

## Course Outline (F2011)

### IND 605: Experimental Design and Quality Assurance

<b>Instructor</b>	Dr. Cory Searcy, Ph.D., P.Eng, Office: 338A Eric Palin Hall Phone: (416)-979-5000 ext. 2095 Email: <a href="mailto:cory.searcy@ryerson.ca">cory.searcy@ryerson.ca</a>
<b>Prerequisites</b>	MTH 410, CPS 125, MEC 222, MTL 200, PCS 211 and MEC 325
<b>Compulsory Texts</b>	<ol style="list-style-type: none"> <li>1. <i>Introduction to Statistical Quality Control</i>, 6<sup>th</sup> Edition, Douglas C. Montgomery, Wiley, 2009.</li> <li>2. <i>Design and Analysis of Experiments</i>, 7<sup>th</sup> Edition, Douglas C. Montgomery, Wiley, 2009.</li> </ol>
<b>Calendar Description</b>	The objective of this course is to introduce students to the design of experiments as well as statistical quality control. Topics on experimental design include single-factor experiments, block designs, factorial designs, 2-factor experiments and Taguchi's approach to parameter design. Topics on quality control include product flow chart, cause-effect diagram, Pareto Analysis, statistical process control, acceptance sampling and Taguchi's approach to quality.
<b>Learning Objectives</b>	<p>At the end of this course, the successful student will be able to:</p> <ol style="list-style-type: none"> <li>1. Demonstrate and apply core engineering principles and concepts to solve engineering problems (1c).</li> <li>2. Describe differences between different evaluation methods, select and apply appropriate evaluation methods at an appropriate point in a design project (4f).</li> <li>3. Deliver persuasive and professional formal presentations adapted to the needs of the audience (7b).</li> <li>4. Listen and appropriately respond to verbal questions and instructions (7b).</li> <li>5. Read and appropriately respond to technical and non-technical written instructions (7c).</li> <li>6. Illustrate concepts in graphical form (7d).</li> <li>7. Understand/establish project scope and desired deliverables (11b).</li> <li>8. Communicate key project deliverables in a clear, concise manner (11b).</li> </ol> <p>Note: Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board. For more information, see: <a href="http://www.feas.ryerson.ca/quality_assurance/accreditation.pdf">http://www.feas.ryerson.ca/quality_assurance/accreditation.pdf</a></p>
<b>Course Organization</b>	<p><u>Lectures:</u></p> <ul style="list-style-type: none"> <li>• Tuesdays: 8:00 am – 10:00 am in ENGLG21</li> <li>• Fridays: 1:00 pm – 2:00 pm in EPH 201</li> </ul> <p><u>Labs/Tutorials:</u></p> <ul style="list-style-type: none"> <li>• Wednesdays: 1:00 pm – 2:00 pm in EPH 344 / EPH 441</li> </ul>

Teaching Assistants:

- TBA

<b>Course</b>	Term Project	25%
<b>Evaluation</b>	Midterm exam	20%
	Lab reports (3)	9%
	Assignments (2)	6%
	Final exam	<u>40%</u>
	Total	100%

**Examinations** The mid-term and final exams are closed-book. The mid-term exam will be 90 minutes. The final exam will be 3 hours. Everything covered in class, the lecture slides, the required readings, the projects, or additional handouts may be tested. Additional details on the exam will be provided prior to the exam date.

**Course Content**

The tentative course schedule is provided in the table below. Every attempt is made to provide a schedule that is complete and that provides an accurate overview of the course. However, circumstances and events may make it necessary to modify the schedule during the semester.

<b>Class Number &amp; Date</b>	<b>Tentative (!) Lecture Topic</b>	<b>Reading</b>
1 September 6	<ul style="list-style-type: none"><li>• Course Introduction.</li><li>• Introduction to Quality Improvement.</li></ul>	SQC: Chapter 1 & 2
2 September 9	<ul style="list-style-type: none"><li>• Modeling Process Quality (Brief Review).</li></ul>	SQC: Chapters 3
3 September 13	<ul style="list-style-type: none"><li>• Inferences About Process Quality (Brief Review).</li><li>• The Magnificent Seven.</li></ul>	SQC: Chapters 4 & 5
4 September 16	<ul style="list-style-type: none"><li>• Introduction to Control Charts.</li></ul>	SQC: Chapter 5
5 September 20	<ul style="list-style-type: none"><li>• Control Charts for Variables.</li><li>• Team Project Work: Proposal Development.</li></ul>	SQC: Chapter 6
6 September 23	<ul style="list-style-type: none"><li>• Control Charts for Variables (continued).</li></ul>	SQC: Chapter 6
7 September 27	<ul style="list-style-type: none"><li>• Control Charts for Attributes.</li></ul>	SQC: Chapter 7
8 September 30	<ul style="list-style-type: none"><li>• Control Charts for Attributes (continued).</li></ul>	SQC: Chapter 7
9 October 4	<ul style="list-style-type: none"><li>• Process Measurement and Capability Analysis.</li><li>• Acceptance Sampling.</li></ul>	SQC: Chapters 8 & 15
10 October 7	<ul style="list-style-type: none"><li>• Acceptance Sampling (continued).</li></ul>	SQC: Chapter 16
11 October 11	<ul style="list-style-type: none"><li>• Management System Standards: ISO 9001 and ISO 14001.</li><li>• Team Project Work: Project Development.</li></ul>	No reading
12 October 14	<ul style="list-style-type: none"><li>• Review for Mid-Term Exam.</li></ul>	No reading
13 October 18	<ul style="list-style-type: none"><li>• <b>Mid-Term Exam.</b></li></ul>	No reading
14 October 21	<ul style="list-style-type: none"><li>• Review of Mid-Term Exam.</li></ul>	No reading.

<b>Class Number &amp; Date</b>	<b>Tentative (!) Lecture Topic</b>	<b>Reading</b>
15 October 25	<ul style="list-style-type: none"> <li>• Introduction to Design of Experiments.</li> <li>• Simple Comparative Experiments.</li> </ul>	DOE: Chapters 1 & 2
16 October 28	<ul style="list-style-type: none"> <li>• Analysis of Variance.</li> </ul>	DOE: Chapter 3
17 November 1	<ul style="list-style-type: none"> <li>• Block Designs.</li> <li>• Team Project Work: Project Development.</li> </ul>	DOE: Chapter 4
18 November 4	<ul style="list-style-type: none"> <li>• Introduction to Factorial Designs.</li> </ul>	DOE: Chapter 5
19 November 8	<ul style="list-style-type: none"> <li>• The 2<sup>k</sup> Factorial Design.</li> </ul>	DOE: Chapter 6
20 November 11	<ul style="list-style-type: none"> <li>• The 2<sup>k</sup> Factorial Design (continued).</li> </ul>	DOE: Chapter 6
21 November 15	<ul style="list-style-type: none"> <li>• <b>Project Presentations.</b></li> <li>• <b>Final Project Report Due.</b></li> </ul>	No reading
22 November 18	<ul style="list-style-type: none"> <li>• <b>Project Presentations.</b></li> </ul>	No reading
23 November 22	<ul style="list-style-type: none"> <li>• <b>Project Presentations.</b></li> </ul>	No reading
24 November 25	<ul style="list-style-type: none"> <li>• <b>Project Presentations.</b></li> </ul>	No reading
25 November 29	<ul style="list-style-type: none"> <li>• Course Wrap-up.</li> <li>• Review for Final Exam.</li> </ul>	No reading

### Laboratory/Tutorials

The tentative lab/tutorial schedule is provided in the table below. Every attempt is made to provide a schedule that is complete and that provides an accurate overview of the course. However, circumstances and events may make it necessary to modify the schedule during the semester.

<b>Number &amp; Date</b>	<b>Tentative (!) Topic</b>	<b>Room</b>
1 September 14	<ul style="list-style-type: none"> <li>• Introduction to the Course Project and Labs.</li> <li>• Selection of Project and Lab Teams.</li> </ul>	EPH 441
2 September 21	<ul style="list-style-type: none"> <li>• Lab 1 (Group A).</li> </ul>	EPH 344
3 September 28	<ul style="list-style-type: none"> <li>• Lab 1 (Group B).</li> </ul>	EPH 344
4 October 5	<ul style="list-style-type: none"> <li>• Lab 2 (Group A).</li> </ul>	EPH 344
5 October 12	<ul style="list-style-type: none"> <li>• Lab 2 (Group B).</li> </ul>	EPH 344
6 October 19	<ul style="list-style-type: none"> <li>• Review of Example Problems.</li> </ul>	EPH 441
7 October 26	<ul style="list-style-type: none"> <li>• Team Meeting (Progress Report) with Professor (Groups 1-5).</li> </ul>	EPH 338A
8 November 2	<ul style="list-style-type: none"> <li>• Team Meeting (Progress Report) with Professor (Groups 5-10).</li> </ul>	EPH 338A
9 November 9	<ul style="list-style-type: none"> <li>• Lab 3 (Group A).</li> </ul>	EPH 344

Number & Date	Tentative (!) Topic	Room
10 November 16	• Lab 3 (Group B).	EPH 344
11 November 23	• Review of Example Problems.	EPH 441
12 November 30	• <b>Project Presentations (if needed only).</b>	EPH 441

### Important Notes

- All of the required course-specific written reports will be assessed not only on their technical/academic merit, but also on the communication skills exhibited through these reports.
- All assignment and lab/tutorial reports must have the standard cover page which can be completed and printed from the Department website at <http://www.ryerson.ca/mie/undergraduate/importantinfo/>. The cover page must be signed by the student(s) prior to submission of the work. Submissions without the cover pages **will not** be accepted.
- Should a student miss a mid-term test or equivalent (e.g. studio or presentation), with appropriate documentation, a make-up will be scheduled as soon as possible in the same semester. Make-ups should cover the same material as the original assessment but need not be of an identical format. Only if it is not possible to schedule such a make-up may the weight of the missed work be placed on the final exam, or another single assessment. This may not cause that exam or assessment to be worth more than 70% of the student's final grade. If a student misses a scheduled make-up test or exam, the grade may be distributed over other course assessments even if that makes the grade on the final exam worth more than 70% of the final grade in the course.
- Students who miss a final exam for a verifiable reason and who cannot be given a make-up exam prior to the submission of final course grades, must be given a grade of INC (as outlined in the *Grading Promotion and Academic Standing Policy*) and a make-up exam (normally within 2 weeks of the beginning of the next semester) that carries the same weight and measures the same knowledge, must be scheduled.
- Medical or Compassionate documents for the missing of an exam must be submitted within 3 working days of the exam. Students are responsible for notifying the instructor that they will be missing an exam as soon as possible.
- Requests for accommodation of specific religious or spiritual observance must be presented to the instructor no later than two weeks prior to the conflict in question (in the case of final examinations within two weeks of the release of the examination schedule). In extenuating circumstances this deadline may be extended. If the dates are not known well in advance because they are linked to other conditions, requests should be submitted as soon as possible in advance of the required observance. Given that timely requests will prevent difficulties with arranging constructive accommodations, students are strongly encouraged to notify the instructor of an observance accommodation issue within the first two weeks of classes.
- The results of the first test or mid-term exam will be returned to students before the deadline to drop an undergraduate course in good Academic Standing.
- Students are required to adhere to all relevant University policies including:  
Undergraduate Grading, Promotion and Academic Standing, <http://www.ryerson.ca/senate/policies/pol46.pdf>  
Student Code of Academic Conduct, <http://www.ryerson.ca/senate/policies/pol60.pdf>  
Student Code of Non-Academic Conduct, <http://www.ryerson.ca/senate/policies/pol61.pdf>  
Academic Integrity Office website for additional policy information, [ryerson.ca/academicintegrity/](http://www.ryerson.ca/academicintegrity/)  
Undergraduate Academic Consideration and Appeals, <http://www.ryerson.ca/senate/policies/pol134.pdf>  
Examination Policy, <http://www.ryerson.ca/senate/policies/pol135.pdf>  
Accom. of Student Relig., Abor. and Spir. Observance, <http://www.ryerson.ca/senate/policies/pol150.pdf>  
Est. of Stud. Email Accts for Official Univ. Commun., <http://www.ryerson.ca/senate/policies/pol157.pdf>

9. Students are required to obtain and maintain a Ryerson Matrix e-mail account for timely communications between the instructor and the students.
10. Any changes in the course outline, test dates, marking or evaluation will be discussed in class prior to being implemented.
11. Students in this course are required to submit electronic file versions of their group lab/design reports to an electronic plagiarism detection service at [www.turnitin.com](http://www.turnitin.com). Students who do not want their work submitted to this plagiarism detection service must, by the end of the second week of class, consult with the instructor to make alternate arrangements. **Please note:** Even when an instructor has not indicated that a plagiarism detection service will be used, or when a student has opted out of the plagiarism detection service, if instructor has reason to suspect that an individual piece of work has been plagiarized, the instructor is permitted to submit that work in a non-identifying way to any plagiarism detection service.
12. Attendance at scheduled Laboratory sessions is compulsory.
13. Posting of grades for projects, labs, tests, and exam is normally done using *Blackboard Gradebook*. However, your final grade (numerical or letter) will not be posted. In some cases grades may be posted by *hardcopy* in a non-identifying way. Students who wish not to have their grades posted in *hardcopy* format must inform the instructor in writing.

Prepared By: \_\_\_\_\_  
Dr. Cory Searcy

Date: \_\_\_\_\_

Approved by: \_\_\_\_\_  
Dr. Saeed Zolfaghari

Date: \_\_\_\_\_