EXPERIMENTAL DESIGN AND DATA ANALYSIS
AGR 6932 Sections 10300 (SAS on campus), 21366
(SAS REC), & 22118 (R on campus)

Credit Hours: 03

INSTRUCTOR: Dr. Edzard van Santen
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SECTIONS 10300 & 22118 – on campus students:

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.

Time: Thursdays Period 04 and 05 (10:40 – 12:35 am); the third instructional period will be small-group, hand-on learning at a mutually agreeable time.

Lecture location: 426 McCarty Hall C

Hands-on Group sessions: SCU teaching lab (426 McCarty Hall C). A mutually agreeable time will be set during the first week of class. Gideon Alake (agideon@ufl.edu) will be the TA for the SAS training and Simon Riley (simon.riley@ufl.edu) will conduct the R training.

Attendance and Make-Up Work

I will NOT take attendance as I find this practice demeaning to graduate students and to myself. General UF rules may be found at https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/. I realize that research, project work, conferences etc. put demands on your time. I am willing and able to work with you to resolve scheduling conflicts but do request that you give me the courtesy of informing me of planned absences, if at all possible. I'd be happy to arrange one-on-one or one-on-few session if you need to review certain concepts.

SECTIONS 21366 – REC students:

NOTE: ALL COMMUNICATION will be through CANVAS. This protect 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: via Zoom by appointment through CANVAS and UF Calendar Function. If you happen to be on campus you may also arrange to meet with me in my office.

Time: Class day is Thursday Period 04 and 05 (10:40 – 12:35 am) but lectures may be viewed at any time. The third instructional period will be small-group, hand-on learning using the Zoom platform and/or prerecorded instructions. It is likely to your advantage if you attend lecture in real time. This will give you the opportunity to ask questions as well as learn from questions your fellow students ask. Edgar Sierra (e.sierra@ufl.edu) from the Gulf Coast REC will be your TA.

Lecture Location: Delivery via online recordings in mp4 format

Hands-on Group sessions: Video conferencing via Zoom. A mutually agreeable time will be set during the first week of class. Edgar Sierra (e.sierra@ufl.edu) from the Gulf Coast REC will be your TA.

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ALL SECTIONS

Required Materials:

Bowley, S.R. A Hitchhiker's Guide to Statistics in Biology (Generalized Linear Mixed Models Edition). Plants et al. Kincardine, Ontario. May be obtained from the instructor. Price $ 55.

Reprints from primary, secondary, and tertiary 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:

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 the inherently human trait to hang on to the 'tried and true', i.e., data are analyzed based on the advisor's statistical knowledge, shaped sometimes decades ago, rather than the most up to date techniques that would extract the maximum amount of information from a given body of 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 participants with hands-on skills needed to analyze their own experimental data efficiently using appropriate statistical procedures, while also providing the theoretical framework.

Learning objectives:

1. Recognize specific experiment designs by following the Factor Relationship Approach.
2. Develop a thorough understanding of the concepts Experiment Unit and Exp. Error.
3. Recognize the difference between linear and non-linear models
4. Develop the ability to develop a mixed models analysis independently.
5. Develop the ability to ability to develop a Generalized linear model independently.
6. Develop the ability to import data into SAS and alter the structure of data tables
7. Develop the ability to summarize data efficiently in SAS
8. Develop the ability to create publication-ready graphs in SAS
9. Develop the coding skills for a Linear Mixed Models analysis
10. Develop the coding skills for a Generalized Linear Mixed Models analysis

Course Description:

AGR 6932 is a 3-credit hour course composed of approximately 20 lectures, plus graded assignments designed to reinforce concepts and techniques.

This 6000-level course requires active student participation. It is based on the 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 you can enhance your 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 (approximate time line):

1. Leveling the playing field, review of basic stats - Week 1
2. The process of analyzing data – Week 1
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. Linear Models – Regression – Week 7 - 9
   a. Linear, including ANCOVA
   b. Multiple
   c. Non-linear
6. Multivariate techniques – Week 10
   a. Variable directed

   b. Class directed
 7. Analysis of multi-environment experiments Week 11

Course Requirements:

1.   Quizzes and Assignments (500 points):

Lecture and Assigned Reading Quizzes. These completely open book quizzes will be published on Friday of most weeks. They are designed to keep you on track and reinforce concepts and understanding of the material. The point value will depend on the difficulty of the topic.

SAS and R Training Quizzes. These completely open book quizzes will be published on Monday each week during the first half of the semester, and due exactly a week later. Each quiz is designed to keep you on track and reinforce concepts and understanding of the SAS/R training material.

Assignments may take on different forms, e.g., an analytical problem, a literature discussion, etc. Depending on the assignment, they may have to be completed individually or by groups. The point value of an assignment will depend on the difficulty of that assignment. A semester is quite short in the great scheme of things and we need to move at a pretty good clip. There are some basic rules: (**1**) Assignments will **only** be accepted through CANVAS or Dropbox (if specified as such). (**2**) Assignments have to be turned in by the deadline given. If an assignment is turned in late, a penalty of 10% may be assigned. (**3**) If I request a correction, you have 5 days to turn in that correction. These assignments will be in the form of problem sets, literature reviews, group discussion, etc.

Exam 1 will test the basic knowledge of the SAS or R statistical software (input, output, data manipulation, and basic procedures). It is due the week following spring break, i.e. the 2nd week of March. This is a take-home exam.

Exam 2 will test knowledge of basic statistical concepts, both background knowledge and concepts covered in class. This is a closed book exam. The only tools allowed are pencil and eraser. It will be administered the week following spring break, i.e. the 2nd week of March. REC have to arrange for a proctor no later than beginning of spring break.

Exam 3 is a take-home exam. Students will develop a portfolio of SAS or R program snippets that they deem useful for their future career as scientists. This portfolio should span the entire range of data analytic tasks, cover at the minimum (1) data acquisition, (2) data manipulation, (3) data summarization and verification, (4) data visualization, and (5) data analysis, include examples for Linear Mixed Models (RCB, ANCOVA, RCB-SP, RCB-SB, RCB repeated measures) and Generalized Linear Mixed Models (RCB, ANCOVA, RCB-SP). Specific requirements will be published in early April, approximately 4 weeks before the end of the spring term.

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
Quizzes and Assignments	500
Exam 1	150
Exam 2	200
Exam 3	150
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 training sessions for three popular number crunching tools (EXCEL, SAS, and R (provided we have at least 5 on-campus students enrolled) during week 2- 9 of the term. These training sessions will expose students to basic input and output commands and some simple data manipulation techniques. These sessions are mandatory. For my class, however, Students will need a laptop with SAS or R and EXCEL either loaded or available via UF Apps. It will be necessary to bring a laptop to the lab sessions and sometimes to lecture.

Study Groups

Over the last several years I have discovered that my course is not for solo fighters. Hence I will assign each student to a study group for purposes of homework assignments and literature reviews, each being evaluated on the basis of team performance. If, and only if, team members do not agree with the joint effort, a member may submit his/her own homework. Groups may be rotated such that group members are exposed to different points o of view by virtue of the diversity of research specialization. Exams have to be submitted by each student individually.

Schedule:

A detailed schedule will be available in CANVAS no later than midnight January 9, 2020, the first lecture day

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 (DS0). 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.

Online Course Evaluation Process

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

The last class day is reserved for this purpose but you may complete the evaluation as soon as it becomes available. The results will not be available to your instructor until the final exam period has passed.