red wines.
7. Conservation, stabilization and clarification of wines. Bottling.
8. Wines alterations.
9. Special vinifications: fortified and generous wines, sparkling wines, Sherry and botrytized wines and late Harvest
10. Physico- chemical and sensorial quality control of musts and wines.

Bibliography

- Boulton, R.B., Singleton, V.L., Bisson, L.F., Kunkee, R.E.(1999) - Principles and Practices of Winemaking. Springer US
- Buffin, J.-C. (2002) – Éducvin: developing your skills as a wine taster. Oenoplurimédia, France.
- Fugelsang, K. And Edwards, C. (2007) – Wine Microbiology. Practical Applications and Procedures, Second edition. Springer US
- International Organisation of Vine and Wine (2015) – International Code of Oenological Practices. OIV. Paris
- International Organisation of Vine and Wine (2015) – International Oenological Codex. OIV. Paris
- International Organisation of Vine and Wine (2015) Compendium of International Methods of Wine And Must Analysis Volume I and II. OIV. Paris
- Ribéreau-Gayon P., Glories Y., Maujean A. Dubourdieu D. (2006) - Handbook of Enology - Volume 1 and 2. John Wiley and Sons Ltd, Chichester.
- Schuster, M. (2009) – Essential Winetasting: The Complete Practical Winetasting Course Publisher: Mitchell Beazley,

Olive oil and vegetable oils technology (5.5 ECTS)

Isabel Maria Pereira Caldas Baer (Ph.D)

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

Understand the importance of products / industries studied in the domestic and global market and in the mediterranean and the rest of the world consumers. Encourage innovation and creativity in developing new products. Give the student the knowledge and tools needed to work across the row of virgin olive oil extraction industries and vegetable oils industry, since the correct selection of the raw material, through the main methods and existing extraction equipment, to the utilization of by-products and quality control at all stages of the process, to the obtention, storage, packaging, preservation and marketing of the final product.

Syllabus

1. Lipid biosynthesis; classification; saturated and unsaturated fatty acids, triglycerides. Degradation of fats.
2. Olive oil: Olive oil formation in the fruit, maturation of the olives; quality control in reception at the olive mill.
3. Main technologies of extraction of virgin olive oil: pressing, centrifugation percolation; equipment; advantages and disadvantages. Byproducts and effluents: uses and treatments. Extraction of oil from olive pomace. The olive oil world market: imports, exports and consumption. The different consumer products: olive oil, virgin olive oil, extra virgin olive oil, DOP olive oil, organic olive oil. The olive oil and health.
4. Determination of the quality of virgin olive oil: sensory analysis - main positive attributes and defects; laboratory analyzes - acidity, peroxide value, UV absorbance, polyphenols. Genuinity analysis. Vegetable oils: main extraction methods; rich and poor oil. Oil refining: main steps.

Bibliography

- Ayton J, Haigh T, Tronson D & Mailor R (2005) The effect of harvest timing on olive oil quality. Centre for horticulture and plant science. Hawkesbury Campus, Sidney, NSW.
- Barranco, Diego et al (1999) – El cultivo del olivo (2ª ed.). Junta de Andalucía – Consejería de Agricultura y Pesca e Ediciones Mundi-Prensa;
- Costa, Bento et al (2002) – Código de boas práticas para o processamento tecnológico dos azeites virgens.
- Casa do Azeite – Associação do azeite de Portugal;
- Curci, Vincenzo (2001) – Manuale dell'olio d'oliva. Calderini edagricole
- Fernández, Manuel et al. (1995) – Elaboracion de Aceites de Oliva de Calidad. Obtencion por el sistema de dos fases. Junta de Andalucía, Consejería de Agricultura y Pesca;

Dairy technology (6.5 ECTS)

Nuno Bartolomeu Mendes Godinho de Alvarenga (Ph.D.)

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

To know the process of milk production in the mammary gland. Composition and structural organization of the major components of milk: fat globules, protein, lactose, water, minerals, vitamins, enzymes and other components.

Understand the value of milk and dairy products in a nutritional and technological point of view.

Understand the theoretical concepts of thermobacteriology, and be able to associate them with the technology used in the different heat treatments, including pasteurization, UHT and sterilization.

To control the physical and biochemical mechanisms and the technology associated with the different manufacturing processes of dairy products, namely cheese, cream, butter, yogurt, drying and concentration of milk and whey.

Apply the concepts of thermodynamics in dimensioning data for a heat exchanger.

Syllabus

1. Production, characterization and definition of milk. Milk versatility as a food, from the point of view nutritional, technological and social. Raw and transformed milk.
2. Heat treatment, effects on milk components and thermobacteriology. Cream. Homogenization. Milk for consume: pasteurized, UHT and sterilized.
3. Processed products: yogurt and fermented milk, evaporated milk and condensed and concentrated.
4. Powdered milk, cream, butter and cheese. Byproducts: buttermilk, whey and curd. New Products.
5. Analysis of the raw materials and final products. Analyses of raw milk, pasteurized milk, UHT milk, yoghurt, cream, cheese and butter. Evaluation of laboratorial results, in accordance with legal and regulatory specifications.
6. Low scale manufacturing: fresh cheese and ripening cheese, butter (includes cream production and churning).
7. Thermodynamic concepts applied to dairy industries - dimensioning data for a heat exchanger of milk.

Bibliography

- Bylund G (1995) Dairy processing hand book, Tetra Pack Processing Systems AB, Lund, Sweden.
- Walstra P, Wouters JTM & Geurts TJ (2006) Dairy Science and Technology. Taylor & Francis Group, LLC & CRC Press. London.
- Preedy VR, Watson RR & Patel VB (2013). Shelf-life extension of cheese: frozen storage. In Handbook of cheese in health: production, nutrition and medical sciences. (Preedy et al. Eds), pp 87-101, Wageningen Academic Publ.
- Fox PF, McSweeney PLH, Cogan TM & Guinee TP (2004) Cheese: Chemistry, Physics and Microbiology. (P. F. Fox, ed.), Vol. 1 & 2. Aspen Publishers, INC, Gaithersburg.

Sensory analysis (5.0 ECTS)

Maria João Barata de Carvalho (Ph.D.)

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

The skills to develop are: Know the basic principles and applications of sensory evaluation of foods (SA). Knowing which factors influence SA. Learning the rules and techniques to select and train panelists. Understand and apply the standards and methodologies to concept sensory sheets, and design the appropriate locations for AS. Know the procedures to perform discriminatory, descriptive and hedonic analysis. Apply the rules and statistical methods to SA results. Identify and interpret the results obtained in SA and its correlation with the instrumental analysis.

Syllabus

1. Concepts, application fields and importance of Sensory Analysis of Food (SA)
2. Factors affecting SA
 - 2.1. Panelists selection and training
 - 2.2. Sensory room and its environmental conditions
 - 2.3. Samples preparation
3. Senses involved in SA
4. Sensory tests used in SA
 - 4.1. Discriminatory tests
 - 4.2. Descriptive tests
 - 4.3. Affective tests
5. Methods of instrumental analysis

Bibliography

- Alba J, Izquierdo J.R., Gutiérrez F., Vossen P. (2008) Aceite de Oliva Virgen. Análisis Sensorial. 2ª ed., Ed Agrícola Española, S.A. Madrid.
- Anzaldúa – Morales A., (1994). La evaluación sensorial de los alimentos en la teoría y la práctica. Ed Acribia. Zaragoza.
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- ISO 8586-1 (1993). Sensory analysis - General guidance for the selection, training and monitoring of assessors.
- ISO 8589 (1988) Sensory analysis -- General guidance for the design of test rooms, International Organization of Standardization. Genève;
- Jackson RS (2009) Wine Tasting: A Professional Handbook, 2ª Ed. Academic Press, Inc. San Diego, California, USA.
- Lawless HT & Heymann H (2010) Sensory Evaluation of Food. Principles and Practices. Second Edition. Springer. New York.

Food Rheology (5.0 ECTS)

Nuno Bartolomeu Mendes Godinho de Alvarenga (Ph.D.)

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

Students' preparation for the basic operations in food physical properties (rheology). Includes acquisition and application of food science and technology knowledge on the food's physical and structural properties, namely in food quality control, product development, food plant layout development and correlations between rheological and sensory food properties.

Syllabus

1. Food rheological behaviour. Rheology: definitions and importance. Rheological tests. Fundamental rheological tests.
2. Fundamental rheology. Rheology of macromolecules suspensions: relative viscosity, specific and reduced viscosity and intrinsic viscosity.
3. Applied rheology: consistency and texture – fundamental food characteristic, sensory evaluation versus instrumental evaluation.
4. The importance of glassy state in food quality and texture preservation.
5. Application of rheology concepts (non-Newtonian fluid behaviour) in plant layout development: Bernoulli, equation and pumping fluids. Rheology of the Newtonian and non-Newtonian flow.
6. Laboratory practices and tutorial classes.
7. Texture analyser: food texture analysis. One cycle compression and puncture tests and texture profile analysis (TPA).
8. Viscometer: liquid and pasty food's behaviour, in particular, its viscosity and flow rate.
9. Product development work (plant development and laboratory analysis).

Bibliography

- Bourne MC (2002) Food texture and viscosity - concept and measurement. New York: Academic Press (ed).
- Rosenthal AJ (1999) Food Texture. Measurement and Perception. Aspen Publishers, Inc. Gaithersburg, Maryland.
- Steffe JF (1996) Rheological methods In food process engineering. Freeman Press. USA.
- Gunasekaren S & MM Ak (2003). Cheese Rheology and Texture (CRC Press ed.). London: CRC Press.
- Huilgol R & Phan-Thien N (1997) Fluid mechanics of viscoelasticity. Elsevier.
- Prentice J (1992) Dairy rheology - a concise guide. VCH Publishers.

Food quality and safety (5.0 ECTS)

Anabela Reis Pacheco de Amaral (M.Sc.)

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

After this course students will be able to: 1 - Implement, manage and control the systems that ensure the quality and food safety in the food chain of several organizations according with the requirements of current legislation; 2 - Implement a voluntary system of food safety management organizations in the food chain according to ISO 22000; 3 - Participate in the implementation of quality management systems in the food chain organizations in accordance with ISO 9001 and 4 - Implement and manage the systems for certification of food products.

Syllabus

1. Control of food safety and quality: standards and regulations. Obligations regarding food hygiene and safety that must obey all actors in the food chain.
2. HACCP: fundamentals, principles and application- Systems of food safety management: ISO 2000:2005.
3. Systems of quality management standards ISO 9000 Application to food industries.
4. Certification of food products: certification and quality recognition systems (designation of origin).

Bibliography

- European Regulations (applicable on the date on which the course is taught)
- ISO 22000:2005 - Food safety management systems -- Requirements for any organization in the food chain
- ISO 9000:2005 Quality management systems -- Fundamentals and vocabulary
- ISO 9001:2008 - Quality management systems -- Requirements
- Mortimore, S. And Wallace, C. (2013) HACCP: A Practical Approach, 3rd edition, Springer US.
- Websites: Codex Alimentarius, European Commission: Quality policy, Food and Feed safety

Internship (9.0 ECTS)

Anabela Reis Pacheco de Amaral (M.Sc.)

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

Students must follow processes inherent to the activities that occur at the various stages of the food chain. Namely: Preparations of food products, quality control and food safety, working in industrial plants of food production, food marketing, participate in developing new products.

Syllabus

The student should develop a work plan, agreed in advance between the supervisor of ESAB and the company where the internship will take place in accordance with the internship regulation of ESAB.

Bibliography

- Bibliography appropriate to the subject to develop

Valorisation of by-products (3.0 ECTS)

Antónia Teresa Zorro Nobre Macedo (Ph.D)

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

Learn about the main by-products resulting from the food industry, as well as the spectrum of potential products which can be obtained from them.

Learn about the main recovery processes of food by-products, whether animal or vegetable.

Learn to select recovery processes of lower costs and energy consumption, regarding an improvement of sustainability.

Syllabus

1. Food processing industries and state-of-the-art in the processing of by-products.
2. The principles of waste recycling.
3. Recovery of food by-products of vegetable origin: cereals, oilseeds, fruits and vegetables, bakery products and confectionery, beverages.
4. Recovery of food by-products of animal origin: dairy, meat, poultry, eggs and seafood.
5. Need for valorisation of by-products and food residues: environmental concerns and regulatory aspects.

Bibliography

- Chandrasekaran M (2012), Valorization of Food Processing By-Products, Series: Fermented foods and beverage series, CRC Press, Índia.
- Wang L (2008), Energy Efficiency and Management in Food Processing Facilities, CRC Press, Greensboro, USA.

Innovation in food industry (3.0 ECTS)

João Jorge Mestre Dias (Ph.D)

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

With this curricular unit, the student should be able to identify the theoretical principles in the basis of new combinations, new textures, new ways of presenting and preserving food.

Syllabus

6. History of food
7. Food innovation in XXth century: case studies
8. Consumers expectations and new consumption trends
9. Portuguese and European legislation in food additives
10. Innovations in functional food
11. Innovations in food packaging
12. Use of hydrocolloids in food industry
13. Registration of patents and industrial property

Bibliography

- Imeson A (2010) Food stabilisers, thickeners and gelling agents. Wiley-Blackwell.
- Phillips G & Williams P (2009) Handbook of hydrocolloids. 2nd Edition. CRC Press.
- Steffe J (1996) Rheological methods in food process engineering. 2nd Edition. Freeman Press.
- Fuller G (2004). New food product development: from concept to marketplace. 2nd Edition. CRC Press.
- Han J (2005). Innovations in food packaging. Elsevier.
- O'Donnell R, O'Malley J, Huis R & Halt G (2008). Intellectual property in the food technology industry: protecting your innovation. Springer.

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