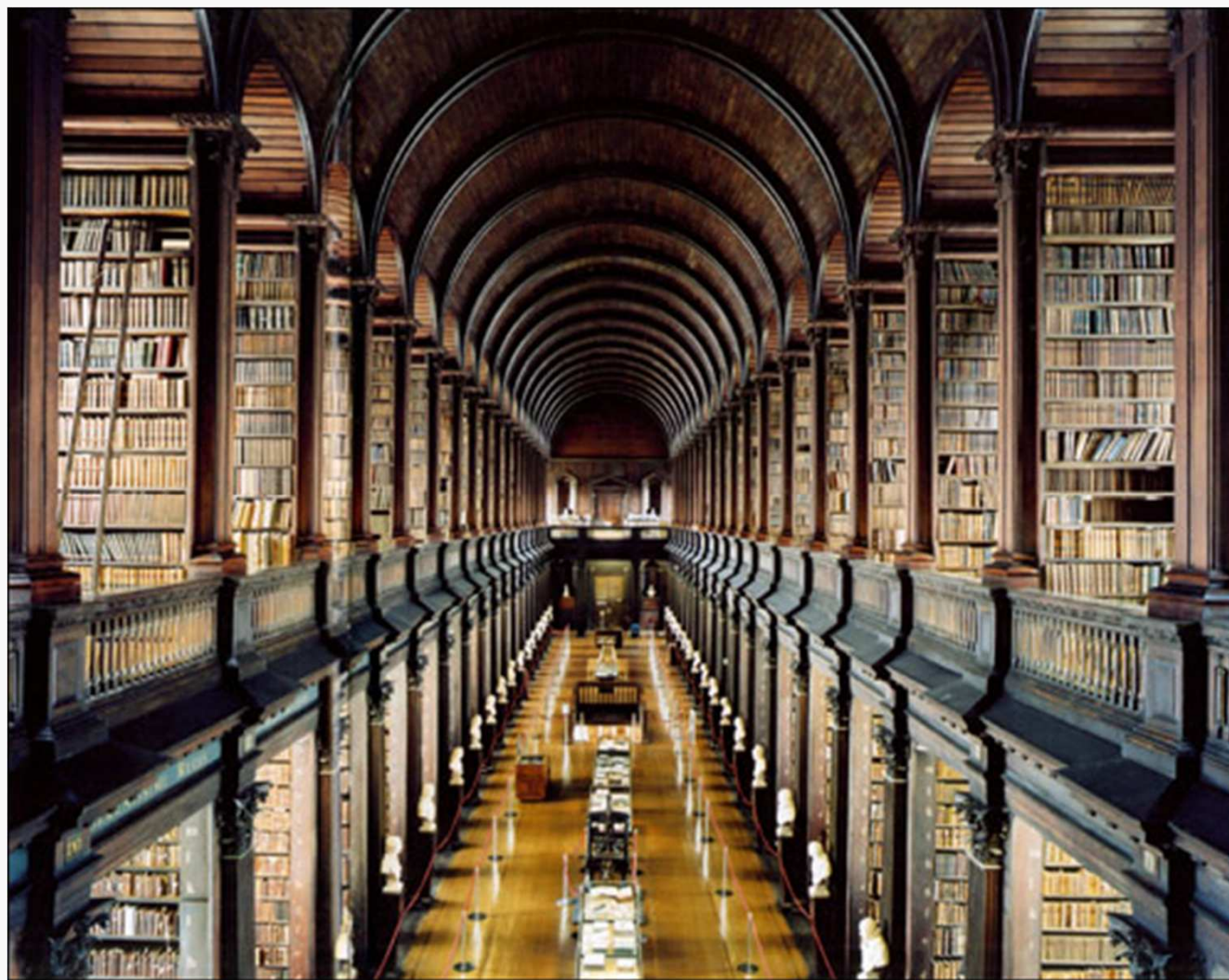*Data Structures and Algorithms*

Trinity College Library
Univ. of Dublin

William D McQuain

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     Office Hours: see course website

CS 3114   Data Structures and Algorithms

Advanced data structures and analysis of data structure and algorithm performance. Sorting, searching, hashing, and advanced tree structures and algorithms. File system organization and access methods.

Course projects require advanced problem-solving, design, and implementation skills.

Having successfully completed this course, the student will be able to:

- Choose the data structures that effectively model the information in a problem.
- Judge efficiency trade-offs among alternative data structure implementations or combinations.
- Apply algorithm analysis techniques to evaluate the performance of an algorithm and to compare data structures.
- Implement and know when to apply standard algorithms for searching and sorting.
- Recognize and apply design patterns, and make judgments about when a particular pattern will improve a design.
- Design, implement, test, and debug programs using a variety of data structures including buffer pools, hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and B-trees.
- Select appropriate methods for organizing data files and implement file-based data structures.
- Apply object-oriented design principles to data structures in medium-scale software systems.
- Apply design guidelines to evaluate alternative software designs.

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CS	2104	**Intro to Problem Solving in CS (for CS majors)**
CS	2114	**Software Design and Data Structures**
CS	2505	**Computer Organization I**
Math	2534	**Discrete Mathematics**

All students must have completed each of the CS prerequisites with a grade of C or higher (C- is not acceptable).

There will be absolutely NO exceptions to these requirements.
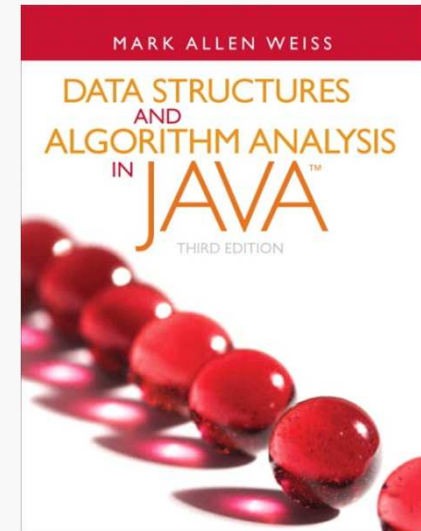
Note   Lying about whether you meet the prerequisites is an Honor Code offense. Students who do so may be charged, at the discretion of the Department of Computer Science.

Required:

Data Structures and Algorithm Analysis in Java, 3rd Edition
Mark Allen Weiss, Addison-Wesley, ©2012
ISBN 978-0-13-257627-7

Recommended:

CS 3114 Course Notes, Summer 2012 Edition
W D McQuain, ©2001-2012
(available ONLY at the course website)

courses.cs.vt.edu/~cs3114/Summer12/

Final grades will be based on the average achieved over the following :

Item	Weight	Dates
Programming Projects	40%	See website
Homework	20%	See website
Midterm	15%	Tentatively: June 14
Final Exam*	25%	10:30 – 12:30 Saturday June 30

* Exam score will replace the midterm score, if it is higher.

Grade Scale

The usual 10-point scale will apply (subject to any curve). A final average of 90% will guarantee an A-, 80% will guarantee a B-, and so forth.

Curve

A grade curve may or may not be employed in this course. The application of a curve is dependent upon class performance on tests, projects and homework. The decision to utilize a curve rests entirely with the course instructor.

Statute of Limitations

Any questions about the grading of an assignment must be raised with your instructor within two weeks after the graded assignment has been made available to you.

Late Penalties for Projects

Project solutions can be turned in after the posted deadline, in which case a per diem penalty will be assessed.

The penalty will be 10% per day.

Extensions

Any request for an extension must be made, preferably by email, at least 24 hours prior to the due date. Reasons must be valid (generally events beyond your control) and documented.

Late submissions will not be given any credit if submitted after graded assignments or solutions have been released.

Homework

Usually, no late submissions will be allowed for homework assignments.

Evaluation of Correctness, Design and Implementation, and Documentation

The correctness of operation of your programming projects will be evaluated by executing your solution with test data constructed by the course staff. While some test data will be provided, there is no guarantee that data will cover all cases.

Each project will have certain explicit requirements for design and implementation. Your solution will also be evaluated for adherence to those requirements.

You are expected to enter CS 3114 with considerable understanding of good software engineering practice, and you are expected to apply those lessons here. That means that you may be penalized for failing to make good decisions, even if there are no explicit guidelines in the specification of a project.

You are also expected to incorporate professional internal documentation into your projects. See the Programming Standards page on the course website for some suggestions and samples.

Test Environments

- All programming assignments submitted are required to compile with `javac` version 6 update 20 or later.

- Unless specified otherwise, programs will only be tested under that environment.

- It is the YOUR responsibility to ensure that YOUR programs execute correctly in the appropriate environment; programs that do not will receive substantial deductions.
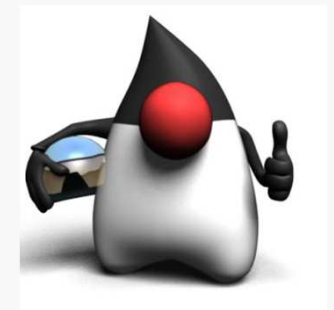
Students developing with a different Java major version are advised that will almost certainly lead to problems.

Your programs WILL be tested with the environment listed above. If it fails to compile, or exhibits incorrect behavior, we don't care that it may compile elsewhere, or appear to run correctly elsewhere.

General Issues

- CS 3114 classmates
- CS 3114 Piazza board
- CS 3114 TA
- CS 3114 Instructor

Java Language Help

- CS 3114 Forum
- texts from earlier courses

Lecture Instruction

Lectures will consist of presentations, applications, problems and solutions interspersed with classroom discussion.

Backups

Students are responsible for making backup copies of all their work in this (and all) courses.

Loss of work due to hard drive failure is **NOT** an acceptable excuse. Backup copies of files on the same hard drive are not backup copies. Backup copies of files on second hard drives are also risky. Backup copies should be maintained on two separate distinct storage mediums, (e.g., hard drives and Zip disks).

Backup copies should be maintained until after the end of the term and students have received their course grade. (The Army lives by triplicate for a reason.)

Remember: Computer systems are mechanical devices.

Systems fail. Drives die. Bad sectors appear.

Network connections break.

Plan for it. It is inevitable!

An exhaustive list of Honor Code violations would be impossible to present here, but among other things, each of the following is a flagrant violation of the Virginia Tech Honor Code, and violations will be dealt with severely (Honor Court):

- Working with another student to derive a common program unless group work is explicitly allowed on that assignment.

- Discussing the details required to solve a programming assignment. You may not share solutions.

- Copying source code (programs) in whole or in part from someone else.

- Copying files from another student's disk even though they might be unprotected.

It <u>is</u> acceptable to discuss with classmates a programming assignment in a general way, i.e., to discuss the <u>nature</u> of the assignment. In other words, you may discuss with your classmates <u>what</u> your program is required to accomplish but <u>not how to</u> achieve that goal using Java. In no way should the individual statements of a program or the steps leading to the solution of the problem be discussed with or shown to anyone except those people cited in the following statement.

Feel free to discuss the homework assignments and your program source code with the teaching assistants assigned to CS 3114, the instructor, or the free tutors provided by UPE. The discussion of your program source code <u>must</u> be limited to these people. Note that this specifically excludes discussions of your program source code with other students (even if they are not enrolled in CS 3114), or with tutors except for those named above. Privately hired tutors are not an exception to this requirement, nor are athletic or other tutors provided by the University.

Copies of all submitted work are retained indefinitely by the Department. Submitted programs are subjected to automated analysis for detection of cheating.

If you have any question as to how the Honor Code applies to this class, remember that:

- Any work done in this class must be done on an individual basis.

- Credit will be given only for work done entirely on an individual basis.

- Do not make any assumptions as to who can provide help on a programming assignment.

- All submitted work is archived. All submitted programs will be subjected to automated cheat analysis.

Evidence indicating the violation of the policies stated above will be submitted to the Honor Court.

It is much easier to explain a poor grade to parents or a potential employer than to explain an Honor Court conviction.