



BE 205 (3 credit hours): Engineering Analytics and Problem-Solving

Location to Provided Later ; Wednesdays, 2:00PM to 4:30PM, Spring Semesters

Description of Course

This course will use computer-based training to learn and master the use of Microsoft Excel. The course will concentrate on data analytics and problem-solving using Python programming language with emphasis on statistics and solving Biosystems Engineering problems. Python programming will cover objects, objects types, graphics user interfaces (GUIs), sequences, strings, lists, dictionaries, coding user-defined functions, decision structures, loop structures and Booleans, classes, simulation and design, object-oriented programming (OOP), using Python libraries. Special topics related to data collections, exploring data, packages, prediction and analytics tools and data over the internet will be introduced.

Course Prerequisites or Co-requisites

None

Instructor and Contact Information

Dr. Akrum H. Tamimi, Professor of Practice; Forbes Bldg. #36, room 140;
520-621-9663; akrumt@arizona.edu

Office Hours: By appointment via Zoom. Send me an email letting me know your availability and I will send an invite to meet one on one or in groups.

D2L: <https://d2l.arizona.edu/d2l/home/989066>

Course Format and Teaching Methods

Due to COVID-19 Pandemic, this course will be taught both in person and via zoom. Lecture recordings will be posted in D2L which will be connected to quizzes. You must view the recording as a condition to take the quiz. You will have multiple of those recordings and connected quizzes every week. Reading materials and quizzes related to the assigned reading materials will also be posted in D2L. During lecture time, a short lecture will be presented emphasizing the main points and students' questions will be answered. More information and examples related to subject matter for that week will be presented.

Students are responsible to check materials, assignments, quizzes, and announcements posted to D2L on regular basis. Materials will be posted to D2L at least one week before it is covered in class.

Students are required to complete all programming assignments, programming project and take the midterm exam to pass the course.

Course Objectives

The course will cover

1. Microsoft Excel application basic operation and advanced functions.
2. Problem-solving techniques using Python programming language.
3. Basic statistical calculations and data analytics using user-defined functions in Python.
4. Python programming elements such as objects, GUI, objects' type, functions, loop structures and Booleans, classes, OOP.

5. Python libraries.
6. Data analytics prediction tools
7. Accessing data over network and the internet.

Expected Learning Outcomes

At the conclusion of the course, students will be able to

1. Use Microsoft Excel with its functions to perform sophisticated calculations including iterations to solve problems.
2. Solve engineering problems using Python programming language.
3. Develop Python modules that can provide central and variability tendency measures for sets of data read from CSV files.
4. Develop Python modules and a complete program that can perform analysis of variance for sets of measurements and make a conclusion about the data sets in regard to statistical significance differences.
5. Write Python code to solve Biosystems Engineering problems such as:
 - a. calculating flow rate in pipes and laterals of irrigation systems
 - b. downloading AZMET data and calculate evapotranspiration and describe environmental data
 - c. determine when to irrigate and calculating how much to irrigate under controlled environment agricultural using solar methods
 - d. graphing objects and engineering layout
 - e. other engineering problems
6. Develop Python functions, modules and classes that uses Python objects, GUIs, sequences, strings, lists, dictionaries, if statements, for and while loop structures
7. Develop Python programs that utilizes object-oriented programming (OOP)
8. Use Python libraries and frames
9. Learn how to install Python libraries, packages and prediction and analytics tools
10. Explore data from the internet, clean it, validate it and use it to make predictions.

Absence and Class Participation Policy

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: <http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop>

The UA policy regarding absences for any sincerely held religious belief, observance, or practice will be accommodated where reasonable, <http://policy.arizona.edu/human-resources/religious-accommodation-policy>.

Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: <https://deanofstudents.arizona.edu/absences>

Participating in the course and attending lectures and other course events are vital to the learning process. As such, attendance is required at all lectures and discussion section meetings. Absences may affect a student's final course grade. If you anticipate being absent, are unexpectedly absent, or are unable to participate in class online activities, please contact me as soon as possible. To request a disability-related accommodation to this attendance policy, please contact the Disability Resource Center at (520) 621-3268 or drc-info@email.arizona.edu. If you are experiencing unexpected barriers to your success in your courses, the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office is located in the Robert L. Nugent Building, room 100, or call 520-621-7057.

Makeup Policy for Students Who Register Late

If you register after the first class meeting, you can make up missed assignments/quizzes and the deadline for doing so will be determined case-by-case. Please talk to the instructor to determine those due dates.

Course Communications

Official UA e-mail address and this course D2L

Required Texts or Readings

The textbook is required and is needed and will be used during the entire semester:

John M. Zelle, 2017. *Python Programming: an introduction to Computer Science*. **Third edition**. Franklin, Beedle & Associates Inc. 2154 NE Broadway, Suite 100. Portland, Oregon 97232. ISBN 9781590282755.

Handouts in the form of PDF files for specific topics will be provided by the instructor via D2L.

Microsoft Excel Computer Based Training will also be required. Links to those materials will be provided via D2L.

Required or Special Materials

You will need a Windows Based computer/laptop preferably (Windows 10). Apple emulating Windows caused many problems in previous semesters. You can check out Windows 10 laptops from the library if you do not have access to one.

Required Extracurricular Activities

None.

Assignments and Examinations: Schedule/Due Dates

You are required to read the materials assigned for the week, view videos, take any quizzes, and develop any code as posted on D2L.

The schedule listed below shows assignments for each week. Quizzes are due as per D2L. Other homework assignments are usually due one week after work is assigned. There will be one midterm at the date shown on schedule. The mid-term exam that will be taken online outside class time.

There will be assignments for every week as shown in the schedule below.

You can request a review of your grade for any homework, quiz, or exam. You have two weeks to discuss your grade after the due materials are graded and returned. Late quizzes, homeworks, and assignments will not be accepted. There are no make ups for exams unless missing an exam is excused.

Final Examination or Project

There will be no final exam for this course. However, there will be 4 programming projects that will take two weeks to complete. Each of those programming projects are due at the end of the two weeks allotted for the project. Start early on those, they take time to complete.

Grading Scale and Policies

Grade distribution for the course are shown in the table below. University policy regarding grades and grading systems is available at <http://catalog.arizona.edu/policy/grades-and-grading-system>

Component	Grade
Weekly Quizzes	30%
Programming Assignments	30%
Programming Projects - 4 Projects	30%
Midterm Exam	10%
Total	100%

Letter Grade	% Upper Limit	% Lower Limit
A	100	90
B	89	80
C	79	65
D	64	60
E	59	0

Incomplete (I) or Withdrawal (W):

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at <http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete> and <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal>, respectively.

Dispute of Grade Policy

All grades can be disputed within 2 weeks of posting them on D2L.

Scheduled Topics/Activities

Schedule of topics and activities is shown below.

Date	Topic	Assignments
1/13/2021	Introduction to course, objectives, procedures, required tools	Install Python and Install the IDEAL. Start working on Excel Spread sheets - See D2L. Purchase the Python Book.
1/20/2021	Computers & Programs. Writing Python Simple Programs	Purchase the Python Book; Take Quiz to Install Python. Read Chapters 1 and 2 in Text Book. Complete Quizzes and Programming assignments for this week
1/27/2021	Computing with Numbers	Read Chapter 3; Complete Quizzes and Programming assignments for this week. Excel HW Assignment 1 Due.
2/3/2021	Sequences: Strings, Lists and Files	Read Chapter 5 and Special Presentation about Lists. Complete Quizzes and Programming assignments for this week.
2/10/2021	Decision Structures: if statements; Loop Structures: for & while loops	Read Chapters 7 and 8. Complete Quizzes and Programming assignments for this week. Excel HW Assignment 2 Due.
2/17/2021	Functions in Python	Read Chapters 6. Complete Quizzes and Programming assignments for this week.
2/24/2021	Objects and Graphics. Introduction to Turtle Graphics	Read Chapter 4. Complete Quizzes and Programming assignments for this week. Excel HW Assignment 3 Due.
3/3/2021	Putting it together	Programming Project 1 - Anova
3/10/2021	Reading Day, No Class	
3/17/2021	Dictionaries; Defining Classes	Read section 11.7 from Chapter 11 and Special presentation about Dictionaries. Read Chapter 10. Complete Quizzes and Programming Project 1
3/24/2021	Special Topics 1	Complete Quizzes and Programming assignments for this week. Continue working on Programming Project 2
3/31/2021	Special Topics 2	Complete Quizzes and Programming assignments for this week. Continue working on Programming Project 2
4/7/2021	Special Topics 3	Complete Quizzes and Programming assignments for this week. Continue working on Programming Project 3
4/14/2021	Special Topics 4	Complete Quizzes and Programming assignments for this week. Continue working on Programming Project 3
4/21/2021	Special Topics 5 Reading Day	Complete Quizzes and Programming assignments for this week. Continue working on Programming Project 4
4/28/2021	Special Topics 6	Complete Quizzes and Programming assignments for this week. Continue working on Programming Project 4
5/5/2021	Last Day of Classes	Catching up on HW, Assignments, programs etc. Class Evaluation

Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Students are asked to refrain from disruptive conversations with people sitting around them during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be reported to the Dean of Students.

Threatening Behavior Policy

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See <http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

Accessibility and Accommodations

Please visit Disability Resource Center website: <http://drc.arizona.edu/instructors/syllabus-statement>.

Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See:

<http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity>.

The University Libraries have some excellent tips for avoiding plagiarism, available at <http://new.library.arizona.edu/research/citing/plagiarism>.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

UA Nondiscrimination and Anti-harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; see <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Additional Resources for Students

UA Academic policies and procedures are available at <http://catalog.arizona.edu/policies>

Student Assistance and Advocacy information is available at <http://deanofstudents.arizona.edu/student-assistance/students/student-assistance>

Confidentiality of Student Records

<http://www.registrar.arizona.edu/personal-information/family-educational-rights-and-privacy-act-1974-ferpa?topic=ferpa>

Subject to Change Statement

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.