

***Algorithms and Data Structures – CPSC-50300***

**Syllabus**

Summer Semester 2023

**I. Instructor Information**

*Instructor’s name:* Dr. Safwan Omari

*Office*: Romeoville, AS-129L

*Office hours:* by appointment

*How to make appointments outside of office hours:* via email

*Lewis office phone number:* (815) 836-5791

*Lewis email address:* omarisa@lewisu.edu

**II. Course Information**

Algorithms and Data Structures, CPSC-50300, 001 (online)

3 credits

***Course description:*** *This course is the study of the design and analysis of computer algorithms including the data structures used in these algorithms. Topics include design techniques, such as divide-and-conquer, dynamic programming, the greedy method and backtracking, sorting, searching, graph computations, pattern matching and NP-complete problems.*

**Prerequisites**

*CPSC 500000 and CPSC 50100*

Weekly Live sessions will be on **TBD** (via Zoom)

***Student Learning Outcomes:***

Course student learning outcomes:

1. Quantify the complexity of algorithms using Big-O notation.
2. Organize data in lists, trees, graphs, and maps, and identify the applications of each.
3. Apply sort and search routines to lists, trees, graphs, and maps.
4. Describe and write algorithms for performing pattern matching and path tracing.
5. Identify NP-complete problems and explain why they are NP-complete.

Program student learning outcomes:

1. Develop efficient programs using languages of various programming paradigms and for a variety of platforms.
2. Make use of mathematical structures and formulations to express theoretical ideas in computer science and solve problems.

**III. University Mission Statement**

Lewis University, guided by its Catholic and Lasallian heritage, provides to a diverse student population programs for a liberal and professional education grounded in the interaction of knowledge and fidelity in the search for truth.

Lewis promotes the development of the complete person through the pursuit of wisdom and justice. Fundamental to its Mission is a spirit of association, which fosters community in all teaching, learning and service.

***How this course connects to the University Mission:***

This course embraces the Mission of the University by fostering an environment in which each student is respected as an individual within a community of learners. In the spirit of Lewis University mission of promoting the complete person and lifelong learner, this course seeks to prepare students and equip them with essential skills that students will use and apply in their day to day activities in their professional work. Furthermore, knowledge that students obtain in this course outlines a framework that students can use to acquire new knowledge on a continuous basis.

**IV. Required Course Materials**

***Textbook(s):***

Title: Data Structures and Algorithms in Python

Edition: 1st edition

Author: Michael T. Goodrich, Roberto Tamassia and Michael H. Goldwasser

Publisher: Wiley

Publication date: March 18, 2013

ISBN: ISBN-10: 1118290275, ISBN-13: 978-1118290279

Required or Optional: Required

***Hardware and software requirements:***

* *General-purpose laptop/desktop (Windows preferred)*
* *Python 3.7(free)*
* *PyCharm community edition (free)*

**V. Instructional Methods and Activities**

***Modality of Instruction:***

This section is 100% online, blackboard and email will be the primary means of communication. Lecture recordings will be made available each week, in those recordings, the weekly material will be thoroughly discussed using power point slides and Python code examples. We will also be conducting weekly live session in which main ideas are emphasized, furthermore, student can interactively ask questions. Students are expected to do the assigned weekly reading and watch lecture recording for the week before attending live sessions. Live sessions will be mostly driven by students’ questions. Although attending live sessions is not mandatory, it is highly recommended. Outside of watching recordings, attending live sessions, and doing assigned readings, students are required to work on one Written Assignment and one Programming Project.

**VI. Course Schedule**

|  |  |  |
| --- | --- | --- |
| Week 1 | Chapter 1 Python Primer  Chapter 2 Object-Oriented Programming | **Written Assignment**   * R1.2, R-1.4, C-1.15, C-1.17, C-1.24 * R-2.5, R-2.8, R-2.10   **Programming Project**   * P-1.36, P-2.39 |
| Week 2 | Chapter 3 Algorithm Analysis  Chapter 4 Recursion | **Written Assignment**   * R-3.8, C-3.35, C-3.42, P-3.57 * R-4.1, R-4.3, C-4.9   **Programming Project**   * P-4.23 |
| Week 3 | Chapter 5 Array-Based Sequences  Chapter 6 Stacks, Queues, and Deques | **Written Assignment**   * R-5.3, R-5.7, C-5.31 * R-6.1, R-6.3, R-6.5, C-6.23   **Programing Project**   * P-6.32   **Midterm Exam** |
| Week 4 | Chapter 7 Linked Lists | **Written Assignment**   * R-7.1, R-7.3, R-.6, C-7.28   **Programing project**   * P-7.44   **Midterm Exam** |
| Week 5 | Chapter 8 Trees  Chapter 9 Priority Queues | **Written Assignment**   * R-8.1, R-8.4, R-8.21, C-8.42 * R-9.3, R-9.5, R-9.21, C-9.26   **Programing project**   * P-8.65 |
| Week 6 | Chapter 10 Maps, Hash Tables, and Skip Lists  Chapter 11 Search Trees | **Written Assignment**   * R-10.1, R-10.4, R-10.9, C-10.42 * R-11.2, R-11.5, R-11.8, C-11.29   **Programing project**   * P-11.61 |
| Week 7 | Chapter12 Sorting and Selection  Chapter 13 Text Processing | **Written Assignment**   * R-12.4, R-12.19, C-12.26 * R-13.3, R-13.12, C-13.43   **Programing project**   * P-12.58 |
| Week 8 | Chapter 14 Graph Algorithms (Optional) | **Final Exam** |

***Schedule Changes:*** *the above schedule is tentative, the instructor reserves the right to do modifications based on student progress and feedback. Any modifications to above schedule will be discussed and communicated verbally and via blackboard announcements.*

|  |  |
| --- | --- |
| *Grade* | *Percentage* |
| *A* | *≥ 93%* |
| *A-* | *90% - 92%* |
| *B+* | *87% - 89%* |
| *B* | *83% - 86%* |
| *B-* | *80% - 82%* |
| *C+* | *77% - 79%* |
| *C* | *73% - 76%* |
| *C-* | *70% - 72%* |
| *D+* | *67% - 69%* |
| *D* | *66% - 63%* |
| *D-* | *60% - 62%* |
| *F* | *< 60%* |

**VII. Grading Criteria and Course Policies**

***Assignments and Course Requirements:***

|  |  |
| --- | --- |
| *Written Assignments (x7)* | *20%* |
| *Programming projects (x7)* | *50%* |
| *Midterm* | *15%* |
| *Final Exam* | *15%* |
| ***Total*** | ***100%*** |

***Course Policies:***submissions will be evaluated using criteria reflecting the nature of the assignment. Your work MUST be completed and submitted by due date using dedicated links in blackboard. No late submissions will be accepted except in extreme emergency situations and with Instructor’s written approval (via email).

***Written Assignments***: these are selected set of questions from textbook end of chapter problems, all questions in a written assignment MUST be answered. All answers MUST be put in a single word document and submitted via blackboard.

***Programming Projects:*** the purpose of programming projects is for students to practice writing programs that are efficient and easy to read. Submitted code MUST be free of syntax errors and it MUST run successfully, before considered for grading. Source code that does not run will receive a grade of zero. Other grading criteria include addressing of all functional and non-functional (performance) requirements listed in the problem description, code readability, style and use of best programming features for the job, this includes use of classes, inheritance, appropriate data structures, meaningful variable names, etc.

*Submission – put all of your source code files (.py) and a README file in one zip-file and upload it in blackboard. Instructor should be able to run your code by simply unzipping all files into a new directory, and follow instructions in the README file. Email submissions will not be graded.*

***Exams***: there will be one Midterm and one Final exam, any material we cover in lectures, written assignments and programming projects may appear in the exams. Although you should not expect to be asked to write an entire program in those exam, you may/will be asked to write certain functions and code snippets. Code will be graded for correctness and efficiency, minor syntax errors are okay as long as they don’t compromise instructors’ ability to read and understand data structure and algorithms used in the code.

***Collaboration on course projects:*** collaborating on certain aspects of your code to resolve syntax errors, discuss programming language features, debate its performance, etc. is permitted, in fact, encouraged. A discussion forum will be available in blackboard shell to facilitate such collaboration. However, sharing/exchanging or verbatim use (i.e., copy/paste) of large portion of your code is NOT allowed (>20%). You can observe, participate in these discussions, learn from others’ ideas, however, you need to write down and submit your own implementation.

***Attendance***

Students are expected to attend and participate in all class sessions. Attendance is particularly important for the first two weeks in order for the instructor to confirm students’ registration status and avoid inclusion in the NO SHOW list submitted for administrative staff.

***Changes to Course Assignments or Grades:*** any changes to above grading components or criteria will be announced during lecture and via blackboard announcements.

**VIII. Information for Students**

***Requests for Reasonable Accommodations***

Lewis University is committed to providing equal access and opportunity for participation in all programs, services and activities. If you are a student with a disability who would like to request a reasonable accommodation, please speak with the Learning Access Coordinator at the Center for Academic Success and Enrichment (CASE). Please make an appointment by calling 815-836-5593 or emailing [learningaccess@lewisu.edu](mailto:learningaccess@lewisu.edu). Since accommodations require early planning and are not provided retroactively, it is recommended that you make your request prior to or during the first week of class.  It is not necessary to disclose the nature of your disability to your instructor. For more information about academic support services, visit the website at: [www.lewisu.edu/CASE](http://www.lewisu.edu/CASE).

Lewis University has adopted Blackboard Ally providing alternative formats for files uploaded by instructors. Students can click the down arrow next to any file, and select *Alternative Formats.*

***Sanctified Zone***

Guided by its Catholic and Lasallian heritage, Lewis University is firmly committed to fostering a campus atmosphere that is permeated by its Mission values of Fidelity, Wisdom, Knowledge, Justice, and Association. Accordingly, we have declared the University campus to be a Sanctified Zone, a place and a people *United in Diversity.* The active promotion of diversity and the opposition to all forms of prejudice and bias are a powerful and healing expression of our desire to be Signs of Faith (Signum Fidei) to each other. To learn more about the Sanctified Zone, please visit: http://www.lewisu.edu/sanctified zone

***Academic Integrity***

Scholastic integrity lies at the heart of Lewis University. Plagiarism, collusion and other forms of cheating or scholastic dishonesty are incompatible with the principles of the University. Students engaging in such activities are subject to loss of credit and expulsion from the University. Cases involving academic dishonesty are initially considered and determined at the instructor level. If the student is not satisfied with the instructor’s explanation, the student may appeal at the department/program level. Appeal of the department /program decision must be made to the Dean of the college/school. The Dean reviews the appeal and makes the final decision in all cases except those in which suspension or expulsion is recommended, and in these cases the Provost makes the final decision.

[***University Student Complaint Policy***](http://www.lewisu.edu/studentcomplaints)

The University Student Complaint Policy can be found at lewisu.edu/studentcomplaints

[***University Grade Appeal Policy***](http://www.lewisu.edu/studentcomplaints)

The University Grade Appeal Policy can be found at lewisuedu/studentcomplaints

***Additional policies and handbooks for this program, department, and college and where they can be found*** *(list policies or handbooks and where they can be found, or provide a link to the web location – delete if this does not apply)*

***Center for Health & Counseling Services***

To support student success, all Lewis students are eligible for free health and mental health services on the Romeoville campus. This includes commuters and those living on campus, part-time and full-time students, graduate and undergraduate students, and those taking Lewis classes at other locations.  For more information, visit the Center for Health & Counseling website at [www.lewisu.edu/studentservices/health](http://www.lewisu.edu/studentservices/health) or call (815)836-5455.

***Responsiveness to Change***

Understanding that the COVID-19 pandemic could influence the course of this semester, Lewis University will be guided by our Lasallian mission and the well-being of our community of students, faculty, and staff in respond and adapting to any sudden changes or circumstances. Based on the guidance of the State of Illinois and the Centers for Disease Control, it may be necessary to change the planned modality this course.

***Flexibility, Accommodations, and Student Absences***

Because we are committed to student success, the University community is committed to academic standards while maintaining flexibility and empathy. Absences relating to the Coronavirus crisis will be recognized as excused. Students experiencing disruptions in their lives related to the Coronavirus that impact class attendance and participation should contact their instructor and/or college Dean’s Office for assistance. Students directly impacted by Coronavirus will have the ability to request alternative grading this semester. Requests will be evaluated on a case by case basis and will require documentation.

Students who require academic accommodations due to disability caused by COVID-19, or to limit risk of exposure to Coronavirus, can engage in an interactive process with the Learning Access Coordinator to explore all avenues for accommodations. Students can contact the Academic Services office at 815-836-5593 or learningaccess@lewisu.edu to request an appointment.

***Face Coverings, Physical Distancing, and Surface Cleaning***

Face coverings are required in classrooms. Students will be expected to maintain physical distancing in the classroom (6 ft minimum) and to keep their nose and mouth covered at all times. Faculty will require students without face covering to obtain a disposable mask at the nearest University office providing them. While the University will disinfect classrooms and common spaces throughout the day, cleaning supplies will be provided in classrooms and offices so that students and faculty can wipe down work surfaces before class begins.