SYLLABUS
CMPS4553– Topics in Computational Science: Survey of Computational Methods

Course Description
A study of computational analysis of complex systems inspired by the natural and physical sciences. Areas may include computational biology, chemistry, epidemiology, physics, or applied mathematics as well as simulation, visualization, and high-performance computing.

Computational science is the scientific investigation of problems through modelling, simulation and analysis of physical processes on a computer. It is an interdisciplinary blend of scientific models, applied mathematics, computer programming, computational methods and tools to solve scientific problems in areas, such as physics, chemistry, biology, and other sciences. The course will include several of the following topics: Monte Carlo methodology, minimization, regression analysis, neural networks, K-means clustering, scientific visualizations and simulations. The main programming language used will be Python.

Instructor:	Dr. Catherine Stringfellow
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Office Hours:	M W F 10-11am, M W 1:30-2:30 pm, T R 2-3pm & by Appt / Zoom Office by Appt

Prerequisites: Minimum grades of C in CMPS 3013 and MATH 1433 or MATH 1534.

Course Website
   D2L - All important class documentation, supplemental readings, assignments, news items, and your gradebook will be posted here.

Required Textbook and Materials
- Data Science Essentials in Python, by D. Zinoviev, 2016, ISBN 978-1-68050-184-1
- Supplemental material from other sources will be provided.

Learning Outcomes
- Understand the scientific process and the philosophy of science.
- Be exposed to basic data analysis and modeling concepts and practices.
- Apply computational techniques/algorithms to solve scientific problems.
- Perform computational approximations and understand concept of error.
- Be exposed to the common tools and practices of working computational scientists, including R/Python and NumPy/SciPy toolkit, plotting and visualization, HPC, Weka, etc.

General Topics
- Computational Science and Natural Computing Concepts
- Python for Data Science
- Tabular Data, Data Series and Data Mining

- Network (Graph) Data
- Simulation, Randomness, Monte Carlo Method
- Plotting and Scientific Visualization
- Basic Statistics, Prediction (Regression Analysis & Machine Learning
- Optimization
- Genetic Algorithms
- Grammatical Evolution

Instructional Methods and Techniques:

The class will meet for two 1 ½ -hour lecture/discussion periods each week. Some lectures may be supplemented with handouts available on D2L. Other CMPS professors will guest lecture.

Exams and Assignments

There will be two exams and one non-comprensive final exam. Exams cover material from the text as well as supplemental material provided. The lectures may not cover all the material in the textbooks. There will be projects involving tools and/or programming.   Programs are expected to be complete and robust, including good user interfaces with the ability to handle improper input. Good documentation will also be expected. ***All projects must be turned in to pass the course – see program grading policy in D2L.***

Course Evaluation

5-6 Projects	= 25-30%.
In-Class Quizzes/Worksheets/HW	= 10-15%
2 tests	= 40%
1 non-comprehensive final exam	= 20%

Grades may be determined according to this scale (approximate):

A	90% - 100%		C	70% - 79%
B	80% - 89%		D	55% - 64%

Course and Department Policies

Attendance Policy

Although student attendance is not calculated into the grade, attendance will be taken each day to track students. If a student is absent more than 2 classes without an excuse and is not performing well in class, a report will be submitted to the Dean of Students and the student may be dropped from the class. Classes will not be streamed for absent students, whether it is excused or not.

Behavior in the classroom

Students are to assist in maintaining a classroom environment that is conducive to learning. This means that the presence of electronic devices other than your calculator are not to be seen, heard, or implied, ever. Questions are encouraged and discussion is acceptable, provided it is pertinent and does not distract from the lesson.

Make Up Work/Exams/Quizzes:
- For planned excused absences: Exam may be taken early by prior arrangement.
- For unplanned excused absences: Student must make up a missed exam within 4 working days. All other missed exams will receive a zero.

Late Work

Late projects will be accepted up to 4 days late with a 10 point deduction per day. ***No late projects for the last project will be accepted.***

Computer Requirements: Taking this class requires you to have access to a computer (with Internet access) to access online course material. ***Personal computer technical difficulties will not be considered a reason for extra time to submit assignments, tests, or online discussion postings.*** Computers are available on campus in various areas of the buildings, as well as the in the library. Contact your instructor immediately upon having computer trouble. If you have technical difficulties in the course, there is also a student helpdesk available to you. The university cannot work directly on student computers due to both liability and resource limitations, however they are able to help you get connected to our online services. For help, log into **D2L.**

Policy on Testing Process

The Department of Computer Science has adopted the following policy related to testing.
- All bags, purses, electronics (turned off), books, etc. will be placed in the front of the room during exams, or in an area designated by the instructor.
- Unless otherwise announced by the instructor, nothing is allowed on the desk but pen/pencil/eraser and test papers.
- A student who leaves the room during an exam must turn in the test and will not be allowed to return.

Academic Misconduct Policy & Procedures

Cheating, collusion, and plagiarism (the act of using source material of other persons, either published or unpublished, without following the accepted techniques of crediting, or the submission for credit of work not the individual's to whom credit is given). The Department of Computer Science has adopted the following policy related to cheating (academic misconduct). The policy will be applied to all instances of cheating on assignments and exams as determined by the instructor of the course. (See below for link to MSU definitions.)
- 1st instance of cheating in a course: The student will be assigned a non-replaceable grade of zero for the assignment, project or exam. *In addition, the student will receive a one letter grade reduction in course.*
- 2nd instance of cheating in a course: The student will receive a grade of F in course & immediately be removed from course.
- All instances of cheating will be reported to the Department Chair and, in the case of graduate students, to the Department Graduate Coordinator.

Note: Letting a student look at your work is collusion and is academic misconduct!

See Also: MSU Student Handbook: Appendix E: Academic Misconduct Policy & Procedures
https://msutexas.edu/student-life/_assets/files/handbook.pdf.

University Policies and Procedures

Covid Precautions
I encourage all those who wish to wear a mask to do so. Any vulnerable or unvaccinated person should wear an N95 or equivalent, if they want to protect themselves from others. I will also meet with students via Zoom by appointment. Covid vaccinations are provided free of charge – and may be obtained on campus on designated vaccine clinic days or by appointment at the Vinson Health Center, or by local pharmacies.

Student with Disabilities
Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible. Students should present appropriate verification from Disability Support Office during the instructor's office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification has been provided. For additional information, contact the Disability Support Office in Clark Student Center 168 - Phone: (940) 397-4140

Policy on Concealed Handguns on Campus
Senate Bill 11 passed by the 84th Texas Legislature allows licensed handgun holders to carry concealed handguns on campus, effective August 1, 2016. Areas excluded from concealed carry are appropriately marked, in accordance with state law. For more information regarding campus carry, please refer to the University's webpage at MSU Campus Carry Policy *https://msutexas.edu/campus-carry/rules-policies*. If you have questions or concerns, please contact MSU Chief of Police Patrick Coggins at **patrick.coggins@msutexas.edu**.

Recording of Class Lectures
Permission must be requested in writing and obtained from the instructor before recording of class lectures. If permission is granted, the recording may only be used by the student making the recording. Recordings (or any class materials) may NOT be posted on any internet source without written permission of the instructor. Failure to adhere to the policy may result in removal from the course with a grade of F or other appropriate punishment.

Midterm Progress Report
In order to help students keep track of their progress toward course objectives, the instructor for this class will provide a Midterm Progress Report for all students in the course through each student's WebWorld account. Midterm grades will not be reported on the students' transcript; nor will they be calculated in the cumulative GPA. They simply give students an idea of where they stand at the midpoint of the semester. Students earning below a C at the midway point should a) schedule a meeting with the professor and b) Seek out tutoring.

Important Dates
Visit MSU's Registrars website Important Dates
https://msutexas.edu/registrar/_assets/files/pdfs/fall21front.pdf