Ph.D./M.S. in ICS — Systems Concentration
Degree Requirements

The Computer Systems Division supports a single concentration in its graduate program (Ph.D./M.S.) referred to as the Systems Concentration.

Ph.D. Program
To demonstrate adequate progress toward the PhD degree, a student must satisfy the requirements specified below. These are in addition to the course and teaching requirements that apply to all ICS graduate students.

1. Grade Point Average (GPA)
   All PhD students are expected to maintain a minimum GPA of 3.5 at all times in the program. Failure to maintain this minimum will result in disqualification from the program. (A maximum one-time 2-quarter probation period may be given.) In addition, no grade lower than B is counted towards satisfying any course requirements.

2. Course Requirements
   **Objective:** Demonstrate knowledge in CS at the introductory graduate level in a broad set of areas
   **Format:**
   - Take a total of 11 courses
     - ICS 200 Seminar in Research (required of all ICS PhD students)
     - 1 course from List 1 (theoretical CS, required of all ICS PhD students)
     - 4 courses from List 2 (systems – core)
     - 5 courses from list 2 or 3 (systems – alternate)
   - Satisfy the following requirement in all 11 courses:
     - achieve an average GPA of 3.5 or better in the selected courses
     - receive at least a B in all selected courses
   - A student with prior subject knowledge may challenge any given course by passing only the corresponding exams given for that course. It is the student’s responsibility to arrange with the instructor in charge of the course for all logistics regarding the taking and grading of the exams.

   - **List 1 (Computing Division)**
     - 260 Fundamentals of the Design and Analysis of Algorithms
     - 261 Data Structures
     - 263 Analysis of Algorithms
• List 2 (Systems – Core)
  211 Advanced Compiler Construction
  214A Principles of Data Management
  241A Computer Systems Architecture
  242 Distributed Computer Systems
  243A Computer Networks
  252 Introduction to Computer Design

• List 3 (Systems – Electives)
  203B Ubiquitous Computing and Interaction
  205 Human Computer Interaction
  212 Introduction to Embedded Computing Systems
  213 Software for Embedded Systems
  214B Transaction Processing and Distributed Data Management
  216 Validation and Testing of Embedded Systems
  217 Design Automation and Prototyping of Embedded Systems
  218 Multimedia Systems and Applications
  241B Modern Microprocessors
  243B Networking Laboratory
  243C High-Speed Networks
  243D Internet Technology
  243E Wireless and Mobile Networking
  243F Middleware for Networked and Distributed Systems
  243G Network and Distributed Systems Security
  244 Parallel Computing
  245 High-Performance Architectures and Their Compilers
  247 Computer Security Algorithms
  248 Queuing Theory
  251 Digital System Verification and Testing
  253 Design Description and Modeling
  256 Design Synthesis
  257 System Tools
  262 Computational Complexity
  265 Graph Algorithms
  266 Computational Geometry
  267 Data Compression
  268 Cryptography and Computer Security
  285 Computer Graphics
  286 Advanced Topics in 3D Computer Graphics
  ECE 251 VLSI System Design
  ECE 254 Fault-Tolerant Computing

3. Comprehensive Exam
   **Objective:** Demonstrate knowledge in core areas of Computer Systems at the introductory graduate level based on the courses taken in these areas
   **Format:**
   After passing all required courses, a student takes an oral exam, which will be offered once a year (during the Winter Quarter):
The exam is administered on a specific day by a committee of 5 faculty members representing different areas of Computer Systems.

The committee reviews the student’s record, including the transcript and other supporting documents (e.g. transcripts from other institutions or published papers).

The committee examines the student in the areas covered by the courses taken by the student. The possible outcomes are: Ph.D. pass, M.S. pass, or fail; a student who fails the exam, or a Ph.D. student who receives an M.S. pass, may retake it at most once (in a subsequent year).

4. Advancement to Candidacy

Objective: Demonstrate in-depth knowledge of an area of CS within which the student intends to carry out research

Format:

- The student selects a committee composed of a minimum 5 faculty members (per RGS regulations) to oversee the advancement to candidacy.
- The student selects a set of research and survey papers representative of the proposed area of research. The student then takes an oral exam during which s/he describes the proposed area and its challenges using the selected papers, and answers questions from the examining committee. The exam is graded PASS or FAIL. In case of FAIL, it may be re-taken once.
- Prior to taking the exam, the student must write a survey or research paper relevant to the proposed area of research.

5. Topic Defense

Objective: Present a detailed plan for completing the PhD degree

Format:

- The student must produce a written document (20-30 pages), representing the student’s dissertation plan. This must include the proposed dissertation abstract, a dissertation outline, and a detailed plan for completing the work.
- A topic defense committee is formed in accordance with the RGS rules; this committee must approve the student’s proposal. (This committee is expected to become the eventual dissertation committee.)
- At the discretion of the student’s advisor, the student may be required to give an oral presentation of the proposed plan to the committee.

6. Dissertation Defense

Objective: Publicly defend the final PhD dissertation

Format:

- The student presents and defends the PhD dissertation in an oral exam, which is open to the public. The defense must be attended by the entire committee.

Expected Timeline for Completion of PhD Degree:
This is the timeline adopted by the School of ICS for the PhD degree in ICS:

For students coming in with a BS in CS degree:

- Comprehensive knowledge satisfied within first 2 years
- Advancement to Candidacy by the end of 3\textsuperscript{rd} year
- Topic Defense by the end of the 5\textsuperscript{th} year
- Final Defense by the end of the 6\textsuperscript{th} year

For students admitted with an MS in CS degree:

- Comprehensive knowledge satisfied within the first year
- Successful Advancement to Candidacy by the end of 2\textsuperscript{nd} year
- Topic Defense by the end of the 4\textsuperscript{th} year
- Final Defense by the end of the 5\textsuperscript{th} year

Exceptions:

- one-time 1-year leave of absence may be requested
- one-year leeway is automatically granted to students with non-CS background to take additional relevant courses (at the undergraduate level)

\textbf{M.S. Program}

All M.S. students in the Systems Division follow the Systems concentration. Course requirements for the M.S. and Ph.D. programs in the Systems Concentration are identical. All other requirements of the M.S. program follow the general requirements described in the catalogue. Specifically, each student may follow the Thesis Plan or the Comprehensive Exam Plan as described in the current catalogue.