Catalog description:

An examination of science philosophy, scientific method, and contemporary paradigms applied to problems in environmental and natural resources management.

Full Description:

The objective of this course is to broaden your understanding of science in your discipline and introduce you to research and management paradigms for the natural resources and environmental sciences. We seek broader understanding of science as it is applied to the unique value-laden problems of environment and natural resources. Throughout this course, you will be exposed to wide-ranging literature dealing with social studies of science, bridges between quantitative and qualitative methods of inquiry, comparisons of natural and social sciences, approaches that emphasize stakeholder participation in science and management, and aspects of the interface between science and society. A thorough knowledge of readings will provide a basis for seminar discussions, some short lectures, and student writings/presentations.

Our goal is to help you as students (and us as instructors) break down the disciplinary barriers that inhibit a comprehensive understanding of environmental and natural resources science and management. We will explore concepts and discuss readings under a variety of subject headings, some representing concepts that have achieved “buzzword” status (e.g., everyone in our field has used, at one point or another, the term “sustainability,” but, in all likelihood, have not paused to consider what the term means or was intended to mean). Because of the format for this course, we expect that students will thoughtfully read all of the assigned readings and come to class prepared to lead and participate in probing and insightful discussions.

Student Performance Objectives

As a consequence of this course, the student will demonstrate the ability to

1. Describe the philosophical underpinnings of science as a way of knowing;
2. Compare and contrast natural and social science, as well as quantitative and qualitative research methods;
3. Incorporate concepts of scientific method and/or philosophy into the student’s own research,
4. Explain concepts related to management paradigms of sustainability, coupled human-ecological systems, adaptive management, and civic science;
5. Understand the role of science in policy making;
6. Identify key components of the “post-modern” paradigm and its challenge to traditional science;
7. Integrate social and natural science into the student’s own research.
Recommended Textbooks:


Additional readings from journal articles, books, and other sources are described in the course outline below. These readings will be made available electronically through the Carmen web program (http://telr.osu.edu/carmen/).

Assignments and Grading:

Your final grade will be out of a total of 100 possible points that will be assigned in the following manner:

1. Class Participation = 25 points
   Participation scores will be based on participation and leadership in classroom discussions. Regular attendance is a necessary, but not sufficient, condition for meaningful participation. Students will take turns leading a discussion on one of the readings. In addition, students will pick one reading of interest and find an outside reading related to it, and summarize that outside reading and how it links to the required reading. On some weeks we will hold a supplemental Thursday session to engage in informal discussion with visiting scholars and OSU faculty. Participation is expected at these sessions.

2. Mid-term Writing Assignment = 35 points

The historian of science Thomas Kuhn used the word paradigm to refer to the set of practices that define a scientific discipline at any particular period of time. Thus the paradigm of a particular scientific discipline comprises:

- what is to be observed and scrutinized
- the kind of questions that are supposed to be asked and probed for answers in relation to this subject
- how these questions are to be structured
- how the results of scientific investigations should be interpreted
- how is an experiment (or research in general to be conducted, and what equipment is available to conduct the experiment.

1) Think about the specific scientific discipline where your dissertation research is or will be centered and attempt to identify what elements in your area of study might satisfy the criteria listed above and thereby constitute the paradigm under which you work.

2) Thinking more closely about your particular research problem, briefly identify and explain the theory or theory set that will guide your research.
3) To the extent that you are able at this stage of your doctoral program, identify or deduce testable hypotheses from your theory base. These hypotheses do not necessarily have to be those that you will test with your dissertation research project, although it would be advantageous if they were.

4) Discuss how you might apply the deductive-nomological model or hypothetico-deductive scientific method to your dissertation or a research problem in your field. What might be the benefits and limitations that you would encounter in using these approaches to doing science in your discipline?

3. End-term writing assignment = 40 points

For this approximately 10-12 page (double spaced) paper, apply your knowledge of science philosophy and methodology to critically evaluate the scientific basis for our understanding of a contemporary environmental or natural resources management problem in your area of expertise. Be sure to keep the problem focused so that you can treat it thoroughly. We recommend that you focus on a problem that you are studying for your doctoral research but this is not required.

The minimum point percentages to achieve a given grade are as follows:

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<tr>
<th>Grade</th>
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<td>A</td>
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Class Meetings: We will meet on Tuesdays and Thursdays, from 2:20 to 3:40, to discuss readings as described in the course outline below. In addition, we may occasionally meet on Thursdays at a time to be arranged, to interact with invited guests and learn about their approaches and philosophies related to science and management. Some of the guest speakers will be presenting at the School’s Thursday seminar series.

Availability of Accommodations: If you need an accommodation based on the impact of a disability, you should contact one of the course instructors to arrange an appointment as soon as possible. At the appointment we can discuss the course format, anticipate your needs and explore potential accommodations. We rely on the Office For Disability Services for assistance in verifying the need for accommodations and developing accommodation strategies. If you have not previously contacted the Office for Disability Services, we encourage you to do so.

Method of Dealing with a Language Barrier: This course will be conducted in English. Students who have difficulty communicating in English are encouraged to seek assistance from sources outside the classroom. Arrangements can be made for enabling students with speech, hearing, or visual impairment to participate in the course, e.g., through assistance of transcribers or readers.

Academic Misconduct: Submitting plagiarized work to meet academic requirements, including the representation of another’s works or ideas as one’s own; the unacknowledged use and/or paraphrasing of another person’s work; and/or the inappropriate unacknowledged use of another person’s ideas; and/or the falsification, fabrication, or dishonesty in reporting research results, shall be grounds for charges of academic misconduct.

Course Schedule
UNIT 1: Science Philosophies and Methods across ENR Disciplines

Week 1 (Jan. 13/15): Introduction

a. Class organization and general discussion

b. First day questions:

What is a world view? Do you have one? If so what is your world view? Read the following to help you answer these questions:

Sire, J. W. 2009 (Chapter 1, A World of Difference)

What is science? What is your philosophy of science? Why are you here? Why did you decide to pursue a doctoral degree? Why is it called Ph.D.? How will you use your degree? Read the following to help you answer these questions:

Rosenburg, A. 2012 a (Chapter 1)
Rosenburg, A. 2012 b (Chapter 1)

c. Second day questions:

Do social scientists and natural scientists approach science differently? What do you have in common with scientists in other disciplines? How does society view scientists, the scientific process, and the outcomes of science? Read the following to help you answer these questions:

Wilson, E.O. 1998 (Chapter 4, The Natural Sciences)
Wilson, E.O. 1998 (Chapter 9, The Social Sciences)

Further Reading:
Wilson, E.O. 1998 (Chapter 10, The Arts and Their Interpretation)

Thursday guest participant: None (Dr. Jeff Sharp??)

Week 2 (Jan 20/22): Paradigms and disciplines

First day questions:

Paradigms, everyone has one, but what are they and what do we do with them? Read the following to help you answer these questions:


Further reading:
Forscher (1963)
Kuhn, *The Structure of Scientific Revolutions*, Chapters III-VII

Second day questions:

Do paradigms define a discipline? What are the paradigms and disciplines within ENR? Read the following to help you answer these questions:

Wilber, K. 2001. (Chapter 1, Introduction: Of Shadows and Symbols)
Creswell and Bean 1981 (Research Output, Socialization, and the Biglan Model)
Graham, M.H and P. K. Dayton 2002
Paine (2002)

Further reading:
Naeem 2002
Fierer et al. 2009

**Thursday guest speaker: Dr. Gerald Blazey**

Week 3 (Jan 27/29): The Meaning of Science and Interdisciplinarity

First day questions:

Rosenburg, A. 2012a (Chapter 2)
Rosenburg, A. 2012b (Chapter 2)

Further reading:
Guthery F. S. 2004 (Chapter 1)

Second day questions:

Davies and Devlin 2007 [Melbourne Model]
Heberlein (1988)
Strang 2009

Further reading:
Davies and Devlin 2009
Crow 2010 [ASU]
Christakis, N.A. 2013. (Let’s shake up the social sciences)

**Thursday guest speaker: Dr. Bob Roth, former SENR Associate Director**
Week 4 (Feb 3/5): Scientific explanation and laws

First day questions:

Rosenburg, A. 2012a (Chapter 3)
Rosenburg, A. 2012 b (Chapter 3)

Further reading:
Murray, B. G. 2001
Rosenburg, A. 2012a (Chapter 4)

Second day questions:

Rosenburg, A. 2012 a (Chapter 5)
Rosenburg, A. 2012 b (Chapter 4)

Further reading:
Salmon, W.C. 1996 (Chapter XI in Papineau, D. 1996 [Tom Kuhn meets Tom Bayes])

Thursday guest speaker: possibly Bob Roth, former SENR Director

Week 5 (Feb 10/12): Theories, hypotheses, and falsification

First day questions: Advocacy

Meyer et al. (2010)
Foote et al. (2009)
Brussard and Tull (2007)
Lackey (2007)
DeStefano and Steidl (2001)

Further reading:
Pace et al. (2010)

Tuesday guest speaker:

Second day questions:

Popper, K. R. 1959 (Chapter 1 [A survey of some fundamental problems])
Popper, K. R. 1959 (Chapter 3 [Theories])
Rosenburg A. 2012a (Chapter 7)
Rosenburg A. 2012b (Chapter 6)

Further reading:
Week 6 (Feb 17/19):  Inference: Induction, retroduction, and deduction

First day questions:

Rosenburg, A. 2012a (Chapter 10)
Popper, K. R. 1959 (Chapter 4 [Falsifiability])
Guthery, F. S. 2007

Further reading:
Loehle (1987)
Murray, B. G. 2001

Second day questions:

Rosenburg (2012a), Chapter 11
Romesburg, H. C. 1981 with comments from Matter and Mannan and reply

Further reading:
Romesburg, H. C. 1991 with comments from Knight and reply
Guthery 2004

UNIT 2: Scientific Method and Practice in the Natural and Social Sciences

Week 7 (Feb 24/26): Natural Science Method—Quantitative—Observation and measurement, vs. experiment

First day questions:

Rosenburg A. 2012a (Chapter 6)
Rosenburg, A. 2012a (Chapter 9)
Havens and Aumen (2000)

Further reading:
Schaffer and Johnson 2008
Johnson, D. H. 1999

Second day questions:

Nuzzo 2014 (Statistical Errors)
Murtaugh 2014 (Defense of P-values)
Burnham and Anderson 2014

Further reading:
Williams (1997)
Chamberlin, T. C. 1890 + Railsback summary [multiple working hypotheses]
Platt, J. R. 1964
*Friday end of day (11:59 pm) mid-term paper is due.

Thursday guest speaker:

Week 8 (Mar 3/5): Social Science Methods--trade-offs and quantitative

First day questions:
- Rosenberg A. 2012b (Chapter 9)
- Hoover, K. and T. Donovan 2004 (Chapters 3-5)

Second day questions:
- McGrath, J. E. 1981
- Singleton, R. A., and B. C. Straits 1999 (pp. 409-418)
- Yin, R. K. 2003 (pp. 1-9)

Thursday guest speaker: Christopher Peterson, chair of Environmental Sciences, Loyola University, Chicago, is giving SENR seminar.

Week 9 (Mar 10/12): Social Science Methods–Qualitative and Integrated

First day questions:
- George, A. L., and A. Bennett 2005 (Chapter 7)
- Brady, H. E. et al. 2004 (Chapter 1 pp. 3-20)

Second day questions:
- Ostrom, E. 2007

UNIT 3: Natural Resources Paradigms: The Interface of Science and Society

Thursday guest speaker:

*Spring Break is March 16-20

Week 10 (March 24/26): Sustainability and Resilience

First day questions:
- Daily and Ehrlich (1996)
- Ludwig et al. (1997)

Second day questions:
Czech (2000)
Costanza

Further reading:
Selected articles from ESA Forum: Science and Sustainability (1993)
Walker et al. 2006

Thursday guest speaker: SENR Thursday seminar speaker is shared with EPN – Joel Sartore, Nat Geo photographer...so not likely able to come speak to our students

Week 11 (March 31/April 2): Civic science and adaptive management

First day questions:
Rosenburg, A. 2012b (Chapter 7)
Excerpts from Fischer (2000)

Further Reading:
Decker et al. 1996
Riley S. J. 2003
Lee, K. N. 1993 (Chapter 7)

Second day questions:
Rosenburg, A. 2012a (Chapter 14)
Sire, J. W. 2009 (Chapter 9)
Gross and Levitt, Chapters 3 and 4.

Further Reading:

Week 12 (April 7/9): Science, policy, and politics

First day questions:
Etzkowitz H. 2000
George and Bennett ch. 12
Blockstein 2002

Second day questions:
Skolnikoff 1999
Sarewitz 2004.

Further reading:
Peterson, M. N. 2007

Thursday guest speaker:
Week 13 (April 14/16): Ethics and Values

Thursday guest speaker: Ajay Singh; Chris Tonra of SENR is doing Thursday seminar

Week 14 (April 21/23): Science and Religion

First day questions:

Rosenburg, A. 2012b (Chapter 13)
Science vs. Religion podcast (1 hour), To the Best of Our Knowledge, Wisconsin Public Radio
Pitock 2007 [Islam]
Mason 2008 [the Vatican]
Dawkins 1999 [no convergence]

Second day questions:

Rosenburg, A. 2012b (Chapter 14)
Ecklund, H. C. and J. Park 2009

Thursday guest speaker: Greg Hitzhusen

Final Exam time slot: project presentations and School vision discussion

References

Collier et Sal., 2003. “Qualitative versus Quantitative: What Might this Distinction Mean?” Qualitative Methods 1(1): 4-8


April 7 religion and science – Alayna and Nick

April 21 Monmet and Kirstin

Adaptive mgt and civic science Brice and Marisol

After spring break Matt and ?? March 24

March 26 Guan and Katie

April 14 Values and ethics Emily and Ashley