

## WIS 6934 Multivariate Statistics for the Life Sciences (3 credits)

Fall 2018

**Tuesday:** Period 4 (McCarty B 3096), **Thursday:** Periods 3 and 4 (McCarty B 3086)

### Instructor:

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**Office hours:** Thursday 1-2pm

### Course Description:

This course provides students with a conceptual and practical understanding of the application of multivariate statistics in the life sciences. This course consists of a one period lecture and a two period computer lab (which may also contain a lecture) where students will put to use the techniques learned in lecture using R, the open source language for statistical computing and graphics. The **prerequisites** are an introductory statistics course and some experience with the R language (although the latter is not strictly necessary).

### Course Objectives:

The goal of this course is for students to gain proficiency in selecting appropriate multivariate analyses, implementing these analyses in R, and interpreting and disseminating results. Sample data sets from across the life sciences will be provided and students will have the opportunity to analyze their own data.

### Course Schedule:

*Course Schedule is subject to change*

*Lecture #	Topic	Readings
1	Intro to multivariate statistics	McGarigal et al., Ch. 1
2	Multivariate Data: screening, transformations, distance measures	Borcard et al. , Ch. 2 & 3 (pgs. 31-45)
3	<b>Ordination 1:</b> Principal Components Analysis (PCA)	McGarigal et al., Ch. 2 (pgs.19-55) Peres-Neto et al. 2003
4	<b>Ordination 2:</b> Principal Coordinates Analysis (PCoA) and Correspondence Analysis, Non-Metric Multidimensional Scaling (NMDS)	Borcard et al. , Ch. 5 (pgs. 132-145)
5 <i>Project Due</i>	<b>Cluster Analysis 1:</b> Clustering Methods	McGarigal et al., Ch. 3 (pgs. 81-104)
6	<b>Cluster Analysis 2:</b> Choosing Clustering Methods and Visualization	Borcard et al. , Ch. 4 (pgs. 53-79)

7	<b>Testing for groups:</b> perMANOVA, Mantel's test	McCune and Grace, Ch.24 & 27
8	Discriminant Analysis/MANOVA	McGarigal et al., Ch. 4
9 <i>Project Due</i>	Classification and Regression Trees (Cart)	De'ath & Fabricius 2000
10	Constrained Ordination	Borcard et al. , Ch. 6
11	Constrained Ordination continued/Variance partitioning	Borcard et al. , Ch. 6 Cushman & McGarigal 2002
12	Final Project Discussion	
13	Advanced Topics: TBD	TBD
14	Comparison of Techniques	McGarigal et al. Ch. 6

\*each lecture has an associated lab

### **Important Dates:**

**Friday, September 21:** Project 1 is due

**Friday, October 19:** Project 2 is due

**Friday, December 7:** Final Project is due

### **Course Readings:**

#### **Required:**

\*Borcard, D., Gillet, F., & Legendre, P. (2011). *Numerical ecology with R*. Springer.

McGarigal, K., Cushman, S., & Stafford, S. (2000). *Multivariate statistics for wildlife and ecology research*. Springer, New York.

\*Everitt, B. & Hothorn, T. (2011). *An Introduction to Applied Multivariate Analysis with R*. Springer, New York.

\*online version available for free from UF Library

### **Grading:**

	<b># of points</b>	<b>% of Grade</b>
Class attendance	30	25%
Class participation	30	25%
Projects (2)	30	25%
Final Project	30	25%

**Grading Scale:** A  $\geq$  92%, A- = 90-91.9%, B+ = 87-89.9%, B = 82-86.9%, B- = 80-81.9%; C+ = 77-79.9%, C = 72-76.9%, C- = 70-71.9%; D+ = 67-69.9%, D = 62-66.9%, D- = 60-61.9%, F < 60%

**Class attendance:** You are required to attend all classes and labs. You may be absent from one class (lecture or lab) without it affecting your grade. You will receive 1 pt. per lecture and lab for being present.

**Class participation:** You are expected to participate in lectures by answering and asking questions. You are expected to participate in lab by completing all of the required assignments. You will receive 1 pt. per lecture and lab for participating.

For information on current UF policies for assigning grade points, see <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### **Attendance and Make-Up Work**

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

### **Online Course Evaluation Process**

Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>. Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.

### **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: <http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>.

### **Sexual Harassment**

It is the policy of The University of Florida to provide an educational and working environment for its students, faculty, and staff that is free from sex discrimination and sexual harassment. In accordance with federal and state law, the University prohibits discrimination on the basis of sex, including sexual harassment. Sex discrimination and sexual harassment will not be tolerated, and individuals who engage in such conduct will be subject to disciplinary action. The University encourages students, faculty, staff, and visitors to promptly report sex discrimination and sexual harassment. If you believe you have been subjected to sex discrimination or sexual harassment please report the incident to me or any University official, administrator, or supervisor. The Office of Human Resource Services investigates all complaints. Incidents should be reported as soon as possible after the time of their occurrence ([larry-ellis@ufl.edu](mailto:larry-ellis@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.

### **Services for Students with Disabilities**

The Disability Resource Center 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.

Disability Resource Center : 0001 Reid Hall, 352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)

### **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/](http://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/](http://www.crc.ufl.edu/)*