



Faculty of Engineering and Applied Science

## CHEE 209 – ANALYSIS OF PROCESS DATA

### Course Syllabus – Fall 2020

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

### TEACHING TEAM

#### COURSE INSTRUCTOR

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## CHEE 209 (F 3-0-0.5 3.5)

### COURSE DESCRIPTION<sup>1</sup>

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.

### COURSE LEARNING OUTCOMES (CLO)

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

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<sup>1</sup> 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.

<b>CLO</b>	<b>DESCRIPTION</b>	<b>INDICATOR</b>
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

<b>Assessment Tool</b>	<b>Due Date</b>	<b>Weight</b>	<b>Alignment with CLOs</b>
<b>Quizzes</b>	<b>Mondays of Weeks 2, 3, 4, 5 (before 23:59 ET)</b>	<b>40%</b>	<b>1, 2, 3, 4</b>
Quiz 1	Monday of Week 2	10%	1, 2
Quiz 2	Monday of Week 3	10%	2
Quiz 3	Monday of Week 4	10%	3
Quiz 4	Monday of Week 5	10%	4

Assessment Tool	Due Date	Weight	Alignment with CLOs
<b>Assignments</b>	<b>Saturdays of Weeks 1, 2, 3, 4, 5, 6 (before 17:00 ET)</b>	<b>12%</b>	<b>1, 2, 3, 4, 5, 6</b>
Assign 1	Saturday of Week 1	2%	1, 2, 6
Assign 2	Saturday of Week 2	2%	2
Assign 3	Saturday of Week 3	2%	3, 4
Assign 4	Saturday of Week 4	2%	4
Assign 5	Saturday of Week 5	2%	4, 5
Assign 6	Saturday of Week 6	2%	5, 6
<b>Final Exam</b>	<b>Exam period</b>	<b>48%</b>	<b>3, 4, 5</b>
		<b>100%</b>	

## ASSESSMENT DESCRIPTIONS

### Quizzes

There are four quizzes in this course. These quizzes are designed to provide learners with immediate feedback on their knowledge. These quizzes are administered through onQ. You will have a one-day window of opportunity to initiate a quiz. Once initiated, you have 45 minutes and one attempt to complete a quiz (and additional time will be given for uploading scanned copy of solutions).

### 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

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.

### Remote Proctoring - Proctortrack

The final exam in this course will use remote proctoring provided by a third-party, cloud-based service that enables the completion of a proctored exam or test from an off-campus location, through onQ or Elenra. This online proctoring solution was chosen as part of the approach to maintaining academic integrity in online assessment. Precise details about how remote

proctoring will be used in this course can be found in the “Getting Started with Remote Proctoring” content module in onQ or will be provided by the instructor.

When writing tests/exams using remote proctoring, you are connecting to the third-party service. Queen’s has conducted a privacy and security review of the service in accordance with Ontario’s privacy legislation.

You should also take measures yourself to protect your information by keeping your NetID password and challenge questions private, closing all applications prior to starting an exam/test, and ensuring your device is updated and safeguarded against malware.

For more information about remote proctoring, see the Student FAQs on the OUR Exams resource page for [remote proctoring](#).

## **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).

**Course notes and other course-related material (SUGGESTED CONTENT)** 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.

### **Required Hardware/Software**

Students must have a reliable [internet connection and hardware](#) that are compatible with online learning and remote proctoring system requirements.

### Course Specific Computer-Related Skills

This course requires computer-related technical skills. For this course, you will also need to use the RocScience software that is available to all mining students at Queen's. This software is available on the desktop computers in the mining computer labs, which means that you will need to connect to the software through the [Queen's Virtual Desktop](#). Follow the link for details on how to set up this connection. Students will learn the software using self-directed tutorials prior to starting the assignments that use the software. The tutorials are located in the content folders for each week that is relevant.

### Suggested Time Commitment

This course represents a study period of 6 weeks. Learners can expect to invest on average 16-18 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 (SAMPLE TEXT)	Assessment
1	<p><b>Summary Statistics and Basics of Probability</b></p> <p>By the end of this week, learners will be able to:</p> <ul style="list-style-type: none"> <li>Summarize, visualize and interpret data using tabular and graphical methods [CLO1]</li> <li>Characterize the central tendency and variability of data using summary statistics [CLO1]</li> <li>Count outcomes in a sample space and perform and visualize event operations using Venn diagrams [CLO2]</li> <li>Apply the JMP software to visualize data and generate summary statistics results [CLO6]</li> </ul>	<p>Assgin 1 [CLO1] [CLO2][CLO6]</p>
2	<p><b>Basics of Probability and Discrete Probability Models</b></p> <p>By the end of this week, learners will be able to:</p> <ul style="list-style-type: none"> <li>Calculate probabilities and conditional probabilities [CLO2]</li> <li>Calculate probabilities and expected costs for discrete random variables [CLO2]</li> <li>Identify data that follow binomial or Poisson distribution, and calculate probabilities for the distributions [CLO2]</li> </ul>	<p>Quiz 1 [CLO1][CLO2]</p> <p>Assgin 2 [CLO2]</p>

Week	Learning Outcomes (SAMPLE TEXT)	Assessment
3	<p><b>Continuous Probability Models and Sampling Distributions</b></p> <p>By the end of this week, learners will be able to:</p> <ul style="list-style-type: none"> <li>• Calculate probabilities and parameters for continuous random variables via integration [CLO3]</li> <li>• Calculate probabilities and parameters for uniform, normal, and log-normal distributions [CLO3]</li> <li>• Calculate probabilities and parameters for the sample mean using sampling distributions and the central limit theorem [CLO4]</li> </ul>	<p>Quiz 2 [CLO2]</p> <p>Assign 3 [CLO3][CLO4]</p>
4	<p><b>Sampling Distributions and Statistical Inferences</b></p> <p>By the end of this week, learners will be able to:</p> <ul style="list-style-type: none"> <li>• Calculate probabilities and parameters for the sample mean and the sample variance using sampling distributions, when population variance is unknown [CLO4]</li> <li>• Construct confidence intervals for the mean [CLO4]</li> <li>• Perform hypothesis tests and calculate the p-values for the mean [CLO4]</li> </ul>	<p>Quiz 3 [CLO3][CLO4]</p> <p>Assign 4 [CLO4]</p>
5	<p><b>Statistical Inferences and Simple Linear Regression</b></p> <p>By the end of this week, learners will be able to:</p> <ul style="list-style-type: none"> <li>• Construct confidence intervals, perform hypothesis tests and calculate the p-values for the variance [CLO4]</li> <li>• Recognize the motivation for regression analysis and assumptions needed for linear regression [CLO5]</li> <li>• Perform simple linear regression analysis, including least squares estimation, quantitative and graphical diagnostics, and inferences on model parameters [CLO5]</li> <li>• Apply the JMP software to generate simple linear regression results [CLO6]</li> </ul>	<p>Quiz 4 [CLO4]</p> <p>Assign 5 [CLO4][CLO5]</p>

Week	Learning Outcomes (SAMPLE TEXT)	Assessment
6	<p><b>Simple Linear Regression and Multiple Linear Regression</b></p> <p>By the end of this week, learners will be able to:</p> <ul style="list-style-type: none"> <li>• Calculate confidence intervals for mean response and a single response for simple linear regression [CLO5]</li> <li>• Perform multiple linear regression analysis [CLO5]</li> <li>• Apply the JMP software to generate multiple linear regression results [CLO6]</li> </ul>	<p>Assign 6 [CLO5][CLO6]</p>

## 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 in a synchronous fashion with either a TA or the instructor through office hours. The instructor will provide a schedule of availability at the beginning of the term.

## **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.

# **COURSE POLICIES**

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

## **COPYRIGHT**

The material presented in this course is intended for use as part of the course at Queen's University and is the property of the instructor unless otherwise stated. Copying this material for distribution (e.g. uploading material to a commercial third-party website) can lead to a violation of Copyright law and constitutes a violation of Academic Integrity

## **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 exams, impersonating another student, copying from another student, making information available to another student about the exam questions or possible answers, communicating with another person during an exam or about an exam during the exam window, or accessing 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 may request an extension to an assignment due date without penalty. Requests must be made to your instructor prior to the original due date of the assignment, and some substantiating documentation is often required (see information below on absences). Note that unacceptable reasons include extra-curricular activities, travel plans, generally behind on schoolwork, etc. In the absence of substantiating documentation, the normal late penalty will apply as described in the assignment or departmental policies.

### **ABSENCES (ACADEMIC CONSIDERATIONS) AND ACADEMIC ACCOMMODATIONS**

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

### **RECORDING SYNCHRONOUS (LIVE) CLASSES**

Synchronous (live) classes will be delivered in this course through a video conferencing platform supported by the University [MS Teams, Zoom]. Steps have been taken by the University to configure these platforms in a secure manner. Classes will be recorded with video and audio (and in some cases transcription) and will be made available to students in the course for the duration of the term. The recordings may capture your name, image or voice through the video and audio recordings. By attending these live classes, you are consenting to the collection of this information for the purposes of administering the class and associated coursework. If you are concerned about the collection of your name and other personal information in the class, please contact the course instructor to identify possible alternatives.

To learn more about how your personal information is collected, used and disclosed by Queen's University, please see the general [Notice of Collection, Use and Disclosure of Personal Information](#).

## **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](mailto: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.

<b>EDUCATIONAL TECHNOLOGY</b>	<b>ACCESSIBILITY COMPLIANCE INFORMATION</b>
onQ (Brightspace Learning Management System by D2L)	<a href="https://www.d2l.com/accessibility/standards/">https://www.d2l.com/accessibility/standards/</a>
RocScience	<a href="https://www.rocscience.com/">https://www.rocscience.com/</a>
Google Spreadsheets	<a href="https://www.google.com/accessibility/products-features/">https://www.google.com/accessibility/products-features/</a>

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

### **ACCOMODATIONS RELATED TO REMOTE ASSESSMENT**

To have your accommodations applied to a remote-proctored exam please follow the instructions for submitting your information, as outlined on the QSAS website. Your accommodations will be incorporated into your exam session by the Queen's University exam coordinators, on behalf of your course instructor. This information is uploaded automatically to [Examity/ Proctortrack](#). Please note that exam accommodations that are uploaded for a specific exam are not visible to students. For example, extra time is calculated and added automatically to the exam duration but is only visible to students once they begin their exam in the Exam Portal.

If you are already registered with QSAS and you require additional accommodations related to remote-proctored exams, please consult with your QSAS advisor to update your Letter of accommodation as appropriate.

### **RELIGIOUS OBSERVANCE**

Students in need of accommodation for religious observance are asked to speak to their professor within a week of receiving their syllabus. Please note that Rosh Hoshana falls on the eve of September 18, 2020 so students in need of accommodation should speak to their professors right away. 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 Chaplain Kate Johnson via [Chaplain@queensu.ca](mailto: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.

### **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 109 countries around the world. You belong here: <https://www.queensu.ca/inclusive/>.