Effective Fall 2009

Breadth Course Requirement

The purpose of the Breadth Course Requirement is to expose students to diverse Computer Science research topics and methods. PhD students must take a total of five (5) courses that satisfy the following requirements:

- Each of the five courses is in a different **sub-area**.
- The student must take at least one course in each different breadth **area**.
- The student **must** take one course in the Theoretical Foundations sub-area.

PhD students must have an average GPA of 3.45 or higher for the five courses they use to satisfy the Breadth Course Requirement. Students have three (3) years to satisfy this requirement. If students want to take a more advanced course in a sub-area than the listed options – typically, one for which one of the listed options is a prerequisite – they may petition the Director of Graduate Studies to use this course for satisfying the requirement. Students may petition the Director of Graduate Studies to transfer credit for up to two courses to use for satisfying the Breadth Course Requirement.

Master's students (MS and MCS) are required to take three (3) courses, one from each of the areas. Students must maintain an overall GPA of 3.0 for MCS and 3.25 for MS candidates for all courses on their degree program, as well as those used to satisfy the breadth requirement. Substitutions are rarely permitted and transfer courses will not count towards the breadth requirement.

All courses must be taken for graduate credit and on the A-F grading basis.

Breadth Areas

There are three breadth areas:

- **Theory and Algorithms**
- **Architecture, Systems, and Software**
- **Applications**

Each area contains a number of sub-areas, and each sub-area contains a number of courses. Defining sub-areas within areas allows for clustering related courses and for increasing the diversity of the courses a student will take to satisfy the breadth requirement.

Theory and Algorithms

1. Theoretical Foundations (*note: all PhD students **must** take one course in this sub-area*)
    - 5421: Advanced Algorithms & Data Structures
    - 5403: Computational Complexity
    - 5304: Computational Aspects of Matrix Theory
2. Applied Algorithms
    - 5302: Analysis of Numerical Algorithms
    - 5471: Modern Cryptography
    - 5481: Computational Techniques for Genomics
    - 5525: Machine Learning

Architecture, Systems, and Software

1. Programming, Software, Languages, Compilers
    - 5106: Programming Languages
    - 5161: Introduction to Compilers
    - 5801: Software Engineering I
2. Systems Software
    - 5103: Operating Systems
    - 5105: Foundations of Modern Operating Systems
    - 5451: Introduction to Parallel Computing: Architectures, Algorithms, and Programming
    - 5708: Architecture and Implementation of Database Management Systems

3. Architecture
    - 5204: Advanced Computer Architecture
4. Networking
    - 5211: Data Communications and Computer Networks
    - 5221: Foundations of Advanced Networking
    - 5231: Wireless and Sensor Networks

Applications

1. Intelligent Systems: AI, Robotics, Machine Learning, Vision
    - 5511: Artificial Intelligence
    - 5521: Pattern Recognition
    - 5551: Introduction to Intelligent Robotic Systems
    - 5561: Computer Vision
2. Data Mining and Bioinformatics
    - 5523: Introduction to Data Mining
    - 5461: Functional Genomics, Systems Biology, and Bioinformatics
3. Graphics, Visualization, Human-Computer Interaction, Social Computing
    - 5107: Fundamentals of Computer Graphics 1
    - 5109: Visualization
    - 5115: User Interface Design, Implementation and Evaluation
    - 5125: Collaborative and Social Computing
4. Security
    - 5271: Introduction to Computer Security