

Department of Food Sciences
University of the Punjab, Lahore
Course Outline



Programme	B.Sc. (Hons.) Food Science & Technology	Course Code	FST-301	Credit Hours	3(2-1)
Course Title	Food Processing engineering				
Course Introduction					
This course provides students with the fundamental knowledge necessary for understanding the different processes carried out in the food industry. It emphasizes the design of machines for processing different foods and the behavior of foods under various processing and storage conditions.					
Learning Outcomes					
After completing this course, students should be able to:					
<ol style="list-style-type: none"> 1. Demonstrate unit operations in food process engineering. 2. Identify and apply various machines/equipment used in food processing 3. Perform engineering approaches to material handling in the industry. 					
Course Content				Assignments/Readings	
Week 1	Unit-I				
	1.1 Agricultural raw materials Physical properties 1.2 Agricultural raw materials mechanical properties				
Week 2	1.3 Agricultural raw materials biological properties 1.4. Agricultural raw materials thermal, and rheological properties				
	Unit-II				
Week 3	2.1 Cleaning, sorting, grading				
	2.2 Size reduction - equipment's and their applications.				
Week 4	Unit-III				
	3.1 Refrigeration, air conditioning, and freezing units				
Week 5	3.2 Refrigeration, air conditioning, and freezing unit				
	Unit-IV				
Week 6	4.1 Mobile refrigeration units.				

	4.2. Mobile refrigeration units.	
Week 5	Unit-V 5.1 Equipment used for packing of fruits, vegetables, and their products	
	5.2 Equipment used for packing of fruits, vegetables, and their products	
Week 6	Unit-VI 6.1 Extraction process for Oil.	
	6.2 Extraction process for seeds, fruits.	
Week 7	Unit-VII 7.1 Cost analysis for Engineering processes, finished products.	
	7.2 Cost analysis for Boilers, steam generators, retorts, fans, blowers: types, selection	
Week 8	Unit-VIII 8.1 Recycling engineering: Fundamentals	
	8.2 Recycling engineering applications	
Week 9	Unit-IX 9.1 Food engineering Trends.	
	9.2 Food engineering Properties of foods: physical, colligative, rheological, engineering.	
Week 10	Unit-X 10.1 Microstructural and imaging analysis related to food engineering	
	10.2 Microstructural and imaging analysis related to food engineering	
Week 11	Unit-XI 11.1 Heat measurement, transfer, and control; steam and its use in the industry.	
	11.2 Heat measurement, transfer, and control; steam and its use in the industry.	
Week 12	Unit-XII	

	12.1 Applications of refrigeration and freezing (Principles, insulation, cold storage).	
	12.2 Applications of refrigeration and freezing (applications design, equipment)	
Week 13	Unit-XIII	
	13.1 Sterilization, evaporation, drying, pasteurizing	
	13.2 Sterilization, evaporation, drying, pasteurizing.	
Week 14	Unit-XIV	
	14.1 Engineering properties of packaging materials	
	14.2 Diffusion through membrane, gas permeation mechanism	
Week 15	15.1 Materials handling	
	15.2 Equipment.	
Week 16	16.1 Steam, fuel utilization, electric power utilization, thermodynamic laws	
	16.2 Energy balance for open systems, dynamic response of sensors.	
PRACTICAL		
Week 1	Materials handling: Cleaning, sorting, grading of raw materials	
Week 2	Determination of different types of storage environment conditions for agricultural raw materials.	
Week 3	Maintenance and operation of equipment used for engineering processes:	
Week 4	3.1. Refrigerant units.	
Week 5	3.2. Heat exchangers	
Week 6	Visit to cold stores and freezing units	
Week 7	Determination of depression in freezing point, surface tension, and absolute viscosity of given fluids.	

Week 8	Determination of freezing time for food products using Plank's equation	
Week 9	Verification of Stokes law	
Week 10	Selection of pumps and fans using characteristic curves	
Week 11	Heat Transfer Analysis	
Week 12	Determination of thermal conductivity of food materials	
Week 13	Determination of overall heat transfer coefficient of shell and tube heat exchangers	
Week 14	Calculation of thermal process time of foods packed in containers	
Week 15	Laboratory performance overview	
Week 16	Laboratory performance overview	

Textbooks and Reading Material

1. Smith, J.S. & Hui, Y.H. (2014). *Food Processing: Principles and Applications* (2nd ed.). Wiley Blackwell.
2. Keith, W. (2007). *Handbook of Waste Management & Co-product Recovery in Food Processing, Vol. I.* CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA.
3. Ramaswamy, H.S. & Marcotte, M. (2005). *Food Processing: Principles and Applications.* CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA.
4. Smith, J.S. & Hui, Y.H. (2004). *Food Processing: Principles and Applications.* Blackwell Pub. Co., Oxford, England.
5. Berk, Z. (2018). *Food Process Engineering and Technology.* Academic Press.
6. Pandey, H., Sharma, H.K., Chauhan, R.C., Sarkar, B.C., & Bera, M.B. (2004). *Experiments in Food Process Engineering.* CBS Publishers, New Delhi, India.

Teaching Learning Strategies

1. Lectures
2. Discussions
3. Presentations
4. Quiz
5. Assignments

Assignments: Types and Number with Calendar

1. ****Engineering Approach in Material Handling****
2. ****Heat Transfer in Food Processing****
3. ****Energy Utilization in Food Engineering****

Assessment			
Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.