University of Zagreb Faculty of Agriculture
Svetošimunska cesta 25, 10000 Zagreb
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Cheesemaking (176007)

Course coordinator

Prof. Samir Kalit, PhD

Course description

Students will be introduced to cheesemaking history, cheese definitions, and classifications. In this course, cheesemaking technology is presented which starts with the milk selection and its preparation for coagulation. These technological steps include milk analysis from the point of milk receiving to the cheese plant, removing the mechanical waste, standardizing the milk for cheesemaking, pasteurizing, homogenization, and adding additives and starter cultures in milk for cheesemaking before coagulation. The fundamental chemical-biochemical mechanism of milk coagulation is described. Furthermore, general rules for curd treatment are described, including cheese molding and salting in the production of different types of cheeses (fresh, soft, semi-hard, hard, and extra hard). This course provides general information about the ripening and packaging of cheese. Knowledge about hygiene and sanitation in cheesemaking is also covered as well as the implementation of Hazard Analysis and Critical Control Points (HACCP). During the practical part of the course, students are introduced to the engineering organization in a cheesemaking plant which includes calculations in the production and dealing of by-products that appear during cheesemaking such as cream, butter, and whey (for instance albumin cheese – ricotta). During the laboratory practical work, students are introduced to fundamental cheese analysis essential for cheese labeling. Practical work in the cheesemaking unit at the Faculty (Practicum) starts with milk receiving, continuing with milk processing in fresh, soft, semi-hard, and hard cheese varieties till packaging of the final products, as well as cleaning maintenance of the production units. Students will be introduced to the most world-famous cheeses through seminars. Each student presents characteristics of a particular cheese originating from her/his Country in front of the group. Moreover, the course includes a technical trip to the island of Pag to visit a medium-sized cheesemaking plant.

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ECTS: **6.00**

E-learning: **L1**

Teaching hours: 60
Lectures: 36
Practicum: 16
Seminar: 8

Lecturer

- Prof. Samir Kalit, PhD
- Assoc. Prof. Nataša Mikulec, PhD
- Assoc. Prof. Milna Tudor Kalit, PhD

Associate teacher for exercises

- Prof. Samir Kalit, PhD
- Asst. Prof. Darija Bendelja Ljoljić, PhD

Associate teacher for seminars

- Prof. Samir Kalit, PhD
- Assoc. Prof. Milna Tudor Kalit, PhD

Grading

Sufficient (2): 60-70 %
Good (3): 71-80 %
Very good (4): 81-90 %
Excellent (5): 91-100%

Type of course

- Graduate studies / MS Courses taught in English (Elective course, 2 semester, 1 year)

General competencies

The program of course Cheesmaking enables students to acquire the theoretical and practical knowledge necessary for: self-managing technological processes of cheese production in industrial conditions, setting up and implementing a quality control system for cheeses in order to produce a safe product and to protect consumers, waste management in cheese production and environmental protection; planning of cheese production in medium and large scale dairy plant.

Types of instruction

- Lectures
  Lectures about cheesemaking history, cheese types and manufacturing procedure
- Auditory Exercises
  Exercises about calculations in cheesmaking and organisation of cheese production in dairy plant
- Laboratory practice/exercises
  Laboratory exercises about basic chemical analyses of cheese necessary for labeling
- Field work
  Field work in the dairy plant
- Seminars
  Seminars about world famous cheeses

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Learning outcomes

Learning outcome	Evaluation methods
Count and present technological procedures in cheesemaking.	Written (Partial written test No 1) and oral exam
Identify control points and critical control points in cheesemaking from receiving the milk till the final product.	Written (Partial written test No 1) and oral exam
Making calculations and plans for cheesemaking in the dairy units for different capacities.	Written (Partial written test No 2) and oral exam
Determine indicators which influence the environment during building, reconstruction and equipping of the cheesemaking units (intensity and duration of some indicators) and form a conclusion about the programme for environmental protection.	Written (Partial written test No 2) and oral exam
Connect different aspects of cheesemaking.	Seminar and oral exam

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Working methods

Teachers' obligations

Lectures
The lecturer of an individual unit should organize the lectures as a power point presentation with the time provided for interactive teaching. Lectures of teaching units that cover the subject should be organized according to the timeschedule and held within 15 weeks of direct teaching. All teaching materials that are not contained in the textbook are organized by teachers and according to teaching units available in the MOODLE system.

Seminars
Seminars are organized and conducted by a teacher on the subject in order to supplement and expand the knowledge of the cheesmaking. The topics of seminar papers must be given to the students at the beginning of the semester and provide them with 10 weeks of preparation. The teacher gives instructions on how to create seminar papers, approaches to scientific literature and databases, useful links, and helps students (provides guidance) during the seminar work. The teacher organizes oral presentation of the seminar papers, actively participates in the discussion together with other students. The overall quality of the seminar work (oral presentation and power point presentation) is evaluated by the teachers with the grade that participate in the final grade.

Auditing and field exercises
The subject teacher should organize the lectures from the auditing exercises as a power point presentation with the time provided for interactive teaching. Field exercises are organized by the subject teacher with the aim of presenting practical work in medium and large scale dairy plants.

Forum for communicating with students; a calendar of important events for the course; information related to the course; the instructions for writing the seminar work and results of written exams are available in the MOODLE system.

Students' obligations

Attending lectures, exercises and seminars is mandatory. In cases of justified or unjustified absence from the lectures and/or exercises and/or seminars, students are obliged to enclose a report stating the reason of the absence, during the semester or within 4 weeks after the end of the semester. In case of the absence of more than 20%, students lose the right of signature, and the subject must be re-enrolled in the next academic year. The obligation of each student is to make a seminar paper and present the topic discussed in the power point presentation (in 10-15 minutes) after which other students and teacher have the right to ask questions. The written part of the exam that is organized within the regular examination period or during the semester students can take written part of exam as two partial written exams. Oral exam is organized during regular examination period.

Methods of grading

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Evaluation elements	Maximum points or Share in evaluation	Grade rating scale	Grade	Direct teaching hours	Total number of average student workload	ECTS
Partial written exam No1	40	< 60 % 60-70 % 71-80 % 81-90 % 91-100 %	Insufficient (1) Sufficient (2) Good (3) Very good (4) Excellent (5)	24	72	2.4
Partial written exam No2	40	< 60 % 60-70 % 71-80 % 81-90 % 91-100 %	Insufficient (1) Sufficient (2) Good (3) Very good (4) Excellent (5)	24	72	2.4
Seminar	12	1/5 2/5 3/5 4/5 5/5	Insufficient (1) Sufficient (2) Good (3) Very good (4) Excellent (5)	8	24	0.8
Oral exam	8	< 60 % 60-70 % 71-80 % 81-90 % 91-100 %	Insufficient (1) Sufficient (2) Good (3) Very good (4) Excellent (5)	4	12	0.4
Total	100			60	180	6

Evaluation elements	Description	Deadline	Recoupment
Seminar	It is estimated whether a student’s seminar covered all default units as well as his/her mode of presentation (whether he/she read from the slides or how he/she prepared presentation).	The last week of course programme	In the examination period
Oral exam	Three questions to determine whether a student understands and connects the material.	The last week in semester	In the examination period

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Weekly class schedule

1. Introduction to lectures, An Overview of the History and Origins of Cheese, Lectures, Cheese definition and classifications (L)
2. Determination of milk acidity, Homogenization of milk for cheesemaking, Determination of milk fat and dry matter of cheese for cheese classification and labeling (L)
3. Mechanical waste in milk for cheesemaking, Inhibitors in cheesemaking milk (residue) (L)
4. The practical lesson, making of soft and fresh cheeses, Practicum
5. The practical lesson, making fresh, cooked, and semihard cheese, Practicum
6. Heat treatment of milk for cheesemaking, Standardization of milk for cheesemaking (L)
7. Calculation in cheesemaking and cheese yield (L)
8. Technical trip - visiting cheesemaking plant (Island of Pag)
9. Technical trip - visiting cheesemaking plant (Island of Pag)
10. Written exam (Part 1), Starter cultures and additives for cheesemaking (L)
11. The importance of effective removal of whey for the cheese quality, The importance of the development of acidity in certain phases of cheese production (L)
12. Microorganisms in cheese production, Hazard Analysis and Critical Control Points (HACCP) in cheesemaking (L)
13. Cheese shaping, salting, pressing and ripening, Hygiene during cheesemaking, Indicators of Hygiene and Safety in Cheesemaking, Packaging and storage of the cheese (L)
14. Seminars, 4 h Students presentation of worldwide famous cheeses
15. Written exam (Part 2) and oral exam (S)

Obligatory literature

1. Law B.A. (1999): Technology of cheesemaking. Sheffield Academic Press.
2. Eck, A. and Gillis, J.C. (2000): Cheesemaking from Science to Quality assurance. Second edition, Editions TEC and DOC, Londres, Paris, New York.
3. Kalit, S. (2016): Oxford Companion to Cheese. In press
4. Wendorf, L.W. and Kalit, S. (2016): Sheep Milk - Processing of Sheep Milk. In Handbook of Milk of Non-Bovine Mammals - Secon Editon, In press

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Recommended literature

1. Magdić, V., Kalit, S., Mrkonjić Fuka, M., Skelin, A., Samaržija, D. (2013): A survey on hygienic and physicochemical properties of Istrian cheese. Mljekarstvo, 63 (2), 55-63.
2. Valkaj, K., Cerjak, M., Kalit, S., Rako, A., Wendorff, W.L. (2013): Do consumers from Međimurje region recognize their autochthonous Turoš cheese. Mljekarstvo, 63 (4), 211-219.
3. Tudor Kalit, M., Kalit, S., Delaš, I., Kelava, N., Karolyi, D., Kaić, D., Vrdoljak, M., Havranek, J. (2014): Changes in the composition and sensory properties of Croatian cheese in a lamb skin sack (Sir iz mišine) during ripening. International Journal of Dairy Technology, 67 (2), 255-264.
4. Matić, A., Kalit, S., Salajpal, K., Ivanković, S., Sarić, Z. (2014): Consumers' preferences and composition of Livanjski cheese in relation to its sensory characteristics. Mljekarstvo, 64 (3), 170-177.
5. Valkaj, K., Kalit, S., Salajpal, K., Zubović, M., Marković, T. (2014): Chemical and microbiological characterization of Turoš cheese. Agriculturae Conspectus Scientificus, 79 (3), 201-207.
6. Matić, A., Kalit, S., Salajpal, K., Ivanković, S., Sarić, Z. (2014): Consumers' preferences and composition of Livanjski cheese in relation to its sensory characteristics. Mljekarstvo, 64 (3), 170-177.

Similar course at related universities

- University of Wisconsin, Madison, Wisconsin Center for Dairy Research