



DEPARTMENT OF MATHEMATICS AND COMPUTER & INFORMATION SCIENCE

SYLLABUS

CS 2521 **Scientific Programming in Python**

Monday & Wednesday – (3:50 - 5:20 PM)

*Instructor* **Renu Balyan; Frank Sanacory**

*Office* **NAB 1012, NAB 2043**

*Office Hours* By appointment

*Email* [balyanr@oldwestbury.edu](mailto:balyanr@oldwestbury.edu); (use CS 2521 in subject line)  
[sanacoryf@oldwestbury.edu](mailto:sanacoryf@oldwestbury.edu)

**TEXTBOOK:**

- <https://thepythoncodingbook.com/>
- A Primer on Scientific Programming with Python (Texts in Computational Science and Engineering) 5<sup>th</sup> ed. 2016 Edition by Hans Peter Langtangen.

**PREREQUISITE:** MA 2310: Calculus I

**COURSE DESCRIPTION:**

This course focuses on the developing the Python coding skills. It discusses the Python fundamentals, anatomy of a program, functions, data structures, dealing with bugs and errors, debugging. Emphasis on scientific applications, data abstraction and object-oriented programming concepts. Students learn the language features of Python with an eye toward scientific and data analysis applications using NumPy, Pandas, Scikit-learn and Matplotlib for visualization.

**COURSE OBJECTIVES:** At the end of this course the students will be able to:

- Understand various data containers and control structures
- Access files, write to files and to and from other data streams
- Understand the object model and OOP concepts
- Use abstract data structures and implement algorithms
- Understand basic concepts in machine learning
- Apply scientific algorithms to various scientific scenarios

## **Topics Covered\*:**

- 1. Fundamental Concepts: Python (*Part 1: Chapter 1*)**
  - a. variables | using functions | data type basics | commenting
  - b. Conditions: if statements
  - c. Importing modules
- 2. Loops, Lists & More Fundamentals (*Part 1: Chapter 2*)**
  - a. Loops: while, For
  - b. Lists
  - c. Indexing & Slicing
- 3. User-defined Functions (*Part 1: Chapter 3*)**
  - a. Defining functions
  - b. Scope
  - c. Parameters & arguments
  - d. Return statement
- 4. Data, Data Types & Data Structures (*Part 1: Chapter 4*)**
  - a. data structures | iterable,
  - b. mutable and immutable data types
  - c. string and list methods
  - d. tuples | dictionaries
  - e. reading data from files | writing data to spreadsheets
- 5. Dealing with Errors & Bugs (*Part 1: Chapter 5*)**
  - a. Understanding bugs and errors
  - b. Error messages
  - c. Debugging
- 6. Object Oriented Programming (*Part 2: Chapter 7*)**
  - a. Classes | attributes |
  - b. data attributes/ instance variables & Methods
  - c. `__init__` and self
- 7. Quantitative Applications using NumPy (*Part 2: Chapter 8*)**
- 8. Analyzing Data using Pandas**
- 9. Data Visualization using Matplotlib (*Part 2: Chapter 10*)**
  - a. 2D plots | subplots | images | 3D plots
- 10. Introduction to Machine Learning using SciKit-learn**

\* The instructor has the right to update the contents if needed.

## **ACTIVITIES/ASSIGNMENTS/REQUIREMENTS:**

There will be programming assignments, exams, and Quizzes. Students are required to submit their work by the due date.

**ATTENDANCE:**

Class attendance is required and a record of attendance will be kept. If you miss a class it is your responsibility to find out what material was covered in class, the homework, any announcements about the schedule for upcoming tests or exams.

**EVALUATION:**

Letter grades will be assigned to each student based on a mathematical calculation of the points earned on the homework, projects, quizzes as well as the mid-term and final exam. The overall weight scheme is:

- Class participation and quizzes: 10%
- Lab Assignments: 30%
- Midterm: 30%
- Final exam: 30%

<b>A</b> = [94, 100] <b>A<sup>-</sup></b> = [90, 93]	<b>B<sup>+</sup></b> = [87, 89]	<b>C<sup>+</sup></b> = [77, 79]	<b>D<sup>+</sup></b> = [67, 69]	<b>F</b> = [0, 59]
	<b>B</b> = [84, 86]	<b>C</b> = [74, 76]	<b>D</b> = [64, 66]	
	<b>B<sup>-</sup></b> = [80, 83]	<b>C<sup>-</sup></b> = [70, 73]	<b>D<sup>-</sup></b> = [60, 63]	

**Note:**

The teaching management tool **Blackboard** will be used to post the assignments, collect the submission, communicate and post grades.

**Course Rules**

- All assignments should be finished individually unless otherwise specified.
- Do not miss the mid-term exam unless under unavoidable circumstances. Contact the instructor within a week of missing the exam for a makeup exam, if you provide valid documentation for the reason you missed the exam.
- There will be No makeup exam for the final.
- It is a student's responsibility to regularly check his/her campus emails and make sure emails can be accessed in his/her devices (computer, cell phone, and so on).
- You need to submit any complaint for a grade within a week of the posted grade.
- Email is the preferred method of communications, make sure to include CS 2521 in the mail subject.

**ATTENDANCE AND PARTICIPATING IN CLASS IS ABSOLUTELY IMPORTANT FOR YOUR SUCCESS IN THIS COURSE.**

**Tips to Succeed**

- Participate in class: ask questions, answer questions, don't be afraid to guess answers.
- If you do not understand a particular concept, ask in class or during office hours.

## **General Rules:**

**Mask Policy:** to protect the health of everyone in this class, all students are required to wear a mask while inside campus buildings. Your mask must adequately cover both your nose and mouth. This is in keeping with the College's fall 2021 policy (all students, faculty, staff and visitors **no matter their vaccination status will be required to wear face masks in all indoor spaces**)( Refer to Guidance Section 2: Campus-wide Protocols – Masks and Social Distancing <https://www.oldwestbury.edu/covid#covidoperations> ). A student who comes to class without a mask will be required to leave to obtain one before returning to class. A limited number of masks may be available at designated locations on campus. Any student who refuses to wear a mask may not enter the classroom nor participate in the class. There will be no exemptions or waivers of the 100% compliance mask policy. Continued refusal to wear a mask or face covering will be reported to the Office of Student Conduct. Masks are for both your own and for others' safety and wellbeing- please remember our campus commitment to care for each other, to Defend the Den, and take this simple step to protect yourself and our OW community. In light of the FDA's full approval of the first COVID-19 vaccine, vaccination is now also mandated for students on our campus in accordance with SUNY policy.

**Attendance Policy:** You are expected to come to class on time and stay until the end of class. It is understood that illness or unforeseen circumstances will, on occasion, prevent class attendance. Excessive absences and habitual tardiness in attending class may have an adverse effect on class performance, the final grade for the course, and could result in the student failing the course.

Finally, while in class, students are expected to behave in a manner that is respectful of other students' right to learn. Therefore, disruptive behaviors of any kind will not be tolerated and such behaviors could affect a student's final grade or result in the student being removed from the class.

**Incomplete:** A grade of Incomplete (I) may be assigned by the instructor when:

- Extenuating circumstances, such as accident or illness, make it impossible for the student to complete the course work by the end of the semester; The student has completed most of the course work at a passing level; The instructor expects that the student will be able to complete the remainder of the course requirements by the end of the following semester.
- A grade of I remains in effect for one semester. A student must make appropriate arrangements with his/her instructor to complete the course requirements. The instructor will inform the student concerning the specific scope and nature of the work that must be completed. To certify fulfillment of course requirements, the instructor is expected to submit a letter grade by the end of the following semester. If the instructor does not submit a grade, the Registrar will automatically assign a grade of F unless the instructor submits a written request to the Registrar for an extension, or the student has filed an application for CR/NC, in which case a grade of NC would be assigned. Students who are completing an incomplete should not register for that course in the semester that they are completing the incomplete.

**Academic Misconduct:** The student is expected to complete the coursework on their own. Handing in someone else's work or copying another student's paper during an exam is a violation of the Student Code of Conduct for the State University of New York at Old Westbury (see policies and definitions below).

**Academic Integrity:** The following policies and definitions were taken from the college catalog of the State University of New York College at Old Westbury:

As is the policy of all SUNY institutions, students are expected to maintain the highest standards of honesty in their college work. Any act which attempts to misrepresent to an instructor or College official the academic work of the student or another student, or an act that is intended to alter any record of a student's academic performance by unauthorized means, constitutes academic dishonesty. Cheating, forgery, and plagiarism are considered serious offenses and are subject to disciplinary action.

**Cheating:** Cheating is defined as giving or obtaining information by improper means in meeting any academic requirements. Examples of cheating, although not inclusive, include: Unauthorized giving or receiving of information for an examination, paper, laboratory procedure, or computer assignment (file or printout); taking an examination for another student or allowing another student to take an examination for you; altering or attempting to alter a grade either on graded work or in an instructor's records or on any College form or record. See above section "Cheating on programming assignments."

**Plagiarism:** Plagiarism is defined as the use of material from another author whether intentional or unintentional, without referencing or identifying the source of the material. If students have any questions as to what constitutes plagiarism, it is their responsibility to get clarification by consulting with the appropriate instructor.

#### **ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES:**

If you have a physical, psychological, medical or learning condition that may impact your course work, please contact Stacey DeFelice, Director, Office of Services for Students with Disabilities (OSSD), NAB 2065, Phone: [516-628-5666](tel:516-628-5666), Email: [defelices@oldwestbury.edu](mailto:defelices@oldwestbury.edu).

The office will help you determine if you qualify for accommodations and assist you with the process of accessing them. All support services are free and all contacts with the OSSD are strictly confidential. SUNY Old Westbury is committed to assuring that all students have equal access to learning activities and social activities on campus. <https://www.oldwestbury.edu/academics/support/OSSD>

**COUNSELING RESOURCES:** As a college student, there may be times when personal stressors interfere with your academic performance or negatively impact your daily life. If you or someone you know at this college is experiencing mental health challenges, please contact the Counseling and Psychological Wellness Services at 516-876-3053. We're located at the Student Union, Lower Level, Suite 100, and are open Monday to Friday, 9am to 5pm. The counseling center continues to operate and offer its services to students even at times of social distancing and remote learning. During this time, the counseling center will offer both in-person or tele-health sessions (video chats or phone calls). If you wish to set an appointment, please contact us at [counselingcenter@oldwestbury.edu](mailto:counselingcenter@oldwestbury.edu).

The National Suicide Prevention Lifeline also offers help 24/7, and can be contacted at 1-800-273-8255.

**TITLE IX, SEXUAL DISCRIMINATION, HARASSMENT AND VIOLENCE:** SUNY Old Westbury prohibits sexual discrimination, harassment and violence, and will promptly respond to all complaints. The purpose of Title IX is to prevent sex discrimination on campus, address reported assaults and incidents, limit the effects of harassment on the educational environment, and prevent its recurrence. If you or someone you know believes they have been subjected to sexual discrimination, harassment or violence, help is available. To report or for more information please visit <https://www.oldwestbury.edu/title-ix>, please contact the Title IX coordinator, Deputy Title IX coordinator or University Police at 516-876-3333. Confidential resources and support are also available from the counseling professionals in the Counseling & Psychological Wellness Services department, located in the Student Union Lower Level Room LL100 (off the Rotunda) at 516-876-3053.

Usama Shaikh, Title IX Coordinator  
Campus Center H-417  
Phone: 516-876-3080 , Email: shaikhu@oldwestbury.edu

**BASIC NEEDS STATEMENT:** Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support at (516)876-3067 or Student Union 303. The Panther Food Pantry is located in the Student Union 301B.

**Online Meeting policy:** The Student Code of Conduct [<https://www.oldwestbury.edu/policies/code-student-conduct>] applies to online behavior as well as in-person or classroom behavior. You are expected to be professional and respectful when attending class online. The following are class policies for our meetings. Please read carefully, these policies are effective immediately and apply for the remainder of the semester. All students are expected to adhere to the policies.

NOTE: Class meetings including video, audio, and chat text may be recorded.

- Mute your microphone when you are not talking. This helps eliminate background noise.
- Use a headset when possible. If you own headphones with a microphone, please use them. This improves audio quality.
- Be in a quiet place when possible. Find a quiet, distraction-free spot to log in.
- Stay on topic. Use the chat window for questions and comments that are relevant to class. The chat window is not a place for socializing or posting comments that distract from the course activities.
- No disrespect or hate speech. Just like in our in-person class, respectful behavior is expected.