# COSC 1P03
# Introduction to Data Structures
# 2021-22

## Course Description

COSC 1P03 is an introduction to the fundamental dynamic data structures of Computer Science: stacks, queues and lists and the data abstraction and information hiding methodologies used in their implementation. COSC 1P03 continues the discussions of the Java programming language features that support class and library development.

## Course Website

Sakai: `COSC-1P03-2022-Winter (S01` and `S02)`

## Staff

| Instructors | Mentor | Teaching Assistants | |
|---|---|---|---|
| Dave Bockus<br>dbockus@brocku.ca<br>Ali Emami<br>aemami@brocku.ca | Baoling Bork<br>pbork@brocku.ca | Andrew Vu<br>av16di@brocku.ca | Course Coordinator<br>Tutorial Leader |

## Textbook

*Introduction to Data Structures*
D. Hughes; (2015)

## Software

IntelliJ IDEA is used in the laboratories and class. It is recommended that computer owners install IntelliJ IDEA for use at home. Download and setup instructions are available on the COSC website.

## Course Learning Outcomes

Upon successful completion of this course, students will be able to:

- Describe the representations of single and multi-dimensional arrays
- Describe asymptotic analysis of algorithms and list the standard complexity classes
- Explain the execution of sequential and binary search, quadratic sort and one non-quadratic sort algorithms
- Describe the behavior of fundamental data structures (stack, queue, list)
- Describe the contiguous and linked representations of fundamental data structures (stack, queue, list)
- Explain run-time storage management including both stack and heap storage
- Describe the phases of software development
- Analyze and explain the behavior of programs involving fundamental data structures, linked representation, multiple classes and/or recursion
- Decompose a problem into a number of classes using both structured decomposition and data abstraction
- Define an API (interface) for an abstract data type
- Apply fundamental data structures (stack, queue, list) in solution to a problem
- Apply recursion in the solution of a problem
- Apply coding/documentation standards in the preparation of a program solution
- Adopt coding/documentation standards and sound principles of program organization as mechanisms for developing readable/modifiable programs.

## Marking Scheme

| | |
|---|---|
| Tutorial Participation | 10% |
| Laboratory Participation | 10% |
| Assignments | 25% |
| Term Test | 15% |
| Final Exam (Scheduled by Registrar) | 40% |

## Assignments

| Number | Due |
|---|---|
| 1 | Jan 28 @ 4:00 pm |
| 2 | Feb 11 @ 4:00 pm |
| 3 | Mar 11 @ 4:00 pm |
| 4 | Mar 25 @ 4:00 pm |
| 5 | Apr 8 @ 4:00 pm |

## Notes

- As part of Brock University's commitment to a respectful work and learning environment, the University will make every reasonable effort to accommodate all members of the University community with disabilities. If you require academic accommodations related to a permanent disability to participate in this course, you are encouraged to contact the Student Accessibility Services (4th Floor Schmon Tower ext. 3240) and also to discuss these accommodations(s) with the professor/instructor.

- Assignments will be available on-line. Assignments are due at the time and date specified above. Late assignments will be accepted, subject to a penalty of 25%, up to three days late.
- Assignments will be carefully examined regarding plagiarism. Cases of suspected plagiarism will be dealt with according to the University regulations and Departmental procedures. A Software Similarity Evaluator may be used to electronically compare assignments for the purpose of detection and prevention.
  - Penalties for misconduct may range from an award of -100% for an individual piece of work, to zero in the course, to suspension, to removal from COSC (e.g. for a repeat offense)
  - Unauthorized distribution of course content constitutes misconduct under the Academic Integrity policy. Additionally, Sakai access will be immediately revoked, for violating usage policies
  - Exams & Tests are closed book and no aids, especially no electronic devices including cell phones and electronic dictionaries will be allowed in the exam/test room.
  - If any penalties are imposed by the dean for misconduct, you will be ineligible for any considerations for weight redistribution, curving, etc.
- The term test will be held during the Mid-term break.
- A mark of at least 40% on the final exam is required to achieve a passing grade in this course.
- Consideration regarding illness for assignment submission or test dates will only be considered if accompanied with the completed Departmental Medical Excuse form (available on the COSC website). Forms must be submitted within 3 working days of return from illness
  - Our ability to accommodate (whether for medical or personal grounds) will always be affected by the timeliness in which we are notified
- Mar 4$^{th}$ is the last day for voluntary withdrawal without academic penalty, 15% of the final grade will be available to students prior to Mar 4th.

### Lecture Schedule

| Week | Date | Chap. | Topics | Tutorial Exercises |
|---|---|---|---|---|
| 1 | Jan 10-14 | 1 | Arrays, array representation | No tutorial |
| 2 | Jan 17-21 | 2, 10 | Analysis of algorithms, searching | Ex 1, arrays |
| 3 | Jan 24-28 | 3 | Linked structures | Ex 2, analysis of algorithms |
| 4 | Jan 31-Feb 4 | 3 | Linked structures | Ex 3, linked structures |
| 5 | Feb 7-Feb 11 | 4 | Abstract data types | Ex 4, more linked structures |
| | Feb 14-18 | | **Mid-term break** | **midterm test** |
| 6 | Feb 21-25 | 5 | stacks | |
| 7 | Feb 28-Mar 4 | 6, 8 | Generics, queues | Ex 5, ADTs |
| 8 | Mar 7-11 | 7 | Recursion | Ex 6, RPN |
| 9 | Mar 14-18 | 11 | Software development | Ex 7, Recursion |
| 10 | Mar 21-25 | 11 | Software development | Ex 8, Debugging |
| 11 | Mar 28-Apr 1 | 9 | Lists | Ex 9, Software Design |
| 12 | Apr 4-8 | 10 | Sorting | Ex 10, Lists |

### Lab Schedule

| Lab | Date | Lab Topics |
|---|---|---|
| | Jan 10-14 | No labs |
| 1 | Jan 17-21 | Arrays |
| 2 | Jan 24-28 | Searching |
| 3 | Jan 31-Feb 4 | Linked Structures |
| 4 | Feb 7-Feb 11 | Linked Structures continued |
| | Feb 14-18 | **reading week** |
| 5 | Feb 21-25 | Abstract data types |
| 6 | Feb 28-Mar 4 | RPN |
| 7 | Mar 7-11 | Queues |
| 8 | Mar 14-18 | Recursion |
| 9 | Mar 21-25 | Software development |
| 10 | Mar 28-Apr 1 | Software development continued |
| 11 | Apr 4-8 | Lists |