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| **STUDY PROGRAMME:** | **Professional Undergraduate Study Programme *Agriculture***  Specific field of study: Zootechnics | |
| **Course:** | **Dairy and cheese production** | |
| **Course code:** 240017  **Course status**: compulsory | **Semester: V** | **ECTS credits: 5** |
| **Course holder:** | **Dražen Čuklić,** Ph.D., professor of professional studies | |
| **Course associates:** | **Goran Mikec**, M.Eng.Agr., assistant | |
| **Modes of delivery:** | **Number of hours** | |
| Lectures | 30 | |
| Excersises, | 20 | |
| Seminars | 10 | |
| Practical training | 15 | |

**Course objectives:** to train participants to independently organize or carry out the production of dairy products in small or large processing plants

**Course content**

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| **Course units** | | **Modes of delivery:** | | | **Places of delivery** |
| **L, E, S** | | |
|  | **MILK**  Definition, chemical composition, physical and organoleptic characteristics, hygienic quality of milk, the concept of milk quality and the factors on which it depends, the importance of individual factors in milk production and processing. Milking cows, getting milk. | 2 | - | - | Lecture Room |
|  | **THE CHEMICAL COMPOSITION OF MILK**  WATER: The importance of free and bound water, the importance of water for the properties of milk  DRY MATTER: the significance of milk dry matter, factors on which the amount of dry matter in milk depends  MILK FAT: the importance of milk fat; chemical composition; fatty acids, physical properties, fat globules, changes in milk fat, lipolysis;  PROTEINS: importance of milk proteins, division (casein and milk serum proteins), characteristics of individual proteins, milk coagulation, factors affecting the amount of protein in milk  LACTOSE: importance of lactose in milk, properties of lactose, influence on certain properties of milk, fermentation of lactose,  MILK ASH: mineral substances: macro and microelements  VITAMINS: division and importance | 8 | - | 2 | Lecture Room |
|  | INTRODUCTION - Specificity of milk production and delivery  Basic factors of milk quality and durability  MILKING COWS  Obtaining hygienically correct milk | - | 3 | - | Dairy Laboratory |
|  | MILK SAMPLES - Method of taking milk samples  Conservation and preparation of samples for analysis | - | 2 | - | Dairy Laboratory |
|  | MILK DENSITY - Determination of milk density by lactoenzymeter, Organoleptic analysis, Purity test | - | 5 | - | Dairy Laboratory |
|  | **MICROBIOLOGICAL QUALITY OF MILK**  SOMATIC CELLS: concept, cell types, applicable regulations, causes of increased numbers on chemical composition, physical and technological properties of milk  MICROORGANISMS IN MILK: origin, action, changes in individual milk components | 3 | - | - | Lecture Room |
|  | **PHYSICAL PROPERTIES OF MILK**  DENSITY: definition, significance of determining density, assessment of milk quality, factors affecting density  ACIDITY: factors affecting acidity, primary and secondary acidity, causes of increased and decreased acidity of milk, methods of determining acidity, titrative and ionometric acidity  MILK ADULTERATION: dilution of milk, cryoscopy, factors on which the freezing point of milk depends, methods of determining dilution.  MILK HARVESTING: methods of determination  VISCOSITY: concept, the significance of determination, the factors on which it depends. | 3 | - | 1 | Lecture Room |
|  | MILK ACIDITY  Rapid or Orientation Methods, Organoleptic Test, Cooking Test, Alcohol Test, Analytical or Quantitative Methods for Determining the Degree of Acidity, Soxhlet –Henkel Method, pH Meter Method | - | 3 | - | Dairy Laboratory |
|  | **PRIMARY MILK PROCESSING**  Milk sampling, post-milking milk procedure, squeezing and filtering, cooling, cooling options and methods  Scooping cream from milk, separator, clarification, baktofugation, homogenization, heat treatment of milk, pasteurization: types and conditions, sterilization: types and conditions. | 3 | - | - | Lecture Room |
|  | DETERMINATION OF MILK FAT CONTENT IN MILK  Gerber's method for determining milk fat | - | 5 | - | Dairy Laboratory |
|  | PRIMARY MILK PROCESSING  Pasteurization – Standardization – Separation | - | 2 | - | Dairy practicum |
|  | **MICROBIAL CULTURES**  Definition, Concept, Role, Division  Types: liquid, freeze-dried, quality  FERMENTED MILK PRODUCTS  Yogurt, Acidophilus milk, Kefir.  Organoleptic quality assessment  errors in taste, smell, consistency | 3 | - | - | Lecture Room |
|  | **BUTTER**  Chemical composition, raw material for the production of butter. The classic butter production process. Continuous butter production process. Description of the individual stages of the technological process. Aroma, taste, consistency of butter. Organoleptic assessment of butter | 2 | - | 1 | Lecture Room |
|  | BUTCHERY  Determination of fat content in cream  Butter production | - | 3 | - | Dairy practicum |
|  | **CHEESE MAKING**  Classification of cheeses The quality of milk for cheese production. Additives in cheese production (pure cultures, rennet, K-nitrate. Ca Cl2.). Stages of the technological process of cheese production (description): milk coagulation, coagulation processing, reheating and drying of cheese grains, cheese shaping, pressing, salting, ripening. Cheese yield and factors on which it depends | 5 | - | 1 | Lecture Room |
|  | CHEESE MAKING  Production of cottage cheese (sour cheese).  Production of semi-hard cheese type gouda (sweet cheese) | - | 4 | - | Dairy practicum |
|  | **Evaluation** | 1 | - | - | Lecture Room |
| **In total** | | **30+20+10** | | |  |

**Practical training**

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|  | **Course units** | **Broj**  **sati** |
| **1.** | Tour of large dairy companies and small dairy plants | 5 |
| **2.** | Professional practice at the dairy farm and the dairy practicum of Križevci secondary school of agriculture. Practical work in the production of dairy products | 10 |
|  | **In total** | **15** |

The practical part of practical training (milking hygiene) will be held at the dairy farm of Secondary agricultural school, and the production of dairy products will be held at the Secondary agricultural school dairy practicum in Križevci.

L=Lectures, E=Excersises, S=Seminars, PT=Practical training

**Learning outcomes (LO)**

LO 1. Evaluate the chemical composition of milk

LO 2. Valorize milk on the basis of chemical and microbiological composition

LO 3. Compare types of dairy products

LO 4. Recommend dairy production technology

LO 5. Provide for the production of dairy products in small plants

LO 6. Organize improvements in milk processing using a practical example

Course holder:

Dražen Čuklić, Ph.D., professor of professional studies

Križevci, July 2024