



# ENGG\*3830 Bio-Process Engineering

Fall 2018

Section(s): C01

School of Engineering

Credit Weight: 0.50

Version 1.00 - September 05, 2018

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## 1 Course Details

### 1.1 Calendar Description

Application of engineering principles to the processing of biological products in the biological and food industry. Analysis and design of unit processes such as sedimentation, centrifugation, filtration, milling and mixing involving rheology and non-Newtonian fluid dynamics of biological materials. Analysis of heat and mass balances for drying evaporation, distillation and extraction.

**Pre-Requisite(s):** ENGG\*2230, ENGG\*2660

**Co-Requisite(s):** ENGG\*3260

### 1.2 Course Description

The aim of this course is to familiarize the students with different unit operations used in biological engineering, bioprocess engineering and food engineering. The students will learn to use different engineering techniques and system analysis tools to analyze, appraise and design these unit operations involving heat and mass transfer, mixing and separation technologies.

### 1.3 Timetable

**Lectures:**

Tuesday 1130am - 1250pm ROZH 108

Thursday 1130pm - 1250pm ROZH 108

**Tutorials/Demo Laboratory:**

Wednesday 0830pm - 0920pm ROZH 108 or THRN 1104

(TBA on CourseLink or in class)

### 1.4 Final Exam

Thursday, Dec 13, 2018 19:00pm - 21:00pm, Room TBA on Webadvisor

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## 2 Instructional Support

### 2.1 Instructor(s)

Mario Martinez Martinez Ph.D.

**Email:** mario.martinez@uoguelph.ca  
**Telephone:** +1 519 824 4120 x58677  
**Office:** Richards building, Room 3501  
**Office Hours:** TBA on Courselink or by appointment

## 2.2 Instructional Support Team

**Lab Technician:** Nick Vanstone  
**Email:** vanstonn@uoguelph.ca  
**Telephone:** +1 519 824 4120 x56676  
**Office:** THRN 1102

## 2.3 Teaching Assistants

Listiya Widjaja (lwidjaja@uoguelph.ca)

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# 3 Learning Resources

## 3.1 Required Resource(s)

### Course Website (Website)

<https://courselink.uoguelph.ca>

Course materials, news, announcements, and grades will be regularly posted to the ENGG\*3830 Courselink site. You are responsible for checking the site regularly.

### Unit Operations in Food Processing. (Textbook)

<http://www.nzifst.org.nz/unitoperations>

Earle, R. 1983. Unit Operations in Food Processing. Web Edition.

## 3.2 Recommended Resource(s)

### Transport Process and Unit Operations. (Textbook)

Geankoplis, C. 2003. 4th Edition. Prentice Hall, Inc. New York.

### UNIT OPERATIONS OF CHEMICAL ENGINEERING (Textbook)

McCabe, W.L., Smith, J.C. and Harriott, P. 2005. 7th Edition. McGraw-Hill, Inc. New York.

### Experimental Methods in Food Engineering (Textbook)

Rizvi, S.S.H. and Mittal, G.S. 1992. Van Nostrand and Reinhold, New York.

### Introduction to Food Engineering (Textbook)

Singh, R.P. and Heldman, D.R. 2013. 5th Edition. Academic Press. Massachusetts.

### Food Process Engineering (Textbook)

Heldman, D.R., and Singh, R.P. 1981. 2nd Edition. AVI Publishing Company, Inc. Connecticut.

## 3.3 Additional Resource(s)

### Lecture Information (Notes)

All lecture notes will be posted on courselink.

### Lab Information (Lab Manual)

The handouts for all the lab sessions will be given out at the lab.

### Assignments (Other)

Five assignments will be given out on various topics. Solutions of all the assignments will be made available on the course web page the following week.

## 3.4 Communication & Email Policy

Please use lectures and lab help sessions as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. It is your responsibility to check the course website regularly. As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its student.

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## 4 Learning Outcomes

### 4.1 Course Learning Outcomes

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

1. Analyze unit operations for biological processes using the techniques of engineering and system analysis
2. Appraise and quantify processes used for the recovery of biological materials in unit operations
3. Explain and design unit operations involving simultaneous heat and mass transfer
4. Understand unit operations involving mechanical separations of biological systems

### 4.2 Engineers Canada - Graduate Attributes (2018)

Successfully completing this course will contribute to the following:

#	Outcome Set Name	Course Learning Outcome
1	Knowledge Base	1, 2, 3, 4
1.1	Recall, describe and apply fundamental mathematical principles and concepts	1, 2, 3, 4
1.2	Recall, describe and apply fundamental principles and concepts in natural science	1, 2, 3, 4
1.3	Recall, describe and apply fundamental engineering principles and concepts	1, 2, 3, 4
1.4	Recall, describe and apply program-specific engineering principles and concepts	1, 2, 3, 4
5	Use of Engineering Tools	1, 2, 3, 4
5.1	Select appropriate engineering tools from various alternatives	1, 2, 3, 4
5.2	Demonstrate proficiency in the application of selected engineering tools	1, 2, 3, 4
5.3	Recognize limitations of selected engineering tools	1, 2, 3, 4

#	Outcome Set Name	Course Learning Outcome
6	Individual & Teamwork	2, 3, 4
6.1	Describe principles of team dynamics and leadership	2, 3, 4
6.2	Understand all members' roles and responsibilities within a team	2, 3, 4
6.3	Execute and adapt individual role to promote team success through, for example, timeliness, respect, positive attitude	2, 3, 4
6.4	Apply strategies to mitigate and/or resolve conflicts	2, 3, 4
6.5	Demonstrate leadership through, for example, influencing team vision and process, promoting a positive team culture, and inspiring team members to excel	2, 3, 4

### 4.3 Relationships with other Courses & Labs

#### Previous Courses:

- **ENGG\*2230:** Application of the conservation of mass and energy laws
- **ENGG\*2660:** Using a “systems” approach for problem investigation and analysis

#### Same Semester Courses:

- **ENGG\*3260:** Foundations of thermodynamics

#### Follow-on Courses:

- **ENGG\*4300:** Foundations of food processing design
- **ENGG\*4380:** Foundations of bioreactor design
- **ENGG\*4110:** Foundations of bioprocessing for related 41X project

## 5 Teaching and Learning Activities

The following is the general breakdown of the topics that will be covered on any given week. There may be variations depending on students' interest.

### 5.1 Lecture

#### Week 1

**Topic(s):** Introduction to Engineering Unit Operations

#### Week 2

**Topic(s):** Mass and Energy Balance

**Week 3**

**Topic(s):** Mass and Energy Balance

**Week 4**

**Topic(s):** Mass and Energy Balance

**Week 5**

**Topic(s):** Psychrometry

**Week 6**

**Topic(s):** Drying of Solids

**Week 7**

**Topic(s):** Drying of Solids

**Week 8**

**Topic(s):** Mechanical Separation

**Week 9**

**Topic(s):** Mechanical Separation

**Week 10**

**Topic(s):** Thermal Processing

**Week 11**

**Topic(s):** Particulate Solids

**Week 12**

**Topic(s):** Additional topics if time permits

## **5.2 Lab**

**Topic(s):** Drying of liquid dispersions (spray-drying)

**Topic(s):** Assessment of newtonian and non-newtonian fluids behaviour

## **5.3 Tutorial/Demo Lab Schedule**

TBA on CourseLink or in class.

## **5.4 Other Important Dates**

**06 September 2018, Thursday:** First day of class

**08 October 2018, Monday:** Thanksgiving holiday

**09 October, 2018, Tuesday:** Study break day

**02 November 2018, Friday:** 40th class day, last day to drop classes

## 6 Assessments

### 6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Assignments	20
Lab Reports	10
Project	20
Final Exam	50
Total	100

### 6.2 Assessment Details

#### Assignments (25%)

5% - Assignment 1

5% - Assignment 2

5% - Assignment 3

5% - Assignment 4

#### Lab reports (0%)

5% - Lab 1 report

5% - Lab 2 report

#### Project (25%)

15% - written report (due on October 31, 2018)

5% - oral presentation in class or tutorial after submission of written report (date(s) to be announced on CourseLink or in class). Either paper or electronic copy are to be submitted.

#### Final Exam (50%)

**Date:** Thu, Dec 13, Room TBA on Webadvisor  
1900pm -2100pm

### 6.3 Course Grading Policies

**Missed Assessments:** If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. See the undergraduate calendar for information on regulations and procedures for Academic Consideration: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

**Accommodation of Religious Obligations:** If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml>

**Passing grade:** Students must obtain a grade of 45% or higher on the exam portion of the course in order for the remaining portions of the course to count towards the final grade.

**Lab Work:** You must attend and complete all laboratories. If you miss a laboratory due to grounds for granting academic consideration or religious accommodation, arrangements must be made with the instructor to complete a makeup lab.

**Late Assignments/Reports:** Late assignments or reports will not be accepted.

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## 7 School of Engineering Statements

### 7.1 Instructor's Role and Responsibility to Students

The instructor's role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture notes will be made available to students on Courselink but these are not intended to be stand-alone course notes. Some written lecture notes will be presented only in class. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for tests and labs.

### 7.2 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and lab sessions. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

### 7.3 Lab Safety

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

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## 8 University Statements

### 8.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

### 8.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The regulations and procedures for [Academic Consideration](#) are detailed in the Undergraduate Calendar.

### **8.3 Drop Date**

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for [Dropping Courses](#) are available in the Undergraduate Calendar.

### **8.4 Copies of Out-of-class Assignments**

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

### **8.5 Accessibility**

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: [www.uoguelph.ca/sas](http://www.uoguelph.ca/sas)

### **8.6 Academic Misconduct**

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The [Academic Misconduct Policy](#) is detailed in the Undergraduate Calendar.

### **8.7 Recording of Materials**



Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

## **8.8 Resources**

The [Academic Calendars](#) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.

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