University of Manitoba
Faculty of Agricultural & Food Sciences
Department of Biosystems Engineering

Course Details

Course Title & Number:	BIOE 4240 Graduation Project (CRN: 50901)
Number of Credit Hours:	3
Class Times & Days of Week:	Lectures: Wednesdays, 12:30 am -1:20 pm
Location for classes/labs/tutorials:	On-line
Pre-Requisites:	BIOE 3270 (034.327) - Instrumentation and Measurement for Biosystems

Course Description

Either an independent or a directed study including at least one of: a comprehensive literature review, an experimental research project, or an engineering design problem. The project is to be concluded by a formal report or thesis.

Instructor Information

Instructor(s) Name:	Dr. David Levin
E-mail address:	david.levin@umanitoba.ca
Contact telephone number:	204-292-1669
Office Location:	I am working from home full time.
Availability:	Please contact me by e-mail to set-up a day and time to meet. Emails sent after business hours will not likely be answered until the next day. Meetings can be by telephone (audio only) or vidro chat (FaceTime, WhatsApp, or Webex link)
Office Phone No.	204-474-9616
Email:	david.levin@umanitoba.ca

General Course Information

The course is project based. Students will meet weekly with the course coordinators for general guidance related to conducting an independent project and the communication of project findings through written reports and formal presentations. Students are expected to have regular contact with their project advisor (a schedule that is mutually agreeable to the student and project advisor).

Why is this course useful?

There are many instances when the engineer will be faced with a situation in which (s)he has insufficient information to make an informed decision. In such situations, there is a need to attain information through means such as experimental study or a comprehensive review of the published literature. The practicing engineer will use these skills to maintain professional competence and to contribute to the advancement

of engineering knowledge. During this course, students will gain the experience of managing and completing independent project work. Communication skills will be developed through preparation of a written project report and a formal presentation of project findings.

How does this course fit into the curriculum?
This is a required course in the Biosystems Engineering program. Students are expected to register for BIOE 4240 in their graduating year (fall or winter semester).

Course Goals

The intent of this course is:

- To give students an opportunity to be solely responsible for completion of a term-long engineering project.
- To provide students with the confidence to undertake lifelong learning activities intended to generate the information needed to make informed decisions.
- To introduce students to the types of research relevant to the discipline of Biosystems Engineering.

Textbook, Readings, Materials

Day, R.A. and B. Gastel. 2011. How to Write and Publish a Scientific Paper, Seventh Edition. Greenwood: Santa Barbara, CA.

This book online through the library at the following url. However, the book cannot be downloaded.
https://search.lib.umanitoba.ca/discovery/fulldisplay?docid=alma991384136500016 51&context=L&vid=01UMB_INST:UMB&lang=en&search_scope=MyInst_and_CI&adaptor=Local%20Search%20Engine&tab=Everything&query=any,contains,How%20to%20Write%20and%20Publish%20a%20Scientific%20Paper

Class Schedule

A preliminary schedule is provided below. The schedule is subject to change at the discretion of the instructors and/or based on the learning needs of the students but such changes are subject to Section 2.8 of the ROASS Procedure.

January 20th	Lecture 1	Course Outline & Introduction
January 27th	Lecture 2	Guest lecture by Ms. Marie Speare on Literature Search Tips and Tricks
February 3rd	Lecture 3	Creating a Research Question & Writing a Literature Review
February 10th	Lecture 4	Guest lecture by Ms. Loie Gervais on Integrating sources: Citing and Paraphrasing **Research Proposal due**
February 17th	**No Class: Reading Week**	
February 24th	Lecture 5	Writing a Scientific Paper: Outline, & Objectives

March 3rd	Lecture 6	Writing a Scientific Paper: Outline, Objectives, and Materials & Methods **Annotated Bibliography due**
March 10th	Lecture 7	Writing a Scientific Paper: Results & Discussion
March 17th	Lecture 8	Writing a Scientific Paper: Acknowledgements and References
March 24th	Lecture 9	Meet to discuss project progress
March 31st	Lecture 10	Preparing an Abstract & the publication process
April 7th	Lecture 11	How to prepare an effective oral presentation **Sentence Outline due**
April 14th	Lecture 12	Oral Presentations **Exit Survey due** **Written Report due**

Important Dates

Last day to drop Winter/Summer semester courses: Friday, January 29th, 2021
Winter semester Voluntary Withdrawal Date: Wednesday, March 31st, 2021

Research Proposal due	Wednesday, February 10th,2021
Annotated Bibliography due	Wednesday, March 3rd 2021
Sentence Outline due	Wednesday, April 7th, 2021
Exit Survey due	Wednesday, April 14th, 2021
Written Report due	Wednesday, April 14th, 2021
Oral Presentations	2021 (To be determined)

Course Evaluation Methods

The grade for this course will be based on four assignments, an oral presentation, a written report and your advisor review. The specific distribution is shown below:

Term Assignments:	10% (Research Proposal; Annotated Bibliography; Sentence Outline; Exit survey)
Oral Presentation:	20%
Written Report:	60%
Advisor Review:	10%
Total	100%

Grading

The grading scale used for this course is shown below.

Letter Grade	Percentage out of 100
A+	93.0 -100.0
A	86.0– 92.5
B+	79.0 – 85.5
B	72.0 – 78.5
C+	65.0 -71.5
C	58.0 – 64.5
D	50.0 - 57.5
F	< 50.0

Assignments

Research Proposal (2.5%): Prepare a research proposal (1-2 pages) that includes: the proposed title of your report, the name of your advisor, the nature of the research project (i.e., experimental research, engineering design, or comprehensive literature review), a statement of the project objective, a description of the proposed methodology (including **analysis of data** if applicable), a project timeline (showing week by week expectations), and a Gantt chart of the project timeline. The research proposal must be signed by your advisor.

Annotated Bibliography (2.5%): An Annotated Bibliography is a list of sources, usually on one topic that includes brief summaries and/or evaluations of the sources. The annotated bibliography: 1) forces you to keep a record of sources, 2) develops the habit of critically examining sources, and 3) develops a specific writing skill that is common in academia. Select at least five publications relevant to your area of research. Generate an annotation for each publication. Do not exceed 1 typed page per source. Your annotation should be concise and include the following information:

- complete bibliographic citation (using CAE style)
- review the main content of the source; be sure to state any limitations of the work
- make an assessment of the usefulness of the source to your proposed (or on-going) research

Sentence Outline (2.5%): A sentence outline is a tool that can help you predict the structure of your written thesis before you actually write it. Unlike a topic outline, which uses only key words or short phrases to depict the structure of a written document, the sentence outline uses complete sentences to depict the written document's structure. You may be questioning the value of the effort associated with preparing an outline when the written report is to contain standard sections such as introduction, literature review, materials and methods, results and discussion, and conclusions. (Note: If you are doing a graduation project that falls into the category of an engineering design or a comprehensive literature review, then not all of these standard sections would apply.) Although these main sections are obvious, your organization of material within each section is often not so obvious. It is important that you carefully consider organization of material within each section to most clearly convey your message. The sentences that you prepare for the sentence outline may be used as the opening sentences in each of the sections of your written report.

Exit Survey (2.5%): The new Canadian Engineering Accreditation Board (CEAB) requires that institutions demonstrate that their students possess 12 specific attributes upon graduation. Attributes are measured by indicators, which are the knowledge, skills and behaviors associated with each attribute. This survey will be used to provide information for the cycle of continual improvement of our Biosystems

Engineering program; it will not be used to assess you individually although this exit survey is a required assignment of this course.

Oral Presentation (20%): Students are required to defend their work to a panel of professors. This defense will take the form of a formal oral presentation (using a tool such as PowerPoint) and a subsequent question period.

Written Report (60%): A written report is required. The report must describe the project that has been completed by the student. A grading rubric will be provided. The reports will be evaluated by one of the course coordinators, your advisor, and one additional member of the department.

Advisor Review (10%): Your academic advisor will be asked to complete a survey to assess your performance on the project. The survey will specifically assess the ability that you displayed with respect to the use of tools to complete the project, your ability to manage the project, and your ability to undertake lifelong learning. From the student perspective, there is no assignment associated with this component of the grade – the mark for this component of the grade will be assigned based on your advisor's perception of your work throughout the semester.

Intended Learning Outcomes

At the conclusion of the course, the student should be able to:

1. Critically evaluate scientific publications using the format of an annotated bibliography.
2. Propose and execute a plan to investigate an engineering problem.
3. Compile a written report and compose (and deliver) an oral presentation.

Expected Level of Development in Course (I – Introductory; D – Developed; A – Advanced)

Learning Outcome	Attribute*					
	IN (Investigation)	ET (Use of engineering tools)	IT (Individual and team work)	CS (Communication skills)	EE (Ethics and equity)	LL (Lifelong Learning)
1						A
2		A	A		A	A
3	A			A		

Graduate Attributes

All courses in the Biosystems Engineering program are expected to contribute, in some way, to the development of one or more of the 12 graduate attributes that have been identified by the Canadian Engineering Accreditation Board. The 12 graduate attributes have been defined below for your information. While there are likely some aspects of many of these attributes that can be found in this course, the attributes being emphasized in this course are: 3) *Investigation, 7) Communication Skills, 11) Economics and Project Management, and 12) Lifelong Learning.*

1) A Knowledge Base for Engineering: Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.

2) Problem Analysis: An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.

3) Investigation: An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data, and synthesis of information in order to reach valid conclusions.

4) Design: An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.

5) Use of Engineering Tools: An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.

6) Individual and Team Work: An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.

7) Communication Skills: An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.

8) Professionalism: An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.

9) Impact of Engineering on Society and the Environment: An ability to analyze social and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.

10) Ethics and Equity: An ability to apply professional ethics, accountability, and equity.

11) Economics and Project Management: An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations.

12) Life-long Learning: An ability to identify and address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.

The table below shows the graduate attributes covered in BIOE 4240 in relation to the assessment element that contributes to your overall grade in the course. The final column indicates the approximate level of development in graduate attributes that is anticipated in this course.

Grade Component	Specific Evaluation Point	Graduate Attribute	Indicators Being Assessed	Level*
Assignments (10%)	Research Proposal	Individual & Teamwork	**IT.2** Contributes equitably to completion of group work **IT.4** Develops or demonstrates leadership skills	A
	Annotated Bibliography	Lifelong Learning	**LL.4** – Demonstrates research and information literacy skills	
	Sentence Outline	Communication Skills	**CS.2** – Designs and produces appropriate engineering documents (i.e., research reports, engineering reports, design documents)	
	Exit survey	/	/	

Oral Presentation (20%)	Research Presentation	Communication Skills	**CS.3** – Delivers effective technical presentations	
Written Report (60%)	Investigation, Methods, Analysis (42%)	Investigation	**IN.1** – Gathers information (literature review, measurements, experiments, laboratory exercises) and analyzes data **IN.2** – Devises and implements an appropriate plan / methodology for gathering information required to solve a complex engineering problem **IN.3** – Interprets results and reaches appropriate conclusions	
	Format and Style (18%)	Communication Skills	**CS.2** – Designs and produces appropriate engineering documents (i.e., research reports, engineering reports, design documents)	
Advisor Review (10%)	Survey by Student Advisor	Use of Engineering Tools Ethics and Equity Individual and Teamwork Lifelong Learning	**ET.1** Uses tools to complete engineering activities **ET. 2** Evaluates and selects appropriate tools for a given scenario **EE.3** Demonstrates individual accountability **IT.2** – Contributes equitably to completion of group work **IT.4** – Develops or demonstrates leadership skills **LL.2** – Engages in activities to advance knowledge and understands the role of on-going professional development **LL.3** – Learns from successes and mistakes; recognizes limitations	

***Level of Development of Graduate Attributes (I = Introductory; D = Intermediate; A = Advanced)**

Using Copyrighted Material

Please respect copyright. We will use copyrighted content in this course. The content used is appropriately acknowledged and is copied in accordance with copyright laws and University guidelines. Copyrighted works, including those created by us, are made available for private study and research and must not be distributed in any format without permission.

Recording Class Lectures

Dr. Song Liu and the University of Manitoba hold copyright over the course materials, presentations and lectures that 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 from Dr. Song Liu. Course materials (both paper and digital) are for the participant's private study and research.

Course Technology

As a courtesy to both the instructors and your classmates, use of cell phones is not permitted during class time. Please remember to switch your cell phone to vibrate mode to avoid interruptions. Laptops may be

used during lectures only for the purpose of taking notes. Some course materials will be available through UM Learn.

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
Please note that all communication between you as a student and your instructors/TAs must comply with the electronic communication with student policy (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.

Expectations and Course Polices

Student and Department Responsibilities: In general, the graduation project is the responsibility of the student. All aspects of the research such as fabrication of equipment, computer programming, and design of data acquisition systems are the responsibility of the student. Support staff are available to provide assistance, not to work for the student. If the work is being carried out in another Department or off campus, the research is still to be the product of the student and not a technician. Although the Department is able to provide some assistance with the purchase of equipment and materials necessary for the thesis, all equipment purchases and requests for use of existing Departmental equipment require prior authorization in writing. The student is responsible for the costs associated with the preparation of the written report and the final oral presentation. Any item requiring fabrication by technicians must receive approval in advance in writing by the project advisor. Furthermore, before carrying out any fabrication or construction work that requires the use of Department power tools or space, the student must receive prior approval of the appropriate technician.

Academic Integrity: Plagiarism or any other form of cheating in examinations, term tests or academic work is subject to serious academic penalty. Cheating in examinations or tests may take the form of copying from another student or bringing unauthorized materials into the exam room. Exam cheating can also include exam impersonation. A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty. Students should acquaint themselves with the University's policy on plagiarism, cheating, exam impersonation and duplicate submission. Electronic detection tools may be used to screen assignments in cases of suspected plagiarism.

Late Assignments: *Each deliverable is due before 4:00 pm* or the appropriate late penalty will apply. Assignments submitted after the due date will be docked 25% per school day.

Referencing Style

Students are expected to follow the CAE reference style when citing references in course assignments. The **Instructions for preparing a paper for Canadian Agricultural Engineering** is available through UM Learn. Please refer to this guide to ensure that you follow the correct referencing style.

Students Accessibility Services

Student 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/
520 University Centre; 204 474 7423; Student_accessibility@umanitoba.ca