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**Department of Food Technology**

**College of Agriculture**

**University of Salahaddin - Erbil**

**Subject: Principles of Dairy Science**

**Course Book – (Year 2)**

**Lecturer's name :PhD.Narin Mohammedamin Wally(Theory)**

 **MSc, Ashna Tahsen Abdulqadr(Practical)**

**Academic Year: 2018/2019**

**Course Book**

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| **1. Course name** | **Principles Of Dairy Science** |
| **2. Lecturer in charge** | **Dr.NarinMohammedamin wally****MSc, Ashna Tahsen Abdulqadr** |
| **3. Department/ College** | **Food Technology/ Agriculter college** |
| **4. Contact** | **(Theory)e-mail:Narin wally@su.edu.krd****Tel:07504623277****(Practical)** ashna.abdulqadr@su.edu.krd |
| **5. Time (in hours) per week**  | **For example Theory: 2**  **Practical: 3** |
| **6. Office hours** | **Saturday 8:30-10:30(Theory)** **Wednesday 8:30 – 2:30 (Practical)** |
| **7. Course code** |  |
| **8. Teacher's academic profile**  |

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| **Name** |  Narin Mohammedamin Wally |
| **Date of Employment** |  1998 |
| **Years of Service** |  18 years |
|  **College** |  Agriculture collage |
|  **Department** |  Food Technology |

**Education and Certificates**

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| **Degrees** | **Department** | **University** | **Country** | **Date of Completion** |
|  **BSc** |  Biology |  Sallahaddin University-Erbil |  Erbil |  1998 |
|  **Diploma** |   |   |   |   |
|  **MSc** |  Food technology |  Sallahaddin University-Erbil | Erbil |  2002 |
|  **PhD** |  Food science & Technology |  Mousl University |  Mousl |  2008 |

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| **9. Keywords** | **Fat,Protein,Carbohydrate,Vitamine in milk, Heat treatment,Separation ,Homogenization,Dairy Product,** pasteurized milk, ghee, processed cheese, ice-cream and UHT products. **….** |
| **10. Course overview:*** Milk considers ideal food for human and calves since it contain almost nutritional requirements.
* Gives idea for students of food technology department about our future study especially in dairy sciences field.
* To provide in-depth knowledge in various unit operations and basic concepts in dairy processing.
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| **Course Objectives**1. Know the variability of milk and milk products components.
2. Know effect of structure variability of milk and milk products on steps process and final dairy product.
3. Learn students haw to understand and resolve manufacture problems of dairy products.
4. Collection and transportation of Milk: Identification of milk shed areas and planning
5. Thermal Processing of Milk: Process descsription and definitions: Thermization, Pasteurization, Sterilization, UHTprocessing. Thermization: significance and methods. Pasteurization methods: LTLT/HTST. UHT - Processing of Milk: Relevance of UHT-processing. Description of UHT-plants-Direct, Indirect.
6. Homogenization of milk: Definition, pretreatment of milk for homogenization, theories of homogenization, synchronization of homogenization with HTST plant. Effect of homogenization on physico-chemical properties of milk.
7. Principles and equipment for bactofugation and Bactotherm processes, Microfluidization of milk: Principle, equipment, effects and applications.
8. Dehydration: advances in drying of milk and milk products; freeze concentration, freeze dehydration: physicochemical changes during freeze drying and industrial developments.
9. Efficiency of cream separation and factors affecting it; control of fat concentration in cream. Receiving, grading, sampling and weighing of raw cream; neutralization, pasteurization. and cooling of cream. Preparation and properties of different types of cream; table cream, sterilized cream, whipped cream, plastic cream, frozen cream and cultured cream.
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| **12. Student's obligation**1. Detailed study of chemical and physical properties of milk, milk products, milk by-products,water and dairy waste Chemical and physical changes which occur in making each product. Water analysis water softing knowledge, its application in dairy operations of solutions, suspensions, emulsions, mixtures, pH, oxidation reduction potential, viscosity, surface tension, forming, freezing point, boiling point, super heating, super cooling, crystallization, coagulation, dessication. Legal standards for milk and milk products.
2. Fats, Fatty acids, saturated and unsaturated hydrogenation Physical and chemical Nutritive value.
3. Proteins, amino acids, amides, ammonia, Lecithino proteins, physical and chemical properties of milk proteins
4. Carbohydrates: Physical and chemical properties of lactose in milk .
5. Minerals: Physical and chemical properties of minerals in milk.
6. Vitamins in milk, how they are affected by processing and storing milk and milk products, deterioration from other cases.
7. Enzymes in milk.
8. Dairy Product
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| **13. Forms of teaching**Teaching Methods-Self Study-Word Microsoft – Power point presentation – Data show – White board - Datasho Power yy |
| **14. Assessment scheme**40% (Theory + Practical)25%Theory: - 20% Exams (at least two) + 5% Quizzes, daily activity and homework. 15%Practical: - 10% Exams + 5% Quizzes and homework. 60% final examination: - 40%theory + 20% practically. |
| **15. Student learning outcome:**At the end of this course, the learner will be able to : Knowledge of the most important components of the milk and their classification. Identify factors affecting the quantity and quality of milk produced and the effect of nutrition and some injuries on the installation of chemical and physical properties of milk . Knowledge of the chemical composition of each component, its ratio , its influence on the milk properties ,and the effect of the interference and proportion of each component on others . Knowledge of the factors surrounding ,as effect of pH and temperature on the manufacturing processes of these components and their role in maintaining the properties of milk. |
| **16. Course Reading List and References‌:**

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| Main references | Useful references | Magazines and review (Internet) |
| 1. Dairy Science. | 1. Dairy Processing Handbook | 1. www.gigapedia.org  |
| 2. Dairy Science and Technology.  | 2. Rural Dairy Technology | 2. www.4shared.com  |
| 3. Dairy Technology | 3. The Technology of Dairy Products | 3. www.osun.com |
| 4. Geoff, G. (1995). Dairy Science and Technology (from the internet) l. |  | http://www.foodsci.uoguelph.ca/dairyedu/home.htm |
| 5. Dairy Chemistry & Biochemistry |  |  |

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|  **17. The Topics: Theory**

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| No. | Title of the Subject | Lecture’s name |
| 1. | What is Milk The approximate composition of milk is  Milk Fractions:Milk can be described as:1- An emulsion.2- A colloid suspension 3- A solution.Colostrum:-Cream:- Skimming: Casein:. Whey:- Types of MilkI- Amount of milk fat present in the finished product Such as :- II- Other types of milk are based on the type of processing involvedIII- Grading:- IV- Specialty milks. V- Amount of milk water present in the finished product Such as :- VI- Animal Species :- Nutritive Value of Milk\*\* quiz or homework | D. Narin Mohammedamin Wally |
| 2 | Variability of Milk components1- Genetic factors 2- Interval between milking 3- Stage of lactation 4- Change in milk composition during milking5- Seasonal variations6- Diseases7- Age 8- Equipment9- Feeding 10- Amount of tissue that secretes milk.11- Species of the mammal. 12- Frequency of milking.13- Animal size.14- Infection of the udder.15- Condition of the animal at calving.16- Efficiency of milk.17- Dry period.18- Drugs.19- Condition of the animal at calving\*\* quiz or homework | D. Narin Mohammedamin Wally |
| 3 | Milk BiosynthesisIntroductionA) Steps of Protein BiosynthesisB) Mechanisms of Milk Lipids Biosynthesis - Sources of Milk Fatty Acids- Sources of Milk glycerolMilk BiosynthesisIntroductionC) Mechanisms of Lactose BiosynthesisD) Water, vitamins and minerals \*\* quiz or homework | D. Narin Mohammedamin Wally |
| 4 | Physico- Chemical Properties of Milk1- Physical State 2- Acidity & pH 3- Specific gravity (Density) 4- Color 5- Flavor 6- Viscosity 7- Surface tension 8- Refractive index 9- Specific heat 10- Electrical conductivity 11- Oxidation- reduction potential 12-Boiling point 13- Freezing point\*\* quiz or homework | D. Narin Mohammedamin Wally |
| 5- | Milk Chemistry1. water

Untitled2-Milk Lipids  Untitled-The different kinds of fat globule aggregates -Primary classes of lipids in cows milk-Milk Lipids - Physical Properties-Milk Lipids - Chemical Properties1-Triglycerides:- 2- Mono & Diglycerides:-  3- Fatty acids :- --Saturated fatty acids- --Unsaturated fatty acid –\*\* quiz & homework | D. Narin Mohammedamin Wally |
| 6- | Principle fatty acids in milk fatStructural formulae of four 18-carbon fatty acids varying in degree of saturation:- Chemical structure of milk fatclasses of lipids include \*phospholipids \* cholesterol \*Carotenoids\*Fat soluble vitamins\* milk fat globule membrane (MFGM),-Milk Lipids - Functional Properties-characteristics of milk fat-Deterioration of milk fat1- Lipolysis(Rancidity)2-Oxidation of milk fat (autoxidation)\*\* quiz or homework | D. Narin Mohammedamin Wally |
| 7- | Milk protein***Untitled***Classification of milk protein(Milk Protein Fractionation)Typical concevtration of proteins in bovine milkA.CaseinImportant properties of the caseins  The Caseins MicellesAverage characteristics of casein micellesEnzymatic coagulation:1. Acid coagulation
2. Enzymatic coagulation

B.Whey Proteins 1-β-lactoglobulin 2- α-lactalbumin 3- blood serum albumin 1. and immunoglobulins

\*\* quiz or homework | D. Narin Mohammedamin Wally |
| 8- | 1. Milk sugar (Lactose)

Lactose plays an important role in milk and milk products: -Other carbohydrates in milk 6-Vitamins untitled-Fanctions &important of some milk vitamins7- ***Minerals***untitled*Other constituents of milk*1. *somatic cells*:-
2. *Gases*:-

They exist in the milk in three states:1) dissolved in the milk2) bound and non-separable from the milk3) dispersed in the milk1. Organic acids:-
2. Non-protein nitrogen:-
3. Hormones:

\*\* quiz or homework | D. Narin Mohammedamin Wally |
| 9 | Milk Production in the FarmQuality Assurance of Raw Milk :-Quality control of raw milk:- **Healthy cows produce healthy raw milk**Quality requirements of raw milk:-Quality influences of raw milk:-\*\* quiz or homework | D. Narin Mohammedamin Wally |
| 10-11 | ***Collection and reception of milk***untitledKeeping the milk cool Delivery to the dairyChurn collectionTesting milk for quality Bulk collectionChurn reception Tanker receptionMeasuring by volume Measuring by weightTanker cleaningChilling the incoming milkRaw milk storageAgitation in silo tanksTank temperature indicationLevel indicationLow-level protectionOverflow protection Empty tank indication\*\* quiz or homework | D. Narin Mohammedamin Wally |
| 12-13 | Dairy processing1. Removal of Particles

Methods of Removal of Particles1-Filtration2- Centrifugal cream separation3-Centrifugal clarifier4- Bactofugation1. Milk Fat Separation
2. Homogenization
3. Heat Treated Milks

1-Thermization2- Pasteurization3-Sterilization\*\*Yoghurt manufacture\*\*Cream manufacture\*\*Cheese manufacture\*\*Butter manufacture\*\*Ice cream manufacture\*\*Concentrated & Dry milk manufacture\*\* quiz or homework | D. Narin Mohammedamin Wally |
| 14- | Clean milk production1. Milk producing animal
2. Dairy men (Milkers)
3. Water supply
4. Flies, insects & rodents
5. Disposal of wastes
6. Milk houses
7. Removal of milk
8. Milk utensils & dairy equipment
9. Cooling of milk

10-Transfer of milk to the factories\*\* quiz or homework | D. Narin Mohammedamin Wally |
| **17. The Topics: Practical**

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| 1-Milk Sampling 2- Quality control tests 3- Milk Acidity determination 4- Milk Density and total solids 5- Milk fat separation and skim milk 6- Milk fat determination 7- Milk standardization 8- yoghurt making(Traditional and Industrial)9- fermented dairy products10- chesse making11- halloumi chesse 12-flavoured milk 13- mastitis 14-milk adulteration 15-gymaq making 16- isoelectric point of casein17-pasturization 18-turbidity19-homognize  | Mrs. Ashna Tashen (3hrs/Lab.)  |
| 15. Examinations:**Define the following** 1- Sampling 2- standardization 3- Cheese 4- Anari **Fill in the blank with suitable word** 1-The whole milk specific gravity varies from ------------ to ----------- . 2- ------------------- and ---------------- are a starter culture in yogurt making. 4- The butyrometer scale for ------------------- is (0-70%). **explain the following sentences** 1- Principle of coagulation theory for cheese making2- Principle of making yogurt**Q/write the reasons****Q/mach the word from list A to the word from list B**  |

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| Some kind of examinationQ) Fill the following blanks : Milk include three families of salts: ……… , ……….. and ……….Q) Give the reasons of the following . Milk is the best ideal food .Q) Define (4) of the following terms: 1- Colostrum 2- Certified milk Q) What are the :- A- forms of milk minerals ? Q) Outline the :- A- casein micelles .Q) Enumerate all kinds of proteins in milk .Q) Differentiate between milk and colostrum .   |

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| **21. Peer reviewپێداچوونه‌وه‌ی هاوه‌ڵ**   |