

12:145 Morphometrics (1-3 s.h.)
The University of Iowa
Fall 2012

SYLLABUS AND COURSE INFORMATION

Instructor: Dr. Ann F. Budd, 255 TH, 335-1817, ann-budd@uiowa.edu; Office hours: 10:30-11:30am MTTh

Department: Geoscience, 121 TH, 319-335-1818

Department Chair: Prof. M. K. Reagan, 121C-TH, geology-deo@uiowa.edu, 319-335-1820

General course description and goals : to provide an introduction and/or review of quantitative methods used in the collection and analysis of morphologic data, including both 2D and 3D geometric morphometrics and the application of multivariate statistical methods to the study of size and shape. Students learn how to conduct independent research projects using morphometric techniques, and to understand and critique current journal articles in evolutionary biology that use morphometrics.

Course websites: For course syllabus and schedule, class materials and grades, see ICON

Modules: The course will consist of three modules: (1) lecture and lab (with lectures from 12:30-1:20pm on Tuesdays in 231 TH, and labs from 2:30-4:20pm on Thursdays in 20 TH), (2) discussion (12:30-1:20pm on Thursdays in 231 TH), (3) independent projects (in which each student meets individually with me every 2-3 weeks). Each module is worth one s.h. and students should register for 1-3 s.h., depending on how many modules they would like to take. There are no exams in any of the modules of this course. The content of the course varies depending on student interests, and this course can be repeated.

Module 1: Lecture and lab

The lecture/lab module will involve a series of 12 labs covering 2D and 3D data acquisition and analysis. The emphasis will be on geometric morphometrics and landmark analysis; however semi-landmarks and outline methods will also be covered. The main difference between 2012 and previous years is that almost all of the data processing and analysis will be performed using R. The old labs have been completely rewritten using R; SAS will no longer be used, and IMP will be used only under very special circumstances. The following statistical analyses will be covered: simple regression, multiple regression, analysis of variance (including MANOVA and multi-factor ANOVA), analysis of covariance (including partial least squares), principal component analysis, canonical variates analysis, various resampling methods etc. Grades will be based on 12 lab reports (30 points each). [360 points total]

The following textbook will be used and will be available at the IMU bookstore:

For IMP: Zelditch, M.L., D.L. Swiderski, and H.D. Sheets, 2012. Geometric morphometrics for biologists, 2nd edition. ISBN 978-0-12-386903-6. Academic Press, 478pp. (required)

Module 2: Discussion

The discussion module will discuss recent journal articles in evolutionary biology, which use morphometric techniques. We will read different articles than in previous years. The articles will be

posted for each of 12 weeks in ICON. Topics include the study of development, adaptation, variation within and among species, among others. One student will serve as discussion leader for each article, and all students will be expected to submit written summaries (300 word) of each article in ICON dropbox [10 points for each 12 weeks], and participate in discussion [5 points for each of 12 weeks]. Grades will be based on discussion leading (60 points), written summaries (120 points), and participation (60 points). [240 points total]

Note: There will be no discussion during weeks 1, 8 or 15. During the discussion period in week 1, there will be an Into to R lecture. During the discussion period in week 15, there will be student presentations. There will be a review of statistical methods during week 8 at a time/place to be announced.

Module 3: Independent project

Students will conduct independent research related to their thesis or dissertation, in which they collect and analyze morphometric data. A 1-page project proposal should be submitted in ICON dropbox by November 1. The final project report should be 10-12 manuscript pages (excluding the title page) and written in APA style (see: <http://www.apastyle.org/index.aspx>). It should be submitted using ICON dropbox. Grades will be based on (1) a 15-minute oral presentation during week 15, and (2) a final project report due on December 7. [100 points total]

Students with disabilities: Students with disabilities that require modifications of seating, testing, or other class requirements should report to Prof. Budd as soon as possible, so that appropriate arrangements can be made.

Tutorial services: No special tutorial services are available for this course.

Student's Rights and Responsibilities: All students in the College have specific rights and responsibilities (see: [CLAS Student Academic Handbook](#)). For example, you have the right to adjudication of any complaints you have about classroom activities or instructor actions. Information on these procedures is available below and in the College's Student Academic Handbook. You also have the right to expect a classroom environment that enables you to learn, including modifications if you have a disability.

Your responsibilities to this class, and to your education as a whole, include attendance and participation. You are also expected to be honest and honorable in your fulfillment of assignments and in test-taking situations (see the University's Code of Student Life). You have a responsibility to the rest of the class, and to the instructor, to help create a classroom environment where all may learn. At the most basic level, this means that you will respect the other members of the class and the instructor, and treat them with the courtesy you hope to receive in turn.

Students who are physically or verbally disruptive in a class may be dealt with summarily by the instructor or referred to the dean of students. The instructor reports in writing to the dean of students any disciplinary action undertaken against a student. If you have questions, please talk to your instructor, your adviser, or CLAS Academic Programs & Services.

The College of Liberal Arts and Sciences Policies and Procedures

Administrative Home

The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall, or see the CLAS [Student Academic Handbook](#).

Electronic Communication

University policy specifies that students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu). Faculty and students should use this account for correspondences. (*Operations Manual*, III.15.2. Scroll down to k.11.)

Accommodations for Disabilities

A student seeking academic accommodations should first register with Student Disability Services and then meet privately with the course instructor to make particular arrangements. See www.uiowa.edu/~sds/ for more information.

Academic Honesty

All CLAS students have, in essence, agreed to the College's [Code of Academic Honesty](#): "I pledge to do my own academic work and to excel to the best of my abilities, upholding the [IOWA Challenge](#). I promise not to lie about my academic work, to cheat, or to steal the words or ideas of others; nor will I help fellow students to violate the Code of Academic Honesty." Any student committing academic misconduct is reported to the College and placed on disciplinary probation or may be suspended or expelled ([CLAS Academic Policies Handbook](#)).

CLAS Final Examination Policies

The final examination schedule for each class is announced around the fifth week of the semester by the Registrar. Final exams are offered only during the official final examination period. **No exams of any kind are allowed during the last week of classes.** All students should plan on being at the UI through the final examination period. Once the Registrar has announced the dates and times of each final exam, the complete schedule will be published on the Registrar's web site.

Making a Suggestion or a Complaint

Students with a suggestion or complaint should first visit the instructor (and the course supervisor), and then the departmental DEO. Complaints must be made within six months of the incident. See the CLAS [Student Academic Handbook](#).

Understanding Sexual Harassment

Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the UI [Comprehensive Guide on Sexual Harassment](#) for assistance, definitions, and the full University policy.

Reacting Safely to Severe Weather

In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the [Department of Public Safety web site](#).

*These CLAS policy and procedural statements have been summarized from the web pages of the [College of Liberal Arts and Sciences](#) and The University of Iowa [Operations Manual](#).

12:145 LECTURE & LAB SCHEDULE FALL 2012

| Week | Date | Lecture topic (Tuesday, 12:30-1:20 pm, 231 TH) | Lab topic (Thursday, 2:30-4:20 pm, 20 TH) |
|------|------------------|--|---|
| 1 | Aug 21, 23 | Intro to R (see ICON for readings) | 1. Sample selection & imaging |
| 2 | Aug 28, 30 | Univariate statistics: correlation, regression (see ICON for readings) | 2. Image processing & digitizing |
| 3 | Sep 4, 6 | Univariate statistics: ANOVA, nonparametric statistics (see ICON for readings) | 3. Data manipulation & description |
| 4 | Sep 11, 13 | Multivariate statistics: PCA, CVA (see ICON for readings) | 4. Univariate statistics |
| 5 | Sep 18, 20 | Morphometric data (Zelditch ch. 1&2) | 5. Multivariate statistics |
| 6 | Sep 25, 27 | Shape coordinates (Zelditch ch. 3&4) | 6. Shape coordinates |
| 7 | Oct 2, 4 | The thin-plate spline (Zelditch ch. 5) | 7. Partial warps etc |
| 8 | Oct 9, 11 | --catchup | --catchup |
| 9 | Oct 16, 18 [SVP] | Outline methods (see ICON for readings) | 8. Outline analysis |
| 10 | Oct 23, 25 | Semilandmarks (see ICON for readings) | 9. Semilandmarks |
| 11 | Oct 30, Nov 1 | Partial least squares (Zelditch ch. 7) - <i>Independent Project Proposals due on Nov 1</i> | 10. 3D data collection 1 |
| 12 | Nov 6, 8 [GSA] | Evolutionary Developmental Biology (Zelditch ch. 10-12) | 11. 3D data collection 2 |
| 13 | Nov 13, 15 | 3D data analysis (see ICON for readings) | 12. 3D data analysis |
| | Nov 20, 22 | THANKSGIVING BREAK | -- |
| 14 | Nov 27, 29 | 3D data analysis –conti- | 12. 3D data analysis –conti- |
| 15 | Dec 4, 6 | Student presentations | Student presentations |