COURSE OUTLINE AND CONTENT

ENVS 3500 – Quantitative Assessment of Environmental and Natural Resource Problems

Instructor:
Charles Romesburg, Department of Environment and Society
(Address me any way you are comfortable with – Charles, Dr. R., Prof., . . . )

Office:
Quinney College of Natural Resources room 316
(I’ll give you my office hours the first day of class.)

Course Book:
Go to the Bookstore and under “Romesburg” you will find the course book in plastic shrink, consisting of lecture notes, homework assignments that go with the lecture notes, and laboratory assignments that go with the laboratory part of the course. (FYI: The course could be taught using commercially published textbooks but that would cost at least $300 per student. The inexpensive course book avoids this.)

Prerequisite Course:
Enrollment in ENVS 3500 is limited to those who have passed a course in inferential statistics. ENVS 3500 builds on the subject of inferential statistics and assumes you already know it.

Purpose of ENVS 3500:
First, to learn four interesting, important, interrelated topics. Second, to improve your ability to think, and third, to help you acquire a command of a subject that is necessary to either go on to graduate school or work professionally in the natural resources or environmental fields.

The four topics are these: (1) decision-making, (2) the calculus of probability, (3) survey sampling, and (4) scientific methods. The theme of this course is how uncertainty and risk affect the four, and how you can exercise control to minimize their adverse effects.
Regarding control you will learn: (1) procedures for making reliable decisions when you are faced with uncertainty and risk; (2) procedures for reliably estimating probabilities of excessive risk; (3) procedures for reliably estimating information about the environment such as the number of elk in a given area, the number of campers and their relevant attributes in a given place, and so forth; and (4) procedures for carrying out valid and reliable research with the most-used scientific methods.

All of this will be taught in the context of natural resources and environmental research using realistic examples. Specifically the topics will be spread over the following 28 Lectures (Lectures are on Mondays and Wednesdays):

Lecture 1: Introduction to ENVS 3500 (where you received this course outline).

Lectures on Decision-making
Lecture 2: Decision-making under uncertainty
Lecture 3: Decision-making under risk

The Calculus of Probability
Lecture 4: Introduction to Venn diagrams
Lecture 5: Practice working Venn diagrams
Lecture 6: Conditional probabilities
Lecture 7: Bayes’ rule
Lecture 8: (Exam #1)
Lecture 9: Improbable events and coincidences
Lecture 10: How chance events can appear as if deterministic laws had produced them
Lecture 11: Introduction to survey sampling
Lecture 12: The computer program MONTE, and simple random sampling
Lecture 13: The population of all sample means, and the standard error of the mean
Lecture 14: Practice interpreting MONTE outputs
Lecture 15: Practice problems in simple random sampling
Lecture 16: Estimating the sample size $n$ in simple random sampling
Lecture 17: (Exam #2)
Lecture 18: Use of the range $R$ in estimating sample size $n$
Lecture 19: How size and shape of quadrats affects the standard deviation of the population of quadrats
Lecture 20: Introduction to systematic sampling
Lecture 21: Introduction to stratified random sampling
Lecture 22: The conceptual basis of stratified random sampling
Lecture 23: Estimating the sample size $n$ in stratified random sampling
Lecture 24: (Exam #3)

**Lectures on Scientific Methods**

Lecture 25: Induction
Lecture 26: Establishing cause and effect. Generating hypotheses by retroduction and analogy.
Lecture 27: Hypothetico-deduction
Lecture 28: Basic science and applied science compared

**ENVS 3500 Lectures and Laboratories**

The Lectures on the above topics are in BNR 278, Mondays and Fridays, 1:00 p.m. to 1:50 p.m. Moreover, the three midterm exams will be on Fridays, 1:00 p.m. to 2:50 p.m., in BNR 278, and are counted as Lectures for convenience of reference.

For most of the other Fridays when there are no midterm exams, you will be doing Laboratory
Assignments from 1:00 p.m. to 2:50 p.m. on subjects that reinforce your understanding of the material covered in the Lectures. (At least one of the Labs will have a change of room from BNR 278 to BNR 360; I’ll let you know beforehand when this happens.)

**Professional Behavior is Expected**
This should be no problem for you. It means acting in a mature, responsible manner in class, not chatting idly or being disruptive in any way that a professional (such as the Forest Service and Park Service professionals I teach in short courses) would not be disruptive. In other words, be serious and businesslike, engaged in learning.

As to being disruptive, it seldom ever happens; yet there are enough people in the world that it is bound to happen some rare year, now and then. In ENVS 3500, the price is heavy – a deduction of 150 points that can be imposed by me, should I experience it in Lecture or Lab. Why such a great penalty? Jobs are in short supply in your fields, and society that foots more than half the expenses for your educations wants the most professional people to get the jobs– thus the weeding out of any who behave in disruptive fashion. I encourage you to ask questions in class, to provide comments, to argue points, even disagree with the material if you can back your idea-- that is not disruptive. What is disruptive is what halts learning and teaching.

Professional work and responsibility go both ways. I will be professional in my behavior to you, for instance in preparing good study material in your course book, preparing my class lectures thoroughly so as not to waste your time, teaching in a way that makes it easy for you to take notes, knowing the subject matter in depth so I can answer your questions, correcting your assignments promptly, providing you with the answers to the midterm and final exams immediately after you take them when exams are still fresh on your mind, and respecting you when you earn it by showing professionalism. Should I be unable to answer a question, I will find out the answer soon after class and report back to you. If ever you think I’m not acting professionally, please tell me.

**Standards for Exams and Laboratory Assignments:**
Exams will not be given ahead of the time they are scheduled, nor can you take them after the
As to missing a Lab by not coming to the full period on a Friday: should you miss one Lab, you will be given at the time you take the final exam a 40-point question on the general course material as a chance to make up the 40 points due to missing the Lab. As to missing more than one Lab, you will lose the chance of making 40 points for each one missed, since there is no way to make up Labs because they are team exercises.

Attendance in Lectures:
I’ll take roll at the start of each Lecture. You are permitted up to three missed Lectures for the term. Any misses beyond this, unless you supply a note from your physician, the athletic department in case of official USU team sporting events, etc., will result in your final grade being dropped a grade notch. For example, a student whose total points in the course translate into a grade of, say, C will instead receive a C-minus. The reason for this policy is that knowledge is transmitted in Lecture, and missing Lectures lessens the transmission.

Grading:
1. Midterms and the final exam. For this, 475 points are possible -- 100 for each of the three midterms and 175 for the final exam. Depending on how the class does, I may sometimes give additional curve points.

2. Homework assignments. These are 4 points maximum each. They will only be accepted for a grade by your turning them in to me when I call for them at the start of Lecture. The two lowest homework assignments will be dropped. In total, about 64 homework points are possible. (Do your own homework as copying is an offense at USU that may result in a student’s dismissal, and the ENVS Department Head, Dr. Mark Brunson, has a policy that professors who see copying send him the names of the students involved.)

3. Laboratory Assignments. You will have eight Laboratory Assignments to do. They are worth a maximum of 40 points each, or 320 points in all. To get 40 points for a Laboratory Assignment, you must prepare for the Assignment (usually as a member of a class has.
team you will be on), come to Lab on the Friday when the Assignment is conducted, be there on time (1:00 p.m.), stay until the assignment is over, and do a professional job in Lab in presenting and discussing the assignment. In other words, your professional preparation and your presence is likely to earn you 40 points each time there is a Lab.

Number of points possible (PP). Total points you earned (TP)

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<td>Exam #1</td>
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<tr>
<td>Homework assignments</td>
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<td>Laboratory</td>
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<td>Final Exam</td>
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PP = 859 assuming professional behavior

Compute your point grade (PG) as PG = (TP/PP) X 100

IF 93.4 ≤ PG ≤ 100 give yourself an A
90.0 ≤ PG ≤ 93.3 give yourself an A-
86.7 ≤ PG ≤ 89.9 give yourself a B+
83.4 ≤ PG ≤ 86.6 give yourself a B
80.0 ≤ PG ≤ 83.3 give yourself a B-
76.7 ≤ PG ≤ 79.9 give yourself a C+
73.4 ≤ PG ≤ 76.6 give yourself a C
70.0 ≤ PG ≤ 73.3 give yourself a C-
66.7 ≤ PG ≤ 69.9 give yourself a D+
60.0 ≤ PG ≤ 66.6 give yourself a D
PG ≤ 66.6 give yourself an F

By regularly attending the Lectures and Labs, and by studying diligently and doing all of the homework assignments, you can put yourself in position for earning yourself a good grade in ENVS 3500.