FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Graduate Programs

Department Mathematical Sciences+ Computer and Electrical Engineering and Computer Science

College Science + Engineering and Computer Science

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

UGPC Approval _____
UFS Approval _____
SCNS Submittal _____
Confirmed _____
Banner Posted _____
Catalog _____

Prefix CAP **Number** 5768	*(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)* **Lab Code**	**Type of Course** Lecture	**Course Title** Introduction to Data Science

Credits *(Review Provost Memorandum)*
3

Effective Date *(TERM & YEAR)*
Fall 2019

Grading *(Select One Option)*
Regular (●)
Sat/UnSat ( )

Course Description *(Syllabus must be attached; see Guidelines)*
This course will survey foundational topics in data science and reinforce practical programming skills in the context of data analytics. Students will learn fundamentals of computational data analysis using statistics and machine learning and gain experience working with data sets from a variety of domains.

Prerequisites
Some programming competency at the level of an online short course (e.g. Code Academy).

Corequisites

Registration Controls *(Major, College, Level)*

Prerequisites, Corequisites and Registration Controls are enforced for all sections of course

Minimum qualifications needed to teach course:
Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field.)

List textbook information in syllabus or here
Python Data Science Handbook: Essential Tools for Working with Data by Jake VanderPlas, 2016.

Faculty Contact/Email/Phone
Lun-Ching Chang / changl@fau.edu / 7-3351

List/Attach comments from departments affected by new course
Information Technology & Operations Management
Department of Political Science

Approved by	***Date***
Department Chair	Dec 11, 2018
College Curriculum Chair	11/01/19
College Dean	1-14-19
UGPC Chair	1/23/19
UGC Chair	1/31/19
Graduate College Dean	1/31/19
UFS President	
Provost	

Email this form and syllabus to UGPC@fau.edu one week before the UGPC meeting.

GRADUATE COLLEGE
JAN 15 2019
Received

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Department of Political Science

Approved by	*Date*
Department Chair	Dec 11, 2018
College Curriculum Chair	12/14/18
College Dean	12/17/2018
UGPC Chair	1/23/19
UGC Chair	2/1/19
Graduate College Dean	2/1/2019
UFS President	
Provost	

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GRADUATE COLLEGE

JAN 17 2019

Received

CAP 5768

Introduction to Data Science

Fall 2019

Lun-Ching Chang, Ph.D.

Email: changl@fau.edu
Office Location: SE 222
Office Hours: TBA
Tel: 561-297-3351

Course Description: This course will survey foundational topics in data science and reinforce practical programming skills in the context of data analytics. Students will learn fundamentals of computational data analysis using statistics and machine learning and gain experience working with data sets from a variety of domains. Instruction and assessment will rely heavily on computational resources. For example Python and Jupyter Notebooks will be used to demonstrate examples and illustrate concepts and gitLab will be used to manage course materials, announcements, and student work. Specific topics are divided naturally into three overarching themes:

1. **Data Fundamentals:** Software tools of the trade (Python, Git, Slack), data wrangling, data mining and visualization, working with large datasets, and efficiency in data manipulation.
2. **Statistical Methods:** Modeling distributions, parameter estimation, hypothesis testing, simulation, correlations, regression, time series, survival analysis.
3. **Machine Learning Methods:** Supervised and unsupervised learning, classification and regression approaches, clustering and dimensionality reduction, feature selection, hyper-parameter optimization, model assessment.

Prerequisite: Some programming competency at the level of an online short course (e.g. Code Academy).

Credit Hours: 3

Textbooks: The course will draw on content from at least two texts and will make use of 2-3 real-world datasets with sufficient depth to span topics across the entire semester.

1. *Python Data Science Handbook: Essential Tools for Working with Data*, 1st Edition
   Author: Jake VanderPlas; **ISBN-13:** 978-1491912058
2. *Think Stats*, 2nd Edition
   Author: Allen B. Downey; **ISBN-13:** 978-1491907337

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Course Objectives: In this course, students will

1. Gain proficiency using the Python programming language and its associated modules to perform a wide variety of data analysis techniques.
2. Develop enough practical programming experience to comfortably transition to other software platforms.
3. Gain experience using various collaborative development software platforms that are becoming ubiquitous in data driven industries.
4. Learn to effectively use data visualization to explore data and report results.
5. Understand what it is to develop statistical models, when and why models are needed, the limitations of models, and how models can be used to support conclusions.
6. Understand commonalities and practical differences between various machine learning methods.
7. Become resourceful and capable of navigating the web of online data analysis resources.
8. Become more discriminating in their assessment of published results.

Grades: Homework assignments will consist of data manipulation, visualization, and analysis exercises using simulated and real data sets. Late homework assignments will be not accepted.

Homework Assignments	30%
Midterm Exam	30%
Final Project	40%

Grading Scale:

>= 90.00	A	70.00 - 74.99	C+
85.00 - 89.99	A−	65.00 - 69.99	C
80.00 - 84.99	B+	60.00 - 64.99	D
75.00 - 79.99	B	<= 59.99	F

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

Course Outline:

Week	Content
Week 1	• Lecture 1: Introduction to tools (Python/R)
Week 2	• Lecture 2: Introduction to NumPy and Pandas/R basics
Week 3	• Lecture 3: Data wrangling
Week 4	• Lecture 4: Visualization and exploratory data analysis
Week 5	• Lecture 5: Modeling distributions/parameter estimation
Week 6	• Lecture 6: Correlations
Week 7	• Lecture 7: Classical hypothesis testing
Week 8	• Lecture 8: Brief introduction to Regression analysis
Week 9	• Lecture 9: Brief introduction to Time series analysis
Week 10	• Lecture 10: Brief introduction to Survival analysis
Week 11	• Lecture 11: Introduction to Machine Learning
Week 12	• Lecture 12: Unsupervised machine learning: Clustering
Week 13	• Lecture 13: Unsupervised machine learning: Dimensionality reduction & manifold learning
Week 14	• Lecture 14: Supervised machine learning: Naive Bayes
Week 15	• Lecture 15: Supervised machine learning: Decision Trees

Course Policies:

- **Classroom Etiquette:** 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 bė disabled in class sessions."

- **University 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.

- **Academic Integrity:** 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 values on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see `http:www.fau.edu/regulations/chapter4/4.001_Code_of_Academic_Integrity.pdf`

- **Disability Policy Statement:** 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 FAUs 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 `http://www.fau.edu/sas`

- **Counseling and Psychological Services (CAPS):** 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 FAUs 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/`