COSC 222 Data Structures

Summer 2021 TERM 1

**Instructor:**

Name: Seyyed Aliasghar Hosseini

Email: sahossei@mail.ubc.ca

**Office Hours:** Thursday 14:30 – 15:30 (Canvas)

**Course Description:**

Introduction to the design, implementation and analysis of data structures. Topics will include lists, stacks, queues, trees, and graphs. Credit will only be granted for one of COSC 210 or COSC 222.

Credits: 3

Prerequisites: A score of 60% or higher in COSC 121.

**Course Format:**

The course will be delivered via online. Pre-recorded lectures will be available for students, complemented by out-of-class readings and labs. In-class activities will take place on Monday between 11:30 and 13:00. Midterm break and other calendar dates can be found at <http://okanagan.students.ubc.ca/calendar/>

**Course Overview, Content and Objectives:**

The course will introduce various common data structures such as lists, stacks, queue, graphs, and trees for solving complex problems. Students will also learn about mathematical techniques to analyze the efficiency of various algorithms and common operations on data structures. Additionally, they will understand how to design new algorithms for the data structure that they studied to solve problems.

Topics to be covered include: Algorithm Analysis, Stacks and Queues, Array and Linked Lists, Recursion, Binary Trees, B-Trees, Sorting and Searching, Heaps, Graph Theory and Hash Tables.

**Learning Outcomes**:

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

* Describe common data structures and mathematically analyze them
* Understand how to implement various data structures and related algorithms.
* Understand and quantify why one data structure and its related algorithmic solution is better than another

**Course Evaluation:**

|  |  |  |
| --- | --- | --- |
| Labs (assignments) | 30% |  |
| Midterm Exam | 30% | Exam Date: June 3, 2021 (8:30-10:00) |
| Final Exam | 40% | Exam Date: TBA |

Please note that bonus marks from labs or in-class activities will not overflow and added to other components. Final grades will be based on the evaluations listed above and the final grade will be assigned according to the standardized grading system outlined in the UBC Okanagan Calendar. Note: Any requests for changes to final exams must be sent to the office of the Associate Dean of Students (bsasdeansoffice.ubco@ubc.ca).

**Final Examinations**

The examination period for **S2021 T-1 June 21 – 25, 2021**.  Except in the case of examination clashes and hardships (three or more formal examinations scheduled within a 24-hour period) or unforeseen events, students will be permitted to apply for out-of-time final examinations only if they are representing the University, the province, or the country in a competition or performance; serving in the Canadian military; observing a religious rite; working to support themselves or their family; or caring for a family member.  Unforeseen events include (but may not be limited to) the following: ill health or other personal challenges that arise during a term and changes in the requirements of an ongoing job.  Further information on **Academic Concession** can be found under **Policies and Regulation in the *Okanagan Academic Calendar***<http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,48,0,0>

**Textbook and Suggested Readings (optional):**

* Introduction to Algorithms by Thomas H. Cormen and others. (Available on UBCO library)
* Java Software Structures: Designing and Using Data Structures by John Lewis and Joseph Chase
* Open Data Structures (in Java) by Pat Morin. URL: [http://opendatastructures.org/ods-java/.](http://opendatastructures.org/ods-java/)

**­­**

**Late lab Policy**

Late submissions are not accepted after the deadline.

# Missed Midterm Policy

No make-up midterm will be given. If a student misses a midterm without a medical note, the mark received will be 0. If a medical note is provided to the instructor, then the midterm portion of the grade will be combined with the other marks.

# Passing Criteria

In order to pass the course:

* Students MUST achieve a passing grade in the lab component.
* Students MUST achieve a passing grade in the exams component.

Failure to satisfy all of the above clauses will result in a maximum of 45% for the course.

# Expectations

* Listen the pre-recorded lectures, the assigned readings before the lecture.
* Learn the material in the course and undertake sufficient effort to produce all the programming assignments.
* Enjoy attending online class and feel free to participate according to your personality. Feel free to ask questions by raising your hand or speaking out at appropriate times.
* Please actively participate in class discussions, questions, and problem-solving exercises.
* I want all students to pass the course, receive a good grade, and feel the course was beneficial.
* For this course, it is expected that you will spend at least six hours per week on out-of-class preparation.

# Tentative Lecture Outline

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Class | Lectures (Mon/Tue) | Topic | Labs (Wed/Thu/Fri) | Lab Topics |
| 1 | Monday May 10 | Course overview, Algorithm analysis | Lab 0 | Java basics, OOP |
| 2 | Thursday May 13 | Lists and Linked Lists |
| 3 | Monday May 17 | Stack, Queue | Lab 1 | Lists and linked lists Stack, queue |
| 4 | Thursday May 20 | Trees and Terminology  Binary search tree and operations |
| 5 | Monday May 24 | Binary search tree and operations | Lab 2 | Recursion & tree basics Binary search tree |
| 6 | Thursday May 27 | Balanced tree, AVL, Red-Black tree |
| 7 | Monday May 31 | Priority queues, heaps  Midterm review(!) | Lab 3 | Balanced tree, AVL, red-black trees  Priority queues, heaps |
| 8 | Thursday June 3 | Midterm |
| 9 | Monday June 7 | Graph terminology, graph traversal | Lab 4 | Graphs |
| 10 | Thursday June 10 | Minimum spanning tree, table, hashing |
| 11 | Monday June 14 | Sorting & Searching | Lab 5 | Min span tree, table, hash, sort, search |
| 12 | Thursday June 17 | Exam review |

**Copyright Disclaimer**  Diagrams and figures included in lecture presentations adhere to Copyright

Guidelines for UBC Faculty, Staff and Students [http://copyright.ubc.ca/requirements/copyrightguidelines/](http://copyright.ubc.ca/requirements/copyright-guidelines/) and UBC Fair Dealing Requirements for Faculty and Staff [http://copyright.ubc.ca/requirements/fair-dealing/.](http://copyright.ubc.ca/requirements/fair-dealing/) Some of these figures and images are subject to copyright and will not be posted to ***Connect***. All material uploaded to ***Connect*** that contain diagrams and figures are used with permission of the publisher; are in the public domain; are licensed by Creative Commons; meet the permitted terms of use of UBC’s library license agreements for electronic items; and/or adhere to the UBC Fair Dealing Requirements for Faculty and Staff. Access to the ***Connect*** course site is limited to students currently registered in this course. Under no circumstance are students permitted to provide any other person with means to access this material. Anyone violating these restrictions may be subject to legal action. Permission to electronically record any course materials must be granted by the instructor. Distribution of this material to a third party is forbidden.

# Grievances and Complaints Procedures

A student who has a complaint related to this course should follow the procedures summarized below:

* The student should attempt to resolve the matter with the instructor first. Students may talk first to someone other than the instructor if they do not feel, for whatever reason, that they can directly approach the instructor.
* If the complaint is not resolved to the student's satisfaction, the student should go to the departmental chair John Braun at SCI 388, 807-8032 or e-mail him at john.braun@ubc.ca.

# Academic Integrity

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic

integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. **For example, incidences of plagiarism or cheating usually result in a failing grade or mark of zero on the assignment or in the course.** Careful records are kept to monitor and prevent recidivism.

A more detailed description of academic integrity, including the policies and procedures, may be found:

<http://okanagan.students.ubc.ca/calendar/index.cfm?tree=3,54,111,0>

If you have any questions about how academic integrity applies to this course, please consult with your professor.

**Grading Practices**  Highlight what is required to pass the course

Faculties, departments, and schools reserve the right to scale grades in order to maintain equity among sections and conformity to University, faculty, department, or school norms. Students should therefore note that an unofficial grade given by an instructor might be changed by the faculty, department, or school. Grades are not official until they appear on a student's academic record. [http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,41,90,1014](http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3%2C41%2C90%2C1014)  If you have any questions about how academic integrity applies to this course, please consult with your professor.

# Disability Assistance

The Disability Resource Centre ensures educational equity for students with disabilities, injuries or illness. If you are disabled, have an injury or illness and require academic accommodations to meet the course objectives, visit our website for more information: <http://students.ok.ubc.ca/drc/welcome.html>or contact the DRC at: drc.questions@ubc.ca

# Equity, Human Rights, Discrimination and Harassment

UBC Okanagan is a place where every student, staff and faculty member should be able to study and work in an environment that is free from human rights based discrimination and harassment. If you require assistance related to an issue of equity, discrimination or harassment, please contact the Equity Office, your administrative head of unit, and/or your unit’s equity representative.

**UBC Okanagan Equity Advisor: ph. 250-807-9291;**

**E-mail:**  equity.ubco@ubc.ca **Web:** <https://equity.ok.ubc.ca/>

# Health & Wellness

At UBC Okanagan health services to students are provided by Health and Wellness. Nurses, physicians and counsellors provide health care and counselling related to physical health, emotional/mental health and sexual/reproductive health concerns. As well, health promotion, education and research activities are provided to the campus community. If you require assistance with your health, please contact Health and Wellness for more information or to book an appointment.

**UNC 337**

Email: *healthwellness.okanagan@ubc.ca* Web: [www.students.ok.ubc.ca/health-wellness](http://www.students.ok.ubc.ca/health-wellness)

# Sexual Violence Prevention and Response Office (SVPRO)

A safe and confidential place for UBC students, staff and faculty who have experienced sexual violence regardless of when or where it took place. Just want to talk? We are here to listen and help you explore your options. We can help you find a safe place to stay, explain your reporting options (UBC or police), accompany you to the hospital, or support you with academic accommodations. You have the right to choose what happens next. We support your decision, whatever you decide. Visit [svpro.ok.ubc.ca](https://svpro.ok.ubc.ca/) or call us at 250.807.9640

# Independent Investigations Office (IIO)

*If you or someone you know has experienced sexual assault or some other form of sexual misconduct* by a UBC community member and you want the Independent Investigations Office (IIO) at UBC to investigate, please contact the ***IIO****. Investigations are conducted in a trauma informed, confidential* and respectful manner in accordance with the principles of procedural fairness. You can report your *experience directly to the* ***IIO*** *via email: director.of.investigations@ubc.ca or by calling 604.827.2060* or online by visiting investigationsoffice.ubc.ca

# The Hub

The Student Learning Hub (LIB 237) is your go-to resource for free math, science, writing, and language learning support. The Hub welcomes undergraduate students from all disciplines and year levels to access a range of supports that include **tutoring in math, sciences, languages, and writing, as well as help with study skills and learning strategies**. For more information, please visit the Hub’s website [(https://students.ok.ubc.ca/student-learning-hub/)](https://students.ok.ubc.ca/student-learning-hub/) or call 250-807-9185.

**SAFEWALK** Don't want to walk alone at night? Not too sure how to get somewhere on campus? **Call Safewalk at 250-807-8076.**

For more information:<https://security.ok.ubc.ca/safewalk/> or download the UBC SAFE – Okanagan app.