The Software Engineering Ph.D. Program at Carnegie Mellon

SE Ph.D. Immigration Course Overview

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Software engineering is the branch of computer science that creates practical, cost-effective solutions to computing and information processing problems, preferentially by applying scientific knowledge, developing software systems in the service of mankind.

- from “Software Engineering for the 21st Century: A basis for rethinking the curriculum” by the CMU SE Faculty (Mary Shaw, editor).
The Software Engineering Ph.D. Program

- Our goal: to help you become future leaders of the SE field
  - **Researchers** developing SE tools and techniques that transform the practice of SE and open new fields of inquiry
  - **Educators** who train the next generation of SE students
  - **Practitioners** who drive innovation within their companies

- Any of these roles can be played in multiple settings
  - Research and teaching universities
  - Government laboratories or leadership
  - Corporate labs, development, or management
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  - Practitioners who drive innovation within their companies
- We believe a community is the best way to provide this help
  - Your advisor, fellow students, other faculty, and the ISR staff
New Faculty! New Faculty!

Eunsuk Kang

Heather Miller
SE Ph.D. Program Elements (1)

• Directed research in Software Engineering
  • Most of your time each semester and throughout the program
  • Goal: make original contributions to software engineering knowledge
  • Culminates in proposal, dissertation document, and defense

• Course requirements (7)
  • 17-808: Software Engineering Research
  • SYM: Symbolic mathematics and analysis
  • ENG: Software systems design and engineering
  • SOC: Software and issues in society, business, or public policy
  • BEH: Behavioral science research methods
  • 2 Ph.D. level electives

• Teaching (2)
  • Assist with teaching two courses
  • One introductory and one advanced
  • Non-native English speakers take International TA test
    • Spend 15 hours/semester in Intercultural Communication Center classes until Pass
SE Ph.D. Program Elements (2)

- Speaking skill
  - Give 2 talks per year in the software research seminar (SSSG)
  - Attend and provide feedback to other SSSG speakers
  - Sustained excellence → pass → continue practice!

- Writing skill
  - Write a high-quality scholarly document
  - Evaluated by 2 faculty, 1 Ph.D. student

- Practicum – a written document and presentation comprising:
  - An issue-focused reflection on personal SE experience, or
  - An empirical study of SE practice

- Thesis
  - A significant piece of original research in software engineering
  - Committee: Advisor + 1 ISR faculty + 1 SCS faculty + 1 external
  - Proposal: describe topic, significance, plan
  - Defense: present thesis contributions publicly

- Volunteer and contribute to the community!
## Typical Program Sequence

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>INTENSITY</th>
<th>COMPLETION TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practicum</td>
<td>¼ time for 1 semester</td>
<td>By the end of year 2</td>
</tr>
<tr>
<td>Writing skills</td>
<td>variable</td>
<td>By the end of year 3</td>
</tr>
<tr>
<td>Speaking skills</td>
<td>SSSG</td>
<td>By the end of year 4</td>
</tr>
<tr>
<td>Required courses</td>
<td>each ¼ time for 1 semester</td>
<td>By the end of year 4</td>
</tr>
<tr>
<td>Thesis research &amp; proposal</td>
<td>≥½ time</td>
<td>By the end of year 4</td>
</tr>
<tr>
<td>Teaching</td>
<td>each ½ time for 1 semester</td>
<td>By the end of year 5</td>
</tr>
<tr>
<td>Thesis research &amp; dissertation</td>
<td>full time</td>
<td>By the end of year 5 (or 6)</td>
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### Notes
- Every student is different—schedules vary substantially
- You should spend ≥½ time on research every semester
- Volunteering and speaking continue through the whole program
Pass/Fail Grading

- Course grades (mostly) don’t matter: learning does
  - From your courses, get research tools and perspective on the field
  - We do expect students to earn the equivalent of a B- (or better)
    - Grades below a B- do not count toward program requirements

- Consistent with this philosophy, grades are recorded pass/fail on your transcript

- Pass/Fail process
  - It’s a little complicated because the registration software doesn’t directly support our policy—sorry about that!
  - You will automatically be enrolled pass/fail in ISR courses
  - For courses in other departments, fill out a pass/fail form
  - Instructors do have the discretion to make courses letter-graded only, so there may be a few exceptions to our general rule
What you can expect of us

• Advising
  • The most important relationship you will have
  • Match comes soon after you state preferences, due Sept. 21
    • Ok to match up earlier by mutual agreement
    • View as a long-term commitment
    • Free to change if needed
  • Academic guidance, especially in research

• Regular feedback
  • From your advisor, often on a weekly basis
  • Each semester from faculty after “Black Friday” meeting

• Financial support
  • All students in good standing receive free tuition and a stipend

• A supportive community!
An Important Note about Culture

• Computer Science is not as diverse as we would like
  • Mostly male
  • Many minorities underrepresented

• CMU is working to change this
  • Example: 50% of our incoming undergraduate class is female
  • But a lot of work remains!

• One big thing we can all do – support each other
  • Recognize that diversity brings benefits (Bogdan, and others, have extensive empirical evidence for this!)
  • Respect each other – avoid jokes, comments, etc. that reinforce stereotypes and make others feel unwelcome

• Talk to me or other faculty if you have concerns
The Ph.D. is a New World

• Research is your #1 job!
  • Start immediately, upon advisor match (or earlier)
  • Make progress each semester

• Nature of the work differs
  • You will be given ill-defined problems, and have to define them
  • Critical thinking and interpretation dominate fact-finding
  • Much of the feedback you get will be informal

• Responsibility for your progress is yours
  • Goals are long-term and high-level
  • Take initiative for your own learning, address your weaknesses
  • Your advisor and the community is there to help – we believe in you!
What you should do first

• Attend the immigration course
  • All faculty meetings in ISR – even if you know your advisor
  • Selected talks from other departments. E.g. CSD:
    http://www.cs.cmu.edu/~csd-ic/

• Find an advisor
  • Meet with faculty who share your interests
  • Start immediately, and expect multiple interactions

• Learn more about the program
  • SE Ph.D. website and wiki: http://isri.cmu.edu/education/se-phd/
  • SE Ph.D. program document
    http://isri.cmu.edu/education/se-phd/program/plan/se-phd-program-plan.pdf

• Take 15-808
  • Introduces SE research from ISR’s point of view

• Consider another course, or focus on research
  • Ask potential advisors for recommendations; also other students