FAU

FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Undergraduate Programs

Department Mathematical Sciences

College of Charles E. Schmidt College of Science

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

| UUPC Approval _____ |
| UFS Approval _____ |
| SCNS Submittal _____ |
| Confirmed _____ |
| Banner Posted _____ |
| Catalog _____ |

Prefix **MAP** Number **2190**	*(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)* **Lab Code**	**Type of Course** Lecture	**Course Title** Mathematics of Data Science

Credits *(Review Provost Memorandum)* 3 **Effective Date** *(TERM & YEAR)* Fall 2020	**Grading** *(Select One Option)* Regular ⦿ Pass/Fail ◯ Sat/UnSat ◯	**Course Description** *(Syllabus must be attached; Syllabus Checklist recommended; see Guidelines)* This course will survey mathematical foundations in data science. Topics may include modeling with functions, matrices, solving linear systems, differentiation, integration, multivariate thinking and geometry, regression models, optimization, sensitivity analysis, and graph theory.

Prerequisites, with minimum grade* MAC 1105 or MGF 1106 with grade C or better + programming competency at the level of an online short course	**Corequisites**	**Registration Controls** *(Major, College, Level)*

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

Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field.)

Faculty Contact/Email/Phone William Kalies / wkalies@fau.edu / 7-1107	**List/Attach comments from departments affected by new course** Approved by BSDSA steering committee -- Computer Science, ITOM, Political Science, Criminal Justice ⊞

Approved by	**Date**
Department Chair ~~R. Hunt~~	Feb 4 2020
College Curriculum Chair *Jerry Haky (via email confirmation)*	3-27-20
College Dean ~~signature~~	3/3/20
UUPC Chair *Jerry Haky (via email confirmation)*	3-30-20
Undergraduate Studies Dean *Edward Pratt (via email confirmation)*	3-31-20
UFS President _____	_____
Provost _____	_____

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

MAP 2190

Mathematics of Data Science

Fall 2020

Lun-Ching Chang, Ph.D.

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

Catalog Course Description: This course will survey mathematical foundations in data science. Topics may include modeling with functions, matrices, solving linear systems, differentiation, integration, multivariate thinking and geometry, regression models, optimization, sensitivity analysis, and graph theory.

Prerequisite: ((MAC 1105 or higher course with a grade of "C" or better) or (MGF 1106 with a grade of "C" or better)) and some programming competency at the level of an online short course (e.g. Code Academy).

Credit Hours: 3

Textbooks: The course will have the two required textbooks listed below and will be supplemented with data science applications and examples from real-world data sets with sufficient depth to span topics across the entire semester.

1. *Introduction to Applied Linear Algebra: Vectors, Matrices, and Least Squares* by Stephen Boyd and Lieven Vandenberghe, Cambridge University Press, 2018, ISBN 978-1-316-51896-0

2. *A Mathematics Course for Political and Social Research* by W.H. Moore and D.A. Siegel, Princeton University Press, 2013, ISBN 978-0-691-15995-9

Course Objectives: In this course, students will

1. Gain basic understanding of what it is to develop mathematical models using elementary functions and how to create such models from data.

2. Gain understanding of the basic concepts of differential and integral calculus and its use in studying mathematical models from data.

3. Gain proficiency in the use of matrix and vector algebra to model multidimensional data.

4. Gain experience in the use of mathematics for optimization, sensitivity analysis, and other data-related problems.

5. Apply knowledge of mathematical concepts to solve real data science problems from multiple disciplines.

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: The grading scale will be no worse than A/A-: 90-100%, B+/B/B-: 80-89%, C+/C: 70-79%, D: 60-69%. A grade of I (incomplete) will only be given for circumstances specified in the FAU Catalog. This rarely happens.

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

Course Outline:

Week	Content
Week 1	• Modeling with Functions
Week 2	• Modeling with Functions • Linear Algebra/Solving Linear Systems
Week 3	• Linear Algebra/Solving Linear Systems
Week 4	• Differentiation
Week 5	• Linear Approximation and Rates of Change
Week 6	• Regression Models
Week 7	• Multivariate Thinking & Geometry
Week 8	• Multivariate Thinking & Geometry • Optimization
Week 9	• Optimization
Week 10	• Integration
Week 11	• Probability Distributions
Week 12	• Sensitivity Analysis
Week 13	• Graph Theory / Networks
Week 14	• Presentation of Final Projects
Week 15	• Presentation of Final Projects

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 be 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 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 `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 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/`