



# Self-Paced Online Courses



## Course Syllabus

### Self-Paced Online Course (SPOC) Data Structures CS 1520

#### Instructor Contact Information

|                                  |                                                                                                                                                                                   |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Instructor</b>                | Mark Fienup                                                                                                                                                                       |
| <b>Phone</b>                     | 319-273-5918                                                                                                                                                                      |
| <b>Office hours and location</b> | By appointment setup via email<br>Location East Bartlett 39 or via Zoom:<br><a href="https://uni.zoom.us/j/3192735918">https://uni.zoom.us/j/3192735918</a><br>Zoom Password: UNI |
| <b>Email Address</b>             | mark.fienup@uni.edu                                                                                                                                                               |
| <b>Class Delivery</b>            | Online / Blackboard Learn                                                                                                                                                         |
| <b>Preferred Communication</b>   | I will primarily communicate with students via email. Email to request an appointment by Zoom.                                                                                    |

#### Course Information

##### Credit Hours: 4

The aggregation of time on tasks, assignment, and interactions in an online course will reflect rigor and expectations equivalent to the federal definition of the credit hour—15 hours of direct faculty instruction and a minimum of 30 hours of out-of-class student work for each credit hour awarded.

##### Course Description

Introduction to use and implementation of data structures such as sets, hash tables, stacks, trees, queues, heaps, and graphs. Additional topics include searching algorithms, sorting algorithms, and algorithmic time and space complexity analysis. Design and implementation of programs using functional decomposition.

- Course prerequisite CS 1510 or departmental approval; Prerequisite or co-requisite: CS 1800 or department approval
- Purpose of the course: This course is the second-semester programming course after Introduction to Computing (CS 1510 or equivalent). It is designed to improve your programming analysis, design, and implementation skills from the "toy-program" level of your introductory programming course

- to "medium-size" programs. The design, implementation and analysis of in-memory data structures (stacks, queues, lists, strings, trees, and graphs) and the algorithms for manipulating them are a major focus of the course.
- How and why the course is organized in a particular sequence (explanation of learning modules, etc.)

## Learning Objectives

### University Level Outcomes:

- **Critical Thinking:** Students will demonstrate critical thinking through the ability to evaluate, analyze, and integrate information from a variety of sources in order to develop reasoned positions and solutions to problems.
- **Communication:** Students will display competence in oral, written, and visual communication, as appropriate for their discipline.
- **Program Content Knowledge:** Students will demonstrate discipline-specific knowledge and skills in their major fields of study.

### Program Level Objectives:

- Students should be able design, implement, and test efficient programs.

### Course Level Objectives: After this course, you should be able to:

- implement efficient data structures include: stacks, queues, lists, heaps, hash tables, trees, and graphs
- design and implement "medium" sized programs using functional decomposition and be able to select appropriate data structures.

## Course Content Requirements

**Required Textbook:** Problem Solving with Algorithms and Data Structures Using Python, 2nd edition, by Bradley N. Miller and David L. Ranum. Franklin, Beedle & Associates. ISBN: 978-1-59028-257-1

### Free on-line version of the textbook:

[https://runestone.academy/ns/books/published/CS1520\\_UNI/index.html](https://runestone.academy/ns/books/published/CS1520_UNI/index.html)

**Software Tools:** You will need to download and install the free Python development package (latest version 3.x) from the Python Web-site: <http://www.python.org/>

## Instructional Methods

This course consists of the following activities and assessments to assist you in achieving the course and instructional units/modules objectives. Each unit corresponds to a textbook chapter which you should complete sequentially from chapters 1 to 7. For each chapter, you should follow these steps:

- 1) read the chapter thoroughly.
- 2) work through **the laboratory assignments** related to the chapter (usually there are two labs per chapter).
- 3) take the True/False and Multiple Choice **chapter quiz** on the eLearning system.

- 4) complete **the programming project(s)** associated with the chapter. Programming projects require you to write larger, complete programs so you can improve your program design, implementation, and testing skills.

## Evaluation Methods

**Laboratory Assignments:** Each chapter typically has two labs to provide you practice on chapter related skills. Each lab will consist of short-answer questions and programming exercises where you will be modifying and writing small sections of Python code. Using a word processor program (Word, Open-Office, etc.), save your short-answer responses to a file as a Word (docx) or in Rich-text format (.rtf) format. Alternatively, you can print the labs and hand-write your answers and submit an electronic scan (.pdf) or image (.jpg) format. Zip your answer file and your Python programming files together and submit the .zip file via **Lab # Submission** link on eLearning system.

**Chapter Quizzes:** Each chapter has an associated True/False and Multiple Choice **chapter quiz** on the eLearning system.

**Programming Projects:** Programming projects require you to write larger, complete programs so you can improve your program design, implementation, and testing skills. Each programming project includes a grading rubric used for its evaluation.

**Examinations:** There will be three exams: two mid-term exams and a comprehensive final exam. Examinations are taken on the eLearning system after satisfactory completion of all labs, quizzes, and programming projects covered on the examination according to the below course schedule. Examination questions will be a combination of True/False, Multiple Choice, fill-in the blank, short essay, and includes writing short Python code segments.

## Course Schedule:

| Chapter                                                                              | Topics                                                                                                                 | Lab Assignments         | Projects               |
|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------------|
| 1                                                                                    | Introduction – Python review and using Python classes                                                                  | Lab 1<br>Lab 2          | Project 1              |
| 2                                                                                    | Algorithm Analysis – Big-oh notation                                                                                   | Lab3<br>Lab 4           | Project 2              |
| 3 and Section 6.6                                                                    | Basic Data Structures – Stack, Queue, Deque, List, and from section 6.6 Priority Queue implemented using a binary heap | Lab 5<br>Lab 6<br>Lab 7 | Project 3<br>Project 4 |
| <b>Mid-term Examination 1 covering Chapters 1, 2, 3, and Section 6.6</b>             |                                                                                                                        |                         |                        |
| 4                                                                                    | Recursion and problem-solving techniques                                                                               | Lab 8<br>Lab 9          | Project 5              |
| 5                                                                                    | Searching and Sorting including hashing techniques                                                                     | Lab 10<br>Lab 11        | Project 6              |
| <b>Mid-term Examination 2 covering Chapters 4 and 5</b>                              |                                                                                                                        |                         |                        |
| 6                                                                                    | Trees – Binary-search trees and AVL-trees                                                                              | Lab 12<br>Lab 13        | Project 7              |
| 7                                                                                    | Graphs – graph representations and graph algorithms                                                                    | Lab 14<br>Lab 15        | (no project)           |
| <b>Final Examination: comprehensive, but focusing on details of chapters 6 and 7</b> |                                                                                                                        |                         |                        |

### **Determination of Grade:**

Course components are weighted as:

|                       |      |
|-----------------------|------|
| Chapter quizzes:      | 5 %  |
| Laboratories:         | 15 % |
| Programming Projects: | 20 % |
| Mid-term exam 1:      | 20 % |
| Mid-term exam 2:      | 20 % |
| Final exam:           | 20 % |

Course grades will be assigned based on the following grading scale:

|          |   |
|----------|---|
| 100-90   | A |
| 89 - 80  | B |
| 79 - 70  | C |
| 69 - 60  | D |
| Below 59 | F |

Plus and minus grades will be assigned for scores within two percentage points from a grade cutoff (e.g., 91.9 to 90 is an A-, and 89.9 to 88 is a B+).

Feedback on labs, programming projects, and examinations is generally provided within a couple days of submission.

### **Important UNI Policies and Statements**

#### **Academic Integrity:**

To ensure academic integrity and to follow [UNI policies on Student Academic Ethics](https://policies.uni.edu/301) (see: IV. Academic Ethics Violations), students will not plagiarize, misrepresent, fabricate, or cheat. Unless otherwise instructed and approved by the instructor, students will take quizzes and exams **individually**, without collaboration with other parties and/or using notes or other texts. Similarly, students will submit work (papers, presentations, and other assessments) that is their own work (in regard to violations of these ethics policies, see: V. Academic Ethics Sanctions). (<https://policies.uni.edu/301>).

#### **Artificial Intelligence (AI) Tools:**

AI is rapidly changing the face of software engineering. Artificial Intelligence tools (e.g. chatGPT and Bard) are rapidly developing that can generate full programs or act as a "copilot" by suggesting lines of code as you are writing. These tools hold great promise to increase your future productivity as a programmer, but only if you are a proficient enough programmer to assess the correctness and quality of code that the AI produces.

To achieve programming proficiency, you need to put in the practice. You will not get any better at programming by having an AI tool write code for you. Thus, in this course you must write all of your own code for programming homework without the use of AI.

### **Free Speech Syllabus Statement:**

As per the Board of Regents - State of Iowa, the Syllabus Free Speech Statement will be reviewed at the beginning of each course. (Approved by UNI Faculty Senate: April 26, 2021)

The University of Northern Iowa supports and upholds the First Amendment protection of freedom of speech and the principles of academic and artistic freedom. We encourage the free and responsible exchange of diverse ideas on our campus. The University is committed to open inquiry and the spirited and thoughtful debate of such ideas.

### **Discrimination, Harassment, and Sexual Misconduct Policy:**

The University is committed to achieving fairness and equity in all aspects of the educational enterprise and therefore prohibits discrimination, harassment, sexual misconduct, and retaliation under this policy. This policy applies regardless of the status of the parties involved and includes students, student organizations, visitors, faculty, administrators, and staff. [Discrimination, Harassment, and Sexual Misconduct Policy webpage](https://policies.uni.edu/1302) (<https://policies.uni.edu/1302>).

If you are aware of or witness discrimination, harassment, sexual misconduct, or retaliation **report the incident** to the Title IX Coordinator or designee in accordance with the [policy](#). Refer to [safety.uni.edu](https://safety.uni.edu) for additional information on resources and reporting options, including on-line reporting. Please take the time to acquaint yourself with your **mandatory reporting responsibilities**. Reporting does not launch an investigation but rather allows us to provide resources and options, such as advocacy services. Riverview Center serves as our primary provider of **advocacy services** for survivors of sexual assault and has an on-campus presence.

For those looking for sexual assault **prevention activities**, including classroom speakers and presentations for student organizations, please use the [Request a Presentation link under the Prevention tab at safety.uni.edu](#), call OCEM at 3.2846, or email [equity@uni.edu](mailto:equity@uni.edu) and we will be glad to make arrangements for you.

Our online educational program related to this policy is available at [training.uni.edu](https://training.uni.edu). Sign in with your CAT ID and pass phrase to view the specific training program(s) assigned to you. It is recommended that you complete the online training or attend an OCEM sponsored training at least once every other year. You will receive an email to alert you of assigned programs.

### **Non-discrimination in Employment or Education:**

Content in this class has the potential to be disturbing to some individuals based on life experiences. If you ever feel the need to step out of the classroom or decline participation in an activity, please request an alternative learning experience.

UNI Policy 13.02 Discrimination, Harassment, and Sexual Misconduct states: "The University is committed to providing a workplace and educational environment, as well

as other benefits, programs, and activities, that are free from discrimination and harassment based on a protected class, as well as retaliation."

Policy 13.02 outlines prohibited conduct and reporting processes. All University employees who are aware of or witness discrimination, harassment, sexual misconduct, or retaliation are required to promptly report to the Title IX Officer or Title IX Deputy Coordinator.

**If you or someone you know has been harassed or assaulted, you can find the appropriate resources at [safety.uni.edu](https://safety.uni.edu) and [equity.uni.edu](https://equity.uni.edu). Resources that provide free, confidential counseling are also detailed at [safety.uni.edu](https://safety.uni.edu).**

For additional information, contact the Office of Compliance and Equity Management, 117 Gilchrist Hall, 273-2846, [equity@uni.edu](mailto:equity@uni.edu).

### **Equal Opportunity and Non-Discrimination Statement:**

The United States Department of Education's Office for Civil Rights (OCR) requires that a notice of nondiscrimination be prominently displayed in any **publications used in connection with recruitment** of students or employees. Please note that this applies to electronic formats as well. Refer to the policy to view the University's approved statement. [Equal Opportunity and Non-Discrimination Statement webpage](https://policies.uni.edu/1303) (<https://policies.uni.edu/1303>).

### **Accommodations of Disabilities Policy:**

No qualified individual with a disability shall, by reason of such disability, be excluded from participation in or be denied the benefits of the services, programs, or activities of the University, or be subjected to unlawful discrimination by the University. This policy applies to all aspects of campus activities including employment, education, student programming, and services provided to the community at-large. [Accommodations of Disabilities Policy webpage](https://policies.uni.edu/1315) (<https://policies.uni.edu/1315>).

### **Student Accessibility Services:**

The University of Northern Iowa (UNI) complies with the Americans with Disabilities Act Amendments Act of 2008 (ADAAA), Section 504 of the Rehabilitation Act of 1973, the Fair Housing Act, and other applicable federal and state laws and regulations that prohibit discrimination on the basis of disability. Students with disabilities experiencing a barrier to access should connect with Student Accessibility Services (SAS) to request accommodations. SAS views disabilities as an integral part of the rich diversity at UNI and works collaboratively with students, faculty, and staff to create an accessible educational environment for students. UNI faculty are not obligated to provide accommodations for students with disabilities without proper notification from SAS and the student. Students may initiate the accommodation process at any time. However, accommodations are not retroactive, and the process for getting connected takes time. Therefore, SAS staff always recommends that students initiate the process as soon as possible rather than wait for academic and social-emotional responsibilities to become overly stressful and/or overwhelming. For more information about the accommodation process, please contact SAS at (319) 273-2677 Relay 711,

[accessibilityservices@uni.edu](mailto:accessibilityservices@uni.edu), or GIL 118. Additional information is also available at [sas.uni.edu](https://sas.uni.edu/). (<https://sas.uni.edu/>).

### **Affirmative Action Policy:**

The University is committed to a policy of equal opportunity in employment, retention, and advancement of employees without regard to age, color, creed, disability, gender identity, national origin, race, religion, sex, sexual orientation, veteran status, or any other basis protected by federal and/or state law, except in rare instances where sex may be a bona fide occupational requirement, and to a policy of affirmative action for protected classes. Affirmative action entails special efforts by the University community to recruit and hire protected class members throughout the University, proportionate to their availability in the relative labor market. These policies apply to all positions in the University. [Affirmative Action webpage](https://policies.uni.edu/1301) (<https://policies.uni.edu/1301>).

### **Office of Compliance and Equity Management:**

The University of Northern Iowa does not discriminate in employment or education. Visit [13.03 Equal Opportunity & Non-Discrimination Statement](https://policies.uni.edu/1303) for additional information. (<https://policies.uni.edu/1303>).

### **The Learning Center @ Rod Library:**

The Learning Center @ Rod Library provides free tutoring for a variety of different areas (i.e. writing, math, science, business, Spanish, college reading and learning strategies). The Learning Center @ Rod Library is open for walk-in assistance Monday-Thursday 10am-10pm and is free of charge for all UNI students. If you are unavailable during normal tutoring hours, online tutoring is also available through Smarthinking. You will need your CATID and passphrase to gain access. Access the [Smarthinking platform](https://tlc.uni.edu/online) (<https://tlc.uni.edu/online>). For more information, go to [The Learning Center](https://tlc.uni.edu) website (<https://tlc.uni.edu>), email [TheLearningCenter@uni.edu](mailto:TheLearningCenter@uni.edu), call 319-273-6023, or visit the TLC desk located on the main floor of Rod Library.

## **Course Communication and Technology**

### **Online Component:**

This course is completely an online utilizing Blackboard for instruction, materials, and communication. This online component can be accessed through the [UNiLearning Suite](http://elearning.uni.edu/) (<http://elearning.uni.edu/>)

All of the handouts and information for this course will be available in Blackboard. Students are advised to check the website and their email for communication. Any changes to the course syllabus or schedule will be announced through Blackboard. Assignments are due as specified in the course schedule and on the course Blackboard page in Blackboard. Students are responsible for learning how to use Blackboard for on-time submission of assignments. Blackboard tutorials are also available on the [Blackboard Learn Help website](https://help.blackboard.com/Learn/Student). (<https://help.blackboard.com/Learn/Student>)



### **Communication with Instructor:**

I will primarily communicate with students via email ([mark.fienup@uni.edu](mailto:mark.fienup@uni.edu)), but I am available to meet via appointments arranged through email. Meeting can be via:

- Zoom at <https://uni.zoom.us/j/3192735918> with Zoom password: UNI
- telephone at 1-319-273-5918, or
- face-to-face in my UNI campus office located in East Bartlett hall room 39

Generally, it will take me less than 24 hours to respond to emails, except on the weekends where it may take up to 48 hours. I will provide grading feedback on assignment submissions online through Blackboard Learn within one week of their submission.

### **Online Netiquette and Classroom Civility:**

Because this is a fully online class, you will mostly be communicating with me and others through email, discussion forums, and other online communication. It is important to think of this communication as a formal dialogue. Be sure that in all communication you create an appropriate subject line, identify yourself, and craft professionally worded content. For example, shorthand messages from your cell phone are generally inappropriate. Always submit assignments through Blackboard and never via email.

Finally, read [Albion's Core Netiquette Rules](http://albion.com/netiquette/corerules.html) and always remember to address your professor and other students in a respectful manner.

(<http://albion.com/netiquette/corerules.html>)

### **Technology Requirements and Digital Literacy:**

The following information has been provided to assist you in preparing to use technology successfully in this course. You are required to have access to and the ability to use:

- UNI Gmail account
- Microsoft Office
- Reliable (High speed) internet connection. An ethernet connection is preferable to a wi-fi connection.
- Firefox and Chrome browsers are recommended.
- .zip a folder on your computer
- Zoom – (optional) for meeting with professor
- Taking images (.jpg) of your work or the ability to edit/draw on .pdf documents

Additionally, this course requires you to download and install the free Python development package (latest version 3.x) from the Python Web-site:

<http://www.python.org/>

### **Technical Support:**

If you experience any technical problems, contact the **Office of Online & Distance Education** at 319-273-7740 (local), 800-772-1746 (toll-free) or [cesp-consult@uni.edu](mailto:cesp-consult@uni.edu).

Please note: Follow the support steps outlined above, as your instructor is not the first line of support for technical problems.

For course support, Monday-Friday from 8:00 a.m. - 4:30 p.m.