

cs2220: Final Exam

The final exam will provide a last opportunity to demonstrate that you understand the most important concepts from cs2220.

Topics. The exam will emphasize these topics:

- **Specification:** how to write a good declarative specification, interpreting a given specification, understanding preconditions and postconditions.
- **Data Abstraction:** encapsulation, specifying data abstractions, reasoning about data abstractions using specifications, implementing data abstractions, reasoning about data type implementations using representation invariants and abstraction functions.
- **Subtyping and Inheritance:** designing with type hierarchies, understanding subtyping and inheritance, substitution principle, reasoning about code that uses subtypes.
- **Concurrency:** programs using multiple threads, race conditions, deadlocks, using synchronization to avoid race conditions.
- **Security:** requirements for code safety, byte code verification, security policies.
- **Design:** understanding tradeoffs between expressiveness and truthiness in software and programming language design; tension between simplicity, efficiency, truthiness.

Eligibility. To be eligible to take the final, you must have collected your Exam 2. If you have not done so, you will only be permitted to take the final after you send me an email with a satisfactory argument for why I should allow you to take the final despite your apparent lack of effort.

Resources. Before the exam, you may use any resources you want, including discussing the starting-point questions with your classmates and other people. During the exam, you should not expect to use any resources, in particular, you may not use any notes. You will, of course, be able to ask me clarifying questions and I will provide follow-up questions to probe your understanding if you are not able to answer a given question well right away.

Questions. There will be at least two starting-point questions, after which I will follow up with more questions depending on your answers. The first two starting-point questions are:

1. Describe *data abstraction* and explain how it helps software developers manage complexity. Explain some mechanisms the Java programming language provides to support programming with abstract data types.
2. Design a software system for an on-line bookstore. You should be able to provide a type hierarchy for your design, and justify your design decisions.

The other questions will not be provided until the exam.

Scheduling. *If you are eligible to take the exam* (see above), sign up for a time slot on the schedule. Each slot is scheduled for 30 minutes, but the exam will take as long as necessary. Exams will take place in my office, Olsson 236A. If there is someone taking the exam before you, you should wait in the 236D conference room (if it is open) or the main hallway (outside the 236 door entrance), not right outside my office to avoid overhearing the previous exam.