FLORIDA ATLANTIC UNIVERSITY

# NEW COURSE PROPOSAL
## Undergraduate Programs

**Department**

**College** Wilkes Honors College

*(To obtain a course number, contact **erudolph@fau.edu**)*

UUPC Approval 12-6-21
UFS Approval _____
SCNS Submittal _____
Confirmed _____
Banner Posted _____
Catalog _____

**Prefix** BSC

**Number** 3452

*(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)*

**Lab Code** C

**Type of Course** Lecture/Lab

**Course Title** Honors Experimental Design and Data Analysis

**Credits** *(Review Provost Memorandum)* 3

**Effective Date** *(TERM & YEAR)* Fall 2022

**Grading** *(Select One Option)*

**Regular** ◉

**Sat/UnSat** ○

**Course Description** *(Syllabus must be attached; see Template and Guidelines)*

This course focuses on the basic concepts of hypothesis testing, experimental design, and data analysis. Students will learn how to design research projects from the inception of an idea, collect data, formulate a hypothesis, develop sampling/experimental designs, and analyze data in the R software environment. The course's objective is to give students tools to design and develop their honors theses and research projects.

**Prerequisites, with minimum grade*** None

**Corequisites** None

**Registration Controls** *(Major, College, Level)* Wilkes Honors College

***Default minimum passing grade is D-.** **Prereqs., Coreqs. & Reg. Controls are enforced for all sections of course**

**WAC/Gordon Rule Course**

☐ **Yes** ☑ **No**

WAC/Gordon Rule criteria must be indicated in syllabus and approval attached to proposal. See WAC Guidelines.

**Intellectual Foundations Program (General Education) Requirement** *(Select One Option)*

None

General Education criteria must be indicated in the syllabus and approval attached to the proposal. See GE Guidelines.

**Minimum qualifications to teach course**

Ph.D. in Biological Sciences or a closely related discipline

**Faculty Contact/Email/Phone**

Andia Chaves Fonnegra/ andia.chaves@fau.edu

**List/Attach comments from departments affected by new course**

| ***Approved by*** | ***Date*** |
|---|---|
| Department Chair: William O'Brien (Digitally signed by William O'Brien, DN: cn=William O'Brien, o=Florida Atlantic University, ou=Wilkes Honors College, email=wobrien@fau.edu, c=US, Date: 2021.11.08 10:19:55 -05'00') | 11/8/2021 |
| College Curriculum Chair: Nicholas R. Baima | 11/15/2021 |
| College Dean: Justin Perry | 11/12/21 |
| UUPC Chair: Dan Meeroff | 12-6-21 |
| Undergraduate Studies Dean: Edward Pratt | 12-6-21 |
| UFS President | |
| Provost | |

Email this form and syllabus to mjenning@fau.edu seven business days before the UUPC meeting.



| | |
|---|---|
| Office | WHC SR 234/ HBOI Lab1-137 |
| Office hours | Fri 2:00-3:00 pm and Wed 2:00-4:00 pm |
| Telephone | 561-860-7098 |
| Email | andia.chaves@fau.edu |


## Course Description

**Welcome!**

This course is focused on the basic concepts of hypothesis testing, experimental design and data analysis. Students will learn how to design research projects from the inception of an idea, formulate a hypothesis, design sampling/experimental techniques and analyze data. It will include an overview of basic statistical analyses such as ANOVAs, linear regression and non-parametric tests. All statistical analyses will be run in the R software environment. The objective of the course is to give tools to students for the design and development of their theses.

## Instructional Method

The course will include lectures/presentations, computer lab sessions and paper discussions. Students are encouraged to seek clarification of complicated topics by asking questions during class, by email, or during office hours. The computer lab session will include individual exercises, virtual activities, data analysis, and student presentations of papers. These sessions are designed to give students practical hands-on experience with most of the techniques covered in the lecture portion of the course.

## Prerequisites/Corequisites

None

## Course Objectives/Student Learning Outcomes

***Knowledge objectives***

In the end, students will be able to:

1. Explain the basic principles of hypothesis testing and probability theory.
2. Explain the basic application, interpretation, and presentation of inferential statistics.
3. Evaluate published research findings and assess their implications for research.
4. Explain the issues and guidelines for analyzing, interpreting, and reporting empirical data.

***Skill objectives***

In the end, students will be able to:

1. Identify the implications of using data and studying complex systems.
2. Demonstrate the ability to test hypotheses and conduct statistical analyses.
3. Demonstrate adequate proficiency in performing statistical analyses in R.
4. Demonstrate the ability to critically analyze published research.
5. Demonstrate the ability to interpret statistical tables, charts, figures published in primary literature.

## Course Evaluation Method

| | % of Grade Points |
|---|---|
| Exam I | 20* |
| Exam II | 20* |
| Presentation and Discussion of Papers | 10 |
| Assignments (weekly) | 20 |
| Data Analysis Project 1 | 15 |
| Data Analysis Project 2 | 15* |
| ***Total*** | ***100%*** |

*Graduate students will have extra questions or tasks.

### VII. Course Grading Scale

| | | | |
|---|---|---|---|
| **A** = 93 – 100% (4.00) | **B** = 83 – 86% (3.00) | **C** = 73 – 76% (2.00) | **D** = 63 – 66% (1.00) |
| **A-** = 90 – 92% (3.67) | **B-** = 80 – 82% (2.67) | **C-** = 70 – 72% (1.67) | **D-** = 60 – 62% (0.67) |
| **B+** = 87 – 89% (3.33) | **C+** = 77 – 79% (2.33) | **D+** = 67 – 69% (1.33) | **F**= <60% (0.00) |

## Policy on Makeup Tests, Late Work, and Incompletes (if applicable)

Any late assignment will receive minus one point (-1) off per day

## Special Course Requirements (if applicable)

None

**Note of Honors Distinction:** *This course differs substantially from the non-Honors version. First, and most importantly, the course is an agreement between the student and instructor that they will work together collaboratively to ensure a significantly enriched learning experience in a manner consistent with other Honors-designated courses at FAU. This means the course will produce substantive work that reflects interdisciplinarity and connections among academic fields, research and direct access to sources of knowledge pertinent to the field, leadership, creative and critical thinking, and engagement with the world outside the university. Secondly, the course will prepare students for upper-division data analyses and for work on the Honors Thesis. Students will be exposed to a field exercise at the Arboretum to obtain light data (brightness), and will be using these data through the course to perform statistical test, discuss results and develop their own critical thinking. In addition, students will give in-class presentations about specific statistical analyses in their subject of interests and will have two data projects that can be based on their own honors thesis/research data. Finally, the course will develop critical attitudes and analytic skills that will teach the student to think for him-herself or themself.*

## Policy on the Recording of Lectures

Students enrolled in this course may record video or audio of class lectures for their own personal educational use. A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach students about a particular subject. Recording class activities other than class lectures, including but not limited to student presentations (whether individually or as part of a group), class discussion (except when incidental to and incorporated within a class lecture), labs, clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, and private conversations between students in the class or between a student and the lecturer, is prohibited. Recordings may not be used as a substitute for class participation or class attendance and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may constitute a violation of the University's Student Code of Conduct and/or the Code of Academic Integrity.

## Attendance Policy

*Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University-approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances and debate activities. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence.*

## Counseling and Psychological Services (CAPS) Center

*Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to http://www.fau.edu/counseling/*

## Disability Policy

*In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU's campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses. For more information, please visit the SAS website at www.fau.edu/sas/.*

## Code of Academic Integrity

*Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty 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.*

## Recommended Texts/Readings

1. Gardener, M. 2017. Statistics for Ecologists using R and Excel. Pelagic Publishing.ISBN978-1-78427-139-8.
2. Gotelli, N. J. and A. M. Ellison. 2004. *A Primer of Ecological Statistics.* Sinauer Associates Inc, Massachusetts, ISBN: 0878932690.
3. Quinn G. P. and M. J. Keough. 2002. *Experimental Design and Data Analysis for Biologists.* Cambridge University Press, New York, NY, ISBN: 0521009766. (Recommended).
4.

## Course Topical Outline

| | | Friday (Lectures) | Friday (Labs) |
|---|---|---|---|
| **Date** | **Week** | **Lecture Topic** | **Lab topic** |
| X/X | 1 | Course introduction, Excel and R. Datasets, variables and observations/Research Methods | Field data Collection - Arboretum. Excel. Datasets, variables and observations/Research Methods. **Lab Due x/x** |
| X/X | 2 | Scientific Method Probability Distributions Hypothesis testing | Intro to R/Summarizing Data **Lab Due x/x** |
| X/X | 3 | Data sampling. Two samples comparisons (t-test) | Data sampling. Two samples comparisons (t-test) **Lab Due x/x** |
| X/X | 4 | Comparing one variable across treatments One Way ANOVA | Comparing one variable across treatments One Way ANOVA **Lab Due x/x** |
| X/X | 5 | Comparing one variable with two or more factors Two/three-way ANOVA | Comparing one variable with two or more factors Two/three-way ANOVA **Lab Due x/x** |
| X/X | 6 | Comparing one variable with two or more factors Nested ANOVA/Repeated measurements ANOVA | Comparing one variable with two or more factors Nested ANOVA **Data Project 1 Due x/x** |
| X/X | 7 | Exam Review | Exam Review |
| X/X | 8 | **Exam 1** | **Exam 1** |
| X/X | 9 | Linear Regression | Linear Regression **Lab Due x/x** |
| X/X | 10 | ANCOVA | ANCOVA **Lab Due x/x** |
| X/X | 11 | Simple and Multiple Correlation Multivariate Analysis Intro | Correlation **Lab Due x/x** |
| X/X | 12 | Multivariate Analysis Intro | Multivariate Analysis Intro **Lab Due x/x** |

| | | | |
|---|---|---|---|
| X/X | 13 | CLUSTER/ NMDs/PERMANOVA | MANOVA/NMDs **Data Project 2 Due x/x** |
| Thanksgiving Break | 14 | | |
| X/X | 15 | Exam Review | Exam Review |
| X/X | 16 | **Exam 2** | |

**Cross-Listed Course - Special Topics Course (BSC 6936)**

Students register in the Special Topics Course (BSC 6936) will be required to answer two extra-questions in both exams, and write a draft of a data note in addition to the final project. (https://bmcresnotes.biomedcentral.com/about/introducing-data-notes).