

CS 401 : Introduction to Advanced Studies I
Department of Computer Science
Illinois Institute of Technology
Fall 2016

This course explores the implementation and application of fundamental data structures and algorithms, with an emphasis on object-oriented programming. During the semester, we will examine the relationship between these elements and the mathematical structures that form the foundation of computer science. By the end of the semester, the student should be able to determine which class of data structures is appropriate for a given problem and be able to describe the performance characteristics and limitations of their choice.

During the semester, lectures will cover material related to complexity analysis, linear data structures (arrays, linked lists, doubly linked lists, queues, and stacks), non-linear data structures (binary trees, heaps, and graphs), and algorithms related to priority queues, graph traversal, shortest path and spanning tree algorithms, sorting (quadratic sorts as well as divide-and-conquer logarithmic sorts), searching algorithms and if time permits, hashing.

The course uses Java as a programming language. It is expected that enrolled students know programming in general and Java in particular. While we will cover some aspects of the Java programming language, the aspects covered are those that form a foundation for the rest of the semester, such as Java Generics and Java interfaces. The student is expected to know the Java programming language, including object-oriented concepts such as inheritance, abstractions, and encapsulation and the language constructs that provide for such concepts, as well as other Java artifacts such as exception handling and packages.

Prerequisites of the class are CS201 or a CS401 placement test. Students can enroll if they know C++ and have passed the CS401 placement test and are willing to self-learn Java during the first two weeks of the semester. But be careful if you do so, **there be dragons!**

Instructor: Dr. Vijay K. Gurbani <vgurbani@iit.edu>

Office hours: SB-228a, Tue 5:00 – 6:00 pm and by appointment.

Course home page: Resources on the Blackboard system.

TA and lab instructor: TBA

TA office hours: TBA

Lecture and Labs

Tue 6:25p – 8:05p – Lecture (SB-111) Caution: Do NOT register for other classes in this timeslot.

Thu 6:25p – 8:05p – Laboratory (SB-108) Caution: Do NOT register for other classes in this timeslot.

Textbooks

Data Structures and the Java Collections Framework, 3e, William J. Collins.
John Wiley and Sons, 2011.

Support Material:

See www.wiley.com/college/collins for laboratory assignments.

See <https://www.cs.usfca.edu/~galles/visualization/Algorithms.html> for visualization of the data structures and algorithms we study in the class.

See <http://pythontutor.com/java.html#mode=display> for another page on visualization of data structures.

Expectations

Students are expected to adhere to IIT's academic integrity policy. Inter-personal discussion is encouraged, however, while inter-personal discussions can help in better understanding the subject matter, such discussions are not to be used as a substitute for sharing solutions on individual homework and laboratory assignments. Homework assignments or laboratory assignments that are the work of one individual and shared with others will result in all affected students receiving a zero (0) grade for that particular assignment.

There will be laboratory assignments throughout the semester. The assignments would occur on a **Tuesday** and will be due on the **Wednesday** of the following week **for all sections**. Assignments are expected to be completed by the due date and submitted using Blackboard. The time stamp on the assignments is expected to be no later than **11:59:59 PM Chicago (US Central) time on the day that the assignment is due**. Each day that the assignment is submitted late will result in a 10% penalty; an assignment that is submitted more than 7 days late will not be accepted. Because assignments are submitted digitally and the points awarded digitally as well, it is up to the students to ensure that they ask the TA where points were lost so improvements on future assignments can be seen.

You can do the laboratory assignment on any operating system (Linux, Unix, Windows), using any IDE (Eclipse, IntelliJ) or no IDE (command line compilation). The TA will provide further instructions during the first laboratory period on using Eclipse and compiling Java programs. It is expected that the student has spent substantial amount of time attempting to solve a laboratory assignment before arriving for the laboratory session each Thursday. Attendance at the laboratory session is mandatory as this is the time the TA will be available for extra help if you are struggling with the material. The TA is available as a general resource to students in all sections; Main campus students have a laboratory session on Thursdays, remote students can interact with the TA (or me) through email.

The lecture is recorded from the Main campus to be provided as a streaming web resource for Internet students. Attendance in lectures for Main campus students is mandatory in order to keep up with the subject material of the class.

There will be a mid-term exam and a final exam. These are closed book and individual effort assignments. Any sharing of resources or subject matter during the exams will result in a penalty for all affected students. Attendance to these exams is mandatory and there are no provisions for make-up exams.

Throughout the semester there will be a series of discussion groups held on various topical areas. Student participation is mandatory in these discussion groups. You will be assigned papers to read, videos to watch on some salient aspect of learning data structures, etc. You will be required to review the academic paper or video assigned during the discussion group, and furthermore, you will also be asked to critique the review of your peers in order to foster a discussion. Discussions are due on the required date, there is no late submission policy. Please upload your picture when you start your first discussion topic; that will allow me to associate names with students as the semester progresses.

It is imperative that students keep up with the laboratory assignments and the discussion groups. At the end of the semester, every point helps. There will not be any individual extra credit laboratory assignments or discussion groups, nor will there be any special projects to aid students who did not concentrate on the work during the semester. If there is any extra credit work awarded, it will be awarded to all the students at the same time. **So please DO NOT ask me for any individual extra-credit assignments.** Such individual extra-credit exercises tend to be unfair to the rest of the students who managed to submit their work on time.

That is it. Have fun; programming is an immensely enjoyable and creative activity. I wish you are able to be creative and have fun while doing so.

Performance Assessment

Standard grading scale applies:

90-100 – A, 80-89 – B, 70-79 – C, 60-69 – D, 0 <= F <= 59.

Grade distribution (subject to change)

Laboratory assignments	40% (about 14 throughout the semester)
Mid-term	25%
Final exam	25%
Blackboard discussion	10% (about 5 throughout the semester)

Grades are not curved. Using the above weights, you can calculate your standing in the class at any point in time.

ADA syllabus statement

Reasonable accommodations will be made for students with documented disabilities. In order to receive accommodations, students must obtain a letter of accommodation from the Center for Disability Resources. The Center for Disability Resources (CDR) is located in Life Sciences Room 218, telephone 312 567.5744 or disabilities@iit.edu.

Schedule

Week/Lecture date	Chapter	Laboratory	Notes
1/Aug-23	Ch. 0-2	Lab 1: Warm up	Introduction, References
2/Aug-30	Ch. 2,3	Lab 2	Algorithm complexity
3/Sep-06	Ch. 4,5	Lab 3	Java Collections, Recursion
4/Sep-13	Ch. 5,6	Lab 4	Recursion complexity, Lists
5/Sep-20	Ch. 7	Lab 5	Linked lists
6/Sep-27	Ch. 7,8	Lab 6	Linked lists (continued), Stacks
7/Oct-04	Ch. 8,9	Lab 7	Queues
8/Oct-11	Ch. 9	Lab 8	Trees
8/Oct-13 **THU**	Mid-term exam	No Laboratory	
9/Oct-18	Ch 10	Lab 9	Binary search trees (BST)
11/Oct-25	Ch. 13	Lab 10	BST (continued), Heaps
12/Nov-01	Ch. 11	Lab 11	Sorting (quadratic)
13/Nov-08	Ch. 11, 15	Lab 12	Sorting (n log n)
14/Nov-15	Ch. 15	Lab 13	Graphs
15/Nov-22	Ch. 15	Lab 14	Graphs (continued)
16/Nov-29	Ch. 14	Lab 15 (Optional)	Hashing techniques
17/Dec-06	Final exam	No Laboratory	

Important dates:

Sep 03, 2016: Last day to add/drop with no tuition charges

Oct 31, 2016: Last day to withdraw