ECE 608 SYLLABUS

GEORGE FREEMAN, SPRING 2017

COURSE INFORMATION

CALENDAR DESCRIPTION

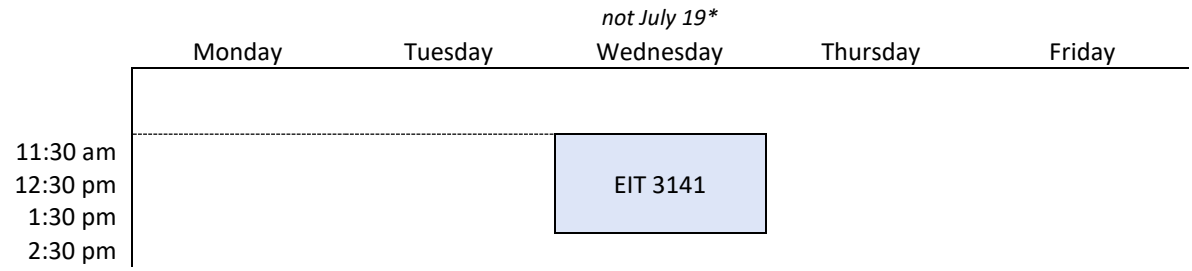
The following description is from the University of Waterloo 2016-2017 Graduate Academic Calendar.

ECE 608 Quantitative Methods in Biomedical Engineering (0.50) LEC — Course ID: 015416

This biomedical engineering core course focuses on topics related to the use of quantitative tools in biomedical engineering research studies. It will teach students how to conduct statistical analysis of biomedical data, design biomedical experiments that can offer statistical insight, and apply computational methods to solve problems in biomedical engineering. Educational emphasis will be placed on developing students' core competence in biostatistics and biomedical computing, so as to prepare them to pursue biomedical engineering investigations that are backed by quantitative reasoning and numerical insights.

WEEKLY MEETINGS

The following chart shows the weekly course meetings.



*Note: I need to be away from campus from July 17 to July 24 inclusive.

My plan is that the classroom time be structured mostly as participatory learning, some of which may be graded. You will need to bring your textbook and laptop with installed R programming environment to each meeting.

CONTACT INFORMATION

Outside of course meetings, email is probably the quickest way to contact me.

INSTRUCTOR

George Freeman Office: EIT 4163 Email: freeman@uwaterloo.ca Telephone: 519-888-4567 x32876
Associate Professor, Department of Electrical and Computer Engineering
Professional Engineer, Province of Ontario

You are welcome to drop by my office any time!
Alternatively, you can email to arrange an appointment time.

Please put ECE 608 in the subject line of email so I know to give you high priority in responding!
It is really helpful to me if you provide your complete name in your email.

GRADUATE OFFICE

See https://uwaterloo.ca/electrical-computer-engineering/current-graduate-students/graduate-studies-contacts.

If sickness or other emergency will interfere with your studies, please contact a graduate-program coordinator with your documentation.

GRADING

The final grade is a mark out of 100 based on weekly activities and a final examination.

The final examination mark will comprise 50% of the final grade.

Other graded components may include weekly assignments (due before the associated class meeting) or in-class activities (group or individual). There will be no midterm examination and no term project.

TERM SCHEDULE

The following chart shows the term schedule. (The date and time of the final examination isn't known until partway through the term.)

SPRING 2017

	Su	Mo	Tu	We	Th	Fr	Sa	Week
May	30	1	2	3	4	5	6	1
	7	8	9	10	11	12	13	2
	14	15	16	17	18	19	20	3
	21	22	23	24	25	26	27	4
	28	29	30	31	1	2	3	5
June	4	5	6	7	8	9	10	6
	11	12	13	14	15	16	17	7
	18	19	20	21	22	23	24	8
	25	26	27	28	29	30	1	9
July	2	3	4	5	6	7	8	10
	9	10	11	12	13	14	15	11
	16	17	18	19	20	21	22	12
	23	24	25	26	27	28	29	1
	30	31	1	2	3	4	5	2
	6	7	8	9	10	11	12	3

Cancelled Meet	Wed Jul 19	11:30 am
Final Exam		

RULES FOR COLLABORATION

Students are strongly encouraged to talk about assigned work, share ideas, or share code fragments. However, each final submission is to be composed individually. Direct copying of a solution, or providing the copy, is considered cheating. Two key things to remember are "separation" and "disclosure."

Separation means that, after you discuss an assignment with other people, you separate yourself from them and from any shared materials while you compose your solution to hand in. In addition to avoiding direct copying, this will significantly improve your speed of learning.

Disclosure means you indicate on the submitted work any significant help you received, and specify any component which you took directly from another source. You may lose whatever portion of the grade relates to the copied part. However, you won't be cheating and you will be learning from the parts you were able to complete on your own.

COURSE READING

Each week may require prior reading and completion of assignments based on the course textbook. In-class discussion and activities will also be based on the course textbook.

TEXTBOOK

- S. Kuiper and J. Sklar, *Practicing Statistics: Guided Investigations for the Second Course*. Boston: Pearson Education Inc., 2013. ISBN 0-321-58601-8.

APPROXIMATE TOPIC ORDER

The following table shows a tentative order of topics we will try to cover. Mostly, this follows the textbook at one chapter per week.

Week	Topics	K&S
1	Introduction, basics of the R programming language	
2	Review of basic probability and statistics	
3	Nonparametric methods	Ch 1
4	Two-sample t-test, regression, analysis of variance	Ch 2
5	Multiple regression	Ch 3
6	Factorial experiments	Ch 4
7	Block, split-plot, and repeated measures designs	Ch 5
8	Categorical data analysis	Ch 6
9	Logistic regression	Ch 7
10	Poisson log-linear regression	Ch 8
11	Survival analysis	Ch 9
12	Review	

PROGRAMMING ENVIRONMENT

You should set up a programming environment on your own laptop and to bring it with you to class meetings.

At the time of writing, I am using R version 3.3.3 and RStudio version 1.0.136 (on a Windows 10 laptop).

Both should work on Mac and Linux machines as well.

R LANGUAGE & ENVIRONMENT

The R language and environment for statistical computing is available from the R Foundation via links at the following url.

https://www.r-project.org/

RSTUDIO

A simple integrated development environment called RStudio Desktop is available at the following url.

https://www.rstudio.com/products/RStudio/

BACKGROUND AND CAVEATS

I assume you have some experience in a programming language (variable, type, if-statement, loop, array, function/method).

I assume you have taken an undergraduate probability or probability and statistics course (probability space, random variable, cdf, pmf, pdf, independence, permutations/combinations, binomial distribution, uniform distribution, gaussian/normal distribution, mean, variance, joint/marginal distributions, Bayes's rule). The textbook assumes you know a little bit about statistics (terminology, hypothesis testing, test statistic, p-value, confidence interval) but I don't intend to rely on any familiarity with introductory statistics.

This is the first offering of a course which is new to the department and new to me. The intended emphasis is on application of second-level statistical methods to problems in biomedical engineering. In this first offering, I will be more concerned with effective understanding of statistics than with the biomedical pedigree of examples. I have significant background in programming, probability theory, and statistical signal processing (some of it applied in biomedical engineering) but this will be my first nontrivial use of the R programming language and many of the statistical methods under discussion. The course will rely on all of us being good collaborative self-learners.

INSTITUTIONAL INFORMATION

ACADEMIC INTEGRITY

In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect, and responsibility. Check the following url for more information.

https://uwaterloo.ca/academic-integrity

GRIEVANCE

A student who believes that a decision affecting some aspect of his or her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4, found at the following url.

https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/policy-70

When in doubt, please be certain to contact the department's administrative assistant, who will provide further assistance.

DISCIPLINE

A student is expected to know what constitutes academic integrity (see the Academic Integrity section above) to avoid committing an academic offence, and to take responsibility for his or her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about rules for group work or collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate Associate Dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline, available at the following url.

https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/policy-71

For typical penalties check the Guidelines for the Assessment of Penalties, available at the following url.

https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/guidelines/guidelines-assessment-penalties

APPEALS

A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition), or Policy 71, Student Discipline, may be appealed if there is a ground. A student who believes he or she has a ground for an appeal should refer to Policy 72, Student Appeals, available at the following url.

https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/policy-72

NOTE FOR STUDENTS WITH DISABILITIES

The AccessAbility Office (formerly Office for Persons with Disabilities or OPD), located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the AccessAbility Office at the beginning of each academic term. For more information, see the following url.

https://uwaterloo.ca/accessability-services