

# **Morphometrics (ANG6930)**

## **Syllabus – Spring 2017**

**Lectures:** Tuesday 3:00pm – 4:55pm (8-9 period) – TUR2303  
Thursday 4:05pm-4:55pm (9 period) – TUR2303

**Instructor:** Dr. Valerie Burke DeLeon  
Department of Anthropology  
University of Florida  
352-294-7602

**Email:** [vdeleon@ufl.edu](mailto:vdeleon@ufl.edu)

**Office hours:** Turlington B374; Wednesdays 11am-1pm and by appointment

### **Course Description:**

This is an applied workshop course in *Morphometrics*, the statistical analysis of shape. Thursday classes will include a lecture on theory, and Tuesday classes will usually include a discussion period, a demonstration of methods used, and “workshop” time for independent progress on class assignments. Readings will be assigned from the text or posted to the website for each week. Grades are based on timely submission of weekly assignments and the submission and presentation of a final project.

### **Course Objectives:**

- 1) Learn to think critically about the quantification and analysis of shape.
- 2) Gain practical experience in collecting precise and repeatable landmark coordinate data.
- 3) Become familiar with commonly used morphometric software packages and their appropriate use.

### **Course Materials:**

#### **Text:**

Zelditch M, *Geometric Morphometrics for Biologists*

#### **Software programs:**

Excel  
ImageJ  
MicroScribe Utility Software  
eTDIPS  
MorphoJ  
WinEDMA  
Geomorph for R

#### **Website:**

Canvas ([ufl.instructure.com](http://ufl.instructure.com))

**Communication:** Email is the best way to reach Dr. DeLeon ([vdeleon@ufl.edu](mailto:vdeleon@ufl.edu)). Please use “Morphometrics” in the subject line.

**Final Project:** You will use methods learned in this course to design and implement a research project that includes the statistical analysis of *shape*. You may have overlap between this project and other program requirements (e.g., course projects). The final project should be written in manuscript form and include the following estimates of *text* length. In addition, please include figures, which may be embedded in or follow the text.

Title page

Introduction (statement of hypothesis with relevant, ***brief*** literature review) ~ 1 page

Materials and Methods (emphasis is on this section; be explicit) ~ 2 pages

Results (include tables, figures, and statements of statistical significance) ~ 2 pages

Conclusions (inferences based on the results and possible future directions) ~ 1 page

References

Each student will also prepare and present a 15-minute Powerpoint presentation to the class. Equal time should be allocated to describing 1) data collection and analytic methods, 2) results and interpretation, and 3) advice, tips, and suggestions for your classmates. Presentations are intended to be fun and informative, so please talk to Dr. DeLeon in advance if you have any concerns about this requirement.

**Grading:** Homework assignments (approximately 12) are equally weighted and count for 60% of your grade. To encourage participation in discussion of articles, 15% of your grade will be based on submission of potential research articles and discussion questions for assigned articles. The final project (written portion) counts for 25% of your grade. Letter grades are assigned in accordance with university policy.

**Attendance:** Our learning environment depends heavily on discussion, and each student has a responsibility to attend and contribute to the class.

**Course Evaluations:** You are encouraged to share your opinions at any time with Dr. DeLeon in person or by email. In addition, students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

**University Policy on Accommodating Students with Disabilities:** Students requesting accommodation for disabilities must first register with the Dean of Students Office (<http://www.dso.ufl.edu/drc/>). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive, therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

**University Policy on Academic Misconduct:** Academic honesty and integrity are fundamental values of the University community. Students should be sure that they understand the UF Student Honor Code at <http://www.dso.ufl.edu/students.php>.

**Course Schedule:**

Jan	5	LECTURE: Review syllabus and software programs READING: none ASSIGNMENT: Install software for use on your personal computer (due 1/10)
	10	LECTURE: <b>Shape</b> READING: Zelditch, Ch 1 WORKSHOP: Use ImageJ to collect metric data from 2D images
	12	LECTURE: <b>Landmark Coordinate Data</b> READING: Zelditch, Ch 2 ASSIGNMENT: Define the chosen landmarks explicitly (due 1/17); Begin collecting landmark data ( $k \geq 10$ , $n=4,4$ , $r=3$ ) using Microscribe or eTDIPS (due 1/26)
	17	DISCUSSION: Landmark definitions WORKSHOP: 1) Use the MicroScribe to collect data from dry skulls. 2) Use eTDIPS to collect data from digital reconstructions of skulls.
	19	LECTURE: <b>Geometric Morphometrics: Superimposition methods</b> READING: Zelditch, Ch3 ASSIGNMENT: Finish collecting landmark data (above, due 1/26)
	24	WORKSHOP: 1) Use the MicroScribe to collect data from dry skulls. 2) Use eTDIPS to collect data from digital reconstructions of skulls.
	26	LECTURE: <b>Geometric Morphometrics: Shape Space and TPS</b> READING: Zelditch, Ch4, skim Ch5 ASSIGNMENT: Format combined data for import to MorphoJ and R. Use MorphoJ and R to calculate shape coordinates for the combined samples (due 2/2).
	31	READING: <i>Article TBD</i> WORKSHOP: Use MorphoJ to explore data, including options for superimposition, identifying errors and outliers. Address data formatting issues.
Feb	2	LECTURE: <b>Principal Components Analysis</b> READING: Zelditch, begin Ch 6; skim Ch 8 and 9 ASSIGNMENT: Produce a figure illustrating some interesting aspects of the combined dataset in a PCA plot. Consider how “size” may or may not be related (due 2/9).
	7	READING: <i>Article TBD</i> WORKSHOP: Statistical analysis of shape coordinates in MorphoJ and R. Formatting graphs in MorphoJ and R.
	9	LECTURE: <b>Canonical Variates and Discriminant Function Analyses</b> READING: Zelditch, finish Ch 6 ASSIGNMENT: Compare and contrast PCA and canonical variates analysis of Macaca vs Papio (due 2/16).
	14	<b>(AAFS Mtg)</b> READING: <i>Article TBD</i> WORKSHOP: Use MorphoJ and R to run canonical variates and discriminate functions, test significance, and interpret results.
	16	<b>(AAFS Mtg)</b> LECTURE: <b>Partial Least Squares</b> READING: Zelditch, Ch 7 ASSIGNMENT: Prepare a one paragraph summary outlining question, samples, data, and analyses for final project (due 2/23).

	21	READING: <i>Article TBD</i> WORKSHOP: Using MorphoJ and R for PLS block analysis
	23	LECTURE: <b>Euclidean Distance Matrix Analysis</b> READING: Richtsmeier et al., 2002 ASSIGNMENT: Use the combined dataset to conduct an analysis in WinEDMA, and illustrate and interpret the results (due 3/2).
	28	READING: <i>Article TBD</i> WORKSHOP: Format combined data for import to WinEDMA. Use WinEDMA for PCOORD, Form, Shape, and Growth analyses. Interpret results.
Mar	2	LECTURE: <b>Measurement Error</b> READING: von Cramon-Taubadel et al., 2007 ASSIGNMENT: Critically assess your own original data collection vs the mean estimates for the class (due 3/16).
	7	SPRING BREAK
	9	SPRING BREAK
	14	READING: <i>Article TBD</i> WORKSHOP: Using R to quantify and illustrate measurement error
	16	LECTURE: <b>Outlines, Surfaces, and Semilandmarks</b> READING: Zelditch, Ch ASSIGNMENT: Use R (or other software) to compare pelvic inlet shape across samples (data provided) (due 3/23).
	21	READING: <i>Article TBD</i> WORKSHOP: Resampling curves (and surfaces); evaluate existing software
	23	LECTURE: <b>Modularity and Integration</b> READING: TBD ASSIGNMENT: Continue progress on final project
	28	WORKSHOP: Using MorphoJ to assess modularity; Using Geomorph to assess integration
	30	LECTURE: <b>Recent Advances</b> READING: TBD ASSIGNMENT: Continue progress on final project
Apr	4	WORKSHOP: TBD
	6	Dedicated Workshop Time
	11	Presentation of Final Projects (4)
	13	Presentation of Final Projects (2)
	18	Presentation of Final Projects (5)