

ES 9002 – Research Methods in Environmental Applied Science and Management

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Office Hours:	Tuesdays: 3:00 p.m. – 4:00 p.m. Thursdays: 2:00 p.m. – 3:00 p.m. Other appointments may be arranged
Course Web Page:	https://my.ryerson.ca
Class Time:	Tuesdays September 8 – December 1, 2015 10:00 a.m. – 1:00 p.m.
Class Location:	SHE 540

Calendar Course Description:

“This seminar course involves study and application of methods appropriate to research in the environmental sciences and environmental management studies. It focuses on the challenges of engaging in research in a multi-disciplinary environment where students examine the conventions of research in their study areas. The purpose is to enable students to identify valid questions open to research and to introduce the methods needed to answer the question in ways that are unambiguous and supportable.” (Ryerson University Graduate Studies Calendar, 2015).

Course Objectives:

The objectives of this course are to present basic concepts and strategies in research methods that are prevalent in the environmental applied sciences and management, and which, in some cases, overlap the boundaries of specific academic areas. Beyond the basic concepts of obtaining data, analysis and interpretation of data, the course will address issues of theory, research organization, experimental design, sampling, data manipulation and communication of the results for graduate theses. The principal objective is to have students encounter and evaluate appropriate methods for research projects in their field of environmental applied science and management.

Students will focus on the conduct of research at the graduate level. They will advance by framing the research question, formulating hypotheses and by examining various modes of data collection. The objective is to specify a method and critically evaluate various data analysis techniques. Different types of research designs and methods will be presented with the emphasis on selecting the appropriate design and methods for a given research problem.

Course Materials:

Textbook: Salkind, N.J. 2012, *Exploring Research*. 8th Edition. Pearson Prentice Hall, Upper Saddle River, N.J.

References: Trochim, W.M.K. and Donnelly, J.P. 2008, *The Research Methods Knowledge Base*. 3rd Edition. Atomic Dog. Mason, OH.

Creswell, J.W. 2014, *Research Design*. 4th Edition. Sage. Thousand Oaks, CA.

Articles: Several articles are also required reading. A list of the required articles is provided on page 4 of the course outline. Hard copies will not be provided.

Slides: Lecture slides will be posted on the course web page in PDF format prior to each class. Please bring a copy of the slides to class. Hard copies will not be provided.

Course Evaluation:

Component	Weight
Assignments	20%
Research Papers	50%
Research Presentations	30%
TOTAL	100%

Assignments: Eight sets of assignment questions will be assigned over the course of the semester. Each set of questions is worth 2.5%. Additional details are available on page 5 of the course outline.

Papers: Two research papers are required. Each research paper is worth 25%. Additional details on the papers are available on page 7 of the course outline.

Presentation: Presentations of both research papers are required. Each research presentation is worth 15%. Additional details on the presentation are available on page 7 of the course outline.

Student evaluation will be expressed in raw marks (out of 100% for each evaluation component) during the course delivery. Mark total for the course will be obtained by assigning the component weights given above to the marks obtained in the course, and summing up the weighed marks. The letter grade system will then be applied to the final total mark only. As a guideline, the following grading scale will be used:

A+ 90.0 – 100%	B+ 77.0 – 79.9%
A 85.0 – 89.9%	B 73.0 – 76.9%
A- 80.0 – 84.9%	B- 70.0 – 72.9%
F < 69.9%	

Final course grades may not be posted or disclosed anywhere (including email) by the instructor.

Course Schedule:

The course will consist of a combination of lectures, in-class discussions, and oral presentations. The tentative course schedule is provided in the table on the next page. Every attempt is made to provide a syllabus that provides an accurate overview of the course. However, circumstances and events may make it necessary to modify the syllabus during the semester. Note that there is no class on **October 13** due to the fall break.

ES 9002 – FALL 2015 COURSE OUTLINE

Week & Date	Module	Tentative (!) Lecture Topic	Reading
1 Sept. 8	Course Introduction	<ul style="list-style-type: none"> • Introductions. • Course Outline and Overview. • Introduction to Research. 	<ul style="list-style-type: none"> • Salkind: pp. 1-5, 10-19, 23-32 • Articles: 1, 2
2 Sept. 15	Focusing Research Efforts	<ul style="list-style-type: none"> • The Research Process. • Selecting a Problem. • Literature Reviews. 	<ul style="list-style-type: none"> • Salkind: pp. 5-10, 21-23, 33-70, 77-81 • Articles: 3, 4, 5
3 Sept. 22	Research Sampling and Measurement	<ul style="list-style-type: none"> • Sampling and Generalizability. • Measurement, Reliability, and Validity. • Methods of Measuring Behaviour. 	<ul style="list-style-type: none"> • Salkind: pp. 95-131, 145-147 • Articles: 6
4 Sept. 29	Research Statistics	<ul style="list-style-type: none"> • Data Collection. • Descriptive Statistics. • Inferential Statistics. 	<ul style="list-style-type: none"> • Salkind: pp. 155-196 • Articles: 7, 8
5 Oct. 6	Non-Experimental Research Methods	<ul style="list-style-type: none"> • Descriptive Research. • Correlational Research. • Introduction to Qualitative Research. 	<ul style="list-style-type: none"> • Salkind: pp. 147-151, 197-213 • Articles: 9, 10
6 Oct. 20		<ul style="list-style-type: none"> • Qualitative Research Sources. • Qualitative Research Methods. • Reflections on Qualitative Research. 	<ul style="list-style-type: none"> • Salkind: pp. 214-227 • Articles: 11, 12, 13, 14
7 Oct. 27	Experimental Research Methods	<ul style="list-style-type: none"> • Introduction to Experimental Designs. • True-, Pre-, and Quasi-Experimental Designs. • Internal and External Validity. 	<ul style="list-style-type: none"> • Salkind: pp. 229-257 • Articles: 15, 16
8 Nov. 3	Mixed Methods Research	<ul style="list-style-type: none"> • Introduction to Mixed Methods Research. • Mixed Methods Research Strategies. • Data Collection, Analysis, and Verification. 	<ul style="list-style-type: none"> • Salkind: None • Articles: 17, 18
9 Nov. 10	Presenting Research	<ul style="list-style-type: none"> • Research Proposals and Papers. • Research Presentations. • Research Defense. 	<ul style="list-style-type: none"> • Salkind: pp. 259-277 • Articles: 19, 20
10 Nov. 17	Research Presentations	<ul style="list-style-type: none"> • Presentations of Research Methodologies. 	<ul style="list-style-type: none"> • None
11 Nov. 24		<ul style="list-style-type: none"> • Presentations of Critical Evaluation of Research Methodologies. 	<ul style="list-style-type: none"> • None
12 Dec. 1	Course Wrap-up	<ul style="list-style-type: none"> • Research Ethics. • Closing Thoughts. 	<ul style="list-style-type: none"> • Salkind: 83-94 • Articles: 21, 22, 23

Articles:

The following articles are required reading. Please review them in accordance with the course schedule provided on page 3. Some of the articles will not be formally addressed in the assignments or in the course slides, but they will provide a basis for discussion and reflection in the lectures.

1. Whetten, D.A. 1989, "What constitutes a theoretical contribution?", *Academy of Management Review*, Vol. 14, No. 4, pp. 490-495.
2. Sutton, R.I. and Staw, B.M. 1995, "What theory is not", *Administrative Science Quarterly*, Vol. 40, pp. 371-384.
3. Goodstein, D. 2000, "How science works", *Reference Manual on Scientific Evidence*. Second Edition. Federal Judicial Center, Washington, D.C. Available online: [http://www.fjc.gov/public/pdf.nsf/lookup/sciman00.pdf/\\$file/sciman00.pdf](http://www.fjc.gov/public/pdf.nsf/lookup/sciman00.pdf/$file/sciman00.pdf)
4. Bohannon, J. 2013, "Who's afraid of peer review?" *Science*, Vol. 342, No. 6154, pp. 60-65.
5. Rothwell, P.M. and Martyn, C.N. 2000, "Reproducibility of peer review in clinical neuroscience", *Brain*, Vol. 123, pp. 1964-1969.
6. Lee, A.S. and Baskerville, R.L. 2003, "Generalizing generalizability in information systems research", *Information Systems Research*, Vol. 14, No. 3, pp. 221-243.
7. Cohen, J. 1990, "Things I have learned (so far)", *American Psychologist*, Vol. 45, No. 12, pp. 1304-1312.
8. Cohen, J. 1994, "The Earth is round ($p < .05$)", *American Psychologist*, Vol. 49, No. 12, pp. 997-1003.
9. Munck, G.L. 1998, "Canons of research design in qualitative analysis", *Studies in Comparative International Development*, Vol. 33, No. 3, pp. 18-45.
10. Pratt, M.G. 2009, "For lack of a boilerplate: Tips on writing up (and reviewing) qualitative research", *Academy of Management Journal*, Vol. 52, No. 6, pp. 856-862.
11. Eisenhardt, K.M. 1989, "Building theories from case study research", *Academy of Management Review*, Vol. 14, No. 4, pp. 532-550.
12. Coghlan, D. 2004, "Action research in the academy: Why and whither? Reflections on the changing nature of research", *Irish Journal of Management*, Vol. 25, No. 2, pp. 1-10.
13. Stemler, S. 2001, "An overview of content analysis", *Practical Assessment, Research & Evaluation*, Vol. 7, No. 17, Available online: <http://pareonline.net/getvn.asp?v=7&n=17>
14. Corbin, J. and Strauss, A. 1990, "Grounded theory research: Procedures, canons, and evaluative criteria", *Qualitative Sociology*, Vol. 13, No. 1, pp. 3-21.
15. Jeng, M. 2006, "A selected history of expectation bias in physics", *American Journal of Physics*, Vol. 74, No. 7, pp. 578-583.
16. Bertrand, J.W.M. and Fransoo, J.C. 2002, "Operations management research methodologies using quantitative modeling", *International Journal of Operations and Production Management*, Vol. 22, No. 2, pp. 241-264.

17. Johnson, R.B. and Onwuegbuzie, A.J. 2004, "Mixed methods research: A research paradigm whose time has come", *Educational Researcher*, Vol. 33, No. 14, pp. 14-26.
18. Howe, K.R. 1988, "Against the quantitative-qualitative incompatibility thesis or dogmas die hard", *Educational Researcher*, Vol. 17, No. 8, pp. 10-16.
19. Linton, J.D. 2012, "How to get your papers rejected (or not)", *Technovation*, Vol. 32, pp. 6-8.
20. Grant, A.M. and Pollock, T.G. 2011, "Publishing in AMJ - Part 3: Setting the hook", *Academy of Management Journal*, Vol. 54, No. 5, pp. 873-879.
21. Hamming, R. 1986, "You and your research", Transcription of the Bell Communications Research Colloquium Seminar, Available online: <http://www.cs.virginia.edu/~robins/YouAndYourResearch.pdf>
22. Daft, R.L. 1983, "Learning the craft of organizational research", *Academy of Management Review*, Vol. 8, No. 4, pp. 539-546.
23. Honig, B. and Bedi, A. 2012, "The fox in the hen house: A critical examination of plagiarism among members of the Academy of Management", *Academy of Management Learning and Education*, Vol. 11, No. 1, pp. 101-123.

Assignment Question Details:

Below are some preliminary details on the assignment questions. Please note that these may be changed at the discretion of the instructor.

1. Eight sets of questions will be assigned over the course of the semester.
2. Students are expected to prepare a brief written answer to each set of questions. The answers must be typed in the Times New Roman style using 12-point font with 1.5 paragraph spacing. The maximum length of the answer for each component of the assignment is one page. A hard-copy must be provided in class.
3. All of the assigned questions will be discussed in class.
4. Each set of questions is worth 2.5% of the overall course mark. Answers will be marked as either "acceptable" or "not acceptable". Answers deemed acceptable will receive full credit, while answers deemed unacceptable will receive no credit.

Preliminary Assignment Questions:

Below are the preliminary assignment questions. Please note that these may be changed.

Assignment 1

- What is knowledge?
- What is science? What is environmental applied science? What is environmental management?
- Write a 1-page introduction of your potential dissertation topic. Provide a brief overview of the topic, the motivation for research, and the preliminary methodology.

Assignment 2

- Briefly discuss the philosophical positions of empiricism and rationalism.
- Briefly discuss the philosophical traditions of positivism, constructivism, and pragmatism.
- Write a 1-page critical evaluation of a journal article focused on environmental management or environmental science.

Assignment 3

Develop a discussion for validity and reliability for research design, with an emphasis on its application to your own dissertation research. In this discussion you must cover the following:

- Discussion of the nature of validity and reliability in research design.
- Strategies that a researcher might employ to enhance validity and reliability in research.
- The most common mistakes in research concerning establishment of validity and reliability.

Assignment 4

- As Cohen (1994) notes, “Popper proposed that a scientific theory be tested by attempts to falsify it”. What are the strengths and weaknesses of this approach?
- Cohen (1990 and 1994) makes frequent reference to power analysis. What is power analysis? Comment on the importance of power analysis in the design of experiments.
- Briefly explain the concept of statistical significance. How can the results of a study be statistically significant but not meaningful? Give an original example of when this might occur.

Assignment 5

- What scholarly criticisms are most likely to be raised regarding a study completed using qualitative methods? How might those criticisms be addressed?
- Write a 1-page evaluation of the qualitative research cycle proposed by Munck (1998).
- What are the key similarities between quantitative and qualitative research? What are some of the key differences?

Assignment 6

Write a research question that would best be answered through the following qualitative methods. In each case, explain why the research method would be most appropriate. Also note the specific scholarly criticisms that would most likely to be raised if the question was addressed using that method and how you would address those criticisms.

- Case study.
- Content analysis.
- Grounded theory.

Assignment 7

- What is an experiment? What are the key characteristics of a well-designed experiment?
- Write a research question that would best be answered through a quantitative modeling approach. Briefly explain why such an approach is appropriate to address the selected research question. Building on the discussion in Bertrand and Fransoo (2002), also briefly explain what this approach would require (i.e., in order to answer your research question).
- What scholarly criticisms are most likely to be raised regarding a study completed using quantitative methods? How might those criticisms be addressed?

Assignment 8

- What scholarly criticisms are most likely to be raised regarding a study completed using mixed methods? How might those criticisms be addressed?
- What research methods will you be using in your own dissertation? Why have you selected these methods? What are the key strengths and weaknesses of these methods?
- What are the most important things you have learned in this course? Do you have any suggestions for updating the course?

Research Paper Details:

Below are some preliminary details on the research papers. Please note that these details may be updated at the discretion of the instructor.

1. Two papers will be required over the course of the semester.
2. The first paper focuses on the development of a preliminary research methodology for your dissertation. All students must address the following question:
“Develop a scholarly discussion of the research methodology you will employ in your dissertation. At a minimum, you must address the following points: (1) Provide a brief introduction to your topic, including a problem statement, discussion of the rationale for research, and a summary of the current status of the topic. (2) Provide a concise summary of the key research questions you will be focusing on. (3) Develop a step-by-step approach to your research and briefly explain each step. At a minimum, you must address the strategy of inquiry, data collection procedures, data analysis procedures, and any anticipated ethical issues. The methodology must also be represented in a figure. (4) Develop a discussion of reliability and validity as they apply specifically to your research design.”
3. The second paper focuses on a critical evaluation of the research methodology presented in the first paper. All students must address the following question:
“Develop a scholarly critique of the research methodology you presented in the first paper. At a minimum, your critique must address the following points: (1) Discuss the philosophical basis for the perspective taken with respect to the proposed approach. (2) Review the scholarly criticisms that are most likely to be voiced concerning your research approach. Discuss the implications of these criticisms for your research design. (3) Discuss your approach to addressing the criticisms identified in your dissertation. (4) Discuss at least one alternative approach (at a high level) you could potentially employ to address the research questions that you have identified.”
4. The papers must be typed in the Times New Roman style using 12-point font with 1.5 paragraph spacing. The maximum length for each paper is fifteen (15) pages. A hard-copy must be provided in class. An electronic copy is also required to be submitted through D2L Brightspace.
5. References should be cited in the APA style. References are not included in the page limit.
6. Each paper is worth 25% of the overall course grade.
7. The first paper is due in class **November 17**.
8. The second paper is due in class **November 24**.

Research Presentation Details:

Below are some preliminary details on the research presentations. Please note that these may be updated at the discretion of the instructor.

1. Two in-class presentations will be required over the course of the semester.
2. Students will be expected to use Powerpoint in the presentations.
3. There is some flexibility on the structure of the presentation. However, the following guidelines should be applied:
 - *Outline*: The presentation should begin with a brief outline.
 - *Topic Overview*: Background on the topic of your research should be provided, including what it is, why it is important, and what needs to be done.
 - *Research Introduction*: A brief overview of the purpose and scope of your research should be provided.

- *Main Body*: In the first presentation, a detailed overview of the methodology should be presented. In the second presentation, a brief overview of the methodology should be provided along with a detailed critical evaluation of it.
 - *Summary*: A brief summary should be provided.
4. The duration of the presentations is 8 – 10 minutes. Please do not exceed the time limit.
 5. The presentation will be followed with a 10 minute question and discussion session. The presenter should be prepared to lead the discussion if necessary.
 6. Each presentation is worth 15% of the overall course grade.
 7. The first presentation will be held in class **November 17**.
 8. The second presentation will be held in class **November 24**.

Class Attendance and Participation:

Participants are expected to attend all classes. Interaction is an important part of the course, and students will be required to participate in weekly discussions. Participation is required for successful completion of this course.

Feedback:

Questions, comments, and suggestions regarding the course are welcomed. Electronic means of communication are preferred for discussions regarding lectures, assignments, and exams. Questions must be sent from a Ryerson University account with the course number in the message subject line. If you do not receive a response within one business day, please feel free to send a follow-up email.

Academic and Non-Academic Conduct:

All participants in the course are required to adhere to all relevant Ryerson University policies. Students are particularly encouraged to familiarize themselves with the Ryerson University Student Codes of Academic Conduct and Non-Academic Conduct.

The Student Code of Academic Conduct is available at:

<http://www.ryerson.ca/senate/policies/pol60.pdf>

The Student Code of Non-academic Conduct is available at:

<http://www.ryerson.ca/senate/policies/pol61.pdf>

Other Ryerson University policies, including the course management policy, are available at:

<http://www.ryerson.ca/senate/policies>