

Experimental Design & Data Analysis

Summer C 2017

AGR 6932 Section 752H for students at REC Campus

Credit Hours: 03

INSTRUCTOR: Dr. Edzard van Santen
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NOTE: ALL COMMUNICATION will be through CANVAS. This protects both sides in any discussion as CANVAS provides a track record of a given exchange. I will generally respond quickly anytime between 5 am and 8 pm.

Office hours: by appointment through CANVAS and UF Calendar Function. A regular weekly schedule, mutually agreeable to all parties, will be established for students to interact with the instructor via Skype.

Time: Voice-over PowerPoint presentation will be available on CANVAS and may be viewed anytime. In order to foster simultaneous progress of all students, it is expected that students deal with the presentations in a timely manner.

Location: REC Campus

Delivery: Lectures and peer-review assignments – online (60%)

Group-assignments – physical presence required at REC campus (40%). Day and Meet Time to be determined by small group for mutually agreeable times.

Required Materials:

Bowley, S.R. A Hitchhiker's Guide to Statistics in Biology (Generalized Linear Mixed Models Edition). Plants et al. Kincardine, Ontario. This required text was submitted through the "Textbook Adoption for UF Faculty and Staff" and should be available from the usual sources.

Reprints from primary and secondary literature will be assigned on a case-by-case basis and made available on CANVAS.

Prerequisites: Prerequisite: STA 6166, ALS 5932 Intro to Applied Statistics, or consent of instructor. Basic statistics and a basic understanding of research and research protocols are prerequisites for the course.

Course overview and learning objectives:

Statistical theory regarding the analysis of experimental data has advanced tremendously over the last 20 years. Yet this progress often is not reflected in the way students analyze their own research data. One reason is an inherently human trait to hang on to the ‘tried and true’, i.e., data are analyzed based on the advisors statistical knowledge, shaped sometimes decades ago, rather than the most up to date techniques that would extract the maximum amount of information from the data. It is crucial that students gain the knowledge of the most modern techniques and procedures to analyze their own data. This course is designed to provide the participants with hands-on skills needed to analyze their own experimental data efficiently using appropriate statistical procedures, while also providing the theoretical framework.

Course Description:

AGR 6932 is a 3-credit hour course composed of 20 lectures, 10 homework assignments, five written paper reviews, five online discussion contributions in CANVAS to posted paper reviews, and two examinations. The first exam (midterm) is an in-class closed book exam and the second (final) is an open book, take home exam.

This 6000-level course requires active student participation. It is based on the following assumptions that we will retain 10% of what we hear, 25% of what we read, 50% of what we do, and 75% of what we teach others. Hence, while the format is that of a traditional lecture, active interaction will enhance the benefits derived from this course. Active participation during lectures is one of the means by which to enhance learning. Thoroughly delving into assigned readings is another. For the homework assignments students will be paired in groups thus covering both the doing and teaching aspects of enhanced learning.

Course Topics:

1. The process of analyzing data – Week 1
2. Treatment designs and implications for analysis – Week 2
3. Basic experimental designs – Week 2 - 3
 - a. CRD, RCB, LS, Crossover
 - b. Restrictions on randomization
4. Linear Models – Classification – Week 4 - 6
 - a. Fixed
 - b. Mixed
 - c. Generalized
 - d. Generalized Mixed
5. Regression techniques – Week 7 - 9
 - a. Linear, including ANCOVA
 - b. Multiple
 - c. Non-linear
6. Multivariate techniques – Week 10 - 11
 - a. Variable directed
 - b. Class directed
7. Analysis of multi-environment experiments Week 12 - 13

Course Requirements:

1. Homework Assignments:

Students will be grouped into teams by location and will submit homework assignments as a team. The instructor will make the assignment during the first week of class. The semester is quite short in the great scheme of things and the course needs to move at a pretty good clip. Homework assignments, which are the key to hands-on learning, are published on CANVAS Thursdays and are due Thursday of the following week. Homework assignments will consist of data analysis problems and answering questions to assigned readings. They are a learning tool and will be graded as follows:

- A.** There will be a penalty of 5 points for every day an assignment is late.
- B.** Once turned in, all homework assignments will be evaluated over the weekend, mistakes noted, graded, and returned by Tuesday of the following week.
- C.** The team then has until 5:00 pm Friday of that week to correct the mistakes and turn in the corrected homework. I will then assign the final grade. If ALL mistakes are corrected a perfect score will be assigned.

2. Reading assignments:

In every field of scientific endeavor there are key papers that shaped the future or explained the past. Experimental statistics and agricultural biometry is no exception. Each student will write five (5) discussion papers from the assigned primary and secondary literature readings and post it on CANVAS for everyone else to read and to respond to.

- A.** Again, students will be working in location teams and the writing will be a group effort.
- B.** There will be a penalty of 5 points for every day the assignment is late.
- C.** Each review will be worth 25 points. Given that this is a graduate course, it is expected that the review follow the format template provided in CANVAS in all aspects. It is understood that the contributions grammatically and syntactically follow standard American English customs.

3. Discussion contributions:

Each individual student is expected to make five (5) substantial contributions to the discussion papers posted by your colleagues on CANVAS.

- A.** In order to avoid having all the discussion contributions at the end of the semester; each students will have to make one substantial contribution for each paper. Not acceptable are responses such as good job, way to go, I like it, etc. An acceptable the response would be “I consider the point raised by the review team X valid for reasons (1)-----, (2)----, and (3) -----.” or “I had trouble understanding the effect of considering Block a random effect has on the scope of inference of the experiment and would appreciate some help.”
- B.** Each discussion contribution will be worth 5 points.

4. Mid-term Examination:

This is a traditional in-class, closed book proctored exam covering the first half of the course, proctored. It will be administered and graded the week prior to the drop date set by the

academic calendar. Answers to exam question will be essays as befits a graduate level course. The entire class period (50 min) will be available for completion of the exam.

5. Final Examination:

The final will be take-home. Students are allowed to use any source of information at his/her disposal within the ethical framework of experimental research. Students may discuss the questions with anyone willing to talk but the write-up has to be the students own. Answers cannot be copied from somebody else. Verbatim quotes from the literature without indicating that fact (plagiarizing) are never permitted. If a student plagiarizes, he/she will receive zero points for the **ENTIRE** final exam. This means that even with a perfect score for all homework, literature review, online discussion and the midterm, the highest grade possible will be a C.

Performance Evaluation:

Required performance measures are given in the following table. Assignments turned in late be assessed a penalty of 5 point per day. If you foresee a problem (Field trips in other classes, Field research requiring you to be away from campus, Jury Duty, National Guard Duty, etc.) please see me beforehand. I am generally very accommodating but it is not my job to anticipate your needs.

Homework / Examination	Points
10 homework assignments @ 30 points	300
5 reading assignments @30 points	150
5 discussion contributions @ 10 points	50
Midterm	250
Final	250
TOTAL MAXIMUM POINTS	1000

The course will follow the customary +/- grading scale, where 950 - 1000 = A, 900 - 949 = A-, 870 - 899 = B+, 830 - 869 = B, 800 - 829 = B-, 770 - 799 = C+, 730 - 769 = C, 700 - 729 = C-, 670 - 699 = D+, 630 - 669 = D, 600 - 629 = D-, and 0 - 599 = E.

Software Training

I will offer weekly training sessions via Skype for three popular number crunching tools (EXCEL, JMP, and SAS) during May and June. These training sessions will expose students to basic input and output commands and some simple data manipulation techniques. Students will need access to a computer with JMP, SAS and EXCEL either loaded or available via UF Apps. Students **will not be permitted** to use SAS Studio as it complicates communication among groups.

Schedule:

A detailed schedule will be available in CANVAS no later than midnight May 8, 2017, the first day of classes.

Academic Honesty

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity." You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment."

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>.

Services for Students with Disabilities

As a professor with a physical disability, whose needs have been addressed by the University, I am sensitized to disability issues. If you have a need, I would strongly encourage you to seek assistance from the Dean of Students Office (DSO). The Disability Resource Center (DRC) within that office coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation. 0001 Reid Hall, 352-392-8565, <https://www.dso.ufl.edu/drc/students>

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general well being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu/cwc/

Counseling Services Groups and Workshops Outreach and Consultation Self-Help Library
Wellness Coaching

Career Resource Center, First Floor JWRU, 392-1601, www.crc.ufl.edu/

Software Use:

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.