

BREADTH REQUIREMENT AREAS FOR 2009-2010 COMPREHENSIVE EXAMINATIONS READING LIST

**Any updates will be e-mailed to:
cscomps2009@lists.stanford.edu**

This reading list addresses each area of the written comprehensive examinations and includes the course alternatives.

- There will be **13** one-hour exams. Students must pass 8 out of the 13 comps in order to fulfill the Ph.D. Program's comprehensive exam requirement. For more details, please refer to "Comprehensive Exams (Comps) Structure" posted outside of Gates 196 or the Comps Central website at:
<http://www-cs-students.stanford.edu/phd/comps.php>
- All examinations assume a certain mathematical sophistication and programming abilities. Proofs of correctness for simple programs may be required. Students are expected to be able to write programs in Pascal and Lisp, and they should be familiar with at least one assembly language.
- Laptops are only allowed in the open book exams unless otherwise indicated below.
- To advance to Ph.D candidacy prior to the end of your 6th quarter in residency, you must pass 6 of the 8 chosen areas.
- Each comp can be fulfilled either by passing the exam or by earning a **grade A- or higher** in the approved alternate course.

Please Note: *Many of the reading lists below have been copied from the 2008-2009 reading list. If you have concerns about the accuracy of the reading list, please contact the professor giving the corresponding comprehensive exam, and ask them to make their new reading list known!*

ANALYSIS OF ALGORITHMS AND CONCRETE MATHEMATICS

Test: 1 hour, closed book / NO laptop

Course Alternative: CS161 – Discrete Structures and Algorithms

Readings:

Alfred Aho, John Hopcroft, and Jeffrey Ullman: Data Structures and Algorithms

R. Graham, D. Knuth, O. Patashnik: Concrete Mathematics. Sections 1.1-1.2, 2.1-2.5, 3.1, 3.4, 4.1-4.7, 5.1-5.2, 6.3, 6.6, 7.1-7.2, 8.1-8.2, 9-page 441.

Cormen, Leiserson, Rivest and Stein. Introduction to Algorithms. 2nd edition, Chapters 1-16, 22-25.

Plotkin recommends reviewing past courses and assignments on the web.

ARTIFICIAL INTELLIGENCE

Test: 1 hour, Open book: notes, articles, books allowed. No old comps/solutions are allowed. No laptops, PDAs, iPhones, or calculators, etc. (Basic calculator without communications functions are okay.)

Course Alternative: CS121 – Introduction to Artificial Intelligence

Readings:

Michael Genesereth, Nils Nilsson: Logical Foundations of Artificial Intelligence. Chapters 1-5, 11 (except for references to circumscription), 12.

Russell & Norvig: Artificial Intelligence: A Modern Approach, Prentice Hall, 2003 edition.

Note that the style of the AI comps changed significantly in 2008. (Please see the 2008 comps exam, available at http://www-cs-students.stanford.edu/phd/comps/2008/2008-Artificial_Intelligence-solutions.pdf.) The AI comps may cover any subset of a broad range of topics in AI such as search, machine learning, uncertain knowledge and reasoning, and application areas such as NLP/perception/robotics, and other topics as reflected in the readings. Of course, the specific questions covered in a specific exam will change from year to year. But the 2009 AI comps will be more similar in style to the 2008 one than to ones from previous years, in the sense that it may have fewer questions on logic, and more questions that go in-depth on a broad range of topics in AI (such as reflected in the readings and in the list above).

AUTOMATA AND FORMAL LANGUAGES

Test: 1 hour, closed book / NO laptops, PDAs, iPhones,

Course Alternative: CS154 – Introduction to Automata and Complexity Theory

Readings:

J.E. Hopcroft, Motwani and J.D. Ullman: Introduction to Automata theory, Languages and Computation, Addison-Wesley, 2001. **Basically chapters 1-11 of the new edition are needed, except for the purposes of the exam sections 5.3, 11.4 & 11.5 can be skipped, as they are not in the 1979 edition.**

COMPILERS

Test: 1 hour, open book / NO laptop or PDAs

Course Alternative: CS143 – Compilers

Readings:

Note: There is very significant but not complete overlap between the two books.

Alfred Aho, Monica S. Lam, Ravi Sethi, and Jeffrey Ullman: Compilers: Principles, Techniques, and Tools, 2nd edition. Chapters 1-9 (except 5.5, 7.8, 9.7, and 9.8).

COMPUTER ARCHITECTURE

Test: 1 hour, open book / no laptops, PDA's, iPhones; calculators ok

Course Alternative: EE108B – Digital Systems II

Readings:

D. Patterson & J. Hennessy: Computer Organization & Design: The Hardware/Software Interface, 2nd /3rd edition. Morgan-Kaufmann, 1997. ISBN: 1-55860-428-6. (note: the first edition is not sufficient)

DATABASES

Test: 1 hour, open book / NO laptop, PDAs, or calculators

Course Alternative: CS145 – Introduction to Databases

Readings:

Jeffrey Ullman and Jennifer Widom: A First Course in Database, Systems, 3rd edition, Prentice-Hall, 2008 OR Hector Garcia-Molina,, Jeffrey Ullman, and Jennifer Widom: Database Systems: The Complete Book., Prentice-Hall, 2nd edition 2008., Chapters 1, 2, 3 (except 3.7), 4 (except 4.7-4.10), 6, 7, 8 (except 8.4), 10 (except 10.2-10.7), 11 (except 11.4)

Human-Computer Interaction

Test: 1 hour, closed book / no laptop, PDAs, or calculators

Course Alternative: CS 147 – Introduction to Human-Computer Interaction Design

Readings:

The reading at <http://cs147.stanford.edu>

GRAPHICS

Test: 1 hour, closed book / NO laptop; calculators or PDAs are OK

Course Alternative: CS148 – Introductory Computer Graphics

Readings (**Copied from 2008-2009 Readings**):

Hearn, Donald and Baker, Pauline. Computer Graphics with OpenGL (3rd edition). New Jersey: Prentice Hall, 2003
(older editions will work just as well)

LOGIC

Test: 1 hour, closed book & notes / NO laptop

Course Alternative: CS157 – Logic and Automated Reasoning **OR** PHIL 251 – First-Order Logic

Readings (**Copied from 2008-2009 Readings**):

Log on to cs157.stanford.edu. Go to Notes.

NETWORKS

Test: 1 hour, closed book / NO laptop, no PDA's, no iPhones, no calculators; no aids

Course Alternative: CS144 – Introduction to Computer Networks

Readings:

Computer Networking: A Top-down approach, 4th Edition, by Kurose and Ross
<http://www.aw-bc.com/catalog/academic/product/0,1144,0321497708-TOC,00.html>
chapter 1-6.

(Note: the Davie, B. and Peterson, L. Computer Networks: A Systems Approach. 1999, Chapter 1-7, excluding section 6.5. Chapter 9, excluding section 9.3. is also indicative of the material, together with cs244a materials).

End-to-end arguments in system design, Saltzer, Reed and Clark
<http://web.mit.edu/Saltzer/www/publications/endoend/endoend.pdf>

NUMERICAL ANALYSIS

Test: 1 hour, closed book / NO laptop, PDA's, iPhones, or calculators.

Course Alternative: CS205A – Mathematical Methods for Robotics, Vision, and Graphics

Reading:

K. Atkinson: [An Introduction to Numerical Analysis.](#)

Burden & Faires: [Numerical Analysis.](#)

Heath: [Scientific Computing: An Introductory Survey.](#)

Kincaid & Cheney: [Numerical Analysis.](#)

PROGRAMMING LANGUAGES

Test: 1 hour, closed book, no laptops, PDA's, iPhones, or calculators.

Course Alternative: CS242 – Programming Languages

Reading:

John Mitchell, Concepts in Programming Languages.

SOFTWARE SYSTEMS

Test: 1 hour, open book / NO laptop or PDA

Course Alternative: CS140 – Operating Systems and Systems Programming

Readings (**Copied from 2008-2009 Readings**):

Abraham Silberschatz, James Peterson and Peter Galvin: Operating System Concepts, 3rd Edition.
(REQUIRED READING)

M. Ben-Ari: Principles of Concurrent Programming. **(OPTIONAL READING)**