

## Preview of the New Masters Program in Computer Science

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## Outline

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- Brief overview of current MS CS program
- Structure of new MS CS program
- Additional details

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## Overview of Current Program

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- Requirement 1: Background prerequisites
  - Basic undergraduate: cs103, 106, 107, 108, 110, Math104
- Requirement 2: Breadth (at most 21 units)
  - Variety of advanced undergraduate level courses
- Requirement 3: Seminar (1-3 units)
  - At least one (and no more than 3) 500-level seminars
- Requirement 4: Depth (at least 21 units)
  - Select from 10 concentration areas (or indiv. designed)
- Requirement 5: Electives
  - Technical courses numbered above 100 related to program and approved by advisor

## (General) Breadth Requirements

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### Area A: Mathematical and theoretical foundations

Required:

Probability (CS109 or Stat116 or MSE220 or CME106)
Automata and Complexity (CS154)
Algorithmic Analysis (CS161)
Choose one of:
Numerical Analysis (CME108 or CME302)
Logic (CS156, 157, 258, or Phil 251)
Mathematical Methods (CS205A)

### Area B: Computer systems

Required:

Computer Architecture (EE108B or EE282)
Choose two of:
Operating Systems (CS140)
Compilers (CS143)
Computer Networks (CS144 or EE284)

### Area C: AI and applications

Choose two, including one at 200 level

Artificial Intelligence (CS121 or CS221)
Databases (CS145 or CS245)
Graphics (CS148 or CS248)

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## Design Goals

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- Program flexibility
  - More flexibility in course requirements
  - Promote more work across different areas in CS
- Program depth
  - Provide ability to pursue more depth in concentration
  - Make student involvement in research easier
- Administrative
  - Simplify the need for faculty to provide course waivers
  - Eliminate existing program inconsistencies

## Structure for New Program

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- Requirement 1: *Foundations*
  - Equivalent to Stanford undergraduate core courses
  - CS103: Logic, Automata & Complexity
  - CS109, Stat116, CME106, or MS&E220: Probability
  - CS161: Algorithmic Analysis
  - CS107: Computer Organization & Systems
  - CS110: Principles of Computer Systems
  - Courses can (and often will be) waived
    - 5 courses to waive (rather than 9)
- **Maximum of 10 units of such courses may count toward MS**

## Structure for New Program

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- Requirement 2: *Significant Implementation*
  - Must take at least one course with a significant software implementation component
  - This course may be one of your breadth, depth, or elective courses
  - Initial set of SI courses: CS140, CS143, CS144, CS145, CS148, CS210B, CS221, CS243, CS248, and CS346
- Requirement 3: *Seminar* (eliminated as requirement)
  - No longer required to take a 1 unit seminar
  - May still take up to 3 units of CS/EE/Engineering seminars as part of program
  - Seminars now count as *elective* units

## Proposed Structure for New Program

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- Students must complete requirement 4a or 4b
- Requirement 4a: *Single Depth Area + Breadth*
  - 27 units now required for depth area
    - CS393, 395, 399 added to depth to promote research
    - Most depth areas have additional courses
  - Breadth requirement: 3 courses
    - Courses must be from *outside* concentration area
    - List of many 100/200-level courses to choose from
    - List includes all classes in previous "Breadth" requirement
- Requirement 4b: *Dual Depth*
  - Primary depth area: 21 units
  - Secondary depth area: 5 courses (replaces Breadth)
  - Allows for more significant work bridging two areas

## Proposed Structure for New Program

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- Requirement 5: *Electives*
  - Additional courses/seminars to reach 45 unit total
  - Technical courses numbered 100+, approved by advisor
  - Pre-approved list: generally includes all 3+ unit CS class numbered > 110, as well as some highly-related classes in other engineering departments.

## Depth Areas

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- All existing depth areas, with *exception* of Numerical Analysis/Scientific Computation (NA/SC), remain
  - NA/SC will no longer be offered as a CS depth area
  - NA/SC largely supplanted by ICME
- Requirements for each depth area have been updated to reflect new depth requirements/options
  - Requirements in each depth expanded to allow for taking 27/21-unit depth as well as 5 course secondary depth
  - Depth areas many now also include more introductory classes (to guarantee sufficient background in area)

## Concentration Areas

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- Artificial Intelligence
- Biocomputation
- Computer and Network Security
- Database Systems
- Human Computer Interaction
- Real-World Computing
- Software Theory
- Systems
- Theoretical CS
- *Individually Designed*

## An Important Caveat

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- Revised MS CS curriculum presented here is still subject to (minor) changes
- Contents here are a *preview* of curriculum changes that will go into effect this coming Fall 2010
  - Wanted to inform you as soon as revised curriculum was approved
  - Give some guidance for course planning
- There may be some modifications that will be made between now and then
  - Additional changes are likely to be minor
  - But, they can still happen!
  - Presentation here is **not** a binding contract
- The 2010-2011 Stanford Bulletin will contain the finalized requirements (as will an updated set of program sheets)

## Depth: Artificial Intelligence

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- a) CS 221\*\*
- b) At least four of: 223A, 223B, 224M, 224N, 224S, 224U, 224W, 226, 227, 228, 229
- c) Sufficient depth units from category (b) and the following: CS 124, 205A, 222, 225A, 225B, 227B, 228T, 246, 262, 270, 273A, 274, 275, 276, 277, 278, 279, 294A\*, 321, 322, 323, 326A, 327A, 328, 329, 341, 345A, 345L, 364A, 364B, 374, 377\*, 379\*, 393\*, 395\*, 399\*; Elect. Eng. 263, 363, 364A, 364B, 376A; Engr. 205, 209A; Man. Sci. 251, 252, 339, 351, 352, 353; Psych. 202, 205; Stat. 202, 315A, 315B
- \* With consent of Specialization chair or (for CS 294A, 393, 395, and 393) advisor.
- \*\* Students with equivalent coursework may waive out of taking CS221 with the approval of their advisor.
- Students with a 27 or 21 unit depth option simply need to take that many units subject to satisfying the area (a), (b), and (c) requirements above.
  - Students with a secondary concentration in this area need to take five total courses satisfying the area (a) and (b) requirements above. Students waiving out of CS221 may take an additional course in either area (b) or (c).

## Depth: Biocomputation

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- a) At least four of: CS 262, 270, 272, 273A, 274, 278, 279
- b) Sufficient depth units from category (a) and the following: CS 228, 229, 245, 246, 261, 268, 275, 277, 341, 345, 346, 374, 393\*, 395\*, 399\*; BIOC 218; Genetics 203, 211; SBIO 228
- \* With consent of advisor.
- Students with a 27 or 21 unit depth option simply need to take that many units subject to satisfying the area (a) and (b) requirements above.
  - Students with a secondary concentration in this area need to take five total courses. Three of those courses must come from area (a) and the remaining two courses may come from either area (a) or (b).

## Depth: Computer & Network Security

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- a) All of: CS140\*\*, 144\*\*, 155, 244, 255
- b) At least three of: CS 142, 240, 241, 244B, 244C, 259, 261, 340, 344, 355; EE 384E
- c) Sufficient additional units selected from 'b' and the following: 240E, 244E, 245, 294S\*, 295, 344B, 341, 345, 347, 361A, 393\*, 395\*, 399\*; EE 384A, 384B, 384C, 384M, 384S, 384X
- \* With consent of advisor.
- \*\* Students with equivalent coursework may waive out of taking CS140 and/or CS144 with the approval of their advisor.
- Students with a 27 or 21 unit depth option simply need to take that many units subject to satisfying the area (a), (b), and (c) requirements above.
  - Students with a secondary concentration in this area need to take five courses. Those courses must satisfy the area (a) requirement and additional courses from area (b) should be taken if any area (a) requirements are waived.

## Depth: Databases

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- a) CS145\*\*, 245
- b) At least two of: CS 341, 345, 346, 347
- c) Sufficient additional units selected from category (b) and the following: CS 240, 242, 243, 244, 244B, 244C, 246, 249A, 249B, 255, 262, 270, 271, 272, 275, 276, 315A, 321, 344, 364B, 374, 393\*, 395\*, 399\*
- \* With consent of advisor.
- \*\* Students with equivalent coursework may waive out of taking CS145 with the approval of their advisor.
- Students with a 27 or 21 unit depth option simply need to take that many units subject to satisfying the area (a), (b), and (c) requirements above.
  - Students with a secondary concentration in this area need to take five courses satisfying the area (a), (b), and (c) requirements above.

## Depth: Human-Computer Interaction

- a) CS147 (maybe waived with equivalent coursework and advisor approval)
  - b) (Project Depth) One of: CS 247, 294H
  - c) (Advanced Topics) One of: CS 376, 378, 448B
  - d) (Technical Breadth) One of: CS 124, 142, 148
  - e) (Empirical Methods) One of: CS 303; Psych 110, 252; Comm 206, 268
  - f) (Design) One of: Art 160; ME203, 216A, 313, 377
  - g) (HCI Depth Electives) One or more courses from areas (b)-(f), or the following: CS 140, 210, 223A, 223B, 224N, 224S, 224U, 224W, 226, 228, 229, 242, 246, 248, 295, 341, 345, 393\*, 395\*, 399\*, or any d.school or HCI class listed as counting toward the MS CS degree.
- \* With consent of advisor.
- Students with a 27 or 21 unit depth option simply need to take that many units subject to satisfying the area (a)-(g) requirements above.
  - Students with a secondary concentration in this area need to take five courses as follows: one course each from areas (a), (d), (e), and (f), and then one course from either area (b) or (c). Students waiving out of the area (a) requirement should take one additional course from areas (b)-(g).

## Depth: Real-World Computing

- a) At least three of: CS 148, 223A, 223B, 248
  - b) At least three of: CS 205A, 205B, 226, 249A, 249B, 262, 268, 277, 348A, 348B, 374; CME 302, 306, 326
  - c) Sufficient additional units selected from the above and from the following: CS 225A, 225B, 228, 229, 247, 270, 271, 272, 273A, 274, 294A, 327A, 328, 448, 393\*, 395\*, 399\*; CME 324
- \* With consent of advisor.
- Students with a 27 or 21 unit depth option simply need to take that many units subject to satisfying the area (a), (b), and (c) requirements above.
  - Students with a secondary concentration in this area need to take 5 total courses satisfying the area (a) and two of the three courses in the area (b) requirements above (i.e., three courses in area (a) and two courses in area (b)).

## Depth: Software Theory

- a) CS 242, 243
  - b) At least one of: CS 241, 258, 259
  - c) At least one of: CS 244, 245, 295, 343, 341, 345
  - d) At least one of the following: CS 255, 261, 268, 355, 361A, 361B
  - e) At least two additional courses chosen from b), c), d), or the following: CS 294S\*, 346, 393\*, 395\*, 399\*
- \* With consent of advisor.
- Students with a 27 or 21 unit depth option simply need to take that many units subject to satisfying the area (a)-(e) requirements above.
  - Students with a secondary concentration in this area need to take 5 total courses satisfying the area (a)-(d) requirements above (i.e., two courses in area (a) and one course each in areas (b)-(d)).

## Depth: Systems

- a) All of: CS140\*\*, 144\*\*, 240, 242
  - b) At least three of: CS 243, 244, 245, 248, 348B; Elect. Engr. 271, 282
  - c) At least two additional courses selected from category (b) and the following: CS 240C, 240D, 240E, 240X, 244B, 244C, 244E, 249A, 249B, 255, 259, 262, 270, 271, 272, 276, 294S\*, 295, 315A, 315B, 340, 343, 344, 344B, 341, 345, 346, 347, 348A, 349, 374, 448, 393\*, 395\*, 399\*; Elect. Engr. 273, 382A, 382C, 384A, 384B, 384C, 384S, 384X, 384Y
- \* With consent of advisor.
- \*\* Students with equivalent coursework may waive out of taking CS140 and/or CS144 with the approval of their advisor.
- Students with a 27 unit depth option simply need to take that many units subject to satisfying the area (a), (b), and (c) requirements above.
  - Students with a 21 unit depth option need to take that many units subject to satisfying the area (a) and (b) requirements above, and additional courses may be taken from area (c) if any courses in the area (a) requirement are waived.

## Depth: Theoretical Computer Science

- a) CS 241 or 258 or 259, 261 (361A or 361B may be used as substitutes for 261)
  - b) Sufficient additional units selected from: CS 228, 241, 246, 254, 255, 258, 259, 262, 268, 341, 345, 355, 356, 357, 358, 359\*, 361A, 361B, 364A, 364B, 369\*, 374, 393\*, 395\*, 399\*, 468\*; Man. Sci. 310
- \* With consent of advisor.

Note: Multiple CS359, CS369, and/or CS468 courses may be taken as long as they are each on different topics (denoted by different letter suffixes for the courses).

- Students with a 27 or 21 unit depth option simply need to take that many units subject to satisfying the area (a) and (b) requirements above.
- Students with a secondary concentration in this area need to take 5 total courses satisfying the area (a) and (b) requirements above (i.e., two courses in area (a) and three courses in area (b)).

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## What If I'm Already Part-way Through?

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- Students can graduate under any curricular requirements since they entered Stanford as an MS student
  - You can choose to graduate under old or new MS requirements
- What if I'm entering MS program in Fall 2010?
  - You should use the new MS requirements
- Is there anything different if I'm a coterminal student?
  - Short answer: not really
  - Detailed answer: you may be able to waive the Significant Implementation requirement if you've already taken such a course as an undergraduate

Thank you for your attention

Questions?