MATH 6397 – Programming Foundations for Data Analytics

Class Number: 25805
Semester: Fall 2018 [August 20 – December 12]
Time: Monday and Wednesday 2:30 – 4:00PM
Class Room: M 111

Instructor: Dr. Dvijesh Shastri
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Office Hours: 4:00 – 5:00 PM [Monday and Wednesday] or by appointment

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Office Hours: TBA

Catalog Description: The course provides essential foundations of Python programming language for developing powerful and reusable data analysis models. The students will get hands-on training on writing programs to facilitate discoveries from data. The topics include data import/export, data types, control statements, functions, basic data processing, and data visualization.

Course Prerequisites: With consent of the instructor.

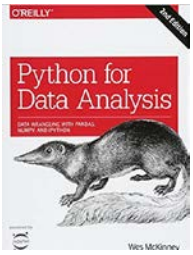
Learning Outcomes: After taking this course, students should be able to

LO1. Write programs in Python to perform sequential execution, arithmetic and logical expression evaluation, and input and output operations.
LO2. Use standard control structures, and functional abstraction.
LO3. Write programs to achieve data structuring, data visualization, mathematical computations, statistical summaries, and basic data modeling.
LO4. Use the Python libraries such as NumPy for scientific computing, and Pandas for structured data analysis.
LO5. Apply programming knowledge in exploring real-world datasets and writing reusable data analysis tools.

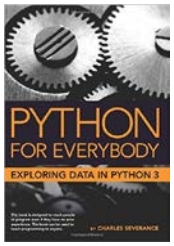
Textbooks:

- Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython by Wes McKinney, 2 edition, 2017, O'Reilly. **(PD)**
  Paper Book-ISBN 13: 978-1491957660

  Available for free on Safari through UH library.



- Python for Everybody (Exploring Data in Python3)
  by Dr. Charles Russell Severance, 2016, 1 edition, CreateSpace Independent Publishing Platform **(PE)**
  Paper Book-ISBN 13: 978-1530051120



  Free online copy:
  https://books.trinket.io/pfe/index.html

Course Topics: The following topics will be covered as time permits.

1. Basic data structures in python - Variables, Strings, Lists, Dictionaries, and Tuples (**PE Chapters:** 1, 2, 6, 8, 9 and 10; **PD Chapters:** 1, 2, and 3.1)
2. Control structures in python (**PE Chapters:** 3 and 5)
3. Data import and export in python (**PE Chapter:** 7**; PD Chapters:** 3.3, and 6)
4. Functions (**PE Chapter:** 4; **PD Chapter:** 3.2)
5. NumPy (**PD Chapter:** 4 and **Appendix:** A)
6. Pandas (**PD Chapters:** 5, 12, and 13)
7. Data cleaning and preparation (**PD Chapter:** 7)
8. Data wrangling (**PD Chapter:** 8)
9. Data plotting and visualization (**PD Chapter:** 9)
10. Data aggregation and group operation (**PD Chapter:** 10)
11. Time series analysis (**PD Chapter:** 11)
12. Basic database and SQL (**PE Chapter:** 15)

Topic Prerequisites: The course is essentially self-contained. The necessary material from statistics and linear algebra is integrated into the course. Background in writing computer programs is preferred but not required.

Workload: 5-7 hours/week

Online Course Support: The Blackboard system (https://elearning.uh.edu) will be used for online course material. As the semester progresses, various materials will be posted there including lecture notes, projects, and course announcements.

Course Grade: Course grades will be determined as follows:

Assignment	Mode	Submission	Weight
Exam-1	Individual	In-class	30 %
Exam-2	Individual	In-class	30 %
Programming Homework Assignments	Group	Take-home	30 %
Labs/Other forms of in-class activities	Individual	In-class Take-home	10 %

Your final course grade will be determined by the standard college formula based on your course average:

	95.00-100.00 → A	90.00-94.99 → A-
87.00-89.99 → B+	83.00-86.99 → B	80.00-82.99 → B-
77.00-79.99 → C+,	73.00-76.99 → C	70.00-72.99 → C-
67.00-69.99 → D+,	63.00-66.99 → D	60.00-62.99 → D-
00.00-59.99 → F		

MAKE-UP POLICIES

- **Programming assignments:** are to be completed and turned in *by the due date*. **For each late day, 15 percent of the total possible points will be deducted** (a day ends at the due time). No work will be accepted more than 5 days late.
- **Exams:** Make-up exams will *only* be given in cases of documented emergencies. It is your responsibility to contact your instructor with documentation of your emergency as soon as possible.
- **In-class activity:** No Make-ups for in-class activities (Labs, quizzes).
- All missed grades will be recorded as zeros.

CLASS POLICIES

Class Attendance Policies: Regular class attendance of all class meetings is expected of every student enrolled in this class. "Your failure to attend class, or make contact with your instructor to adequately explain your absence by the 10th class day of the semester will result in your being administratively dropped from this course. Being dropped from this course may affect your enrollment status and/or your financial aid eligibility."

Student Conduct In Class Policy

Any acts of classroom disruption that go beyond the normal rights of students to question and discuss with instructors the educational process relative to subject content will not be tolerated, in accordance with the Academic Code of Conduct described in the Student Handbook.

Children In Class Policy

Only in extreme cases are children allowed in classroom or laboratory facilities, and then only with approval of the instructor prior to class.

Electronic Devices In Class Policy

Cellular phones, pagers, CD players, radios, and similar devices are prohibited in the classroom and laboratory facilities. Calculators and computers are prohibited during examinations and quizzes, unless specified. Reasonable laptop-size computers may be used in lecture for the purpose of taking notes.

Academic Dishonesty: You are encouraged to generally discuss assignments with fellow students, but may not copy their solution or code. **Doing so constitutes academic dishonesty which will be sanctioned with a grade of F in the course.** See https://www.uh.edu/provost/policies/honesty/ for more information on UH's policy on academic dishonesty.

Campus Carry Law

Beginning August 1, 2016, the new campus carry law that was signed by Governor Abbott on June 13, 2015 allows persons with a state mandated concealed handgun license (CHL) to carry a concealed handgun in certain areas on campus so long as the area has not been designated by the University as an exclusion zone. The University's campus carry policy can be found here:
http://www.uh.edu/af/universityservices/policies/mapp/07/070105.pdf .

Tentative Course Outline

Week	Lect.	Date	Topic	Lab	HW
1	1	08/20 Mon	**Introduction** • Programmatic Lecture		
	2	08/22 Wed	**Python Programming** • PE Chapter-1; PD Chpater-1		
2	3	08/27 Mon	**Variables, Expressions and Statements** • PE Chapter-2; **IPython and Jupyter Notebooks** • PD Chapter-2 Team forming	L-0	H-0
	4	08/29 Wed	**Conditional Statements** • PE Chapter-3	L-1	
3		09/03 Mon	*Labor day holiday*		
	5	09/05 Wed	**Functions** • PE Chapter-4; PD Chapter: 3.2	L-2	
4	6	09/10 Mon	**Iterations** • PE Chapter-5	L-3	H-1
	7	09/12 Wed	**Strings** • PE Chapter-6	L-4	
5	8	09/17 Mon	**Files** • PE Chapter-7; PD Chapter: 3.2	L-5	H-2
	9	09/19 Wed	**Lists** • PE Chapter-8; PD Chapter: 3.1	L-6	
6	10	09/24 Mon	**Dictionaries** • PE Chapter-9; PD Chapter: 3.1	L-7	H-3
	11	09/26 Wed	**Tuples** • PE Chapter-10; PD Chapter: 3.1	L-8	
7	12	10/01 Mon	**Exam-1**		
	13	10/03 Wed	**NumPy Basics** • PD Chapter-4	L-9	
8	14	10/08 Mon	**Pandas Basics** • PD Chapter-5	L-10	H-4
	15	10/10 Wed	**Data Loading, Storage, and File Formats** • PD Chapter-6	L-11	
9	16	10/15 Mon	**Data Cleaning and Preparation** • PD Chapter-7	L-12	H-5

	17	10/17 Wed	**Data Wrangling** • PD Chapter-8	L-13	
10	18	10/22 Mon	**Plotting and Visualization** • PD Chapter-9	L-14	H-6
	19	10/24 Wed	**Data Aggregation and Group Operations** • PD Chapter-10	L-15	
11	20	10/29 Mon	**Time Series** • PD Chapter-11		H-7
	21	10/31 Wed	**Time Series** • PD Chapter-11	L-16	
12	22	11/05 Mon	**Advanced Pandas** • PD Chapter-12	L-17	H-8
	23	11/07 Wed	**Advanced Pandas** • PD Chapter-12	L-18	
13	24	11/12 Mon	**Introduction to Modeling Libraries** • Chapter-13	L-19	H-9
	25	11/14 Wed	**Advanced NumPy** • Appendix-A		
14	26	11/19 Mon	**Databases** • PE Chapter-15		H-10
	27	11/19 Mon	**SQLite** • PE Chapter-15	L-20	
			Thanksgiving Holiday (11/22 – 11/24)		
15	28	11/26 Mon	**Buffer-I** •		
	29	11/28 Wed	**Buffer-II** •		
			Reading Day (12/03)		
		12/05 Wed	**Final Exam (Tentative)**		