



**Department of Food Technology**

**College of Agricultural Engineering Sciences**

**Salahaddin University-Erbil**

**Subject: Food Preservation**

**Course Book – (Year 4)**

**Course Book – (4<sup>th</sup> Stage)**

**Lecturer's name**

**Theory: Assist. Prof. Dr. Nabil Hussain Rasul**

**Practical: MSc. Mahmood F. Saleem**

**Academic Year: 2022-2023**

# Course Book

<b>1. Course name</b>	<b>Food preservation</b>
<b>2. Lecturer in charge</b>	<b>*Dr. Nabil Hussain Rasul</b> <b>**MSc. Mahmood F. Saleem</b>
<b>3. Department/ College</b>	<b>Food Technology / Agricultural Engineering Sciences</b>
<b>4. Contact</b>	<b>e-mail: nabil.rasol@su.edu.krd</b> <b>mahmood.saleem@su.edu.krd</b> <b>Tel: +9647504729357</b>
<b>5. Time (in hours) per week</b>	<b>Theory: 2</b> <b>Practical: 3</b>
<b>6. Office hours</b>	<b>3 hours</b>
<b>7. Course code</b>	<b>AFT403</b>
<b>8. Teacher's academic profile</b>	<b>*Bsc: in food Industrial 1991, Msc: in Food Technology in 2003, PhD. In Food Sciences 2010.</b> <b>**Bsc: in food technology in2005, Msc: in Food processing in 2011</b>
<b>9. Keywords</b>	<b>Food Preservation , chilling , Freezing, Drying, Thermal Processing, Deterioration, Solution, Hydrometer, Refractometer.</b>
<b>10. Course overview:</b> In this course the student must be know the methods to industrial, preserve and storage the foods. Food processing includes the methods and techniques used to transform raw ingredients into food for human consumption. Food processing takes clean, harvested or slaughtered components and uses them to produce marketable food products	
<b>11. Course objective:</b> The aim for this course to process and prevent the foods from the spoilage, length the shelf life. <ul style="list-style-type: none"> <li>• To understand the methods of food preservation &amp; techniques of each methods .</li> <li>• To understand the types &amp; methods of pre-treatments before food preservation .</li> <li>• To know definition and steps of each preservation methods</li> </ul>	
<b>12. Student's obligation</b> The student has to prove its presence in the lecture and that by taking the percentage of attendance by me and has quiz in most lecture, working in lab production of food products and in the end the students have exam by monthly and finally.	

### **13. Forms of teaching**

Lectures , papers, data show, white board, videos, pictures, Laboratory, Samples

### **14. Assessment scheme**

Daily activity , quiz, Exam.

### **15. Student learning outcome:**

1. Training and teaching students how to preserve foods
2. To identify the different ways of preserving food.
- 3.To identify the food characteristics & how to determine that the food is high quality or not
3. To identify the factors that lead to elongate the shelf life of products.
4. To identify the factors that lead to food deterioration & it is Solution.

### **16. Course Reading List and References:**

▪ Key references:

1. **Al-Aswad, M.B. et al, (1993)**,principles of food processing.
2. **Stef Steffe.J.F. (1992)**. Rheological methods in food process engineering, Freeman Press, Michigan University, East Lansing, MI, 1.
3. **Lecturers of Industrial (1986)**, Food Industrial, Cairo University.
4. **Brennan, J. G. (2006)**.Food Processing Hand book. published by WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim ISBN: 3-527-30719-2.

▪ Useful references:

1. **Ahvenainen, R. (2000)**. Ready-to-use fruits and vegetables, Flair-Flow Europe Technical Manual. [http://flairflow4.vscht.cz/fru\\_veget00.pdf](http://flairflow4.vscht.cz/fru_veget00.pdf).
2. **Brecht, J. (1995)**. Physiology of lightly processed fruits and vegetables. HortScience, 30(1): 18–22.
3. **Manay , N. S. and Shadaksharaswamy , M. (2008)**. Foods facts and principles. Third revised edition. New Age International (p) Ltd., publisher.
4. **Ramaswamy , H. and Marcotte, M. (2006)**. Food processing principles and applications. Published by CRC pres., Taylor and Francis group, Library of Congress.

▪ Magazines and review (internet):

1. Journal of Food Processing and Preservation
2. [http://www.4shared.com/Food\\_Process\\_Design.html](http://www.4shared.com/Food_Process_Design.html)
3. <http://www.who.int/en/>

<p><b>17. The Topics:</b></p> <p><b>Theoretical Topics</b></p> <p><b>1. Food Processing</b> Food preservation Meaning and need for preservation The principles of food preservation</p> <p><b>2. Handling and Preparation of Foods for Processing</b> Raw Material Properties Raw Material Specifications Storage Deterioration of Raw Materials (foods)</p> <p><b>3. Unit Operations In Food</b> Processing Industry Raw Material Cleaning Separating Mixing Peeling Sorting Blanching Sulphring of Fruits and Vegetables Practical:</p> <p><b>1. Processing by the removal of heat</b> Chilling Shelf life of chilled processed foods Mechanical refrigerators</p> <p><b>2. Methods of cooling</b> Methods for Pre-Cooling Produce room cooling</p> <ul style="list-style-type: none"><li>• forced-air cooling</li><li>• hydro-cooling</li><li>• ice cooling</li><li>• vacuum cooling</li></ul> <p>Chill storage</p> <p><b>3. Preservation by Freezing</b> Freezing curve Slow freezing Quick freezers Rapid freezing Ultra rapid freezers Physical effects of freezing Types of chemical changes Microbiology Of Frozen Food Freezing Foods Freezer Equipment Frozen Food Quality Issues</p> <p><b>4. Thawing</b> Thawing Methods: Refrigerator Method Cold Water Method</p>	<p>Lecture's name Dr.Nabil H. Rasul</p> <p>2 hours</p>
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<p>Method Microwave. Cook it frozen method. Metal pan method Room temperature method Warm water method Other thawing methods</p> <p><b>5. Preservation by Rehydration</b></p> <p><b>Drying</b> Drying Curve Drying Methods Sun Drying Solar Drying Type of solar dryers</p> <p><b>6. Equipment Used in Hot Air Drying</b> Cabinet (Tray) Drier Conveyor (Belt) Drier Bin Drier Fluidised Bed Drier Rotary Drier Spray Drying Drum (Roller, Film) Drier Vacuum Band (Belt) Drier Commercial Drying Freeze Drying (Sublimation Drying, Lyophilisation) of Solid Foods</p> <p><b>7. Preservation by Thermal Processing</b> Blanching Immersing in boiling water 2) Steam 3) Microwave 4) Hot gas 2. Pasteurization 1) Batch Method 2) Continuous Method A. Flow Pasteurization B. Tunnel Pasteurization 1. Water Spray System 2 Water Circulation System Cooking</p> <p><b>8. Sterilization</b> •Retorted Retorts vertical horizontal still agitating batch continuous •Aseptically packaged</p>	
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<p>Rate of heat penetration Survivor Curve D value Z value F F0 5-D Process 12-D Process</p> <p><b>9. Operations In Canning</b></p> <ul style="list-style-type: none"><li>•Blanching</li><li>•Filling the container</li><li>•Exhausting</li><li>•Sealing the container</li><li>•Heat processing</li><li>•Cooling</li><li>•Incubation and quality control checks</li><li>•Labeling, palletizing, warehousing and dispatch</li></ul> <p><b>10. Preservation by Food Additive</b></p> <p>Major groups Delaney Clause Fortification Enriched Restoration Standardization Supplementation Phytochemicals Types of Additives Food Additives – Ingredients with a Purpose Numbering</p> <p><b>11. Preservation by Irradiation</b></p> <p>The main advantages of irradiation Major Disadvantages Theory Food Irradiator Sources Irradiation Processes Equipment Effect on micro-organisms Are irradiated foods safe to eat</p> <p><b>12. Preservation by Hydrostatic high pressure</b></p> <p>The main advantages of Hydrostatic high pressure Disadvantages Theory Equipment Effect on micro-organisms</p>	
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<p><b>18. Practical Topics</b></p> <p><b>1- Solutions</b> Objective of the topic: The purpose of it is training and educating the students in the preparation, concentrations or dilution of sugar or salt solutions and types of solution.</p> <p><b>2- Methods of determination solutions concentration</b> Objective of the topic: The purpose of it is training and teaching students to use various methods and apparatus for estimating the concentrations of salt and sugar solution and calculate correction value if there is difference in temperature between hydrometer and solution which have been prepared.</p> <p><b>3- Food Characteristics and its spoilage</b> Objective of the topic: To inform students what are the food characteristics &amp; Aspects of Food Quality. also how preserve it, Types of food deterioration and the factors that leads food to deteriorate.</p> <p><b>4- (Food preservation by low temperature) Chilling</b> Objective of the topic: The purpose of this subject is training and educating students on use of lower temperatures in food preservation, The essential requirement of it and observe the changes that occur on the food for example color and textures, Also the steps, procedures of food preservation by this way &amp; How to calculate Refrigeration Load.</p> <p><b>5- (Food preservation by low temperature) Freezing</b> Objective of the topic: The purpose of this subject is training and educating students on the use of lower temperatures in food preservation, methods &amp; types of freezing and observe the changes that occur on the food during freezing for example color and textures, also the steps ,procedures and equipments of food preservation by this way, Also how calculating pre cooling period &amp; The amount of heat which must be remove.</p> <p><b>6- Exam ( theory and practical)</b></p> <p><b>7- Food preservation by Drying</b> Objective of the topic: The purpose is training and teaching students to how preserve food by drying and different methods of drying and the comparison between models, Also general steps of</p>	<p>Lecturer's name</p> <p>Mr. Mahmood</p> <p>ex: (3 hrs)</p>
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<p>drying, Quality Changes During Drying &amp; How to calculate moisture content &amp; Rehydration ratio.</p> <p><b>8- Food preservation by Fermentation and Pickling</b> Objective of the topic: The purpose of this subject is training and teaching students to how preserve food by fermentation &amp; the types of it ,products of each type, also pickling definition and to know the changes that occur during pickling, fermentation process for fruits and vegetables, also Imperfections of pickling &amp; its steps.</p> <p><b>9- Food Preservation by canning</b> Objective of the topic: The purpose of this subject is training and education of students on food preservation by canning, principles of canning, Basics of Home Canning, steps of food canning &amp; The factors that effect on the period of canning.</p> <p><b>10- Food Preservation by chemical additives</b> Objective of the topic: The purpose of this subject is training and teaching students the preservation of foods by chemical additives, and types of food additives and uses each of them with their advantages and disadvantages.</p> <p><b>11- Food preservation by smoking</b> Objective of the topic: Introduction , Principles of it , Methods of it &amp; the tool which used, and the advantages and disadvantages of this method.</p> <p>12- Exam</p> <p><b>13- Preserving with salt ( Curing)</b> Objective of the topic: The purpose of this subject is training and teaching students how to preserve food by Salt &amp; its principles, Chemical action of curing, amount of salt, types of salting and Warning.</p> <p><b>14- Food Preservation by radiation</b> Objective of the topic: The purpose of this subject is training and teaching students on the basis of food preservation by this way also the steps of it and the advantages and disadvantages of this method.</p> <p><b>15- Application of ultrasound for food preservation</b> Objective of the topic: Introduction ,Fundamentals of ultrasound, Ultrasound as a food preservation tool, Ultrasound as a food preservation aid</p>	
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**19. Examinations:**

Sample of Questions

1- Define the following

2-What is the cause each of the following:

3- Write what you know about the following

Tomato juice extraction

4-prepare sugary solution with 20% concentration and its weight 60 kg

5- Enumerate each of the following

6- Fill the following blanks with appropriate word

7-Answer by true or false the following statement & correct the false statement :

8- What are the differences between:

Examples

**Q1 // Define:-**

1. Controlled Atmosphere Storage System.
2. Blanching

**Q2//A))Write whether the following statements are True or False and Correct the False One:-**

1. Spiral freezers require relatively small floor-space and have high capacity.  
True
2. Hot gas blanching using combustion of flue gases without of steam .
3. Optimum temperature for drying food is 140°F.
4. Constant rate period, in which moisture is comparatively easy to remove.
5. There are a number of cleaning methods available, classified into Wet and Dry methods

**Q2//B))Fill the blanks:-**

1. Ionic polarization is more important than Dipole rotation as a microwave heating mechanism.
2. Ultra rapid freezers (10-100 cm/h), that is cryogenic freezers.
3. **Cryogenic freezers** : Cryogen may be ... sprayed ...on food or food may be ... **immersed** ...in cryogen.
4. .... **Fluidised Bed Drier**... In this type of drier heated air is blown up through a perforated plate which supports a bed of solid particles.

**Q3)) Explain:-**

1. Purpose of pasteurization for Beer.
2. Purpose of pasteurization for liquid egg.
3. Microwave vegetable blanching, Among the first important findings
4. Changes detrimental to the quality of the food may also occur during drying.

**Q4-A // Choose the correct answer "A , B, C, or D" :-**

1. Method used for onions Peeling  
A. Steam    B.Lye (1–2% alkali)    C.Brine solutions    D.Flame
2. Minimum processing condition of fruit juice pasteurization  
A. 77°C for 1 min                      B. 71.5°C for 15 s.  
C. 60°C for 3.5 min                      D. 78°C for 10 min

3. Minimum processing condition of liquid egg pasteurization  
A. 77°C for 3.5 min      B. 63°C for 30 min.  
C. 60°C for 3.5 min      D. 61°C for 10 min
4. This is the Drier most commonly used to dry liquid foods and slurries.  
A. Tunnel Drier      B. Fluidised Bed Drier      C. Spray Drier      D. Cabinet (Tray) Drier

**Q4-B// Write only two examples of each of the following:-**

1. Designs of spray drying chambers
2. Designs of drum driers
3. Advantages of Plate freezer

**Q5//A) Enumerate:-**

1. Types of Water Spray System pasteurizers
2. The most common thawing methods of frozen food
3. The aims of the food industry.

**Q5//B) Draw:-**

1. Block diagram of a flash pasteurizer Draw  
Vacuum cooling equipment

**20 Extra notes:**

Here the lecturer shall write any note or comment that is not covered in this template and he/she wishes to enrich the course book with his/her valuable remarks.

**21. Peer review**

This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.

*(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).*