

CE 215 Computer-Aided Analysis and Design

Instructor

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Office hours: M, Th, F 11:00–12:00.
Or you can email me and I will set aside time.

Class Location and Meeting Times

We meet for labs in McClure Hall 214A:
Section 1: Tues & Thur 12:30 pm – 2:20 pm
Section 2: Tues & Thur 2:30 pm – 4:20 pm

Course Description

Application of basic science, mathematics, and fundamental engineering principles to solution of civil engineering design problems; use of structured programming concepts in design; develop oral and written communication skills.
3 credits, prerequisites: ENGR 1230 and MATH 1700. Minimum grade of 'C' or better is required for all pre/corequisites.

The syllabus and schedule might change during the semester. The current version and additional materials are online:
<http://www.webpages.uidaho.edu/~mlowry/Teaching/syllabus.ce215.pdf>

Learning Objectives

Students who successfully complete this course will be able to conduct civil engineering analysis and design using computational tools and methods.

1. **Concepts:** Students will be able to perform “analysis” and “design” within civil engineering.
2. **Methods:** Students will be able to perform the following computational methods for analysis and design: regression, integration, differentiation, optimization, and matrix operations. Students will solve problems from the various civil engineering subdisciplines and learn to present technical data, calculations, and results.
3. **Tools:** Students will be able to use spreadsheets (Excel) and programming (Python) for analysis and design.

Grading Criteria

Grades are posted in Canvas and will be assigned according to the following criteria:

Participation in class and lab discussion or in my office	2%
Assignments	38%
Exams	60%

Open Portion of Exams:

[Instructions Exam Excel Open.pdf](#)

[Instructions Exam Python Open.pdf](#)

****Using assignments, projects, or exams from previous semesters to study for exams, to help complete your assignments, or for any other purpose whatsoever is strictly prohibited. Violators will be failed. ****

****I will not accept late assignments or exam rescheduling without documentation from the Dean of Students or a medical professional. Requests for exam rescheduling must be made prior to the day of the exam.****

****I will not accept extra or alternative work to replace assignments or improve your grade.****

Python for Civil Engineers

My class notes for Python are here: [Python for Civil Engineers](#) at <https://bit.ly/python4civil>

Equations for Example Civil Engineering Problems

Many lab assignments will be based on these example civil engineering problems: [Equations for Example CE Problems.pdf](#)

Other Resources

The ability to type will help you in this course. There are tutorials online like this one: <https://www.typingclub.com/>

You should become familiar with these excel functions: [Important Excel Functions.pdf](#)

This is a list of shortcut keys for Greek letters and math equations: [Greek Letters and Math Shortcuts.pdf](#)

List of matplotlib commands: [Matplotlib Commands.pdf](#)

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Schedule

Week Tuesday*	Unit	Tuesday Lab 1	Thursday Lab 2	Weekly Reading
7-Jan	0.0 Course Introduction	<i>No class</i>	0.0 Preparation and Overview	
14-Jan	1.0 Excel Introduction	1.1 Excel Basics	1.2 IF Function	Basics
21-Jan	2.0 Excel Functions	2.1 VLOOKUP Function	2.2 Design Statements	Functions
28-Jan	3.0 Reports & Presentations	3.1 Excel Charts and MS Word	3.2 Tables and MS PowerPoint	Data Analysis/Charts
4-Feb	4.0 Mathematical Analysis	4.1 Excel Solver	4.2 Design Optimization	Data Analysis/Solver
11-Feb	5.0 Data Analysis	5.1 Pivot Tables	5.2 Descriptive Statistics	Data Analysis/Pivot Tables
18-Feb	6.0 Statistical Analysis	6.1 Simple Linear Regression	6.2 Multiple Linear Regression	Analysis ToolPak
25-Feb	7.0 Excel Exam Week	7.1 Excel Final Words	Exam 1: Excel	
4-Mar	1.0 Python Introduction	1.1 Math Calculations & Printing	1.2 if statements and for loops	Python Tutorial: 1 to 4.2
11-Mar	<i>Spring Recess</i>	<i>Spring Recess</i>	<i>Spring Recess</i>	
18-Mar	2.0 Using for loops	2.1 Accumulate and Collect Values	2.2 Defining Simple Functions	Python Tutorial: 4.3 to 4.5
25-Mar	3.0 Functional Programming	3.1 Documenting Elaborate Functions	3.2 Creating Modules	Python Tutorial: 4.6 to 6.4
1-Apr	4.0 Creating Plots	4.1 Plotting y vs x	4.2 Pie Charts and Bar Charts	Matplotlib
8-Apr	5.0 Mathematical Analysis	5.1 Roots, Solver, Minima, & Maxima	5.2 Derivatives & Integrals	Scipy
15-Apr	6.0 Data Analysis	6.1 Read Input/Write Output	6.2 Descriptive Statistics	Pandas
22-Apr	7.0 Matrix Analysis	7.1 Matrix Operations	Exam 2: Python	Numpy
29-Apr	8.0 Other Languages	8.1 Java, Go, ChatGPT		

Assignments are given at the start of every lab and are due at the start of the subsequent lab.

Required Readings

Excel-Easy.com

Online Excel Tutorial <https://www.excel-easy.com/>

Python Tutorial

The Python Tutorial by Guido van Rossum. <https://docs.python.org/3/tutorial/index.html>

Matplotlib

Pyplot Tutorial. <https://matplotlib.org/tutorials/introductory/pyplot.html#sphx-glr-tutorials-introductory-pyplot-py>
Gallery. <https://matplotlib.org/gallery/index.html>

Scipy

Root. <https://docs.scipy.org/doc/scipy/reference/generated/scipy.optimize.root.html>
Minimize. <https://docs.scipy.org/doc/scipy/reference/generated/scipy.optimize.minimize.html>
Derivative. <https://docs.scipy.org/doc/scipy/reference/generated/scipy.misc.derivative.html>
Integration. <https://docs.scipy.org/doc/scipy/reference/tutorial/integrate.html>

NumPy

Quickstart tutorial. <https://docs.scipy.org/doc/numpy/user/quickstart.html>

Pandas

10 Minutes to pandas. <http://pandas.pydata.org/pandas-docs/stable/10min.html>

StatsModels

Ordinary Least Squares. <https://www.statsmodels.org/stable/examples/notebooks/generated/ols.html>

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Assignments

Assignments are given at the start of each lab and are due at the start of the subsequent lab.

***I will not accept late assignments.**

Create these folders in your OneDrive

\Courses\CE215\Part1_Excel

\Courses\CE215\Part2_Python

For every lab you will create at least two files: (1) an Excel file (or Python script) and (2) a Word document. Name your files with your last name, Excel (or Python), and the lab number (all separated by underscores).

For the **Excel** portion of the class you will create:

File Name	Description
Lastname_Excel_1.1.xlsx	Excel file with your calculations and proper formatting (colors, comments, etc.)
Lastname_Excel_1.1.docx	Word document with sufficient problem information, proper formatting, and screenshots as needed. Print and submit this for your grade.

For the **Python** portion of the class you will create:

File Name	Description
Lastname_Python_1.1.py	Python script with your calculations and proper documentation and style (comments, spacing, good variable names, etc.). Print and submit this for your grade.
Lastname_Python_1.1.docx	Word document with sufficient problem information and proper formatting. Print and submit this for your grade.

- **Email both files to me and the TA with the subject:** CE215 Excel 1.1
- Print and submit a hardcopy of the Word document.

Data Files

[Data Files.zip](#)

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Student Conduct and Policies

Each student is expected to assist in maintaining a classroom environment that is conducive to learning. In order to assure that all students have the opportunity to gain from time spent in class, unless otherwise approved by the instructor, students are prohibited from engaging in any other form of distraction. Inappropriate behavior in the classroom shall result, minimally, in a request to leave class.

- **Attendance.** Attendance at all course activities is expected. Missing more than one class period is considered excessive. You are expected to arrive to class on time.
- **Deadlines.** Assignments must be turned in by the due date and time unless prior arrangements have been made. I will not accept late assignments or exam rescheduling without documentation from the Dean of Students or a medical professional. Requests for exam rescheduling must be made prior to the day of the exam.
- **Extra or Alternative Credit.** I will not accept alternative or extra work to replace assignments or improve your grade.
- **Classroom Engagement.** Use of personal phones, music players, tablets, iStuff, etc. is not permitted in class. This includes texting. Please place your ringer on silent before entering class. Reading or working on other materials while in this class is strongly discouraged.
- **Student Conduct:** All students are expected to honor the UI Student Code of Conduct. Violations include, but are not limited to: copying homework assignments completed by others, plagiarism, and cheating. Please be aware that any violation of the UI Student Code of Conduct may result in a course grade of "F".
<http://www.uidaho.edu/DOS/judicialaffairs/studentcodeofconduct>
- **Plagiarism:** Plagiarism occurs when you use but do not cite someone else's work, even if it is re-worded, or by not indicating that a passage (paragraph, sentence, or even a small part of sentence) is directly quoted even if the reference is cited. Following the structure or organization of someone else's work is also plagiarism. Students caught plagiarizing will be given a grade of "F".
- **Cheating.** Using assignments, projects, or exams from previous semesters to study for exams, to help complete your assignments, or for any other purpose whatsoever is strictly prohibited. Violators will be failed.

University of Idaho Classroom Learning Civility Clause

In any environment in which people gather to learn, it is essential that all members feel as free and safe as possible in their participation. To this end, it is expected that everyone in this course will be treated with mutual respect and civility, with an understanding that all of us (students, instructors, professors, guests, and teaching assistants) will be respectful and civil to one another in discussion, in action, in teaching, and in learning.

Should you feel our classroom interactions do not reflect an environment of civility and respect, you are encouraged to meet with your instructor during office hours to discuss your concern. Additional resources for expression of concern or requesting support include the Dean of Students office and staff (885-6757), the UI Counseling & Testing Center's confidential services (5-6716), or the UI Office of Human Rights, Access, & Inclusion (885-4285).

Disability Support Services

If you believe that you require disability-related academic adjustments for this class (including pregnancy-related disabilities), please contact Center for Disability Access and Resources (CDAR) to discuss eligibility. A current accommodation letter from CDAR is required before any modifications, above and beyond what is otherwise available for all other students in this class will be provided. Please be advised that disability-related academic adjustments are not retroactive. CDAR is located at the Bruce Pitman Building, Suite 127. Phone is 208-885-6307 and e-mail is cdar@uidaho.edu. For a complete listing of services and current business hours visit <https://www.uidaho.edu/cdar>