11:117:333 –ENVIRONMENTAL ENGINEERING ANALYSIS TOOLS

and

14:180:301 CIVIL ENGINEERING ANALYSES

3 credits

Spring 2022

Tuesdays and Fridays, 10:20 – 11:40 AM,

Join URL:
https://rutgers.zoom.us/j/93661438500?pwd=N3VKWFp
aVmxCL2RZVkVDckJQT0Nndz09

Instructor: Roger Wang; rq.wang@rutgers.edu; virtual

Office Hours: Tuesday 11:40am-12:10pm, and by appointment.

Catalog Description: This course applies state-of-the-art data analysis tools for analyzing civil and environmental engineering systems and creating solutions and designs. Tools include spreadsheets, MATLAB and Python. We will focus on system modeling, data analysis, and visualization in civil and environmental engineering.

Prerequisites: 14:440:127 Introduction to Computers for Engineers

14:180:215 Engineering Graphics, or 14:180:216 Introductory Computer-Aided Design and Drafting

Course Type: Elective

Text: *Python and Matplotlib Essentials for Scientists and Engineers.* M.A. Wood. Morgan & Claypool., 2015.

Reference: *Fundamentals of Environmental Sampling and Analysis*. C. Zhang. Wiley, 2007.

Website: https://rutgers.instructure.com/courses/165013 (The website is a source of links and downloads of all course handouts.)

Students will learn how to obtain data from a variety of sources, select an appropriate computing tool, validate data and present it in a human-interpretable form, parameterize an environmental system model using real data, and use the model to optimize the system or predict its behavior. Students will complete four projects, which will each count for 20% of the final course grade. Six quizzes (20% of final grade) will be used primarily to gauge student understanding and needs for additional instruction.

Course grading:

Four projects (20 percent each)

Six quizzes (lowest grade dropped; 20 percent of final grade)

Students who miss a quiz without a legitimate excuse will automatically receive 0 points for that quiz. There will be a penalty of 10% per calendar day for a late project submission.

Project format:

Project submissions consist of various formats detailing the problem, approach and solution, along with printouts of relevant code or spreadsheets. Figures and/or references are to be included as needed.

Date	Lecture #	Activity	Due Date
01-18	1	Syllabus, Introduction to Engineering Data Analysis	
01-21	2	Spreadsheet 1: Basic Operations	
01-25	3	Spreadsheet 2: Statistics Description of Data	
01-28	4	Spreadsheet 3: Data Visualization	*P1 out*
02-01	5	Quiz 1	Quiz 1
02-04	6	MATLAB 1: Basic Operation I	
02-08	7	MATLAB 2: Basic Operation II	
02-11	8	MATLAB 3: Read, Write and Understand Data	
02-15	9	MATLAB 4: Data Type	
02-18	10	MATLAB 5: Data Cleaning	*P1 in P2 out*
02-22	11	Quiz 2	Quiz 2
02-25	12	MATLAB 6: Data Statistics and Correlation	
03-01	13	MATLAB 5: Data Visualization and Map Plotting	
03-04	14	MATLAB 7: Curve Fitting and Regression	
03-08	15	Quiz 3	Quiz 3
03-11	16	Python 1: Introduction (List, for loops, conditional, dict, freq tables)	
03-15		**Spring Break**	*P2 in P3 out*
03-18		**Spring Break**	
03-22	17	Python 2: Introduction II	
03-25	18	Python 3: Data Type and Formatting (strings, dates and time)	
03-29	19	Python 4: Numpy and Pandas I	
04-01	20	Quiz 4	Quiz 4
04-05	21	Python 5: Pandas I and II	
04-08	22	Python 6: Data Visualization I	
04-12	23	Python 7: Data Visualization II	
04-15	24	Python 8: Data Visualization III	*P3 in, P4 out*
04-19	25	Quiz 5	Quiz 5
04-23	26	Python 9: Data Streaming and Web Scrapping	
04-26	27	Quiz 6	Quiz 6
04-29	28	GIS: Introduction	
05-03		No class	*P4 in*