



Course Outline

Instruction Team

- Dr. Chyngyz Erkinbaev (he/him)
E1-344 EITC
(204) 474-6977
Chyngyz.Erkinbaev@umanitoba.ca

Student Hours

- Wed 3:00 – 4:00 PM (by appointment)

Teaching Assistant

- Logesh Dhanapal (he/him)
dl@myumanitoba.ca

Location

- **Lecture E2-310**
Mon 10:30 AM - 11:20 AM
Wed 10:30 AM - 11:20 AM
Fri 10:30 AM - 11:20 AM

Contact Hours

- 3 credit hours
- Lectures:
3 hours x 12 weeks = 36 hours

Prerequisites:

- None

Course Website:

<http://umanitoba.ca/umlearn>

BIOE 7300 Food Process Engineering

Winter 2024

Course Objectives

This course allows students with a background in either biological sciences or engineering to gain an understanding of food engineering processes. Topics include unit operations in food engineering, fluid flow, heat and mass transfer, thermal and non-thermal food processing, canning, drying, filtration, evaporation, fermentation, food packaging, advanced food processing technologies, quality and safety control methods.

Course Content

This course deals with main unit operations and processing conditions that aim to analyze, design, and optimize various food processing operations. The course has three major blocks of food engineering: thermal, non-thermal processing, and novel processing methods. The principles of this course are built based on chemistry, physics, transport phenomena, thermodynamics, and computer modelling. The course will assist students in understanding the principles involved in food processing and help in the designing aspect of handling of various food matrices in providing healthy, safe and nutritious foods. The following topics will be covered in lectures and tutorials.

LECTURES:

- (Jan. 8) Course introduction
- (Jan. 10) Unit operations
- (Jan. 12) Fluid flow in food processing
- (Jan.15) Heat transfer in food matrices (convection, conduction, radiation)
- (Jan. 17) Heat transfer (food thermal properties, heat exchangers)
- (Jan. 19) Heat transfer (overall heat exchange)
- (Jan. 22) Thermal food preservation (blanching, pasteurization, sterilization)
- (Jan. 24) Thermal food preservation (canning, thermal rate, D, Z-value)
- (Jan. 26) Assignment tutorial for A1 and A2
- (Jan. 29) Thermal food processing (Aseptic, F- value)
- (Jan. 31) UHT 1
- (Feb. 2) UHT 2
- (Feb. 5) Ohmic heating and pulse electric treatment
- (Feb. 7) Drying 1
- (Feb. 9) Drying 2
- (Feb. 12) Evaporation 1
- (Feb. 14) Evaporation 2
- (Feb. 16) Freeze technology
- (Feb. 19) no classes (Luis Riel Day)**
- (Feb. 21) no classes (reading week)**
- (Feb. 23) no classes (reading week)**
- (Feb. 26) Size reduction 1
- (Feb. 28) Size reduction 2 and mixing

- (Mar. 1) Solid separation 1
- (Mar. 4) Solid separation 2
- (Mar. 6) Extraction 1
- (Mar. 8) Midterm Exam**
- (Mar. 11) Advanced extraction (Guest Lecture 1)
- (Mar. 13) Water activity
- (Mar. 15) (Feb. 20) Assignment Tutorial for A3 and A4
- (Mar. 18) Filtration (membrane filtration, reverse osmosis)
- (Mar. 20) Industry visit TBD or Advanced extrusion (Guest Lecture 2)
- (Mar. 22) Assignment Tutorial for project
- (Mar. 25) Smart food packaging/ modified atmosphere
- (Mar. 27) Advanced food quality control methods
- (Mar. 29) Advanced food quality control methods / Guest Lecture 3)
- (Apr. 1) Group Presentation 1
- (Apr. 3) Group Presentation 2
- (Apr. 5) No lecture (Good Friday)**
- (Apr. 8) Group project feedback
- (Apr. 10) Course discussion

Tutorials/Assignments:

Tutorials will include numerical experiments and determination of process-design parameters. Assignments will be posted on the UM Learn website:
<https://universityofmanitoba.desire2learn.com/d2l/login> assigned to the course.

- A1: Fluid Flow/Heat Transfer
- A2: Canning/UHT/Drying
- A3: Side reduction/mixing
- A4: Filtration/mixing/evaporation

Textbook

There are several textbooks available on food processing. Students will be provided lecture series developed by Dr. Erkinbaev.

Evaluation

The basis of the final grade is agreed upon with the students at the beginning of the term. The usual weighting is:

- 25% midterm test
- 20% assignments
- 20% major project (presentation: 50% and written report: 50%)
- 35% on written final examination

Late submission of assignments and reports would result in loss of 20% marks for each working day (5 days after the deadline).

Traditional Territories Acknowledgement

The University of Manitoba campuses are located on the original lands of the Anishinaabeg, Cree, Oji-Cree, Dakota, and Dene peoples, and on the homeland of the Métis Nation.

We respect the Treaties that were made on these territories, we acknowledge the harms and mistakes of the past, and we dedicate ourselves to move forward in partnership with Indigenous communities in a spirit of reconciliation and collaboration.

Updated: July 11, 2022

Accreditation Details

- Mathematics: 20%
- Natural Science: 30%
- Complementary Studies: 0%
- Engineering Science: 25%
- Engineering Design: 25%

Graduate Attributes

KB: A knowledge base for engineering
 PA: Problem analysis
 IN: Investigation
 DE: Design
 ET: Use of engineering tools
 IT: Individual and team work
 CS: Communication skills
 PR: Professionalism
 IE: Impact of engineering on society/environment
 EE: Ethics and equity
 EP: Economics and project management
 LL: Life-long learning

Grading Scale

Note: These boundaries represent a guide for the instructor and class alike. Provided that no individual student is disadvantaged, the instructor may vary any of these boundaries to ensure consistency of grading from year-to-year.

Letter	Mark
A+	95–100
A	87–94
B+	78–86
B	72–77
C+	66–71
C	60–65
D	50–59
F	< 50

Learning Outcomes

By the end of this course, you will be able to:

No.	Learning Outcome	Transferable Skill
1	Understand the concept of fluid flow, heat and mass transfer in food processing. Determine design parameters for selected food processing operations such as drying, mixing, fermentation, evaporation, freezing.	A knowledge base for engineering, Use of Engineering Tools
2	To be familiar with novel food processing and advanced food quality control methods.	Investigation, Problem analysis
3	Able to hypothesize, identify the research gaps, analyze and propose solution and prepare a conceptual design of processing food operations.	Problem analysis, Teamwork, Design
4	Collaborate with group members in a team setting to manage an engineering design project.	Design, Project management
5	Apply laws and theories to practical solutions.	Problem analysis
6	Communicate orally and in writing a design solution.	Communication skills

Expected Competency Levels

Outcome	KB	PA	IN	DE	ET	IT	CS	PR	IE	EE	EP	LL
1	4				1C							
2		3	2									
3		3		4		2						
4				4							1	
5		4										
6							2					

CEAB Graduate Attributes Assessed

- KB.4– Recalls, defines, comprehends and applies information and concepts in specialized engineering science (Determined the engineering problems associated with food engineering).
- PA.3&4– Evaluates solution(s) to a complex engineering problem(s). (Solving real life problems using knowledge).
- IN.2 – Devises and/or implements an appropriate plan/ methodology for gathering information required to solve an engineering problem. (Understands appropriate safe work procedures during experiments or lab exercises. Investigation of novel, advanced, green technologies and methods in food processing).
- DE.4 – Devises and implements a plan to evaluate a proposed design solution. (Understands appropriate safe work procedures during experiments or lab exercises. Develops possible solutions to an open-ended design problem, leading to an appropriate recommendation).
- ET.1C– Uses hands-on tools to complete engineering activities. (Use of engineering tools, tables, charts to determine the physico-chemical properties of complex food matrices).
- I T.2 – Exhibits appropriate interpersonal skills when interacting with team members, including giving and receiving constructive feedback. (Participates in group activities and decision-making).
- PA.4&4 – Evaluates solution(s) to a complex engineering problem(s). (Provide solution for conceptual design of processing conditions).
- CS. 2 – Designs, produces, and delivers effective technical presentations for specific audiences. (Demonstrate communication and writing skills).
- EP.1– Understands and applies engineering economics. (Management of the group projects in a team, written report and oral presentation).

Important Dates

- **Early Withdrawal Deadline**
January 19, 2024
- **Louis Riel Day**
February 19, 2024
No classes or examinations
- **Winter Term Break**
February 19-23, 2024
No classes or examinations
- **Voluntary Withdrawal Deadline**
March 20, 2024
- **Last Day of Classes**
April 10, 2024
- **Examination Dates**
April 12 - 26, 2024

Evaluation

Component	Value (%)	Assessor	Method of Feedback*	Learning Outcomes Evaluated	I/T**
Midterm Exam	25	CE	S	1,2,4	I
Assignments	20	CE	F, S	2,3,4,5	I
Major design project (presentation 50% and written report 50%)	20	CE	F, S	2, 3, 4, 5, 6	I/T
Final Exam	35	CE	S	1,2,3,4	I

* Method of Feedback: F - Formative (written comments and/or oral discussion), S - summative (numerical grade)

** I/T: I – Individual effort, T – Team effort

Academic Integrity

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the *General Academic Regulations on Academic Integrity*, students are reminded that plagiarism or any other form of cheating in examinations, term tests, assignments, projects, or laboratory reports is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating by another student is also subject to serious academic penalty.

Requirements/Regulations

- No programmable devices or systems (such as calculators, PDAs, iPods, iPads, cell phones, smart watches, wireless communication, or data storage devices) are allowed in examinations unless approved by the course instructor.
- All email communication must conform to the Communicating with Students university policy.

[Communicating with Students](#)

- Attending lectures and laboratories is essential for the successful completion of this course.
- Self-declaration forms may be completed for missed tests, exams, or assignments during short-term absences (≤ 72 hours) for extenuating circumstances. Students don't need to share personal information about their situation beyond declaring the nature of the extenuating circumstance on the self-declaration form.

[Self-Declaration Form for Brief or Temporary Absence](#)

- This form cannot be used for planned absences like vacations. It is also not to be used for longer-term absences, or ongoing circumstances (e.g., Authorized Withdrawals, Leaves of Absence, or other accommodations), which will still require additional documentation.

[Self-Declaration Policy for Brief or Temporary Absences](#)

- It is the responsibility of each student to contact the instructor in a timely manner if he or she is uncertain about his or her standing in the course and about his or her potential for receiving a failing grade. Students should familiarize themselves with the University's *General Academic Regulations*, as well as Section 3 of the Faculty of Engineering *Academic Regulations* dealing with incomplete term work, deferred examinations, attendance, and withdrawal.

[General Academic Regulations](#)

[Engineering Academic Regulations](#)

- Students should be aware that they have access to an extensive range of resources and support organizations. These include Academic Resources, Counselling, Advocacy and Accessibility Offices as well as documentation of key University policies e.g. Academic Integrity, Respectful Behaviour, Examinations and related matters.

Retention of Student Work

Students are advised that copies of their work submitted in completing course requirements (i.e. assignments, laboratory reports, project reports, test papers, examination papers, etc.) may be retained by the instructor and/or the department for the purpose of student assessment and grading, and to support the ongoing accreditation of each Engineering program. This material shall be handled in accordance with the University's *Intellectual Property Policy* and the protection of privacy provisions of *The Freedom of Information and Protection of Privacy Act (Manitoba)*. Students who do not wish to have their work retained must inform the Head of Department, in writing, at their earliest opportunity.

Copyright Notice

All materials provided in this course are copyright and are provided under the fair dealing provision of the Canadian Copyright Act. This material may not be redistributed in any manner without the express written permission of the relevant copyright holder.