جامعة الشرقية
A' SHARQIYAH UNIVERSITY

Course Descriptor
FSHNF414 Food Engineering

Proposed Academic Year	2021-2022	**Last Reviewed Academic Year**	2020-21
Course Code	FSHNF414	**Course Title**	Food Engineering
Credit hours	3	**Level of study**	Bsc
College / Centre	CAHS	**Department**	CAHS/FSHN
Co-requisites	STAT201	**Pre-requisites**	MATH101, FSHNF111, PHYS101

1. COURSE OUTLINE

This course provides practical knowledge on modern engineering solutions for food processing engineering, safety and convenience as well as to maximize the benefits to human nutrition by applying food process engineering princiles including; hydronic systems, refrigeration, cold storage, optimum cold storage conditions to retain essential nutrients, heat loads,heat sterilization systems, boilers and heat exchange systems, compressed air and vacuum systems, corrosion principles, material selection, food processing equipment, programmable controllers, Newtonian and non-Newtonian fluids, food rheology, process mass and energy balances, food flavour extraction techniques and safety associated with food engineering systems..]

2. AIMS

[Students will become acquainted with the principles of handling and processing food and agricultural products. Particular emphasis will be given to the principles of operation of equipment used in the processing industry and the response of biological materials to these operations. A wide variety of topics including systems and equipment, various types of food processing such as dairy products, seafood, meat and poultry, etc., will be covered in order to equip students with all the required practical knowledge for food processing. It is expected that prior to studying food engineering principles, the student will have taken basic courses in mathematics, chemistry, and physics

3. LEARNING OUTCOMES, TEACHING, LEARNING and ASSESSMENT METHODS (Indicative)

Learning Outcomes (Definitive)	Teaching and Learning methods	Assessment (Indicative)
1. Describe the construction and operating principles of food and beverage processing, handling and packaging systems using engineering terminology	Lectures and seminars	*In-class tests, quizzes and Written Examination*

2. Describe the construction and operating principles of refrigeration systems using engineering terminology	Lectures and seminars	*In-class tests, quizzes and Written Examination*
3. Determine heat loads and heat losses in heating and cooling food process systems	Group work and presentations	*Class Presentation*, Case Study report
4. Apply the principles of mass and energy balance to food processing systems	Group work and presentations	Assignments, Written Examination
5. Describe the construction and operating principles of boilers, pumps and heat exchangers using engineering terminology	Group work and presentations	Assignments and Quizzes
6. Describe the construction and operating principles of pneumatic fluid power systems and vacuum systems using engineering terminology.	Presentations and visit to food processing plants	Case study and Field trip reports
7. Explain the use for and characteristics of proportional, PI, PD and PID process control methods using engineering terminology.	Demonstrations, Lectures and seminars	Assignments and Quizzes
8. Explain Newtonian and non - Newtonian behaviour of fluids and their relevance to food rheology principles and related food processing methods.	Lectures and seminars	*Class Presentation*, Case Study report

4. **Assessment Weighting**

Assessment	**Percentage of final mark (%)**
Quizzes	20
Mid-Term Exam	25
Assignments	15
Final Exam	40
TOTAL	**100%**

5. ACHIEVING A PASS

Students will achieve **3** credit hours for this course by passing **ALL** of the course assessments and achieving a **minimum overall score of 50%**

6. COURSE CONTENT (Indicative)	
LECTURE TOPIC	
1	Dimensions, units and unit operations, and a brief discussion of systems
2	Fluid flow in food processing and Classification of fluids and fluid flow.
3	Thermal and Rheological Properties of Fluids.
4	The equation of continuity in fluid behavior.
5	Pipework, pumps and valves & energy equation for steady flow of fluids.
6	Heat transfer in food engineering and principles of heat exchangers design.
7	Modes of heat transfer, steady and unsteady state heat conduction.
8	Estimation of Specific Heat Capacity and Heat-transfer Coefficients.
9	Food preservation process, Thermal and Non Thermal preservation.
10	Drying and Dehydration. Types of Dehydrators.
11	Irradiation, Ozonation and Ohmic heating in food processing
12	Evaporation process.
13	Evaporators, Boilers and Condensers
14	Encapsulation process in food industry.
15	Innovations in Food engineering
TOTAL HOURS	
Plus **RECOMMENDED INDEPENDENT STUDY HOURS**	
TOTAL COURSE HOURS	

7. RECOMMENDED READING

Core text:

R. Paul Singh and Dennis R. Heldman (2013). Introduction to Food Engineering (Fifth Edition). Academic Press. ISBN: 978-0-12-398530-9

Additional Reading:

1. Rao, M. Anandha, et al., eds. Engineering properties of foods. CRC press, 2014. ISBN: 978-1-4665-5642-3.
2. Sun, Da-Wen, ed. Thermal food processing: new technologies and quality issues. CRC Press, 2012. ISBN: 0-8493-1216-7.
3. Jun, Soojin, and Joseph M. Irudayaraj. Food processing operations modeling: design and analysis. Vol. 107. CRC press, 2008. ISBN:13:978-1-4200-5553-5..

Library + online resources:

Open Educational Resources: