Northeastern University
College *of* Professional Studies

Undergraduate Course Syllabus

CET 2200

Data Structures and Algorithms

Course Information

Term and Year:	Fall 2017
Credit Hours:	3 semester credits
Course Format:	15-weeks on-campus
Location:	BOS
Meeting Days/Times:	Thursday 5:50 – 8:20pm

Instructor Information

Name:	Mohammed Anwaruddin
Email Address:	m.anwaruddin@northeastern.edu
Office Hours:	*Email me to schedule an appointment. I respond to emails within 48 hours*

Course Description

Covers the design, analysis, and implementation of data structures and algorithms to solve engineering problems using an object-oriented programming language. Topics include elementary data structures, (including arrays, stacks, queues, and lists), advanced data structures (including trees and graphs), the algorithms used to manipulate these structures, and their application to solving practical engineering problems. Pre-requisite: GET 2100 or ITC 2100.

Course Materials

- **Text Book**

  Required — Weiss, Mark A. *Data Structures and Algorithm Analysis in C++*. 4th Edition. Pearson 2014. ISBN-13: 978-0-13-284737-7

  Reference — Malik, D S. *Data Structures in C++,* 2nd Edition, Cengage Learning

- **Compiler**
  - Microsoft Windows Visual Studio 15 or higher
  - GCC 5.3 for Linux
  - Clang or g++ compilers for OS X (check online for latest versions)

Program Objectives

The objective of the Engineering Technology Programs at Northeastern University is to prepare students such that within a few years of graduation they will be able to secure for themselves a successful engineering career and contribute decisively to the improvement and development of technology by demonstrating their ability to:

1. Address and solve complex broadly-defined engineering problems related to their discipline and field of specialization
2. Work as team members, show leadership, and communicate technical concepts and ideas effectively
3. Manifest a high level of professional integrity, and make ethical decisions that will have a positive impact on the organization and society
4. Embrace and practice lifelong learning, continue personal growth, and professional self-improvement.

Student Learning Outcomes

Based on satisfactory completion of the course, a student should be able to:

- Formulate and apply object-oriented programming, using C++, as a modern tool to solve engineering problems.

- Demonstrate an understanding of basic data structures (such as an array-based list, linked list, stack, queue, binary search tree) and algorithms.

- Demonstrate the ability to analyze, design, apply and use data structures and algorithms to solve engineering problems and evaluate their solutions.

- Demonstrate an understanding of analysis of algorithms. Study an algorithm or program code segment that contains iterative constructs and analyze the asymptotic time complexity of the algorithm or code segment.

Expectations

- Workload: This is a *15-week-three semester credit* course. Students should expect 2.5 weekly hours of classroom faculty instruction, and a minimum of 5 hours of out-of-class student work per week.
- Attendance is mandatory
- Policy on late work
  - Late assignments will AUTOMATICALLY receive half credit.
  - Assignments are due during the first half-hour of class on the due date. (If class begins at 9:30am, you have until 10:00am to hand the assignment in before it is considered late)
  - If you are absent when an assignment is due, the assignment must still meet the deadline or suffer the penalty of being late.
  - No make-up work (homework, discussion board posts, quizzes, etc) will be permitted.
  - Extra credit assignments are not available.

Course Methodology

This course emphasizes the choice and use of appropriate data structures and efficient algorithms in implementing applications. Instructor and students interact directly in class. During the lectures, the instructor discusses the behavior of the data structures and the efficiency of algorithms that operate on the data.

This course will combine traditional lecturing with hands-on exercises to reinforce student learning. Students are expected to attend classes regularly, take tests, and submit assignments and other work at the times specified by the instructor.

The instructor reserves the right to make changes to the course schedule as needed under unexpected circumstances. These changes will be announced in class and on Blackboard.

Grading/Evaluation Standards

Student’s progress, productivity and learning in engineering technology will be assessed and evaluated based on demonstrated performance, completion and quality of course assignments and activities that may include: exams, tests, quizzes, homework assignments, participation in class lectures, attendance and participation in laboratory sessions, team-member or individual project development, technical written and oral reports, and other assignments as specified by the Instructor.

Grading Policy

The final numeric grade is computed based on student’s performance in weekly assignments and exams/quizzes. The final numeric grade for the course will be determined as follows:

• Weekly homework assignments	30%
• Quizzes (2)	10%
• In-class midterm exam	20%
• Final exam (or a programming problem)	40%

The final letter grade of the course is assigned based on the following ranges:

A [96 - 100], A- [91- 95], B+ [87 - 90], B [83 - 86], B- [80 - 82], C+ [77 - 79], C [74 - 76]
C- [70 - 73], D+ [66 - 69], D [60 – 65], F less than 60

Week	Dates	Topic	Reading	Assignment
1	9/5 – 9/10	Data Types. Abstraction. Data abstraction and Abstract Data Types (ADTs). Review C++ classes	Chapter 1 Sec: 1.4 Chapter 3 Sec. 3.1	
2	9/11 – 9/17	Friend functions. Operator overloading. Exception handling. Memory allocation and deallocation. `bad_alloc` exception.	Chapter 1 Sec. 1.5	HW 1 due.
3	9/18 – 9/24	Encapsulation. Inheritance. Polymorphism. Virtual functions. QUIZ 1	Chapter 2 Ref. text	HW 2 due
4	9/25 – 10/1	Templates. Function and class templates. Programming using class and function templates. Standard Template Library (STL). Components of STL.	Chapter 1 Sec. 1.6	HW 3 due
5	10/2 – 10/8	Basic data structures. Arrays. Static arrays and Dynamic arrays. Explore how a generic `Vector` container is used to manipulate data.	Chapter 1 Sec. 1.8 Chapter 3 Sec. 3.3	HW 4 due
6	10/9 – 10/15	List ADT. Implementation using arrays (static and dynamic). Basic operations on a List	Chapter 3 Sec. 3.2.1	HW 5 due
7	10/16 – 10/22	**IN CLASS MIDTERM EXAM**		
8	10/23 – 10/29	Linked-List. Singly linked-lists. Implementation using pointers. Basic Operations	Chapter 3 Sec. 3.2.2, 3.3, 3.5	
9	10/30 – 11/5	Stacks and Queues. Behavior of a Stack. Basic operations on a Stack. Array-based stacks. Linked-list based implementation. Expression evaluation using a stack. Queues. Behavior of a queue. Basic queue operations Study implementations using an array and a linked-list.	Chapter 3 Secs. 3.6 and 3.7	HW 6 due
10	11/6 – 11/12	Tree data structure. Binary and non-binary trees. Structure of a binary tree. Definitions and properties. Traversing a binary tree. Study binary tree implementation QUIZ 2	Chapter 4 Secs. 4.1 and 4.2	HW 7 due
11	11/13 – 11/19	Binary Search Tree (BST). Organizing data in a BST. Inserting and deleting items in a BST. Traversing a BST. Non-	Chapter 4 Sec. 4.3,	HW 8 due

		binary (General) tree. General tree traversal.	4.6	
12	11/20 – 11/26	Algorithm analysis. What to analyze. Analysis techniques. Efficiency of algorithms. Comparing efficiency of various algorithms	Chapter 2	ThanksGiving Recess
13	11/27 – 12/3	Searching and Hashing algorithms. Search algorithms – Sequential Search, Ordered lists, binary search. Searching using Hashing. Hash tables. Hash functions. Some examples of hash functions. Collision resolution.	Chapter 5. Chapter 9 Ref. text	HW 9 due
14	12/4 – 12/10	Sorting algorithms. Sorting an array of elements. Study various algorithms and their efficiency.	Chapter 7	HW 10 due
15	12/11 – 12/16	**FINAL EXAM.**		

End-of-Course Evaluation Surveys

Your feedback regarding your educational experience in this class is very important to the College of Professional Studies. Your comments will make a big difference in the future planning and presentation of our curriculum.

At the end of this course, please take the time to complete the evaluation survey at https://neu.evaluationkit.com. Your survey responses are **completely anonymous and confidential.** For courses 7.5 weeks in length or shorter, surveys will be open one week prior to end of the courses, for courses greater than 7.5 weeks in length, surveys will be open for two weeks. An email will be sent to your HuskyMail account notifying when surveys are available.

Academic Integrity

A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University.

As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Students are responsible for learning the conventions of documentation and acknowledgment of sources in their fields. Northeastern University expects students to complete all examinations, tests, papers, creative projects, and assignments of any kind according to the highest ethical standards, as set forth either explicitly or implicitly in this Code or by the direction of instructors.

Go to http://www.northeastern.edu/osccr/academic-integrity-policy/ to access the full academic integrity policy.

Student Accommodations

The College of Professional Studies is committed to providing equitable access to learning opportunities to students with documented disabilities (e.g. mental health, attentional, learning, chronic health, sensory, or physical). To ensure access to this class, and program, please contact The Disability Resource Center (http://www.northeastern.edu/drc/) to engage in a confidential conversation about the process for requesting reasonable accommodations in the classroom and clinical or lab settings. Accommodations are not provided retroactively so students are encouraged to register with the Disability Resource Center (DRC) as soon as they begin their program. The College of Professional Studies encourages students to access all resources available through the DRC for consistent support.

Library Services

The Northeastern University Library is at the hub of campus intellectual life. Resources include over 900,000 print volumes, 206,500 e-books, and 70,225 electronic journals.

For more information, visit http://library.northeastern.edu/.

Tutoring Services

Tutoring can benefit skilled professionals and beginning students alike. NU offers many opportunities for you to enhance your academic work and professional skills through free one-on-one academic support on and off campus. Tutoring is available in multiple subject areas.

For more information, visit http://www.cps.neu.edu/student-resources/tutoring-services.php.

Undergraduate Catalog

The College of Professional Studies Undergraduate Catalog is a reference/resource with information about curricula, resources, and academic and student policies.
For more information, visit http://www.cps.neu.edu/student-resources/.

Northeastern University Online Copyright Statement

Northeastern University Online is a registered trademark of Northeastern University. All other brand and product names are trademarks or registered trademarks of their respective companies.

This course material is copyrighted and Northeastern University Online reserves all rights. No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, electronic, mechanical, magnetic, optical, chemical, manual, or otherwise, without the express prior written permission of Northeastern University Online.