New Jersey Institute of Technology

Ying Wu College of Computing

Department of Computer Science

CS 114 - Introduction to Computer Science II – Fall 2023

Instructor Details: Arashdeep Kaur, Ph.D., Email: ak3257@njit.edu, Phone: 732-762-4265

Office Hours: Friday-12:00 -1:00 p.m. or by appointment

Course Description-NJIT

A study of advanced programming topics with logical structures of data, their physical representation, and the design of computer algorithms operating on the structures. The course covers program specifications, correctness and efficiency, data abstraction, and algorithm analysis.

Prerequisite: CS 113

Course Description-Instructor

This is a 3-credit course which covers the fundamental data structures and algorithms for information processing. This course uses a high-level programming language to illustrate the concepts covered. Students enrolled in the course must have a prior background in programming (course work or practical experience).

Course Objective

This course is an introduction to the study of data structures and basics of algorithms. This course gives knowledge of different types of data structures and the estimation of space and time complexity of algorithms. This course deals with organizing large amounts of data in order to reduce space complexity and time requirements.

Learning Outcomes

Students will have knowledge of basic algorithms and data structures for various sorting and searching techniques and can apply the knowledge and skills of algorithms and data structures in various domains. Students will be able to:

- Write programs that make good use of stacks, queues, linked lists, trees, graphs, and hash tables.
- Analysis of performance of algorithms in terms of Big O, Big Omega, and Big Theta.
- Understand worse case, best case and average case analysis.
- To program and discuss with others basic algorithms and data structures
- Design or select an appropriate data structure for a particular problem.

Tentative Course Contents

Introduction: Introduction to Data structures, Algorithms and their complexity and Time-Space trade-offs, Review of recursion.

Arrays: Array Definition and Analysis, representation, traversing, insertion and deletion.

Stack & Queue: Introduction to Stacks and queue, operations associated with stack and Queue, problem applications.

Linked list: Introduction to linked lists, Representation of linked lists in memory, Operations associated with Linked lists.

Trees and Graphs Trees: Basic Terminology and representations, operations associated with trees and graphs.

Sorting and Searching: Different types of searching and sorting algorithms and their corresponding implementations.

Applications: Discussion (and/or implementation) of applications of various concepts discussed.

Textbook & References

- Goodrich, M. and Tamassia, R. Data Structures and Algorithms in Java , John Wiley and Sons, Inc.
- T H Cormen, C E Leiserson, R L Rivest and C Stein, Introduction to Algorithms, 3/e, MIT Press, 2009.
- Lecture notes and resources.

Grading Policy

- Assignments 30%
- Midterm exam 20%
- Quiz 15%
- Class attendance and participation 5%
- Final exam 30%

Guidelines & Policies

Attendance: Attendance will be taken. Students are expected to attend the lectures in the section that they are registered in. Lectures are a sequence. If you skip one you will not be able to understand the lecture that follows, if you don't catch up with the one you missed. Catching up lectures is your responsibility and is done in your own time. Instructor has the right to modify the grading criteria to include attendance and class participation when necessary.

Email: Use of your NJIT email or Canvas inbox is strongly encouraged.

Grade Corrections: Check the grades in course work and report errors promptly. Please try and resolve any issue within one week of the grade notification.

Late submission: No late submissions will be allowed for homework assignments or projects, or any other course related work assigned.

Exam and Proctoring Policy: See the <u>NJIT Online Course Exam Proctoring page</u> for information on proctoring tools and requirements.

Collaboration and External Resources for Assignments: Some homework problems will be challenging. You are advised to first try and solve all the problems **on your own**. For problems that persist you are welcome to talk to the course assistant or the instructor. You are also allowed to collaborate with your classmates and search for solutions online. But you should use such solutions only if you understand them completely (admitting that you don't understand something is way better than copying things you don't understand). Also make sure to give the appropriate credit and citation.

Requesting Accommodations: If you need an accommodation due to a disability please contact Scott Janz, Associate Director of the <u>Office of Accessibility Resources and Services</u>, Kupfrian Hall 201 to discuss your specific needs. A Letter of Accommodation Eligibility from the office authorizing student accommodation is required.

NJIT Services for Students, Including Technical Support: Please follow this link.

Canvas Accessibility Statement: Please follow this link.

Academic Integrity: Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy. Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu