FAU

FLORIDA ATLANTIC UNIVERSITY

COURSE CHANGE REQUEST
Undergraduate Programs

Department Mathematical Sciences

College Charles E. Schmidt College of Science

UUPC Approval _____

UFS Approval _____

SCNS Submittal _____

Confirmed _____

Banner Posted _____

Catalog _____

Current Course Prefix and Number	STA 3173	*Current* Course Title Introduction to Biostatistics

Syllabus must be attached for ANY changes to current course details. See Checklist. Please consult and list departments that may be affected by the changes; attach documentation.

Change title to:

Change prefix

    From: **To:**

Change course number

    From: **To:**

Change credits*

    From: **To:**

Change grading

    From: **To:**

Change WAC/Gordon Rule status**

    Add ☐   **Remove** ☐

Change General Education Requirements***

    Add ☐   **Remove** ☐

*Review Provost Memorandum

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

***General Education criteria must be indicated in syllabus and approval attached to this form. See GE Guidelines.

Change description to:

Change prerequisites/minimum grades to:

Change the prerequisite from MAC 2233 to the following:
(MAC 1105 with a grade of "C" or better)

Change corequisites to:

Change registration controls to:

Please list existing and new pre/corequisites, specify AND or OR and include minimum passing grade (default is D-).

Effective Term/Year for Changes:	Fall 2020	**Terminate course? Effective Term/Year for Termination:**

Faculty Contact/Email/Phone Philip Pina/ppina@fau.edu/(cell) 305-502-9682, (work) 297-3340

Approved by	*Date*
Department Chair _____	4/22/2020
College Curriculum Chair _____	9/14/20
College Dean _____	9-8-2020
UUPC Chair _____	9/14/2
Undergraduate Studies Dean *Edward Pratt* _____	9-15-20
UFS President _____	_____
Provost _____	_____

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

SYLLABUS
STA 3173 Introduction to Biostatistics
(3-credits)

Instructor:	Section/CRN:
e-mail: Phone:	Office: Office Hours:
Lectures Time and Room:	Exam room:

Description: Introduces basic statistical concepts and procedures that are necessary to conduct statistical analysis for biological researchers. The topics covered are probabilistic foundations, experimental designs and their analyses, summarizing and visualizing data, inferential statistics, including hypothesis tests and regression modeling. **Prerequisite: MAC 1105 College Algebra with a grade of "C" or better.**

Objectives, Learning Outcome Goals: This course aims to impart an understanding of elementary descriptive and inferential statistics, design of experiments using statistical software and reproducible research philosophy and workflow. The emphasis will be on both applied problem solving and interpretation of results as well as theoretical foundations, although hand computation will sometimes be required. Students who successfully complete this course should be able to calculate and explain basic descriptive statistics, generate and interpret tables and graphs, make estimates of unknown parameters, create confidence intervals, conduct hypothesis tests using confidence intervals, test statistics and p-values, construct and interpret simple linear and multiple regression models, and understand ANOVA concepts. Successful completion of this course counts toward the computational requirement of the Gordon Rule.

IFP General Education Outcomes:

1. Knowledge in several different disciplines;
2. The ability to think critically;
3. The ability to communicate effectively;
4. An appreciation for how knowledge is discovered, challenged, and transformed as it advances; and
5. An understanding of ethics and ethical behavior.

Information available at http://www.fau.edu/deanugstudies/NewGeneralEdCurriculum.php
General Education: This course satisfies, in part, the general education requirements for Foundations of Mathematics and Quantitative Reasoning.
http://www.science.fau.edu/student_services/student_info_gen_edu.php

Course Structure:

Class lectures, in which content will be introduced and example problems solved. This material will be tested by Homework, Labs, Quizzes, Exams, a Final Project and/or Final exam. **Please find the exact dates in the course calendar.**

In addition, all information pertaining to STA 3173 will be posted on Canvas. Students should check Canvas for updated information daily. Ignorance of posted information is NOT a valid excuse for missing assignments, quizzes, exams or project.

Books:

- Introductory Statistics for the Life and Biomedical Sciences Preliminary Edition by Julie Vu and David Harrington
- Biostatistics Open Learning Textbook-http://bolt.mph.ufl.edu/

Software

- **R** -Statistical Programming Language
- **RStudio**-R Statistical Programming Language Integrated Development Environment
- **MikTex**/**MacTex-**Mathematical Typesetting Language

- **Excel**

Required R Packages

- **rmarkdown**
- **tufte**
- **swirl**
- **tidyverse**
- **devtools**
- **openintro**
- **OIdata**
- **oibiostat**

Supplementary Materials:

- OpenIntro Statistics 3rd edition by David M. Diez, Christopher D. Barr, and Mine Cetinkaya-Rundel-https://www.openintro.org/book/stat/

- Introductory Statistics with Randomization and Simulation

  https://www.openintro.org/book/isrs/

- Penn State Elementary Statistics-https://online.stat.psu.edu/stat200/

- Penn State Applied Statistics-https://online.stat.psu.edu/stat500/

- Penn State Regression Statistics (advanced)-https://online.stat.psu.edu/stat501/

- Carnegie Mellon Open and Free Statistics-https://oli.cmu.edu/courses/probability-statistics-open-free/

- Penn State Topics in R-https://online.stat.psu.edu/statprogram/stat484

- Modern Statistics for Modern Biology by Susan Holmes and Wolfgang Huber (advanced)-http://web.stanford.edu/class/bios221/book/introduction.html

Lecture Sessions:

The majority of conceptual ideas and statistical techniques are discussed and presented during the lecture sessions though some concepts may be introduced through homework and lab assignments. Attendance though strongly encouraged is not mandatory. Although a grade is not associated with attendance, it is used when determining the final grade if a student is on the edge between two grades!

Attendance Policy:

Attendance though strongly encouraged, is not mandatory. Again, although a grade is not associated with attendance it is used however when determining the final grade if a student is on the edge between two grades!

Note: If a student misses a lecture, it is student's responsibility to get notes from a classmate, not the instructor.

Homework:

Homework will come from assignments in the text(s) and lecture material. Homework normally will not be collected. Bonus point opportunities in this course will generally involve topics related to R and RStudio.

R and RStudio are the chosen vehicles used for data analysis in this course. A consistent uniform workflow will be developed and adhered to. Students should pay strict attention to the development of style guidelines as we progress through the course. Reproducible research is a guiding principle behind modern research. Ethical behaviour in scientific endeavors is essential to improving the human condition. "**Don't be evil!**" "**Do no harm!**"

Quizzes:

Short quizzes will be given each week testing basic knowledge of statistical techniques and concepts as well as associated knowledge of *R*.

Lab Work:

Labs will reinforce topics discussed in class. Real data will be used whenever possible so it is important for students to understand the research question(s) that motivated the scientific inquiry. As such whenever real data is cited students must refer to associated papers. The background and context of what motivated the research is essential to critiquing the analysis in an objective, prudent manner. At least one lab will be assigned each week.

Exams:

Exams will be held in class or assigned as take-home. Exams will use RStudio and typically located in Canvas. The use of one 8 ½" by 11" sheet with notes on one side will be allowed for exams but not quizzes. There are a total of four exams inclusive of the final. Descriptions of possible topics is given below. Actual topics for exams may change slightly due to weather related concerns (typically hurricanes) and possible time constraints. As such, the topic outline below is for general guidance but should not be considered as set in stone.

Exam I-Basic Counting, Elementary Probability, Conditional Probability, Exploratory Data Analysis, Random Variables, Design of Experiments, Random Sampling, Partitioning, Applications, Introduction to *R* and *RStudio*

Midterm Exam-Uniform, Binomial, Poisson, Exponential, Normal, t, Chi square, and F distributions, Law of Large Numbers, Central Limit Theorem, Applications, Intermediate *R* and *RStudio*

Exam III-Averaging Random Variables, Confidence Intervals, Hypothesis Testing, p-values, Power of the Test, Type I and Type II error, Non-parametric Techniques, Applications, Advanced *R* and *Studio*

Final Exam-Analysis of Variance, Regression Analysis, Advanced Topics, Applications

Final Project

Students have the option to do a final statistics lab project in lieu of a final exam. Final projects are conducted by groups of three to five students. However, the final exam project must be approved by the instructor within the first three weeks of class and must be of high quality as determined by the instructor. Student progress on the final project must be monitored by a faculty member or senior graduate student. Final Projects not given approval at the 8th week of the course will be deemed not sufficient to replace the final exam. Students must then prepare and take the final exam. Successful Final Projects in the past have included on-going research projects that students are

engaged in with faculty members, statistical questions outside of biostatistics that interest students but are of high interest and quality, projects aimed at developing skill with advanced statistical R packages, and verifying (or not!) questionable results of statistical papers.

Final Grade Components and Percentage Breakdown

Final Project or Final Exam 20%

Exams 25%

Labs 35%

Quizzes 20%

Grading Scale

90 or above A

87-89 A-

83-86 B+

80-82 B

77-79 B-

73-76 C+

60-72 C

50-59 C-

40-49 D+

0-39 F

Tutoring:

Free tutoring is available in the Math Learning Center (MLC), room GS 211. For the schedule visit http://www.math.fau.edu/MLC/

Make-up Policy: There are no makeups! The lowest exam score will be dropped.

Email Policy:

In order to get a response all communication with the instructor via email **MUST** be via student's FAU email address and must contain student's name, class CRN and section. Because of the proliferation of email pollution at workplaces (everyone emails every triviality when most things could be relegated to a website) email communication is highly discouraged when face to face or text communication will suffice! For example, if you need to know when something is due and you can't access the website then text me or a colleague. Do not pollute my inbox with simple questions. In general, I answer my chairman's and direct supervisor's email messages first. All other email communication will be responded to within 48-72 hours generally.

Text Messaging:

Text messaging is highly encouraged for simple questions and its simplicity. It is infinitely faster and more convenient than sloth and snail mail. Most students will take a picture of the problem and ask their question. Usually, I answer text messages immediately. However, text message me after you have tried to determine an answer yourself first! Do not abuse your text message access to me. Otherwise I will rescind the privilege and relegate you to sloth and snail mail correspondence.

Phone Messaging:

In dire circumstances, you may call me directly. Again, do not abuse this privilege. If you want to alert me to your absence in class a simple text message will suffice. If you feel that you want a preserved record of an important message that is urgent, then email me as well as text message me. I do not delete text messages.

Academic Honesty:

The University has an honor code to ensure the academic integrity at FAU. Any kind of academic misconduct will result in an F and will be reported to FAU. Harsh penalties are associated with academic dishonesty. For more information, see University Regulation 4.001.

Students Accessibility Services:

In compliance with the Americans with Disabilities Act Amendment Act 2008 (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with the Student Accessibility Services (SAS)—in Boca Raton, SU 133 (561-297-3880); in Davie, LA 131 (954-236-1222); or in Jupiter, SR 111 (561-799-8585) —and follow all SAS procedures.

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 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.

Withdrawals and Incompletes:

Students are responsible for withdrawing themselves from this course if that is what their personal situation requires. The instructor makes no promise either implicit or explicit to withdraw students from the course. Students who wish to drop from the course, should do so before the official university deadlines. **Incompletes** are discouraged. They will be given **ONLY** when extraordinary events intervene the completion of the course. A request for an incomplete grade, where appropriate, has to be made in writing with supporting documentation. To receive an incomplete the student must have completed the first two exams with a grade of C or better. Incompletes will not be given to students who are behind schedule when the semester nears its end.

This syllabus is subject to reasonable changes at the discretion of the instructor.

Topic Outline

Week 1- Introduction to R, Numerical and Graphical Descriptors, Introduction to Counting

Week2-Introduction to R, Counting, Sampling, Designs of Experiments, Applications

Week3-Introduction to R, Elementary Probability, Conditional Probability, Bayes Rule, Applications

Exam I, **Final Project Topic Approval**

Week 4- Intermediate R, Simulation, Discrete Distributions, Applications

Week 5- Intermediate R, Simulation, Discrete Distributions, Applications

Week 6- Intermediate R, Simulation, Continuous Distributions, Applications

Week 7- Intermediate R, Simulation, Continuous Distributions, Central Limit Theorem, Applications

Midterm Exam

Week 8-Advanced R, Averaging Random Variables, Confidence Intervals, Introduction to Hypothesis Testing, Applications, **Final Project Approval/Disapproval**

Week 9-Advanced R, Hypothesis Testing, Test Statistics, p-values, Applications

Week 10-Advanced R, Hypothesis Testing, Non-Parametric Techniques

Exam III

Week 11- Simple Linear Regression, Applications, Hypothesis Testing Involving Regression Parameters

Week 12- Analysis of Variance, Advanced Topics

Week 13- Analysis of Variance, Advanced Topics
Week 14- Review

Week 15-Review

Final Exam/Final Project