



Department of: Food Technology

College of Agriculture Engineering Sciences

University of Salahaddin

Subject: Food chemistry (Theory + Practical)

Course Book – (Year 3)

**Lecturer's name: MSc. Dina Suad Ali, Rahela Siamand Qader,
Shno salam mohammed , Shymaa Omar Ali**

Academic Year: 2024/2025

Course Book/ 1st semester: 3rd Stage

1. Course name	Food chemistry
2. Lecturer in charge	Dina Suad Ali & Rahela Siamand Qader
3. Department/ College	Food Technology dept.- College of Agricultural Engineering sciences.
4. Contact	e-mail 1-dina.ali@su.edu.krd.com 2-rahela.qder@su.edu.krd 3-shno.mohammed@su.edu.krd 3-Shaema.ali@su.edu.krd
5. Time (in hours) per week	Theory:2 Practical: 2
6. Office hours	Monday (8:30-10:30) Tuesday (8:30-10:30)
7. Course code	
8. Teacher's academic profile	Dina suad ali// Rahela Siamand Qader// Shno salam mohammed//Shymaa Omar Ali
9. Keywords	water, carbohydrates, protein, lipids

8. Course overview:

Theory:

The course will cover water, carbohydrates, protein, lipids, minerals, vitamins and enzymes. In addition, color, flavor, and additives will be discussed.

Practical section

The lab component will cover the principles of chemical and instrumental methods for the qualitative and quantitative analyses of moisture, protein, carbohydrate, lipids, minerals and vitamins. Students will perform experiments to determine major food components using chemical and instrumental methods.

9. Course objective:

The course is intended to give students an overview of the chemical and physical properties of the major and minor food components and their changes during processing, handling and storage and to establish a connection between the chemical structure of food components and their roles in chemical reactions and properties of food and food products.

Practical

The student will explain how environmental factors such as temperature, pH, ionic characteristic and strength, bonding, light, etc. affect chemical changes in food systems and judge how to adjust these conditions to improve or minimize chemical and biochemical deterioration of food systems.

10. Student's obligation:

Attendance at lectures and labs is required.

The student will write notes on their notebook which are written on whiteboard besides the lecture on

11. Forms of teaching:

Teaching Methods: Self Study, Word Microsoft, Power point presentation, Data show and White board.

Practical A form of teaching is Data show with power point program and laboratory tests.

12. Assessment scheme:

Theory 65% (midterm exam 15% + final exam 50%)

Practical 35% (quiz 5% + 30% exam)

13. Student learning outcome: Students are expected to understand and be able to control the major chemical and biochemical (enzymatic) reactions that influence food quality with emphasis on food industry applications. To understand how the properties of different food components and interactions among these components modulate the specific quality attributes of food systems, and to understand the principles that underlies the biochemical/enzymatic techniques used in food analysis.

14. Course Reading List and References:

1-Fennema's Food Chemistry, fourth edition, edited by S. Damodaran, K.L. Parkin, and O. R. Fennema, 2007, published by CRC Press may be used as a reference.

2-Principles of Food Chemistry, 1999. 3rd Edition. J.M. deMan, Aspen Publishers, New York.

3-Food Chemistry, 3rd edition 1996 . O.R. Fennema, Ed. Marcel and Dekker, Inc., New York, NY.

4- Students are responsible for reading articles that are found in the library and on the Internet

15. The topics	Lecturers name
<p>1- Introduction to Food Chemistry, Food Chemistry History, Food Elements</p>	<p>Dina suad ali + Rahela Siamand Qader (2 hrs.)</p>
<p>2-: Water in food. Structure of water and ice. Water solute interactions. Water activity and 1- relative vapour pressure (RVP). Moisture sorption isotherms. Aw and mallard, Oxidation, Enzymatic reactions and Aw and growth of microorganisms.</p>	<p>Dina suad ali+ Rahela Siamand Qader (2 hrs.)</p>
<p>3- Proteins in Foods, Protein Chemistry: Amino acid Chemistry and its Role in Food Proteins Properties</p>	<p>Dina suad ali+ Rahela Siamand Qader (2 hrs.)</p>

<p>4 -Peptides; Flavour Enhances; Hydrolysed vegetable protein; browning reactions, protein denaturation.</p>	<p>Dina suad ali+ Rahela Siamand Qader (2 hrs.)</p>	
<p>5-Carbohydrate Chemistry: Monosaccharides, Disaccharides, Artificial Sweeteners, Carmalization.</p>	<p>Dina suad ali+ Rahela Siamand Qader (2 hrs.)</p>	
<p>6- Polysaccharides : starch, vegetable, dietary fibre and their Role in Food Processing.</p>	<p>Dina suad ali+ Rahela Siamand Qader (2 hrs.)</p>	

7 th	Lipids in Foods, Lipid chemistry: Fatty Acid Chemistry; Commercially -Important Fats and Oils.	Dina suad ali+ Rahela Siamand Qader (2 hrs.)	
8th	Oxidation and Rancidity; Emulsions and Emulsifiers	Dina suad ali+ Rahela Siamand Qader (2 hrs.)	
9th	Food Enzymes	Dina suad ali+ Rahela Siamand Qader (2 hrs.)	
10th	The Roles of Food enzymes in food processing	Dina suad ali+ Rahela Siamand Qader (2 hrs.)	
11th	Food Vitamins fat soluble and water soluble vitamins, dietary re bioavailability, process-induced changes to vitamins in food, vita optimisation of vitamin retention and vitamin supplementation.	Dina suad ali+ Rahela Siamand Qader (2 hrs.)	
12th	Mineral composition of foods Chemical and functional pro elements.	Dina suad ali+ Rahela Siamand Qader (2 hrs.)	
13th	Food Pigments ,Effects of Food processing on Food Pigme	Dina suad ali+ Rahela Siamand Qader (2 hrs.)	
14th	Food Acids, Flavor Compounds	Dina suad ali+ Rahela Siamand Qader (2 hrs.)	
15th	Food Additives.	Dina suad ali+ Rahela Siamand Qader (2 hrs.)	

16. Practical Topics:		
Weeks	The curriculum	The Target
1-	Introduction to food chemistry	<u>shno.mohammed@su.edu.krd</u>+ Shymaa Omar Ali
2	Determination of water in different foods	<u>shno.mohammed@su.edu.krd</u>+ Shymaa Omar Ali
3	pH and carboxylic acids in food	<u>shno.mohammed@su.edu.krd</u>+ Shymaa Omar Ali
4-	Exams	
5	Kjeldhal and Protein determination	<u>shno.mohammed@su.edu.krd</u>+ Shymaa Omar Ali
6	Fat determination by soxhlet	<u>shno.mohammed@su.edu.krd</u>+ Shymaa Omar Ali

7	Sucrose determination in soft drinks (Reducing sugars)	shno.mohammed@su.edu.krd + Shymaa Omar Ali
8	Enzymes in food	shno.mohammed@su.edu.krd + Shymaa Omar Ali
9	Exams	
10	Enzymatic oxidative browning, of fruits and vegetables	shno.mohammed@su.edu.krd + Shymaa Omar Ali
11	Extraction of pigments in food	shno.mohammed@su.edu.krd + Shymaa Omar Ali
12	Preparation of solution	shno.mohammed@su.edu.krd + Shymaa Omar Ali
13	Gelatinization	shno.mohammed@su.edu.krd + Shymaa Omar Ali
14	Foams in food	shno.mohammed@su.edu.krd + Shymaa Omar Ali
15	Emulsions, in food	shno.mohammed@su.edu.krd + Shymaa Omar Ali

In this section The lecturer shall write titles of all practical topics he/she is going to give during the term. This also includes a brief description of the objectives of each topic, date and time of the lecture

17. Examinations:

Typical questions:

Q / Define the following:

Dialysis, Thixotropic Gel, Stachyose, Modified Starch, Polyglactouronase, Dextrose Equivalent, Volatile fatty acids, Acid value, BHA, Elaidic acid, Valin, Sved berg, Tyrosine, Lysozyme, protein denaturation.

Q/what are the differences between:-

Inuline and Cellulose

- Amylase and α -Amylase β Amyloglucosidase,

Pectin and Pectic Acid

Fats and Oils

Q / Write chemical structure and significance of the following compounds:

Lecithin, Triolein, Octadecadienoic acid, Eicosanoic, Stearic acid, Vitamin A, Sphingosine, Tyrosine, Tochoferol,

Monoglyceride, EPA, Salting out, Tofu, Collagen, Prolamins. Nigerose, Moroctic, Un-conjugated fatty acids,

Gliadin, Asparaginase, BHT, Tributyrin

Q/A/Explain the role of pectin in jelly production.

B/How jelly special for diabetic people is produce.

Q / Write chemical structure for each of the following amino acids and explain its role in physical and chemical

properties of foods:

1-Proline 2-Serine 3-Alanine 4-Glutamic acid

Q/write the chemical equation of initiation step of food lipids oxidative rancidity.

Q/write the chemical equation of food lipids hydolysis rancidity.

Q/Name the following:-

1- Two essential amino acids found in food proteins.

2- Two non-essential amino acids founded in food proteins.

3- Phospho-protein founded in food.

4- Enzyme used for food processing.

5-Enzyme responsible for food deterioration

6- Main sugar found in fruits.

7- Can sugar.

8-Homotriglyceride.

9-Heterotriglyceride.

10-Natural Antioxidant found in food.

11-Artificial Antioxidant found in food.

12-Pigment found in meat

Q4/ Answer with (Yes) or (No) and correct the wrong:-

1- all enzymes are proteins.

2-Maltose in non-reducing monosaccharide's.

3-glucose is sweeter than fructose.

4- Denaturation of this protein leads to converting of the sulfhydryl bonds to disulfide groups which are responsible

for the cooked flavor in food.

5-melting point of oleic acid is higher than stearic acid.

6-tartaric acid is the main acid found in citrus.

Q/Conjugate suitable word in list A with list B.

saturated fatty acid , Svedberg, Rancidity , A- BHA, Salting out , Ultracentrifugation, Phospholipid, Tyrosine, B-Lipase, Antioxidant, Emulsifier, Ammonium Sulphate, Aromatic Agent, Caprylic acid, Bioactive protein.

Q/Discuss the following:-

1-Melting point of stearic acid is higher than melting point of linolenic acid.

2-Proline called imino-acid.

3-Cellulose is not digested in human digestive tract.

4-Fat are solid at room temperatures.

5-Oils are liquid at room temperatures.

6- Electrical behavior of hydrophilic suspended colloids.

7- Mutarotation of carbohydrates.

8- The existence of various sugars with differences viscosity in aqueous solutions.

Q/Fill the following blanks:-

1- ----- is the major carbohydrate fraction in cereal, It is made up of ----- building block.

2- Measuring the inactivation of peroxidase is a method of testing the----- process efficiency

3- Heating food to above 100°C causes sugar to combine irreversibly with ----- by reaction called-----.

4- The melting point of food lipids increased with -----and decreased with----- of fatty acids

5----- gives food a yellowish color.

6-The red color of tomato refer to-----.

Q\ List \1- The reactions that occur during caramelization process. 2- Lipid quality analyses.

B- What is the importance of three of the following enzymes in food industry?

Microbial transglutaminase , Glucose oxidase , Lipoxygenase , Invertase

Q\A-Write the chemical structure of the following fatty acid then rearrange them from lower to higher melting point & classify them according to omega system.

Oleic , Eladic , Linoleic ,Linolinic .

Q\ Write the chemical the chemical equation of apple browning reaction by PPO enzyme

Q\ What are the differences between the LM & HM pectin.