FLORIDA ATLANTIC UNIVERSITY™

Graduate Programs—NEW COURSE PROPOSAL[1]

UGPC APPROVAL _____
UFS APPROVAL _____
SCNS SUBMITTAL _____
CONFIRMED _____
BANNER® POSTED _____
CATALOG _____

DEPARTMENT: BIOLOGICAL SCIENCES | **COLLEGE: COLLEGE OF SCIENCE**

RECOMMENDED COURSE IDENTIFICATION:

PREFIX _____PCB__ **COURSE NUMBER** _6457_____ **LAB CODE (L or C)** _____

(TO OBTAIN A COURSE NUMBER, CONTACT MJENNING@FAU.EDU)

COMPLETE COURSE TITLE: Advanced Multivariate Biometry

EFFECTIVE DATE
(first term course will be offered)
SPRING 2015

CREDITS[2]: 3

TEXTBOOK INFORMATION: Anderson, D. and K. Burnham. 2002. Model selection and multi-model inference: A practical Information-Theoretic Approach. Springer-Verlag Publ. NY, NY.

Grace, J.B. 2006. Structural equation modeling and natural systems. Cambridge University Press. NY, NY.

GRADING *(SELECT ONLY ONE GRADING OPTION)*: REGULAR _X_____ **SATISFACTORY/UNSATISFACTORY** _____

COURSE DESCRIPTION, NO MORE THAN THREE LINES: Class involves learning advanced techniques for analyzing biological and ecological data including time-series analyses, structural equation modeling, MDS, multiple regression, and other methods.

PREREQUISITES *: Experimental Design and Biometry (PCB 6456) or equivalent or Permission of the instructor	**COREQUISITES*:**	**REGISTRATION CONTROLS (MAJOR, COLLEGE, LEVEL)*:**

** PREREQUISITES, COREQUISITES AND REGISTRATION CONTROLS WILL BE ENFORCED FOR ALL COURSE SECTIONS.*

MINIMUM QUALIFICATIONS NEEDED TO TEACH THIS COURSE: PH.D. IN THE RELEVANT FIELD

Faculty contact, email and complete phone number:	Please consult and list departments that might be affected by the new course and attach comments.[3]
Dr. C. Edward Proffitt cproffit@fau.edu (772) 242-2207	

Approved by:	*Date:*
Department Chair:	1/30/14
College Curriculum Chair:	2/10/14
College Dean:	2/10/14
UGPC Chair:	2/26/14
Graduate College Dean:	2/26/14
UFS President:	
Provost:	

1. **Syllabus** must be attached; see guidelines for requirements: *www.fau.edu/provost/files/course syllabus.2011.pdf*
2. Review **Provost Memorandum: Definition of a Credit Hour** *www.fau.edu/provost/files/Definition_Credit_Hour_Memo_2012.pdf*
3. **Consent** from affected departments (attach if necessary)

Email this form and syllabus to *UGPC@fau.edu* **one week before** the University Graduate Programs Committee meeting so that materials may be viewed on the UGPC website prior to the meeting.

Course Syllabus for Advanced Multivariate Biometry

1. **Course title/number, number of credit hours**
   Advanced Multivariate Biometry – PCB 6457 – 3 credit hours

2. **Course prerequisites**
   a. Experimental Design and Biometry (PCB 6456) or equivalent
   or
   b. Permission of the instructor

3. **Course logistics**
   a. Term –Spring 2015
   b. Notation if online course – N/A
   c. Class location and time (if classroom-based course) – To be determined

4. **Instructor contact information**
   a. Instructor's name – C. Edward Proffitt
   b. Office address – Department of Biological Sciences, c/o Harbor Branch Oceanographic Institute, Marine Science II room 105, Ft. Pierce, FL
   c. Office hours – To be determined
   d. Contact telephone number – office (772) 242-2207, fax (561) 297-2436
   e. E-mail address – cproffit@fau.edu

5. **TA contact information (if applicable)**
   N/A

6. **Course description**
   The course covers advanced techniques for analyzing biological, marine science, and ecological data. In a collaborative, hands-on learning environment, we will explore the nature of multivariate biological data and study methods designed to handle those data. Students will learn to formulate and test multivariate hypotheses & to extract useful information from sometimes messy ecological & biological data. Real-world data will be used in most exercises and students will explore different techniques for analyzing these data, and discuss such options with the instructor and in some cases the scientists who gathered the data. Methods will include, but are not limited to, confirmatory factor analysis & structural equation modeling, Kullback-Leibler informatic approach to model selection & multi-model inference, multiple regression & correlation, ordination, metric and non-metric multidimensional scaling, meta-analysis, MANOVA, methods based on randomization techniques, etc.. Students will be exposed to SAS, R, Mplus, Primer, & Systat at a minimum. Copies of Mplus and Primer for student use will be available at the Harbor Branch campus, SAS is available at Harbor Branch, Davie and Boca campuses. R is free on-line.

7. **Course objectives/student learning outcomes**
This course aims to introduce fundamental advanced techniques for analyzing data gathered in experimental and observational studies.

Students will be able to: explore data (summary statistics, graphs, etc), develop multivariate or coordinated hypotheses, design studies to address such hypotheses using appropriate statistical techniques, work in different platforms and with various kinds of statistical programs, analyze and evaluate data using the methods mentioned above.

8. **Course evaluation method**
There will be graded homework project assignments accounting for 80% of the student's cumulative performance. Presentation of results in oral and written form will account for the remaining 20%.

9. **Course grading scale (optional)**

Cumulative Performance	Grade
>94%	A
>90% - 94%	A-
>87% - 90%	B+
>83% - 87%	B
>80% - 83%	B-
>75% - 80%	C+
>65% - 75%	C
>60% - 65%	C-
>57% - 60%	D+
>53% - 57%	D
>50% - 53%	D-
<50%	F

10. **Policy on late work and incompletes**
If a student cannot and in a homework project on time due to circumstances beyond their control then the instructor may assign appropriate make-up work. Students will not be penalized for absences due to participation in University-approved activities, including athletic or scholastics teams, musical and theatrical performances, and debate activities. These students will be allowed to make up missed work without any reduction in the student's final course grade. Reasonable accommodation will also be made for students participating in a religious observance. Also, note that grades of Incomplete ("I") are reserved for students who are passing a course but have not completed all the required work because of exceptional circumstances. A grade of "I" will only be given under certain conditions and in accordance with the academic policies and regulations put forward in FAU's University Catalog. The student must show exceptional circumstances why requirements cannot be met. A request for an incomplete grade has to be made in writing with supporting documentation, where appropriate.

11. Special course requirements (if applicable)

N/A

12. Classroom etiquette policy (if applicable)

University policy on the use of electronic devices states: "In order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular telephones and pagers, are to be disabled in class sessions."

13. Disability policy statement

In compliance with the Americans with Disabilities Act (ADA), students who require special accommodation due to a disability to properly execute coursework must register with the Office for Students with Disabilities (OSD) -- in Boca Raton, SU 133 (561-297-3880); in Davie, MOD 1 (954-236-1222); in Jupiter, SR 117 (561-799-8585); or at the Treasure Coast, CO 128 (772-873-3305) – and follow all OSD procedures.

14. Honor Code policy statement

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty, including cheating and plagiarism, is considered a serious breach of these ethical standards, because it interferes with the University mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the University community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see University Regulation 4.001 at http://www.fau.edu/regulations/chapter4/Reg_4.001_5-26-10_FINAL.pdf

15. Required texts/readings

Anderson, D. and K. Burnham. 2002. Model selection and multi-model inference: A practical Information-Theoretic Approach. Springer-Verlag Publ. NY, NY.

Grace, J.B. 2006. Structural equation modeling and natural systems. Cambridge University Press. NY, NY.

16. Supplementary/recommended readings (optional)

Bollen, K.A. 1989. Structural equations with latent variables. John Wiley and Sons, Inc.

Byrne, B.M. 2012. Structural equation modeling with Mplus: basic concepts, applications, and programming. Routhledge Taylor and Francis Group, NY.

Gotelli, N.J. and A.M. Ellison. 2004. A primer of ecological statistics. Sinauer Associates. Sunderland, MA.

Gurevitch, J., L.L. Morow, A. Wallace, and J.S.Walsh. 1992. A meta-analysis of field experiments on competition. American Naturalist 140:539-572.

Mitchell, R.J. 1992. Testing evolutionary and ecological hypotheses using path analysis and structural equation modeling. Functional Ecology 6:123-129.

Quinn, G.P. and M.J. Keough. 2002. Experimental design and data analysis for biologists. Cambridge University Press.

Scheiner, S.M. and J. Gurevitch. 1993. Design and analysis of ecological experiments. Chapman & Hall, NY, NY.

Shipley, B. 2000. Cause and Correlation in Biology: A users guide to path analysis, structural equations, and causal inference. Cambridge University Press, Cambridge, UK.

Underwood, A.J. 1997. Experiments in Ecology: Their logical design and interpretation using analysis of variance. Cambridge University Press, Cambridge, U.K.

Wagner, H.H. 2003. Spatial covariance in plant communities: integrating ordination, geostatistics, and variance testing. Ecology 84:1045-1057.

Wagner, Helene H. and Marie-Josée Fortin. 2005: Spatial analysis of landscapes: concepts and statistics. Ecology: Vol. 86, No. 8, pp. 1975–1987.

17. Course topical outline

- Introduction to advanced and multivariate data analysis; Exploratory data techniques and developing meaningful graphics with appropriate error bars (1 week)
- Kulbeck-Leibler model selection & multimodel inference (3 weeks)
- Using model selection and multi-model inference to test alternative models as a means to resolve different points of view and disputes among parties (ie, the spotted owl example, etc) (2 weeks)
- ANOVA vs Semi-variogram analysis in field experiments (1 week)
- Metric and non- metric multidimensional scaling (1 week)
- A survey of techniques in ordination (1 week)
- Path analysis, structural equation modeling with manifest variables (2 week)
- Exploratory factor analysis (1 week)
- Confirmatory factor analysis; Latent variables (and "the measurement model" in structural equation modeling) (1 week)

- Structural equation modeling - latent variables (structural model) (2 weeks)
- Network analysis (1 week)