

# Graduate Examination

## Spring 2009

February 5, 2009

### General Specification

The Graduate Examination in Computer Science will consist of tests in each of the following areas: Theory, Artificial Intelligence, 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 three days, one area exam per day.

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

*Date:* The Spring 2009 examination is tentatively scheduled for sometime in April 2009.

### 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 four sections to the Systems exam. Each examinee must identify three of the four parts by 16 February, 2009 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 six (at least one in each identified part) 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 Software Engineering

Bruegge, B. and A. H. Dutoit, Object-Oriented Software Engineering: Using UML, Patterns, and Java, 2nd edition.

*Readings:* Chapters 1-13, 16.

### 1.2 Programming Languages (Compilers and Principles)

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

Aho, Lam, Sethi, and Ullman. Compilers: Principles, Techniques, and Tools (Second Edition), Addison Wesley, 2006.

*Readings:* Chapters 2, 3, 4, 5, 6

### 1.3 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

### 1.4 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 five sections to the theory exam. The examination will be based on the references listed below. Each examinee must identify three of the five parts by 16 February, 2009 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 referenced 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 (2<sup>nd</sup> Ed.)*, 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

J. M. Hitchcock, *Lecture Notes on Computational Complexity*, 2007.

*Readings:* Chapters 1-14.

C. H. Papadimitriou, *Computational Complexity*, Addison Wesley, 1994.

*Readings:* Chapters 1-3, 7-9, 10.1, 11, 17, 19.

## 2.5 Languages and Automata

D. Kozen, *Automata and Computability*, Springer, 1999.

*Readings:* Numbered Lectures 1-16, 19-27.

# 3 Artificial Intelligence

The examination will be based on the reference listed below. There will be a total of four questions on this area examination. Each examinee must identify three questions to be graded. The examination is **closed book**, reference material may not be consulted during the examination.

S. Russell and P. Norvig, *Artificial Intelligence: A Modern Approach* (first or second edition), Prentice Hall.

*Readings:* Chapters 1-21.