

**CIVE/STAT 547**  
**Statistics for Environmental Monitoring**  
**Spring**

**Catalog Description:** (3,0,0). Applications of statistics in environmental pollution studies involving air, water, or soil monitoring; sampling design; trend analysis; censored data.

**Objectives:** Students will become familiar with standard statistical methods for design of environmental sampling programs and analysis of environmental data. Both parametric and nonparametric approaches will be covered. The course is interdisciplinary and should appeal to students from mathematics and statistics, engineering, and natural sciences. The course concentrates on practical applications, including case studies and the use of statistical software. Applications include air, water, soil, and biological monitoring.

Upon completion of this course, students should be able to:

- Describe the standard statistical methods for design of environmental sampling programs and analysis of environmental data.
- Choose an appropriate sampling design—such as simple random, stratified, or systematic sampling—for a specific environmental monitoring program.
- Compute precision or sample size requirements for given sampling design and population characteristics
- Choose and apply appropriate data analysis methods for characterizing environmental populations, standards compliance, cultural trends, and watershed or urban development

**Prerequisite:** STAT 301 (or familiarity with basic statistics)

**Text:** *Statistical Methods for Environmental Pollution Monitoring*  
by R.O. Gilbert, Van Nostrand Reinhold, 1987

**Instructor:** Jim Loftis, Civil and Environmental Engineering  
A205D Engineering  
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Email: [Jim.Loftis@colostate.edu](mailto:Jim.Loftis@colostate.edu) (best way to contact me)  
Phone: 970-491-2667  
Office Hours: 10-11am (before class) on Tuesday and Thursday

**Web Delivery and Expected Workload:**

This is a RamCT Blackboard course. Pre-recorded lectures (audio with Powerpoint slides) and course notes (Powerpoint slides) are available on RamCT Blackboard and are

the most important source of course content for both campus students and distance students. The pre-recorded lectures will be supplemented by problem and discussion sessions in the regularly scheduled class periods. The classroom sessions will be recorded and made available to both campus students and distance students via Blackboard as well.

Attendance is optional but encouraged and should be enjoyable and worthwhile. Please bring questions to class when possible so that everyone can benefit from the discussion. **If you do not attend class, you will need to view the recorded classroom sessions on Blackboard-- in addition to the pre-recorded lectures--since important content and course information will be presented in the classroom sessions. The total workload for the course including pre-recorded lectures, classroom sessions, and reading/homework/exam preparation, is expected to average at least 9 hours per week.**

E-mail is the best way to contact the instructor. Phone conversations can be arranged when needed. Campus students may arrange office visits during office hours or at other times.

Reading and homework assignments are posted on Blackboard. Due dates and exam dates will be posted on the Blackboard course calendar. Distance students will have one additional week beyond the posted due dates to complete both homework assignments and exams.

### **Exams:**

Exams will be handled in the traditional way for on-campus students. For off-campus students, exams will need to be proctored. In accordance with Colorado State University OnlinePlus proctoring guidelines, off-campus students have two options for having paper-based exams proctored for this course. Both options require you to submit a Proctor Identification Form found at <http://www.online.colostate.edu/proctoring/> at least two weeks prior to the first exam.

### Proctoring Options:

1. Take the exam at an OnlinePlus facility in Fort Collins or Denver, or at the University Testing Center (UTC) on-campus. Schedule an appointment at least three days before you need to take your exam. OnlinePlus offices do not charge for proctoring services. Contact OnlinePlus at 970-492-4704 (Fort Collins) or 303-573-6318 (Denver) or the UTC at (970) 491-6498 for more information.
2. Work with an eligible proctor outside of Colorado State University. Your proctor selection is subject to approval. Any costs incurred due to using an outside proctor is your responsibility. Please review the eligibility guidelines found on the OnlinePlus website when selecting an outside proctor.

Visit the OnlinePlus website at <http://www.online.colostate.edu/answers/services/proctoring.dot> for more information about your proctoring options and eligible proctors.

It is your responsibility to select an eligible proctor, schedule exams with your proctor, and abide by all rules for bringing only appropriate materials into the testing area. Mobile or other electronic devices are strictly prohibited. You will need to provide photo identification to your proctor prior to taking any exam. Appropriate identification includes: driver's license, CSU Student ID, passport, or other government issued photo identification.

If you have any questions or concerns about your responsibilities, you may contact OnlinePlus at [onlineplus\\_proctoring@colostate.edu](mailto:onlineplus_proctoring@colostate.edu).

### **Special Accommodation:**

Students who need special accommodation for exams should contact Resources for Disable Students ([rds.colostate.edu](http://rds.colostate.edu)).

### **Homework:**

Homework is not graded or returned, but must be turned in to receive credit and to prepare for the exams. Solutions are found in the text or posted on Blackboard.

**Grading:**

Two exams:	20% each
Final exam:	25%
Term project:	20%
Homework:	15%

For the final course grade, +/- grading is used, A-, B+ etc. based on rank in class.

**Software:** All you need for now is Excel. We shall also use ProUCL, which is a free download from EPA. Minitab will be discussed and is a great bargain at student pricing (from Minitab or the Software Cellar on campus), but is not needed for the course.

## **CIVE/STAT 547 TOPICS AND TENTATIVE SCHEDULE**

<b>Week</b>	<b>Topic</b>	<b>Chapters</b>
1	Introduction and review, populations, Distributions, sampling design	1-3
2	Simple random sampling	4

3	Stratified random sampling, two-stage sampling	5-6
4	Three-stage sampling, compositing, systematic sampling	7-8
5	Double sampling, locating hot spots	9-10
6	ProUCL, Boxplots; <b>Exam #1</b>	notes/lecture
7	Quantiles, proportions, means; binomial distribution	11, notes
8	Skewed distributions, goodness-of-fit, ProUCL	12
	<b>SPRING BREAK</b>	
9	Characterizing lognormal populations, Censored data	13-14
10	Censored data, ROS/ProUCL,	14
11	Outlier Detection, Prediction Intervals, Regression	15 notes
12	Software (regression and PLs), <b>Exam #2</b>	
13	Nonparametric trend analysis	16-17
14	Comparing populations, ANOVA	18, notes
15	Multivariate Methods, Course Evaluation	Notes
16	<b>Final Exam</b> (May 14, 2014 9:40 – 11:40 am)	