TECHNOLOGY AND QUALITY CONTROL OF MILK AND ITS PRODUCTS

COURSE OUTLINE

GENERAL

SCHOOL	AGRICULTURAL SCIENCES		
DEPARTMENT	FOOD SCINECE AND NUTRITION		
COURSE LEVEL	*Undergraduate*		
COURSE CODE	ME711	**SEMESTER**	7th
COURSE TITLE	TECHNOLOGY AND QUALITY CONTROL OF MILK AND ITS PRODUCTS Course coordinator: M. KAKAGIANNI		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
Lectures	3	6
Laboratory-exercises	3	

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	*Scientific Area, specialized background*
PREREQUISITES:	-
LANGUAGE OF TEACHING AND EXAMINATIONS:	GREEK
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES
URL	https://food.uth.gr/poiotikos-elegxos-galatos/

TEACHING RESULTS

Teaching Results
The course introduces students to the composition, physicochemical and microbiological characteristics, processing technology and quality control of milk and dairy products. It covers quality, hygiene and safety management from the production and reception of raw milk to the production, storage and distribution of the final products. The theoretical teaching is complemented by laboratory exercises, interpretation of analytical results and an educational visit to a cheese-production unit. Upon successful completion of the course, students will be able to: Describe the biosynthesis, composition, nutritional value and basic physicochemical characteristics of milk. • Interpret the effect of raw material quality, heat treatment, cooling, homogenization and other technological processes on the quality and shelf life of milk and dairy products. • Recognize the main groups of microorganisms, spoilage mechanisms and basic hazards associated with raw and processed milk and dairy products. • Explain the main production stages, critical quality characteristics and hygiene requirements for drinking milk, fermented products, cheeses, cream, butter, concentrated and powdered milks and ice cream. • Select basic sampling and quality-control procedures for raw milk and dairy products.

• Perform basic physicochemical and microbiological analyses under guidance and interpret their results in relation to specifications and quality criteria.
• Recognize common adulterations, inhibitory substances and milk contaminants, including aflatoxin M1, and explain their significance for product safety and compliance.
• Apply the basic principles of hygiene, cleaning and disinfection, HACCP and traceability in milk-processing units
• Evaluate simple quality, safety and spoilage problems and propose documented preventive or corrective measures.
• Use the scientific terminology of the field correctly and collaborate effectively in laboratory exercises and case studies.

General Skills

- Application of knowledge in practice
- Search, analysis and synthesis of data and information using the necessary technologies
- Decision-making
- Autonomous work
- Teamwork
- Work in an interdisciplinary environment
- Adaptation to new situations
- Critical thinking and self-reflection
- Promotion of free, creative and inductive thinking

CONTENT

LECTURES

1. Biosynthesis and secretion of milk. Composition, physicochemical characteristics and nutritional value of milk.
2. Effect of breed, feeding, stage of lactation and other factors on the composition and physicochemical characteristics of milk.
3. Effect of heating, cooling, homogenization and other technological processes on the composition, properties and stability of milk.
4. Microbiology of raw milk: sources of contamination, microbial growth, fermentations and spoilage mechanisms. Hygiene during production, storage and transport of raw milk.
5. Quality control of raw milk and effect of raw material quality on final products. Sampling, specifications and basic control methods.
6. Technology, hygiene and quality control of pasteurized, high-heat-treated, sterilized, concentrated, powdered and chocolate milk. Shelf life and spoilage.
7. Technology, hygiene and quality control of cheeses, yoghurt and other fermented products (sour milk, kefir), cream, butter and ice cream.
8. Enzymes and microbial cultures in dairy-product manufacture. Coagulation, syneresis and basic principles of cheese ripening.
9. Microbiology and spoilage of pasteurized milk and dairy products. Unsuitable and non-compliant products.
10. Hygiene of milk-processing units: cleaning and disinfection, equipment, automation and basic principles of plant design.
11. Quality and safety assurance from raw material to final product: prerequisites, HACCP, traceability, sampling and compliance assessment.
12. Utilization of by-products from dairy plants and use of milk components in the production of other foods. Current trends in milk technology.

LABORATORY EXERCISES

1. Physicochemical characteristics of raw milk: pH, titratable acidity, indirect methods for estimating acidity, stability and specific gravity.
2. Determination of main milk components: fat content and protein separation.
3. Assessment of the hygienic status of raw milk: inhibitory substances, indirect and direct methods for estimating microbiological status and cleanliness control.
4. Additional quality checks of raw milk: detection of water adulteration and identification of different milk species in mixtures.
5. Familiarization with basic equipment used in dairy industries: cream separators, homogenizers and heat exchangers.

6. Milk standardization and use of an automated milk analyzer for composition control.
7. Control of the degree of heat treatment: phosphatase and peroxidase tests. Control of heat-resistant and psychrotrophic microorganisms.
8. Use of lactic acid cultures and yoghurt production: determination of acidity and control of characteristic culture microorganisms.
9. Rennet coagulation of milk and study of factors affecting coagulation ability and syneresis.
10. Sensory and physicochemical control of cheeses: fat content and acidity determination.
11. Ice cream production and quality control.
12. Determination of milk contaminants: detection of aflatoxin M1 and antimicrobial substances.
13. Educational visit to a cheese-production unit: monitoring of traditional Greek cheese manufacture (Feta, Graviera and whey cheeses) and pH measurements during cheese making.

TEACHING AND LEARNING METHODS - EVALUATION

TEACHING METHOD.	Face-to-face lectures in the auditorium/classroom and laboratory exercises in an appropriate laboratory.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Use of ICT in teaching and communication with students. Use of spreadsheets for recording, processing and interpreting laboratory analysis data. Teaching material, laboratory instructions, announcements and assessment criteria are posted on the Department e-class platform. Communication takes place through e-class and e-mail.
TEACHING STRUCTURE	

Activity Semester	***Workload***
Lectures	39
Laboratory exercises	39
Study and preparation of laboratory exercises	45
Independent study and exam preparation	27
Course Total: ***(25 hours of workload per credit unit)***	**150**

EVALUATION OF STUDENTS	Assessment language: Greek. 1. Final written theory examination (70% of the final grade), including multiple-choice, short-answer, critical-thinking and essay/development questions. The final theory examination is a summative assessment. 2. Final laboratory examination (30% of the final grade), including multiple-choice questions, short-answer questions and interpretation of laboratory-exercise results. The final laboratory examination is a summative assessment. Feedback during laboratory exercises supports formative assessment. Assessment criteria, weighting factors and successful completion requirements are announced at the beginning of the semester and posted on e-class.

BIBLIOGRAPHY

-Suggested Bibliogrphy:

- Hygiene and technology of milk and its products, MANTIS I. ANTONIOS, PAPAGEORGIOU K. DIMITRIOS, FLETOURIS I. DIMITRIOS, ANGELIDIS S. APOSTOLOS, 2nd Edition, 2018, Publications: AFOI KYRIAKIDI EDITIONS S.A.

Technology of Dairy Products - Cheesemaking, Zerfyridis G. 2001, Yahoudis Publications

- Science and Technology of Milk and Dairy Products, Kehagias Chr., Tsakali Efstathia, 2nd Edition 2020, Publications: NEW TECHNOLOGIES Publications PRIVATE CAPITAL COMPANY
- Laboratory examination of milk and dairy products, MANTIS ANTONIOS, PAPAGEORGIOU DIMITRIOS, FLETOURIS DIMITRIOS, 2nd Edition, 2015, AFOI KYRIAKIDI EDITIONS S.A.
- Science and Technology of Milk and Dairy Products, Walstra, Pieter Walstra, Jan T. M. Wouters, Tom J. Geurts, 1st Edition, 2023, BROKEN HILL PUBLISHERS LTD
- Zerfyridis G. (2001), "Milk products technology - Fermented products, ice cream, cream, butter", Ed. Yahoudi – Yapouli
- Cheesemaking, Anifantakis Emmanuel M., 2004, STAMOULI Publications
- Milk, Science, Technology and Quality Assurance Controls, Kehagias Chr. Edition 1, 2011, Publishers: MARIA PARIKOU & SIA EPE
- Kaminaridis S., Moatsou G. (2009), "Dairy", Ed. EMBRYO - STYLIANOS VASSILIADIS
- Bintsis, Th. and Papadimas F. (2009), "Cheese - milk technology - cheesemaking - presentation of cheeses", Ed. Cool guy.
- Milk and Milk Products, Varnam Alan H., Sutherland Jane P., 1st Edition, 2008, Publishers: STELLA PARIKOU & SIA OE
- Kechagias X. and Koulouris S. (2005), "Elements of Technology and milk quality controls and of dairy products" Ed. ION

-Related bibliography:

- Anil Kumar Puniya (2015). Fermented Milk and Dairy Products. 1st Edition, CRC Press [ISBN 9781466577978]
- Britz T.J. and Robinson R. K. (2008), “Advanced dairy science and technology”, Blackwell Pub. Professional. [ISBN: 978-1-4051-3618-1]
- Mattila-Sandholm T and Saarela M. (2007), “Functional Dairy Products”, Vol.2., CRC Press; Cambridge, England. [ISBN-13: 9781845693107]
- Tamime A.Y. and Robinson R.K. (2007), “Tamime and Robinson’s yoghurt: science and technology”, Elsevier Science. [ISBN: 9781845692612]
- Dairy science and Technology, P. Walstra, J.T.M. Wouters, T.J. Geurts, 2nd Edition, 2005, CRC Press Taylor & Francis Group [ISBN 9780824727635]
- Cheese chemistry, Physics and microbiology, Vol1&2, Edited by P.F. Fox, P.L.H. McSweeney, T.M. Cogan and T. P. Guinee, 3rd Edition, 2004, Elsevier academic press [ISBN: 9780080500935]
- Varnam A. H. and Sutherland J.P. (2001), “Milk and milk products: technology, chemistry and microbiology”, Springer US. [ISBN: 978-0-8342-1955-7]
- Horwitz W. (2000), “Official methods of analysis of AOAC International”, 17th edition, Vol. II,
- Association Of Analytical Communities International. [ISBN-10: 0935584781]
- International Dairy Journal
- Journal of Dairy Science
- International Journal of Dairy Technology