Graduate Examination
Spring 2011

October 11, 2010

General Specification

The Graduate Examination in Computer Science will consist of tests in each of the following areas: Theory and Systems. Three hours will be allowed for the completion of each area test and the entire examination will take place over the course of two days, one area exam per day.

The Ph.D. Qualifying Examination in Computer Science will consist of both area examinations. The Plan B Master's Final Examination will consist of one of the two area examinations as chosen by the student and agreed to by the student's graduate committee.

Date: The Spring 2011 examination is tentatively scheduled for sometime in early April 2011.

Exam Administration and Grading Procedure

Each area examination will be administered by a group of faculty associated with that area of examination. The completed exams are submitted to the department office, to become part of the student's permanent record. Faculty members receive photocopies of the portions of the exams they are grading. The grades and any associated grading comments are submitted to the department office. The grades and comments become part of the student's permanent record. The student is permitted to view those grades and comments.

A Computer Science faculty meeting will be held after the questions have been graded. At this meeting the faculty will examine the grades and comments for each student's exam. The faculty will decide a grade of *Pass*, *Pass Conditionally*, or *Fail* on the whole examination for each doctoral student. A grade of Pass or Pass Conditionally requires a two-thirds majority vote by the tenured and tenure-track Computer Science faculty. It is important that this process remain confidential within the Computer Science Faculty. Each student is to be informed of their outcome by their own advisor.

The grade Pass Conditionally is included in recognition that borderline cases will appear from time to time. The conditions foreseen are (1) that the student must pass (with a specified grade or better) one or more particular courses the next time these courses are offered, or (2) the student must pass an oral examination in one or more areas of the examination. Each oral examination will be administered by the faculty in the area involved within two weeks of the student's receiving notification of the Pass Conditionally grade and its conditions.

A student may continue in the Ph.D. program with a grade of Pass or Pass Conditionally. If a student with a Pass Conditionally grade fails to meet the conditions at the earliest possible time, that student's grade will be changed to Fail. A student with the grade of Fail may retake the qualifying examination at most a second time. Failure to Pass or Pass Conditionally the examination at the second sitting will terminate the student from the Ph.D. program.

Area Examination Specifications and Reading Lists

1 Systems

There are six sections to the Systems exam. Each examinee must identify three of the six parts by 15 February 2011 over which he/she will be examined. The examination will be based on the references listed below. Each part will consist of three questions making a total of nine questions on this examination for each student. At the time of the exam, students may select two questions in each identified part, for a total of six of the nine questions, to be graded. The exam is **open book**, meaning that those taking the examination may consult the references cited below during the examination.

1.1 Computer Graphics

Focused Topics: Mathematics for CG, Graphics Pipeline, Geometric Transformations, Viewing, Modeling, Curves and Surfaces, Reflection Models and Surface Shading, Texture Mapping, Ray Tracing, Visible Surface Finding Algorithms,Color, Raster Algorithms/Scan-conversion Algorithms, and Sampling and Anti-aliasing.

F.S.Hill and S.M.Kelly, *Computer Graphics Using OpenGL*, Prentice-Hall, Inc., Third edition, 2006.
Readings: Chapters 2–12, Appendix 3.

Peter Shirley and Steve Marschner, *Fundamentals of Computer Graphics*, A.K.Peters, Second edition, 2009.
Readings: Chapters 2–18, 25.

Edward Angel, *Interactive Computer Graphics: A top-down approach*, Addison Wesley, Third Edition, 2003
Readings: Chapters 1, 2, 4–7, 9 10, 12, 13, Appendix B and C.

1.2 Operating System Design

Silberschatz, Galvin, and Gagne, *Operating System Concepts*, (Seventh or Eighth edition), John Wiley & Sons, Inc., 2005/2009.
Readings: Chapters 3, 4, 5, 6, 7, 8, 9, 11

1.3 Computer Networks

Kurose and Ross, *Computer Networking*, (Fifth edition), Addison Wesley, 2009.
Readings: Chapters 2, 3, 4, 5, 6

1.4 Programming Languages

David A Schmidt, *The Structure of Typed Programming Languages*, MIT Press, 1994.
Readings: Chapters 1, 2, 6.1-6.3.

John C. Mitchell, *Foundations for Programming Languages*, MIT Press, 1996.
Readings: Chapters 1, 2

1.5 Compiler Construction

Aho, Lam, Sethi, and Ullman. *Compilers: Principles, Techniques, and Tools*, (Second Edition), Addison Wesley, 2007.
Readings: Chapters 2, 3, 4, 5, 6

1.6 Principles of Database Systems

Ullman and Widom, *A First Course in Database Systems*, (third edition), Pearson Prentice Hall, 2008.
Readings: Chapters 2 - 7, 8.3 - 8.4, 10.2 - 10.5, 11.

2 Theory

There are six sections to the theory exam. The examination will be based on the references listed below. Each examinee must identify three of the six parts by 15 February 2011 over which he/she will be examined. Each part will consist of three questions making a total of nine questions on this examination for each student. At the time of the exam, students may select five of the nine questions to be graded. The exam is **open book**, meaning that those taking the examination may consult the references cited below during the examination.

2.1 Foundations of Computing

J.L. Hein *Theory of Computation: An Introduction*, Jones and Bartlett, 1996.
Readings: Sections 1.1, 1.4, 2.1, 2.2, 2.4, 3.6, 5.1, 5.2, 5.4, 6.1, 6.2, 6.4, 7.1, 8.3

J.L. Hein *Discrete Structures, Logic and Computability* (first or second editions), Jones and Bartlett, 1996.
Readings: Sections 1.1, 3.1, 3.2, 3.3, 4.4, 8.2, 11., 11.4, 12.1, 12.2, 12.4, 13.1

2.2 Theory of Computation

M. Davis, R. Sigal, and E. Weyuker, *Computability, Complexity, and Languages*, (second edition), Academic Press, 1994.
Readings: Chapters 2–7

2.3 Analysis of Algorithms

S. Dasgupta, C.H. Papadimitriou, and U.V. Vazirani, *Algorithms*, McGraw Hill, 2007.
Readings: Chapters 1-9.

2.4 Computational Complexity

Sanjeev Arora and Boaz Barak, *Computational Complexity: A Modern Approach*, Cambridge University Press, 2009.

2.5 Languages and Automata

D. Kozen, *Automata and Computability*, Springer, 1999.
Readings: Numbered Lectures 1-16, 19-27.

2.6 Computational Learning

Michael J. Kearns and Umesh V. Vazirani, *An Introduction to Computational Learning Theory*, MIT Press, 1994.