

## School of Food and Agricultural Sciences

**Course Title: Food Processing and Preservation**

**Course Code: FT-207**

**Resource Person: Dr. Sadia Aslam**

**Department: School of Food and Agricultural Sciences (SFAS)**

### **SFAS Vision**

SFAS endeavours to be a premier centre of excellence, offering innovative, high-quality education and professional programs aimed at achieving academic and research excellence, enriching the lives of individuals and making a difference in the world of academia and industry, and to develop a society of professionals, who can contribute towards the betterment of their respective communities.

### **SFAS Mission Statement**

School of Food and Agricultural Sciences (SFAS) provides an intellectually rich, collaborative, research-focused and dedicated learning environment for students, faculty, and staff, while serving the community at various levels. SFAS at UMT has been established with the aim to integrate recent advances in food sciences/technology and agricultural innovations.

### **Program Learning Objectives**

Students graduating with BS Food Science and Technology shall be able to:

1. Explain the basic principles of food sciences, and its multidisciplinary scope.
2. Explain the physical, chemical and biological properties of food and their effects on food safety, and sensory and nutritional quality.
3. Apply analytical techniques to characterize composition, and to identify physical, chemical and biological changes in foods.
4. Explain the effects of food processing, engineering, preservation, packaging, and storage on food safety and quality.
5. Identify the importance of food laws and regulations in ensuring safety and quality of the processed/manufactured foods.
6. Conduct applied research and use statistical tools in experimental design and data analysis.

7. Apply acquired knowledge to real world situations in food systems, components, production, and processes.
8. Apply critical thinking to professional problems.
9. Communicate effectively in both oral and written forms.
10. Develop organizational, teamwork, and leadership skills.
11. Demonstrate professional skills and thoughts of ethical, social integrity, and respect for diversity.
12. Demonstrate preparedness for continued reflective practice, and lifelong learning relevant to careers in food sciences.

## **Course Learning Objectives**

At the completion of the course, a student will be able to:

- Explain the basic principles of food preservation processes: heating, chilling, freezing, control of water activity, acidification, chemical preservatives, packaging, etc.
- Explain the mechanisms of spoilage and deterioration of foods and raw materials: microbial, chemical, physical, biochemical, etc.
- Understand the importance and processes of preliminary operations in the food processing industry
- Explain the range of conventional food processing operations used for food preservation including thermal processing, chilling and freezing and dehydration
- Explain the applications, equipment design and principles of different non-thermal food processing techniques and minimal processing techniques

## Learning Objectives:

Sr#	Course Learning Objectives	Link with Program Learning Objectives
1.	Understand the importance and processes of preliminary operations in the food processing industry	Explain the basic principles of food sciences, and its multidisciplinary scope.
2.	Explain the mechanisms of spoilage and deterioration of foods and raw materials: microbial, chemical, physical, biochemical, etc.	Explain the physical, chemical and biological properties of food and their effects on food safety, and sensory and nutritional quality.
3.	Explain the basic principles of food preservation processes: heating, chilling, freezing, control of water activity, acidification, chemical preservatives, packaging, etc.	Explain the effects of food processing, engineering, preservation, packaging, and storage on food safety and quality.
4.	Explain the range of conventional food processing operations used for food preservation including thermal processing, chilling and freezing and dehydration	Apply analytical techniques to characterize composition, and to identify physical, chemical and biological changes in foods.
5.	Explain the applications, equipment design and principles of different non-thermal food processing techniques and minimal processing techniques	Apply acquired knowledge to real world situations in food systems, components, production, and processes.

## Learning Outcomes

- **After successful completion of the Course Work, Students have the skills to:**
  1. Compare and contrast preservation methods for foods
  2. Describe the principles of food preservation
  3. Suggest the application of the preservation process depending on the type of food
  4. Determine the thermal processing conditions (time / temperature) for each type of food
  5. Choose the appropriate application of certain preservation processes with regard to the preservation of quality and the satisfactory durability of food products

## Teaching Methodology (List methodologies used –example are given below)

Interactive Classes:

- Use media to increase student engagement and improve learning outcomes.
- Try adding metaphors to help students remember details.
- Give students a real-world context with extra projects to reinforce skills.
- Provide practical practice within your lessons. Making it relatable will do wonders.
- Find ways to include differentiated lesson plans in Food Processing and Preservation classes

## **Class Participation**

Positive, healthy and constructive class participation will be monitored for each class. Particular emphasis will be given to participation during the presentation sessions. The manner in which the question is asked or answered will also be noted. Your participation in class discussion will contribute to the class participation marks.

## **Word of advice**

Assignments/ projects are very demanding and time consuming. Since you might be exposed to the real corporate environment, the ensuing reality checks could be demoralizing and frustrating. So, you must learn to handle the intra group conflicts and any clash of interests. Unless you start working on the assignments/ projects right away from the very first day you are likely to miss the deadlines.

## **Participant Responsibilities:**

Student should be responsible enough to practice whatever they have learnt during class sessions. They should also implement it to other subjects as well. They are expected to come prepared in the class.

Class activities:

## **Presentations**

After careful analysis, resource person will constitute the groups to achieve balanced heterogeneity among groups, for group assignments/projects and will have the final decision in this regard. Every member of the group is expected to be able to handle all aspects of the assignments. Groups are not allowed to choose presenters for various parts of the presentations; instead resource person will nominate them. Individuals will be judged for their understanding of the topic through question handling. Q/A section of the presentations will weigh heavily for grading of assignments/ projects.

## **Team Discussions:**

During class, each student will work in a team on discussion questions. Teams will be assigned questions, allowed ten minutes for Internet research, and permitted five minutes to present their results. Points are earned by active participation with your team.

**STUDENTS ARE REQUIRED TO READ AND UNDERSTAND ALL ITEMS OUTLINED IN THE PARTICIPANT HANDBOOK**

## **Class Policy: -**

- **Be on Time**  
You need to be at class at the assigned time. After 10 minutes past the assigned time, you will be marked absent.
- **Mobile Policy**  
**TURN OFF YOUR MOBILE PHONE!** It is unprofessional to be texting or otherwise.
- **Email Policy**  
**READ YOUR EMAILS!** You are responsible if you miss a deadline because you did not read your email.  
Participants should regularly check their university emails accounts regularly and respond accordingly.
- **Class Attendance Policy**

A minimum of 80% attendance is required for a participant to be eligible to sit in the final examination. Being sick and going to weddings are absences and will not be counted as present. You have the opportunity to use 6 absences out of 30 classes. Participants with less than 80% of attendance in a course will be given grade 'SA' (Short Attendance) and will not be allowed to take end term exams. International students who will be leaving for visa during semester should not use any days off except for visa trip. Otherwise they could reach short attendance.

- **Withdraw Policy**

Students may withdraw from a course till the end of the 12th week of the semester. Consequently, grade W will be awarded to the student which shall have no impact on the calculation of the GPA of the student. A Student withdrawing after the 12th week shall be automatically awarded "F" grade which shall count in the GPA.

- **Moodle**

UMT –LMS (Moodle) is an Open Source Course Management System (CMS), also known as a learning Management System (LMS). Participants should regularly visit the course website on MOODLE Course Management system, and fully benefit from its capabilities. If you are facing any problem using Moodle, visit <http://oit.umt.edu.pk/moodle>. For further query send your queries to [moodle@umt.edu.pk](mailto:moodle@umt.edu.pk)

- **Harassment Policy**

Sexual or any other harassment is prohibited and is constituted as punishable offence. Sexual or any other harassment of any participant will not be tolerated. All actions categorized as sexual or any other harassment when done physically or verbally would also be considered as sexual harassment when done using electronic media such as computers, mobiles, internet, emails etc.

- **Use of Unfair Means/Honesty Policy**

Any participant found using unfair means or assisting another participant during a class test/quiz, assignments or examination would be liable to disciplinary action.

- **Plagiarism**

Policy

All students are required to attach a "Turn tin" report on every assignment, big or small. Any student who attempts to bypass "Turn tin" will receive "F" grade which will count towards the CGPA. The participants submit the plagiarism report to the resource person with every assignment, report, project, thesis etc. If student attempts to cheat "Turn tin", he/she will receive a second "F" that will count towards the CGPA. There are special rules on plagiarism for final reports etc. all outlined in your handbook.

- Communication of Results

The results of quizzes, midterms and assignments are communicated to the participants during the semester and answer books are returned to them. It is the responsibility of the course instructor to keep the participants informed about his/her progress during the semester. The course instructor will inform a participant at least one week before the final examination related to his or her performance in the course.



## **Course Outline**

Course code: **FT-207**

Course title: **Food processing and Preservation**

Program	Food Processing and Preservation
Credit Hours	3 Credit Hours
Duration	One Semester
Prerequisites (If any)	This course requires that students must have basic knowledge of the course introduction to food science and technology
Resource Person Name and Email	Dr. Sadia Aslam Sadia.aslam@umt.edu.pk
Counseling Timing (Room# )	10 hours per week
Contact no.	03347601300
Web Links:- (Face book, Linked In, Google Groups, Other platforms)	

**Chairman/Director Programme**

**Signature.....**

**Date.....**

**Dean's signature.....**

**Date.....**



## Grade Evaluation Criteria

Following is the criteria for the distribution of marks to evaluate final grade in a semester.

Marks Evaluation	Marks in percentage
Mid-Term (Written/Practical)	20%
Final exam (Written)	35%
Class Participation	5%
Lab component	20%
Presentation	5%
Quizzes	10%
Assignments	5%
<b>Total</b>	<b>100%</b>

## Recommended Text Books:

1. Bhat, R., Alias A.K. and Paliyat, G. 2012. Progress in food preservation. John Wiley and Sons Ltd., USA.
2. Brennan, J.G. 2006. Food processing handbook. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany.
3. Fellow, P.J. 2005. Food processing technology. Woodhead Publishing Ltd. Cambridge, England.
4. Heldman, D. 2011. Food preservation process design. Elsevier Corporation, USA.
5. Rahman, M.S. 2007. Handbook of food preservation. CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA.

**Course: Food Processing and preservation**

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	<b>Topics to be covered in the course</b>	<b>Learning Objective of this topic</b>	<b>Expected Outcomes from Students</b>	<b>Teaching Method</b>	<b>Assessment Criteria</b>	<b>Deadlines and Homework</b>
	Introduction to food processing and preservation: aim of food preservation, food preservation methods: biological, physical and chemical	Understand the need of preserving food Introduce students to the fundamentals of food processing and preservation	Group Discussion/ Surprise Questions	Lecture	Basic understanding about food processing and preservation methods	Within a Week
	Modes of food spoilage, factors affecting the food spoilage: Microbial and chemical spoilage	Describe the factors (chemical, enzymatic, microbiological) that commonly contribute to food deterioration and spoilage	Class Activity/Surprise Questions	Lecture	Defining the causes of different types of food products	Within a Week
	Postharvest handling and preparation of foods for food processing; Raw material properties and specifications	Understand the properties of raw food materials and their susceptibility to deterioration and damage	Quiz/ Practical Assignment	Lecture/Practical Activity	Basic understanding about post-harvest handling of fresh produces in order to get the high-quality raw	Within a Week

					materials for value addition	
	Principles of food preservation: heating, chilling, freezing, control of water activity, acidification, chemical preservatives, packaging, etc.	Summarize possible mechanisms for inhibiting the factors that promote deterioration of quality in food systems	Group Discussion/ Surprise Questions	Lecture/Practical Activity	Understand about different principles underlying the food preservation	Within a Week
	Different preliminary operations in Food Processing Industry: Cleaning, peeling, sorting, grading, sulfiting	Understand the importance of cleaning, grading, blanching in the food processing operations  Know the cleaning and grading devices and their operating principles	Practical Assignment/ Assigning group tasks	Lecture/Practical Activity	Describing the importance and mechanism of different preliminary unit operations for raw materials in food processing industry	Within a Week
	Thermal processing: principles & application; blanching, pasteurization, sterilization, HTST, commercial sterilization, UHT,	Interpret the basis of thermal food processing.  Compare and contrast thermal processing categories: blanching, pasteurization, and commercial sterilization	Class Activity/Surprise Questions	Lecture/Practical Activity	Basic understanding about principle of preserving the thermally processed food materials and thermal food processing operations	Within a Week

	canning, aseptic packaging					
	Dehydration & Evaporation - significance and Equipment used in dehydration and evaporation	<p>Illustrate the underlying concepts of various methods of food dehydration and evaporation.</p> <p>Outline the basis for extension of storage life of foods by dehydration and evaporation.</p> <p>Compare and contrast methods for dehydrating and evaporation of different foods, and the consequences in terms of food quality</p> <p>Explain factors affecting the rate of dehydration and evaporation</p>	Class Activity/Surprise Questions	Lecture/Practical Activity	Basic understanding about principle of food preservation via lowering water activity and Working and principle of different dehydrators and evaporators	
	(Mid Term)	Mid Term			Mid Term	Within a Week
	Freezing, and refrigeration - principle, mechanism of ice formation, methods, equipment	<p>Explain the principles that form the basis of extension of storage life of foods at low temperatures.</p> <p>Outline the importance of freezing rates, temperature stability during storage of frozen foods, and thawing rates on</p>	Presentation/Surprise questions	Lecture/Practical Activity	Basic concepts of mechanism behind the food preservation using low temperature. Know the working and principle of freezing &	Within a Week

		<p>quality maintenance in frozen foods</p> <p>Describe the factors that can affect quality of foods during frozen storage</p>			refrigeration equipment	
	<p>Fermentation technology: principles, objectives, types - alcoholic, acetic and lactic fermentations, Fermented foods: bread, wine, vinegar, yoghurt, sausages, pickles</p>	<p>Describe the importance and processes of fermentation</p> <p>Identify the ranges of fermentation</p> <p>Explain the use of fermentation technology in food processing and preservation</p>		Lecture/Practical Activity	<p>Basic concepts about different types of fermentations used for transforming the food raw materials</p>	Within a Week
	<p>Chemical preservation: different chemical additives and their mode of action for improving food quality and preservation</p>	<p>Familiarize with the basic concept of additives, adulterants and contaminants</p> <p>Describe the benefits and risks of food additives</p> <p>Identify different types and functions of food additives and how they are regulated in Pakistan</p>	Quiz/ Practical Assignment	Lecture/Practical Activity	<p>Basic concepts essential to the understanding of preservation and technological improvements in food products using food additives</p>	Within a Week

	<p>Irradiation: principles of food irradiation, effects on the properties of food</p>	<p>Understand the concept of food irradiation as a food preservation method</p> <p>Outline the terminologies commonly used in conjunction with preservation of food with ionizing energy</p> <p>Describe the principles for determining the required irradiation dose depending on the desired outcome</p>	<p>Group Discussion/ Surprise Questions</p>	<p>Lecture/Practical Activity</p>	<p>Understanding the importance and principle of food preservation using radiations</p>	<p>Within a Week</p>
	<p>Emerging technologies for food processing: High pressure processing, pulse electric field, ultrasound, ozonation, plasma processing</p>	<p>Analyze and evaluate novel food processing methods including non-thermal food processing techniques using pressure, light, sound waves and plasma.</p>	<p>Group Discussion/ Surprise Questions</p>	<p>Lecture/Practical Activity</p>	<p>Exploring the emerging technologies used for food processing and preservation</p>	<p>Within a Week</p>
	<p>Role of food Packaging in food preservation: Modified and controlled atmosphere</p>	<p>Outline the purpose and principles of food packaging and examine the operations involved in packaging of food materials</p>	<p>Group Discussion/ Surprise Questions</p>	<p>Lecture/Practical Activity</p>	<p>Concepts about use of different packaging technologies for shelf life extension of food materials</p>	<p>Within a Week</p>



# University of Management and Technology



	packaging, aseptic packaging					
	Mixing and size reduction	Describe and differentiate principles of mixing process and homogenization, and compare and select equipment for mixing and size reduction of food materials	Quiz/ Practical Assignment	Lecture	Understanding the importance and need of different mixing and size reduction techniques	Within a Week
	Extrusion, baking, frying and roasting operations	Describe and compare the principles and operations for roasting, baking and frying and extrusion cooking of food materials	Group Discussion/ Surprise Questions	Lecture	Basic concepts about extrusion cooking, baking frying and roasting processing operations	-
	Final Exam	-	-	-	-	-

## List of Experiments

1. Preparatory operation in food processing and preservation
2. Food Freezing, thawing and calculating drip loss
3. Blanching of fruits and vegetables
4. Sun-drying of fruits and vegetables
5. Preparation of fermented food products; Pickle and yoghurt
6. Preparation of fruit jam and jam marmalades
7. Preparation of fruit jelly and jelly marmalades
8. Preparation of tomato ketchup
9. Preparation of Fruit Squash
10. Preparation of fruit cordial
11. Preparation of fruit nectar

