



Faculty of Engineering and Applied Science

CHEE 209 – ANALYSIS OF PROCESS DATA

Course Syllabus – Fall 2021

This is your course syllabus. Please download the file and keep it for future reference.

LAND ACKNOWLEDGEMENT

Queen's University is situated on traditional Anishinaabe and Haudenosaunee Territory.
See: <http://www.queensu.ca/encyclopedia/t/traditional-territories>

INCLUSIVITY STATEMENT

Queen's students, faculty, and staff come from every imaginable background – small towns and suburbs, urban high rises, Indigenous communities, and from more than 100 countries around the world. You belong here: <https://www.queensu.ca/inclusive/>.

TEACHING TEAM

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CHEE 209 (F 3-0-0.5 3.5)

COURSE DESCRIPTION¹

Statistical methods for analyzing and interpreting process data are discussed, with special emphasis on techniques for continuous improvement of process operations. Topics include: role of data in assessing process operation, identifying major problems, graphical and numerical summaries, principles of valid inference, probability distributions for discrete and continuous data, process capability, comparing process performance to target values, comparing performances of two processes, control charts, and an introduction to linear regression analysis.

Prerequisites: APSC 171 (Calculus I), APSC 172 (Calculus II), APSC 174 (Introduction to Linear Algebra)

(27/0/0/15/0) (Mathematics/Natural Sciences/Complementary Studies/Engineering Science/Engineering Design)

PRE-REQUISITE KNOWLEDGE

This course is designed for learners with background on calculus and algebra.

¹ Course Author(s): Xiang Li and Thomas J. Harris. 1st Edition (initial development): Fall 2020; Queen's University holds a license for the use of the Course Author's Intellectual Property for CHEE 209.

COURSE LEARNING OUTCOMES (CLO)

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

CLO	DESCRIPTION	INDICATOR
CLO 1	Summarize, visualize and interpret data using tabular and graphical methods.	KB-Mathematics KB-ES-ApplMath (b)
CLO 2	Apply simple discrete probability models to analyze data related to quality such as particle size and ore concentration, and to evaluate risk factors such as safety and environmental compliance.	KB-ES-ApplMath (b) PA-Formulate
CLO 3	Apply continuous probability models to assist in decision making with applications to quality improvement, resource estimation, safety and environmental compliance.	KB Mathematics PA-Evaluate
CLO 4	Formulate confidence intervals and hypothesis tests for the sample average and sample variance under standard conditions.	KB Mathematics
CLO 5	Develop and analyze linear models to describe and predict process and laboratory behavior.	KB-ES-ApplMath (b) PA-Formulate PA-Evaluate ET-Apply
CLO 6	Apply computer software to solve statistical problems.	PA-Evaluate ET-Apply

COURSE EVALUATION

ASSESSMENT WEIGHTING

Assessment Tool	Due Date	Weight	Alignment with CLOs
Quizzes	Mondays of Weeks 4, 6, 8, 10	40%	1, 2, 3, 4
Quiz 1	Monday of Week 4	10%	1, 2
Quiz 2	Monday of Week 6	10%	2
Quiz 3	Monday of Week 8	10%	3
Quiz 4	Monday of Week 10	10%	4
Assignments	Tuesdays of Weeks 3, 5, 7, 9, 11 Friday of Week 12	12%	1, 2, 3, 4, 5, 6
Assign 1	Tuesday of Week 3	2%	1, 2, 6
Assign 2	Tuesday of Week 5	2%	2
Assign 3	Tuesday of Week 7	2%	3, 4
Assign 4	Tuesday of Week 9	2%	4
Assign 5	Tuesday of Week 11	2%	4, 5
Assign 6	Friday of Week 12	2%	5, 6
Final Exam	Exam period	48%	3, 4, 5
		100%	

ASSESSMENT DESCRIPTIONS

Quizzes

There are four quizzes in this course. These quizzes are designed to provide learners with feedback on their knowledge.

Assignments

There are six assignments in this course. Each assignment will require you to solve 2-3 problems. More details about these assignments can be found in onQ.

Final Exam

The final exam is closed book. Students must write their exam on the day and time scheduled by the University. You should not schedule vacations, travel, etc. during the exam period. The [Term and Session Dates](#) will indicate the final exam period session dates in each term.

GRADING

All assessments in this course will receive numerical percentage marks. The final grade you receive for the course will be derived by converting your numerical course average to a letter grade according to the established [Grade Point Index](#).

Feedback on Assessments

The teaching team will provide feedback on graded activities. You can expect feedback on your assessments within seven days of the due date.

Accessing Your Final Grade

Your final grades will show on SOLUS. Official transcripts showing final grades will be available on the Official Grade Release Date. Please note that in official transcripts, a mark of IN (incomplete) is considered a grade, and your transcript is released with this grade.

COURSE MATERIALS

Optional Textbook

- Miller & Freund's Probability and Statistics for Engineers, 8th or 9th edition, Richard A. Johnson (author).

Other Material

All other course material is accessible via OnQ.

Required Calculator

A Casio 991 is required. **ONLY** this type of non-programmable, non-communicating calculator will be allowed during tests and exams.

Suggested Time Commitment

This course represents a study period of one semester spanning 12 weeks. Learners can expect to invest on average 7-9 hours per week in this course. Learners who adhere to a pre-determined study schedule are more likely to successfully complete the course.

WEEKLY COURSE OUTCOMES

Week	Learning Outcomes	Assessment
1	<p>Summary Statistics</p> <p>By the end of this week, learners will be able to:</p> <ul style="list-style-type: none"> Summarize, visualize and interpret data using tabular and graphical methods [CLO1] 	
2	<p>Summary Statistics and Basics of Probability</p> <p>By the end of this week, learners will be able to:</p> <ul style="list-style-type: none"> Characterize the central tendency and variability of data using summary statistics [CLO1] Count outcomes in a sample space and perform and visualize event operations using Venn diagrams [CLO2] Apply the JMP software to visualize data and generate summary statistics results [CLO6] 	
3	<p>Basics of Probability and Discrete Probability Models</p> <p>By the end of this week, learners will be able to:</p> <ul style="list-style-type: none"> Calculate probabilities and conditional probabilities [CLO2] Calculate probabilities for discrete random variables [CLO2] 	Assign 1 [CLO1] [CLO2][CLO6]
4	<p>Discrete Probability Models</p> <p>By the end of this week, learners will be able to:</p> <ul style="list-style-type: none"> Calculate expected costs for discrete random variables [CLO2] Identify data that follow binomial or Poisson distribution, and calculate probabilities for the distributions [CLO2] 	Quiz 1 [CLO1][CLO2]

Week	Learning Outcomes	Assessment
5	<p>Continuous Probability Models</p> <p>By the end of this week, learners will be able to:</p> <ul style="list-style-type: none"> • Calculate probabilities and parameters for continuous random variables via integration [CLO3] • Calculate probabilities and parameters for uniform and normal distributions [CLO3] 	Assign 2 [CLO2]
6	<p>Continuous Probability Models and Sampling Distributions</p> <p>By the end of this week, learners will be able to:</p> <ul style="list-style-type: none"> • Calculate probabilities and parameters for log-normal distribution [CLO3] • Calculate probabilities and parameters for the sample mean using sampling distributions and the central limit theorem [CLO4] 	Quiz 2 [CLO2]
7	<p>Sampling Distributions and Statistical Inferences</p> <p>By the end of this week, learners will be able to:</p> <ul style="list-style-type: none"> • Calculate probabilities and parameters for the sample mean and the sample variance using sampling distributions, when population variance is unknown [CLO4] • Construct confidence intervals for the mean [CLO4] 	Assign 3 [CLO3][CLO4]
8	<p>Statistical Inferences</p> <p>By the end of this week, learners will be able to:</p> <ul style="list-style-type: none"> • Perform hypothesis tests and calculate the p-values for the mean [CLO4] 	Quiz 3 [CLO3][CLO4]

Week	Learning Outcomes	Assessment
9	Statistical Inferences and Simple Linear Regression	Assign 4 [CLO4]
	By the end of this week, learners will be able to: <ul style="list-style-type: none"> • Construct confidence intervals, perform hypothesis tests and calculate the p-values for the variance [CLO4] • Recognize the motivation for regression analysis and assumptions needed for linear regression [CLO5] • Perform simple linear regression analysis, including least squares estimation and graphical diagnostics [CLO5] 	
10	Simple Linear Regression	Quiz 4 [CLO4]
	By the end of this week, learners will be able to: <ul style="list-style-type: none"> • Perform simple linear regression analysis including quantitative diagnostics and inferences on model parameters [CLO5] • Apply the JMP software to generate simple linear regression results [CLO6] 	
11	Simple Linear Regression and Multiple Linear Regression	Assign 5 [CLO4][CLO5]
	By the end of this week, learners will be able to: <ul style="list-style-type: none"> • Calculate confidence intervals for mean response and a single response for simple linear regression [CLO5] • Perform multiple linear regression analysis, including least squares estimation, graphical and quantitative diagnostics [CLO5] 	
12	Multiple Linear Regression	Assign 6 [CLO5][CLO6]
	By the end of this week, learners will be able to: <ul style="list-style-type: none"> • Perform multiple linear regression analysis to make inferences on model parameters [CLO5] • Apply the JMP software to generate multiple linear regression results [CLO6] 	

COURSE COMMUNICATION

NETIQUETTE

In this course, you may be expected to communicate with your peers and the teaching team through electronic communication. You are expected to use the utmost respect in your dealings with your colleagues or when participating in activities, discussions, and online communication.

Following is a list of netiquette guidelines. Please read them carefully and use them to guide your online communication in this course and beyond.

1. Make a personal commitment to learn about, understand, and support your peers.
2. Assume the best of others and expect the best of them.
3. Acknowledge the impact of oppression on the lives of other people and make sure your writing is respectful and inclusive.
4. Recognize and value the experiences, abilities, and knowledge each person brings.
5. Pay close attention to what your peers write before you respond. Think through and re-read your writings before you post or send them to others.
6. It's alright to disagree with ideas, but do not make personal attacks.
7. Be open to be challenged or confronted on your ideas and challenge others with the intent of facilitating growth. Do not demean or embarrass others.
8. Encourage others to develop and share their ideas.

QUESTIONS ABOUT COURSE MATERIAL

Questions or comments regarding the course material that can be of benefit to other students should be posted in the Q&A forum on the class website. The instructor, TAs, and students are encouraged to answer these questions directly in the discussion forum for the benefit of everyone in the course.

COURSE ANNOUNCEMENTS

The instructor will routinely post course news in the Announcements section on the main course homepage on OnQ. Please sign up to be automatically notified by email when the instructor posts new information in the Announcements section. Instructions on how to modify your notifications are found in the **Begin Here** section of the class website.

OFFICE HOURS

In addition to interaction in the Q&A discussion forums, you will have the opportunity to interact with either a TA or the instructor through email or in-person by appointments.

CONFIDENTIAL MATTERS

If you have a confidential matter you would like to discuss with your instructor, their contact details are on the first page of this document. Expect email replies within 48 hours.

STANDARD FEAS INFORMATION

COURSE POLICIES

Please review the following policies concerning copyright, academic integrity, absences and academic accommodations:

COPYRIGHT

Course materials created by the course instructor, including all slides, presentations, synchronous and asynchronous course recordings, handouts, tests, exams, and other similar course materials, are the intellectual property of the instructor. It is a departure from academic integrity to distribute, publicly post, sell or otherwise disseminate an instructor's course materials or to provide an instructor's course materials to anyone else for distribution, posting, sale or other means of dissemination, without the instructor's **express consent**. A student who engages in such conduct may be subject to penalty for a departure from academic integrity and may also face adverse legal consequences for infringement of intellectual property rights and, with respect to recordings, potentially privacy violations of other students.

ACADEMIC INTEGRITY

As an engineering student, you have made a decision to join us in the profession of engineering, a long-respected profession with high standards of behaviour. As future engineers, we expect you to behave with integrity at all times. Please note that Engineers have a duty to:

- Act at all times with devotion to the high ideals of personal honour and professional integrity.
- Give proper credit for engineering work

The standard of behaviour expected of professional engineers is explained in the [Professional Engineers Ontario Code of Ethics](#). Information on policies concerning academic integrity is available in the [Queen's University Code of Conduct](#), in the [Senate Academic Integrity Policy Statement](#), on the [Faculty of Engineering and Applied Science website](#), and from your instructor.

Departures from academic integrity include plagiarism, use of unauthorized materials or services, facilitation, forgery, falsification, unauthorized use of intellectual property, and collaboration, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions which contravene the regulation on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the University.

In the case of online or remotely proctored exams, impersonating another student, copying from another student, making information available to another student about the exam questions or possible answers, posting materials to online services, communicating with another person during an exam or about an exam during the exam window, or accessing unauthorized materials, including internet sources and using unauthorized materials, including smart devices, are actions in contravention of academic integrity.

LATE POLICY

Any applicable late penalties are described in the details for each assessment. In the event of extenuating circumstances, you must follow the policies for requesting an academic consideration (please see below). Note that unacceptable reasons include extra-curricular activities, travel plans, generally behind on schoolwork, etc. In the absence of an approved consideration request, the normal late penalty will apply as described in the assignment or any course/departmental policies.

INVALID EXAMS

An exam may be declared invalid in case of an interruption in an in-person examination; if the instructions in a remote or online exam were not followed; if the student uploads wrong materials; or if a situation arises where the integrity of the exam cannot be verified. If an exam is declared invalid, the student may be granted a re-write.

ABSENCES (ACADEMIC CONSIDERATIONS) AND ACADEMIC ACCOMMODATIONS

For absences and academic accommodations please review the information on the [FEAS website](#).

ACADEMIC AND STUDENT SUPPORT

Queen's has a robust set of supports available to you including the [Library](#), [Student Academic Success Services \(Learning Strategies and Writing Centre\)](#), and [Career Services](#). Learners are encouraged to visit the Faculty of Engineering and Applied Science [Current Students](#) web portal for information about various other policies such as academic advisors, registration, student exchanges, awards and scholarships, etc.

INDIVIDUAL NEEDS AND SUPPORT

If you have a disability or health-related condition that may require academic accommodations, please approach the [Queen's Accessibility Services](#). The staff at Accessibility Services are available by appointment to develop individualized accommodation plans, provide referrals, and assist with advocacy. The sooner you let us know your needs, the better we can assist you in achieving your learning goals. For questions or assistance with requesting Academic Consideration or Accommodation, contact the FEAS Academic Accommodation Coordinator at engineering.aac@queensu.ca

Every effort has been made to provide course materials that are accessible. For further information on accessibility compliance of the educational technologies used in this course, please consult the links below.

EDUCATIONAL TECHNOLOGY	ACCESSIBILITY COMPLIANCE INFORMATION
onQ (Brightspace Learning Management System by D2L)	https://www.d2l.com/accessibility/standards/
MS-Teams	https://support.microsoft.com/en-us/office/accessibility-support-for-microsoft-teams-d12ee53f-d15f-445e-be8d-f0ba2c5ee68f
Zoom	https://zoom.us/accessibility

If you find any element of this course difficult to access, please discuss with your instructor how you can obtain an accommodation.

RELIGIOUS OBSERVANCE

Students in need of accommodation for religious observance are asked to speak to their professor within a week of receiving their syllabus. Note also that alternative assignments are considered a "reasonable accommodation" under the Ontario Human Rights Code. Students with questions about their rights and responsibilities regarding religious accommodation should contact the Chaplain via Chaplain@queensu.ca.

TECHNICAL SUPPORT

Some basic comfort level with basic hardware and software skills are required for this course. If you require technical assistance, please contact [Technical Support](#).

SUPPORTIVE PERSONAL COUNSELLING

If at any time you find yourself feeling overwhelmed, anxious, sad, lonely, or distressed, consider confidential supportive counselling offered by the [embedded counselors](#) at the Student Wellness Service Faculty of Engineering and Applied Science.