

Western University
Faculty of Engineering
Department of Chemical and Biochemical Engineering

CBE 9460 - Fundamentals of food Engineering, Winter 2026

DESCRIPTION

Basic principles and fundamentals of food processing and engineering are introduced. The most common processes employed in food industries are reviewed in detail and the design methodologies are presented. Various unit operations used exclusively in food industry are reviewed, emphasizing the basic concepts, design methodologies, and mechanism of operations. The approaches to enhance food quality and self-life are illustrated. The importance of Hygienic design and sanitation and the related new technologies are introduced. Food storage systems and related design approaches are covered. Rules and regulations as well as standards in food industry are briefly explained. Safety considerations and available technologies to avoid contamination are discussed. Case studies are presented to illustrate design and optimization in food engineering. The modeling and simulation packages in food industry are presented. Recent modern engineering solutions and technologies and their practical applications are reviewed. Critical review on the latest technologies and innovation in the food industry are presented through a project carried out individually.

PREREQUISITES

None

TOPICS

All lectures and learning activities will be carried out online. The synchronous lectures will be recorded and made available to students after the lectures.

Topic #	Description	Learning Activities	Tentative timeline
1	Lesson 1: Introduction Review the state of the Food industry and ongoing challenges	<ul style="list-style-type: none">• Become familiar with the food industry	Week 1
2	Lesson 2: principles of design and operation in food industry focusing on the differences with chemical industry, preparation of flow charts	<ul style="list-style-type: none">• Describing unit operations exclusive to food production processes	Weeks 1-2

3	Non-Newtonian fluids in food processing (1)	<ul style="list-style-type: none"> • Become familiar with the non-Newtonian fluids and their importance in food industry 	Week 3
4	Non-Newtonian fluids in food processing (2)	<ul style="list-style-type: none"> • Become familiar with rheological models and behavior in food processing 	Week 3-4
5	Lesson 5: Disinfection and Hygienic operations, food contaminants, Hygienic Design in Food engineering	<ul style="list-style-type: none"> • Understand the disinfection principles and hygienic design approaches 	Week 5
6	High pressure processing in food industry and non-thermal process	<ul style="list-style-type: none"> • Comprehend principles of high pressure and non-thermal processing 	Week 6
7	Food Refrigeration and Freezing, Design of the freezing chambers	<ul style="list-style-type: none"> • Understanding the freezing process and its applications • Learning the design procedures 	Week 7-8
8	Evaporation methods in concentrating food products (single and multiple effect evaporators)	<ul style="list-style-type: none"> • Becoming familiar with the principles of the operations and design process 	Week 9-10
9	Selection of materials of construction for food processing equipment, Soft wares in Food processing	<ul style="list-style-type: none"> • To comprehend the importance of the materials in food processing and the selection methods 	Week 11

SPECIFIC LEARNING OUTCOMES

Degree Level Expectation	Weight	Assessment Tools	Outcomes
Depth and breadth of knowledge	25%	<ul style="list-style-type: none"> • Assignments • Project/presentation • Examinations 	<ul style="list-style-type: none"> • Understanding of principle of operations if food industry • Awareness of important current problems and new technologies in food industry
Research & scholarship	15%	<ul style="list-style-type: none"> • Project/presentation 	<ul style="list-style-type: none"> • Ability to conduct critical evaluation of current advancements in food processing • Ability to conduct thorough analyses processes and applying engineering judgement for process improvement
Application of knowledge	35%	<ul style="list-style-type: none"> • Assignments • Project • Examinations 	<ul style="list-style-type: none"> • Ability to apply knowledge in a rational way to analyze a particular problem • Ability to use coherent approach to design a particular engineering system using existing design tools
Professional capacity / autonomy	10%	<ul style="list-style-type: none"> • Project 	<ul style="list-style-type: none"> • Awareness of academic integrity • Ability to implement established procedures and practices in the coursework • Defends own ideas and conclusions • Integrates reflection into his/her learning process
Communication skills	5%	<ul style="list-style-type: none"> • Project 	<ul style="list-style-type: none"> • Ability to communicate (oral and/or written) ideas, issues, results and conclusions clearly and effectively
Awareness of limits of knowledge	10%	<ul style="list-style-type: none"> • Project 	<ul style="list-style-type: none"> • Awareness of the need of assumptions in complex scientific analyses and their consequences • Understanding of the difference between theoretical and empirical approaches • Ability to acknowledge analytical limitation due to complexity of practical problems

ASSESSMENTS

Assessment Type	Material Covered	Tentative Due Date	Weight
Homework Assignments (4)	Topics 2, 3, 4, 5, 7	Weeks 3, 5, 8, 10, 11	10%

Quizzes Multiple Choice/short-answer questions or problems Q (4)	Topics 2, 3, 4, 5, 6, 7	Weeks 3, 5, 8, 10	15%
Participation (synchronous)	Attendance in synchronous class activities	Whole semester	5%

Final exam	All topics	N/A	50%
Project	Critical review, design, simulation	Whole semester	20%

Activities in which collaboration is permitted:

- None

Activities in which students must work alone (collaboration is not permitted):

- All activities

CONTACT INFORMATION

Course instructor: Shahzad Barghi

Email address: sbarghi2@uwo.ca

Contact policy:

- Contact instructor via email (above) or through messages in OWL
- A general FAQ section on the ‘forums’ section of OWL will be used for students to pose course-related questions so that all have the same information.

REQUIRED TEXTBOOK

None

OPTIONAL COURSE READINGS

Dennis R. Heldman And R. Paul Singh, “Food Process Engineering”, AVI publishing Company Inc., 2nd Ed., 1981, ISBN 978-0-87055-380-6 ISBN 978-94-010-9337-8 (eBook)

Singh, R Paul; Heldman, Dennis R., “Introduction to Food Engineering”, Academic Press Print, 5th Ed. 2013, ISBN: 9780123985309, eText ISBN: 9780124016750.

Theodoros Varzakas and Constantina Tzia, “Food Engineering Handbook”, CRC Press, 1st Ed., 2014, ISBN 9781482261691.

COURSE CONTENT

The lecture notes and presentation as well as assignment and sample problems will be available through the course website. could be subjected to legal actions.

CHEATING, PLAGIARISM/ACADEMIC OFFENCES

Academic integrity is an essential component of learning activities. Students must have a clear understanding of the course activities in which they are expected to work alone (and what working alone implies) and the activities in which they can collaborate or seek help; see information above under “Assessments” and ask instructor for clarification if needed. Any unauthorized forms of help-seeking or collaboration will be considered an academic offense. University policy states that cheating is an academic offence. If you are caught cheating, there will be no second warning. Students must write their essays and assignments in their own words. Whenever students take an idea or a passage of text from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence. Academic offences are taken seriously and attended by

academic penalties which may include expulsion from the program. Students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence (see Western's scholastic discipline regulations for graduate students).

SYNCHRONOUS LEARNING ACTIVITIES

Students are expected to participate in synchronous learning activities as outlined in the course syllabus and/or described by the instructor. If you have issues that will impede your ability to participate in synchronous activities, please discuss with the course instructor at the beginning of the course.

CONDUCT

Students are expected to follow proper etiquette during synchronous and asynchronous activities to maintain an appropriate and respectful academic environment. Any student who, in the opinion of the instructor, is not appropriately participating in the synchronous and asynchronous learning activities and/or is not following the rules and responsibilities associated with the online learning activities, will be reported to the Associate Dean (Graduate) (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Associate Dean (Graduate), the student could be debarred from completing the assessment activities in the course as appropriate.

HEALTH/WELLNESS

As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Western provides several health and wellness related services (remotely accessible) to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. Information regarding health- and wellness-related services available to students may be found at <http://www.health.uwo.ca/>.

Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. Campus mental health resources may be found at http://www.health.uwo.ca/mental_health/resources.html
<https://www.uwo.ca/health/psych/index.html>

SICKNESS

Students should immediately consult with the Instructor (for a particular course) or Associate Chair (Graduate) if they have problems that could affect their performance. The students should seek advice from the Instructor or Associate Chair (Graduate) regarding how best to deal with the problem. Failure to notify the Instructor or the Associate Chair (Graduate) immediately (or as soon as possible thereafter) will have a negative effect on any appeal. Obtaining appropriate

documentation (e.g., a note from the doctor) is valuable when asking for accommodation due to illness.

ACCESSIBILITY

Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at 661-2111 x 82147 or http://academicsupport.uwo.ca/accessible_education/index.html, for any specific question regarding an accommodation.