FOOD 3210: FOOD ENGINEERING FUNDAMENTALS (3 credit hours)

Course Syllabus – Winter 2018

COURSE DETAILS

Course Number & Title: FOOD 3210 Food Engineering Fundamentals
Number of Credit Hours: 3
Class Times & Days of Week: Lectures → 8:30-9:20 M, W, F
                           Labs → 2:30-5:25 Th
Location for classes/labs/tutorials: Lectures → Agriculture 134
                                    Labs → J. H. Ellis 216
Pre-Requisites: BIOE 3530
Voluntary Withdrawal Date: Mar. 16, 2018

INSTRUCTOR CONTACT INFORMATION

Instructor(s) Name: Filiz Koksel
Office Location: Ellis 205
Office Hours or Availability: Arrangement of mutually convenient time
                           (Send an e-mail to Filiz.Koksel@umanitoba.ca)
Office Phone No. 204-474 6486
Email: All email communication must conform to the Communicating with Students university policy.
COURSE DESCRIPTION
Applications of engineering fundamentals to unit operations in the food industry.

COURSE OBJECTIVES
This course is designed to teach students the fundamentals required for food engineering. Students will acquire knowledge of food engineering principles in food processing, such as flow characteristics of fluids, heat and mass transfer (and their combination), refrigeration, and the interaction of electromagnetic radiation with food materials in order to apply these fundamentals to various unit operations in the food industry.

By the end of the course, the student should be able to:
1. Identify the mechanisms by which various unit operations in food processing optimize food quality and extend the shelf life of foods.
   o Explain the principles that permit various food technologies to make a food product safe for consumption
   o Understand principles of heat and mass transfer phenomena
   o Explain basic fluid dynamics characteristics of liquid foods
   o Recall the unit operations used to produce a range of food products
   o Describe the theories of refrigeration and freezing
   o Restate the principles and practices of processing techniques and the effects of processing parameters on product yield, quality and safety
2. Apply physical principles to understand why food components are processed in specific ways.
   o Understand how various physical processes employed in food processing affect the quality and safety of food
   o Understand the source and variability of raw food material and their impact on food processing operations
   o Manipulate mass and energy balances for a given food processing operation
   o Quantify the extent to which certain physical processes, e.g., addition or removal of thermal energy, addition or removal of water, affect the survival of pathogenic and spoilage organisms.
   o Analyze transport processes and unit operations in food processing as demonstrated both conceptually and in practical laboratory settings
   o Understand the unit operations required to produce a given food product
   o Categorize the principles and current practices of processing techniques and the effects of processing parameters on product quality
   o Employ computers to solve food engineering and food process problems
3. Justify the application of basic mathematical and principles to food processing issues.
   o Critique practical, real-world food process situations and problems using food engineering concepts
o Plan food processing strategies to control and assure the quality of food products
  o Generate process flows to attain specific process strategies
  o Predict the effect of specific heat and mass transfer operations on product quality and safety
4. Acquire specific success skills to prepare for a career in the food industry.
  o Demonstrate effective written communication skills
  o Apply critical thinking skills to new situations, especially processing problems.
  o Improve upon information acquisition skills and organizational skills
  o Manage time effectively

**TEXTBOOK, READINGS, MATERIALS**

- There is no required textbook for the course, but much of the course material is taken from: *Introduction to Food Engineering*, (Singh & Heldman). Three versions of this textbook are placed on Reserve in the Agriculture Library (4th edition, 3rd edition, 2nd edition).
- For material covered in Section 7, most of the course material is taken from: *Physics, 6th Edition* (Cutnell & Johnson). John Wiley & Sons, 2004. One copy of this textbook is placed on Reserve in the Agriculture Library.
- Required course material will be given as web-pages, hand-outs or class notes.
- Lab coats are required for lab sections.

**COURSE TECHNOLOGY**

It is the general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner. The student can use all technology in classroom setting only for educational purposes approved by instructor and/or the University of Manitoba Disability Services.

UM Learn [formerly known as Desire2Learn (D2L)] platform is used for course resources, communication and assessment. For details on UM learn please visit: [http://intranet.umanitoba.ca/academic_support/catl/resources/umlearn.html](http://intranet.umanitoba.ca/academic_support/catl/resources/umlearn.html)

**POLICY ON CLASS COMMUNICATION**

The University requires all students to activate an official University email account. For full details of the Electronic Communication with Students please visit: [http://umanitoba.ca/admin/governance/media/Electronic_Communication_with_Students_Policy_-_2014_06_05.pdf](http://umanitoba.ca/admin/governance/media/Electronic_Communication_with_Students_Policy_-_2014_06_05.pdf)

Please note that all communication between me and you as a student must comply with the electronic communication with student policy ([http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html](http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html)). You are required to obtain and use your U of M email account for all communication between yourself and the university.
RECORDING CLASS LECTURES

Dr. Filiz Koksel and the University of Manitoba hold copyright over the course materials, presentations and lectures which form part of this course. No audio or video recording of lectures or presentations is allowed in any format, openly or surreptitiously, in whole or in part without permission of Dr. Filiz Koksel. Course materials (both paper and digital) are for the participant’s private study and research.

USING COPYRIGHTED MATERIAL

Please respect copyright. We will use copyrighted content in this course. I have ensured that the content I use is appropriately acknowledged and is copied in accordance with copyright laws and University guidelines. Copyrighted works, including those created by me, are made available for private study and research and must not be distributed in any format without permission. Do not upload copyrighted works to a learning management system (such as UM Learn), or any website, unless an exception to the Copyright Act applies or written permission has been confirmed. For more information, see the University’s Copyright Office website at http://umanitoba.ca/copyright/ or contact um_copyright@umanitoba.ca.

PLAGIARISM AND CHEATING

Plagiarism or any other form of cheating in examinations, term tests or academic work is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). Cheating in examinations or tests may take the form of copying from another student or bringing unauthorized materials into the exam room (e.g., crib notes, pagers or cell phones). Exam cheating can also include exam personation. (Please see Exam Personation, found in the Examination Regulations section of the General Academic Regulations). A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty.

To plagiarize is to take ideas or words of another person and pass them off as one’s own. In short, it is stealing something intangible rather than an object. Plagiarism applies to any written work, in traditional or electronic format, as well as orally or verbally presented work. Obviously it is not necessary to state the source of well-known or easily verifiable facts, but students are expected to appropriately acknowledge the sources of ideas and expressions they use in their written work, whether quoted directly or paraphrased. This applies to diagrams, statistical tables and the like, as well as to written material, and materials or information from Internet sources. To provide adequate and correct documentation is not only an indication of academic honesty but is also a courtesy which enables the reader to consult these sources with ease. Failure to provide appropriate citations constitutes plagiarism. It will also be considered plagiarism and/or cheating if a student submits a term paper written in whole or in part by someone other than him/ herself, or copies the answer or answers of another student in any test, examination, or take-home assignment.

Working with other students on assignments, laboratory work, take-home tests, or on-line tests, when this is not permitted by the instructor, can constitute Inappropriate Collaboration and may be subject to penalty under the Student Discipline By-Law.
An assignment which is prepared and submitted for one course should not be used for a different course. This is called “duplicate submission” and represents a form of cheating because course requirements are expected to be fulfilled through original work for each course. When in doubt about any practice, ask your professor or instructor. The Student Advocacy Office, 519 University Centre, 474-7423, is a resource available to students dealing with Academic Integrity matters.

**STUDENTS ACCESSIBILITY SERVICES**

If you are a student with a disability, please contact SAS for academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

*Student Accessibility Services* [http://umanitoba.ca/student/saa/accessibility/](http://umanitoba.ca/student/saa/accessibility/)

520 University Centre
204 474 7423
[Student_accessibility@umanitoba.ca](mailto:Student_accessibility@umanitoba.ca)

**OTHER STUDENT SERVICES**

**Writing and Learning Support:**
The Academic Learning Centre (ALC) offers services that may be helpful to you throughout your academic program. Through the ALC, you can meet with a learning specialist to discuss concerns such as time management, learning strategies, and test-taking strategies. The ALC also offers peer supported study groups called Supplemental Instruction (SI) for certain courses that students have typically found difficult. In these study groups, students have opportunities to ask questions, compare notes, discuss content, solve practice problems, and develop new study strategies in a group-learning format.

You can also meet one-to-one with a writing tutor who can give you feedback at any stage of the writing process, whether you are just beginning to work on a written assignment or already have a draft. If you are interested in meeting with a writing tutor, reserve your appointment two to three days in advance of the time you would like to meet. Also, plan to meet with a writing tutor a few days before your paper is due so that you have time to work with the tutor’s feedback.

These Academic Learning Centre services are free for U of M students. For more information, please visit the Academic Learning Centre website at: [http://umanitoba.ca/student/academiclearning/](http://umanitoba.ca/student/academiclearning/)

You can also contact the Academic Learning Centre by calling 204-480-1481 or by visiting 201 Tier Building.

**University of Manitoba Libraries (UML):**
As the primary contact for all research needs, your liaison librarian can play a vital role when completing academic papers and assignments. Liaisons can answer questions about managing citations, or locating appropriate resources, and will address any other concerns you may have, regarding the research process. Liaisons can be contacted by email or phone, and are also available to meet with you in-person. A complete list of liaison librarians can be found by subject or by name: [http://bit.ly/1sXe6RA](http://bit.ly/1sXe6RA). In addition, general library assistance is provided in person at 19 University Libraries, located on both the Fort Garry and Bannatyne campuses, as well as in many Winnipeg hospitals. For a listing of all libraries, please consult the following: [http://bit.ly/1tJ0bB4](http://bit.ly/1tJ0bB4). When working remotely, students can also receive help online, via the Ask-a-Librarian chat found on the Libraries’ homepage: [www.umanitoba.ca/libraries](http://www.umanitoba.ca/libraries).

**Student Counselling Centre (SCC):**
Contact SCC if you are concerned about any aspect of your mental health, including anxiety, stress, or depression, or for help with relationships or other life concerns. SCC offers crisis services as well as individual, couple, and group counselling. **Student Counselling Centre:**
474 University Centre or S207 Medical Services
(204) 474-8592

**Student Support Case Management:**
Contact the Student Support Case Management team if you are concerned about yourself or another student and don’t know where to turn. SCCM helps connect students with on and off campus resources, provides safety planning, and offers other supports, including consultation, educational workshops, and referral to the STATIS threat assessment team.
520 University Centre
(204) 474-7423

For **24/7 mental health support, contact the Mobile Crisis Service at 204-940-1781.**

**University Health Service:**
Contact UHS for any medical concerns, including mental health problems. UHS offers a full range of medical services to students, including psychiatric consultation.
**University Health Service** [http://umanitoba.ca/student/health/](http://umanitoba.ca/student/health/)
104 University Centre, Fort Garry Campus
(204) 474-8411 (Business hours or after hours/urgent calls)

**Health and Wellness:**
Contact our Health and Wellness Educator if you are interested in information on a broad range of health topics, including physical and mental health concerns, alcohol and substance use harms, and sexual assault.
**Health and Wellness Educator** [http://umanitoba.ca/student/health-wellness/welcome.html](http://umanitoba.ca/student/health-wellness/welcome.html)
Katie.Kutryk@umanitoba.ca
469 University Centre
(204) 295-9032

**Live Well @ UofM:**
For comprehensive information about the full range of health and wellness resources available on campus, visit the Live Well @ UofM site: http://umanitoba.ca/student/livewell/index.html

**Your Rights and Responsibilities:**
As a student of the University of Manitoba you have rights and responsibilities. It is important for you to know what you can expect from the University as a student and to understand what the University expects from you. Become familiar with the policies and procedures of the University and the regulations that are specific to your faculty, college or school. The **Academic Calendar** http://umanitoba.ca/student/records/academiccalendar.html is one important source of information. View the sections **University Policies and Procedures** and **General Academic Regulations**.

While all of the information contained in these two sections is important, the following information is highlighted.

- If you have questions about your grades, talk to your instructor. There is a process for term work and final **grade appeals**. Note that you have the right to access your final examination scripts. See the Registrar’s Office website for more information including appeal deadline dates and the appeal form http://umanitoba.ca/registrar/

- You are expected to view the General Academic Regulation section within the Academic Calendar and specifically read the **Academic Integrity** regulation. Consult the course syllabus or ask your instructor for additional information about demonstrating academic integrity in your academic work. Visit the Academic Integrity Site for tools and support http://umanitoba.ca/academicintegrity/ View the **Student Academic Misconduct** procedure for more information.

- The University is committed to a respectful work and learning environment. You have the right to be treated with respect and you are expected conduct yourself in an appropriate respectful manner. Policies governing behavior include:

  **Respectful Work and Learning Environment**
  http://umanitoba.ca/admin/governance/governing_documents/community/230.html

  **Student Discipline**
  http://umanitoba.ca/admin/governance/governing_documents/students/student_discipline.html and,

  **Violent or Threatening Behaviour**
  http://umanitoba.ca/admin/governance/governing_documents/community/669.html

- If you experience **Sexual Assault** or know a member of the University community who has, it is important to know there is a policy that provides information about the supports available to those who disclose and outlines a process for reporting. The **Sexual Assault** policy may be found at:
  http://umanitoba.ca/admin/governance/governing_documents/community/230.html
  More information and resources can be found by reviewing the Sexual Assault site http://umanitoba.ca/student/sexual-assault/
• For information about rights and responsibilities regarding **Intellectual Property** view the policy

For information on regulations that are specific to your academic program, read the section in the Academic Calendar and on the respective faculty/college/school web site [http://umanitoba.ca/faculties/](http://umanitoba.ca/faculties/)

Contact an **Academic Advisor** within our faculty/college or school for questions about your academic program and regulations [http://umanitoba.ca/academic-advisors/](http://umanitoba.ca/academic-advisors/)

**Student Advocacy:**
Contact Student Advocacy if you want to know more about your rights and responsibilities as a student, have questions about policies and procedures, and/or want support in dealing with academic or discipline concerns. [http://umanitoba.ca/student/advocacy/](http://umanitoba.ca/student/advocacy/)

520 University Centre
204 474 7423
student_advocacy@umanitoba.ca

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**Expectations: I Expect You To**

See **Respectful Work and Learning Environment Policy**.

**Laboratory Expectations**

- If you do not attend the lab period you are ineligible to hand in a report. You will therefore receive no marks. If you suspect that you will be unable to attend a given lab, please give me (Dr. Filiz Koksel) prior warning.

- The wearing of lab coats is obligatory. Do not come to the lab without YOUR lab coat.

- Reports are due TWO WEEKS after the date on which you took the lab. Thereafter, 10% of the total remaining marks will be deducted for each day that the report is delayed by. If you suspect that you will be unable to complete the report by the required date, please see your TA (Nasibeh Younessinaki) BEFORE the due date so that you can arrange an alternate due date.

- Lab Periods not used for lab sessions are to be considered tutorial sessions that can be used to accomplish the assignments.

**Lab Schedule**

Lab schedule will be announced at the end of week 1.

**Class Topics**

This schedule is subject to change at the discretion of the instructor and/or based on the learning needs of the students but such changes are subject to Section 2.8 of the – **ROASS-Procedure**. 
1. Introduction
   Units and dimensions
   Mass balances
   Energy balances
   Thermal balances

2. Flow of Fluids
   Viscosity
   Viscometry and rheology
   Reynolds number
   Mechanical energy balance

3. Heat Transfer
   Conduction
   Convection
   Overall heat transfer coefficient and heat exchangers
   Unsteady-state heat transfer
   Thermal processing of foods

4. Mass Transfer
   Diffusion
   Unsteady-state mass balance
   Mass transfer across natural interface
   Mass transfer across imposed interface

5. Refrigeration and Freezing
   Components of a refrigeration system
   Refrigeration cycle
   Food freezing

6. Heat and Mass Transfer Operations
   Evaporation
   Dehydration

7. Interactions of Foods with External Energy Sources
   Elasticity
   Harmonic motion
   Wave motion and sound
   Electromagnetic waves

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**Course Evaluation**

Please see the Assignment Description on the following page of the syllabus for details.

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<th>Value of Final Grade</th>
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<td>Final Exam</td>
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<td>Labs and write-ups</td>
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<td>Quiz</td>
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<td>Class participation</td>
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Grading

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<td>86-94</td>
<td>3.75-4.24</td>
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<td>B+</td>
<td>80-85</td>
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Referencing Style

Assignments should use the APA reference style.

Assignment Descriptions

- Lab report assessment marking rubric will be posted on UM Learn at the end of week 1.
- Lab reports will be submitted through UM Learn.

- The final exam will include all materials covered in class including videos and guest speakers during the entire semester

Schedule “A” Policies and Resources, references to specific course requirements for individual work and group work, such as:

(i) Group projects are subject to the rules of academic dishonesty;
(ii) Group members must ensure that a group project adheres to the principles of academic integrity.
(iii) Students should also be made aware of any specific instructions concerning study groups and individual assignments;
(iv) The limits of collaboration on assignments should be defined as explicitly as possible; and

Assignment Grading Times

You can expect to receive their graded assignments within two weeks after you hand them in.
You can expect to receive your midterm grades and two lab report grades prior to the VW date which will allow you to make a decision about completing or withdrawing from the course.