***PLNTPTH 5550:***

***Quantitative Methods for Agricultural Scientists***

**Instructor:** Brian McSpadden Gardener, Professor, Dept. of Plant Pathology, 214 Selby Hall, OARDC, Wooster (330) 202-3565, mcspadden-garden.1@osu.edu

**Credit:** 3 semester credit hours (U or G)

**Semesters Offered:** AutumSemester. Monday 6 pm to 9 pm.

**Prerequisites:** None.

**Required Texts:**

Ireland, C. 2010. Experimental statistics for agriculture and horticulture. CABI/Cambridge University Press: Cambridge.

McSpadden Gardener, BB and AK Lilley. 2006. Statistical analyses of microbiological and environmental data. P. 553-583. In Modern Soil Microbiology, 2nd ed., van Elsas, Trevors, and Wellington eds. CRC Press: Boca Raton, FL. (on Carmen)

*Suggested Supporting Texts:*

Clewer, AG and DH Scarisbrick. 2001. Practical Statistics and Experimental. Design for Plant and Crop Science. John Wiley & Sons:Chichester.

Forthofer, RN, Lee, FS, and M. Hernandez. 2007. Biostatistics, Second Edition: A Guide to Design, Analysis and Discovery. Academic Press:London.

Fry, JC (editor) 1993. Biological Data Analysis, a Practical Approach. IRL Press, Oxford, England. Chapters: 1,2, 4, 5, 6

Sheskin, DJ. 1997. Handbook of parametric and nonparametric statistical procedures. CRC Press, Boca Raton, FL

McGarigal, K., Cushman, S., and S. Stafford. 2000. Multivariate Statistics for Wildlife and Ecology Research. Springer: New York.

**Course Objectives:**  After taking the course students should have the ability to:

Describe and design sampling strategies for agricultural and environmental research

Link research hypotheses to the design and implementation of statistical analyses

Describe the key questions addressed by different univariate and multivariate approaches

Independently analyze data from their own experiments

Effectively use Minitab statistical software and interpret the outputs

Prepare figures and tables that most effectively communicate their results

Critically evaluate quantitative methods used in published research

Participate in more advanced courses on experimental design, multivariate statistics, and modeling.

**Overview of Course:** The nature of biological data requires that particular attention be paid to model formulation and analysis. This course provides an accelerated and hands-on introduction to the quantitative methods commonly used in agricultural and environmental life sciences research. Course content will consist of lecture/discussion and a hands-on laboratory where students perform and present data analyses.

This course focuses on the methods used to describe and evaluate typical data collected in biological experiments at the molecular, cellular, organismal, population, and ecosystem levels. The use of standard statistical methods (e.g. comparison, correlation, regression) for single and multivariate cases will be reviewed. Application of such methods to experimental design will be highlighted. Additional material will cover clustering and ordination methods and their use in taxonomy and phylogenetic analysis.

**Course Logistics:** PLNTPTH 5550 is a combined lecture and lab course taught simultaneously on both campuses. For lab, students need to bring be prepared to conduct analyses in class on their own laptop (or with a friend) and on the video linked computer. Video-links will be provided between the main campus in Columbus and the OARDC campus in Wooster.

There will be regular homework assignments, completion of which will be considered as part of the participation grade.

There will be a Student Practicum presentation, wherein each student will analyse and report on their own data set. The assignment requires an oral presentation in the format of a lab meeting, and a written report including one figure or Table formatted for a specific journal of the student’s choosing. If the student has yet to generate a sufficient amount of data, the instructor will provide a model data set for the student to analyze.

**Lectures Topics and Class Schedule:**

**Aug 27: Class Introduction** and **Topic 1**: Scientific method, data, and variables

**Sept 3:** No class, students meet to discuss their data sets and prepare spreadsheets**.**

**Sept 10: Topic 2**: Descriptive statistics and **Topic 3**: Graphing data

**Sept 17: Topic 4:** Modeling and distributions and **Topic 5:** Hypothesis testing

**Sept 24: Topic 6:** Assumptions

**Oct 1: Topic 7:** Linear regression

**Oct 8: Topic 8:** Analysis of variance and Experimental Design

**Oct 15:Topic 9:** Transformations, trimming and nonparametrics and **Review for midterm exam**

**Oct 22: *Midterm Exam***

**Oct 29: Discussion of Practicum** and **Topic 10:** Classification

**Nov 5: Topic 11:** Ordination and discrimination

**Nov 12:Topic 12:** Cluster analysis

**Nov 19: Topic 13:** Evolution and algorithms and **Topic 14:** Alignments and phylogenetics

**Nov 26: Student Practicum Presentations**

**Dec 3: Student Practium Presentations** and **Review for final exam**

**Dec 10: *Final Exam***

**Evaluation and assessment:** This course will be letter graded. Each item below will be graded on a 0-100 scale, and final grades will be curved.

Midterm Exam 20%

Final Exam (comprehensive) 30%

Class participation 25%

Practicum presentations 25%

**Grading Scale:** Total points accumulated will be used as the basis for the final course grade, as follows: (Some percentages are approximate).

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| --- | --- |
| 94% - 100% | A |
| 90% - 93% | A- |
| 87% - 89% | B+ |
| 83% - 86% | B |
| 80% - 82% | B- |
| 77% - 79% | C+ |
| 73% - 76% | C |
| 70% - 72% | C- |
| 67% - 69% | D+ |
| 60% - 66% | D |
| <60% | F |

**Academic Misconduct:** Adopted in 1992, the Code of Student Conduct is a set of rules that protects persons and property of the university community. As members of the university community, each of us enjoys certain rights and privileges. Among these are the right to be free from a variety of forms of discrimination and sexual harassment, the right to discuss and exchange ideas, the right to be involved in University governance, and the right to privacy. Privileges like these are accompanied by an obligation to live by the rules and policies established for the orderly operation of the university. Degree requirements, rules against plagiarism and other forms of academic dishonesty, residence hall rules, and financial aid eligibility requirements are examples of the rules that govern life on campus. Please review these rules as they apply to you during your participation in PLNTPTH 8300. Pay particular attention to section **3335-23-04 Prohibited conduct** of the Code of Student Conduct (online at http://studentaffairs.osu.edu/resource\_csc.asp). Academic misconduct erodes the integrity of the University and will not be tolerated. All suspected cases will be forwarded to the University's Committee on Academic Misconduct for action. Copies of the Resource Guide for Students may be obtained from the Student Advocacy Center, Room 205 Ohio Union (292-1111), the office of Student Judicial Affairs, Room 2025 Drake Union (292-0748), or from the College office.

In practice, this means that there will be no tolerance for submitting plagiarized work to meet academic requirements. This includes, but is not limited to, 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 (i.e. cheating) in producing material for evaluation of your performance. All this shall be grounds for charges of academic misconduct and will be treated according to the above statement.

**Students with disabilities:** Arrangements can be made for enabling students with speech, hearing, or visual impairment to participate in the course. Please contact the instructors. Additional assistance is also available through the Office for Disability Services - Room 150 Pomerene Hall (Columbus) or by calling (614) 292-3307.