Developing Software When it Matters

What Does it Mean to Engineer Software?

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What do these have in common?

250,000 SLOC

1 – 2 million SLOC

8 million SLOC


10 million SLOC

- They all need a ***lot*** of software to operate.
- These are **huge** software systems that can not be thought of one line or class at a time. The software engineer needs to think about design at different levels–from a line of code up to the entire system.

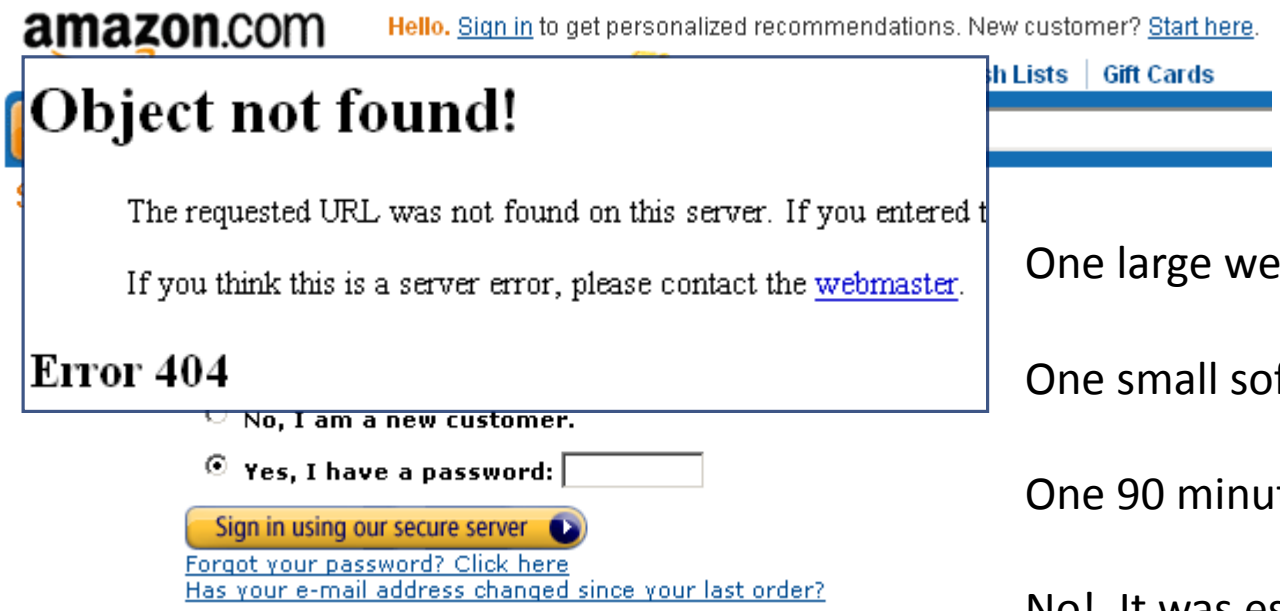
Engineering design

An engineer's favorite calculation tool is the back of an envelope.

This calculation shows that **one software engineer** writing 1 line of code per minute for a year, can produce **120,000 lines per year**.

2 million lines for a top-level game will take more than 17 software engineers a year to produce.

Teamwork



One large website. Complex.

One small software upgrade. Easy.

One 90 minute outage. Priceless?

No! It was estimated to cost **$2.8M** in lost revenue.

This is not safety-critical, but it is financial-critical.

This team needed a better understanding of the process for developing a critical system, and how to bring an upgrade on-line without taking down the system.

Software development process

The software engineer's daily job is to answer questions about the software system.

- How can I help the customer? What is required to solve the customer's problem?
- How will the user interact with the system?
- What operating system, language, hardware is going to be used?
- What is the overall software system structured and how do different components interact with each other?
- What code do I have to write?
- How do I organize my team so we are effective?
- Can we finish the game to have it on the shelves for Christmas shopping?

To answer those questions, the software engineer must interact with many people.

- Customers asking for the system
- People who will use the system
- Domain experts: banking, avionics, security, medical, scientists, …
- Engineers from other engineering disciplines
- Most closely with the other software engineers on the project

Communication

The difference between computer science and software engineering is the difference between science and engineering.

- **Scientists build** things **to learn** something new.
- **Engineers learn** things **to** design and **build** quality products.

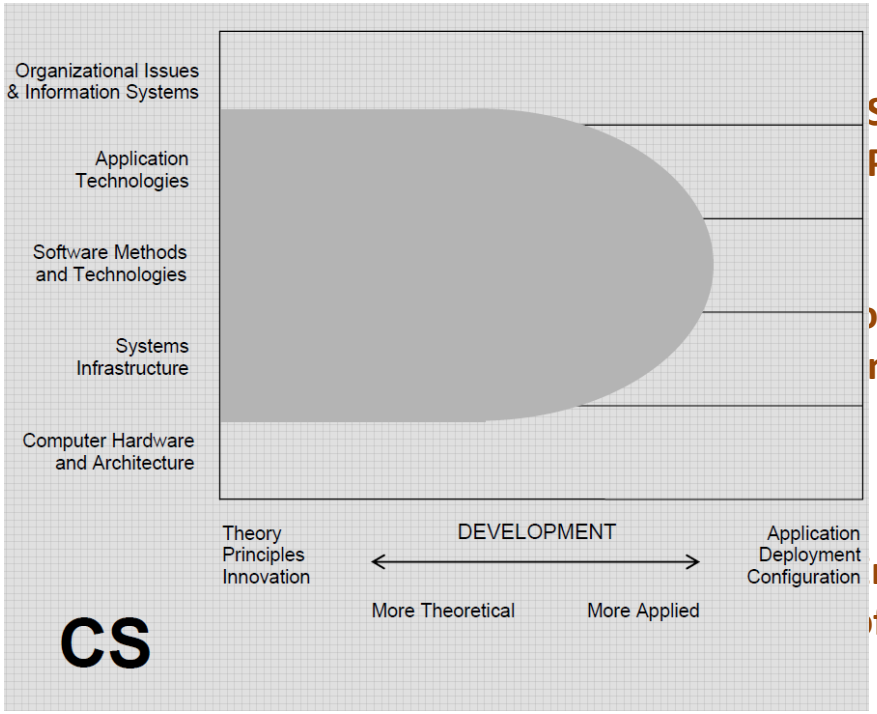
- Scientists want to achieve scientific breakthroughs.
- Engineers want to avoid engineering failures.

- Computer scientists want to learn
  - Algorithms and theory
  - How the basic technologies work
  - Where technology needs to be improved

- Software engineers want to learn
  - Design principles
  - Best practices for developing software
  - Characteristics of technology to use the most appropriate for their software systems requirements

Lutz, Naveda, Vallino - Undergraduate Software Engineering: Addressing the Needs of Professional Software Development, ACM Queue, v12 n6, June 2014. http://dl.acm.org/citation.cfm?id=2653382

A software engineer needs a skill set that is a balance of all areas in the computing realm.



Software Process and
Project Management

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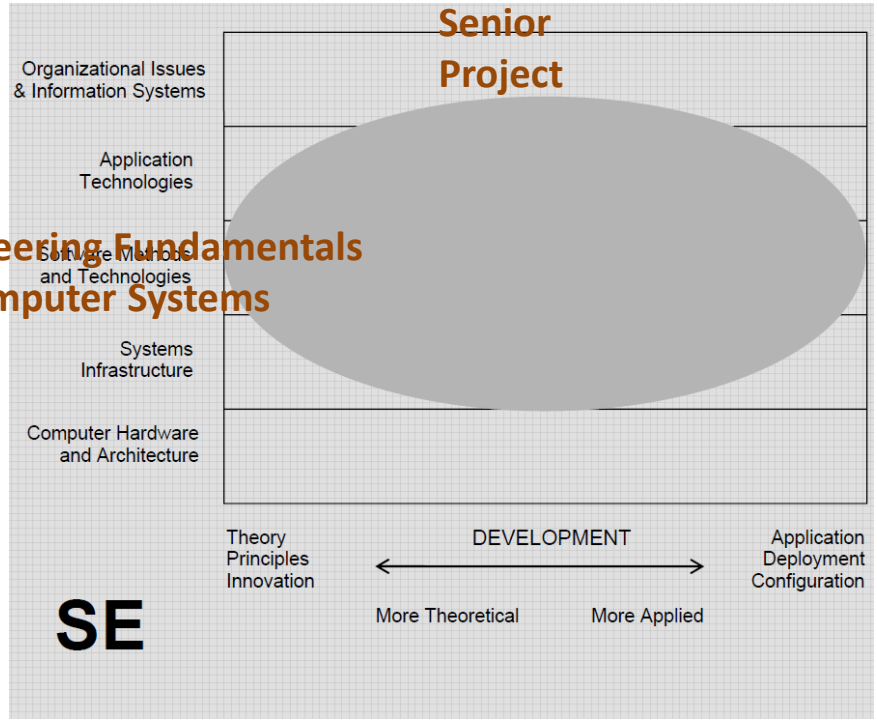

You can have the title on your degree match the title on your business card and the best job to have.

INFOTECH FEATURE

April 28, 2011

Software Engineer Ranked Best Job for 2011

CNNMoney
A Service of CNN, Fortune & Money

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BEST JOBS IN AMERIC

MONEY Magazine and Salary.com rate careers on sa

By Tara Kalwarski, Daphne Mosher, Janet Paskin and Donna

Top 10 best jobs

MONEY Magazine and Salar
growth, pay, stress-levels and

1. Software Engineer
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The 10 Best Jobs of 2011

By Andrew Strieber

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The geeks strike back: despite enduring an industry bubble and the threat of outsourcing, Software Engineer ranks as the Best Job of 2011.

Best Jobs in America

2015

CNNMoney/PayScale's top 100 careers with big growth, great pay and satisfying work.

Recommend 2.2k

Rank ▲	Job title	Median pay	10-year job growth
1	Software Architect	$124,000	23%

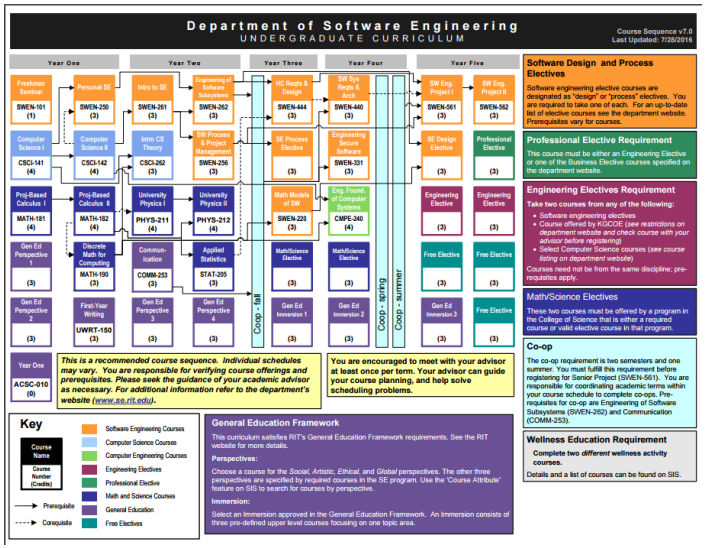
Why Choose Software Engineering @ RIT

Today, you will see the multiple aspects that contribute to the quality of RIT's software engineering program.

The quality of our program is in our

Staff & Advisors

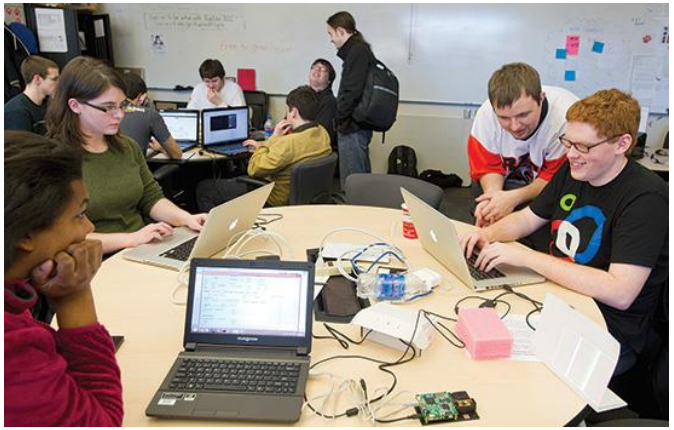


Faculty



… and Students!



Our students and graduates are finding jobs in a broad array of companies across many domain areas.

RIT's software engineers earn great salaries for both co-op and full-time employment.

Program	Co-op Average	Full-time Range		Full-time Median
Software Engineering	**$21.03**	**$55,000**	**$115,000**	**$75,000**
Computer Science	21.65	40,000	102,000	72,000
Management Information Systems	16.98	30,000	95,000	67,000
New Media Interactive Development	17.50	40,000	80,000	64,300
Computing Security	21.03	42,000	160,000	64,250
Computer Engineering	20.71	50,000	87,500	63,000
Networking & Systems Admin.	17.20	38,000	96,000	63,000
Information Technology	16.47	24,000	80,000	60,000
Game Design and Development	17.05	33,600	110,000	57,500

Source: RIT Office of Cooperative Education and Career Services website, Spring 2016 (partials)

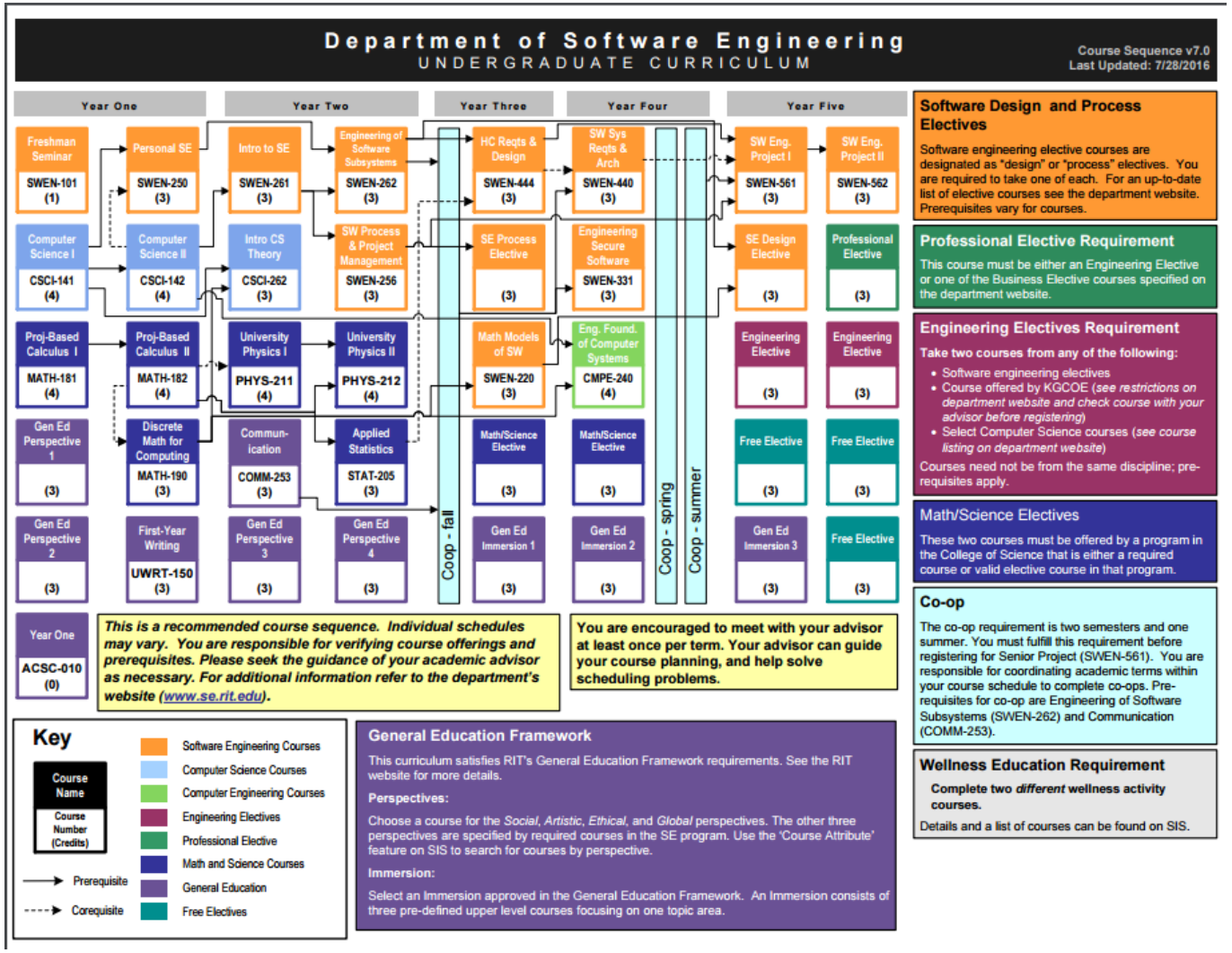
Placement rate in full-time positions or graduate school is > 90%.

Our program is based on the four elements of a software engineer's daily practice discussed earlier.

- **Software engineering design**
- **Software development process**
- **Teamwork**
- **Communication**

By learning these four skills, you will be able to deliver software products that meet the customer's needs, arrive on time, within budget, and operate without bugs.

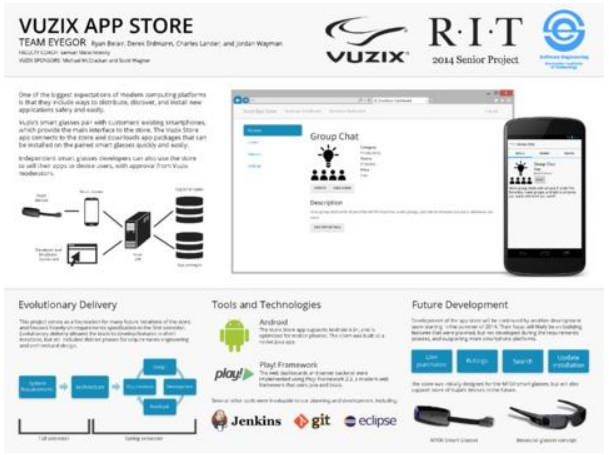
We have a curriculum designed from the ground up as a software engineering program.

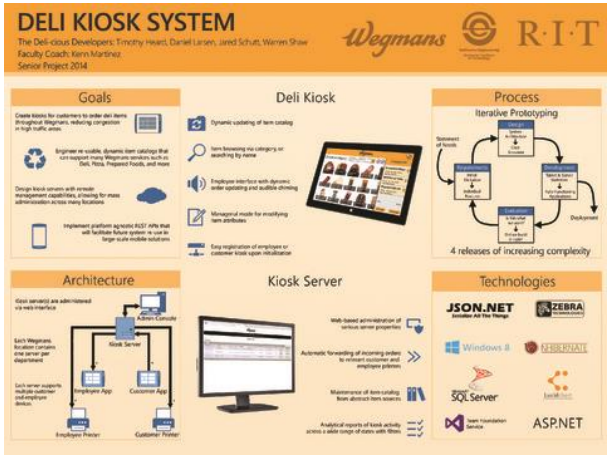


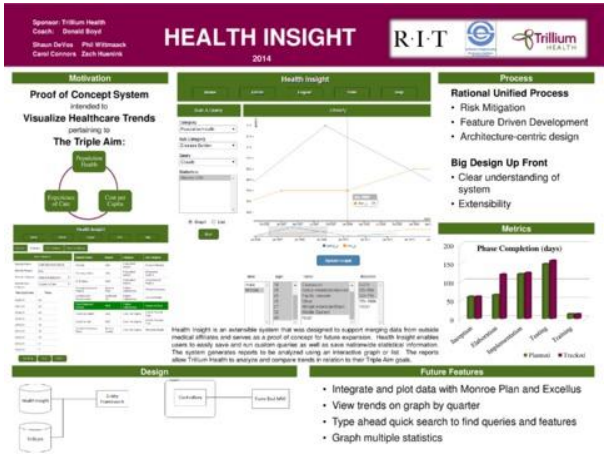
Content area	#credits/%
Software Engineering	37/30%
CS and Comp. Eng.	15/12%
Eng. Electives	9/7%
Math/science	28/22%
General Education	27/22%
Free Electives	9/7%

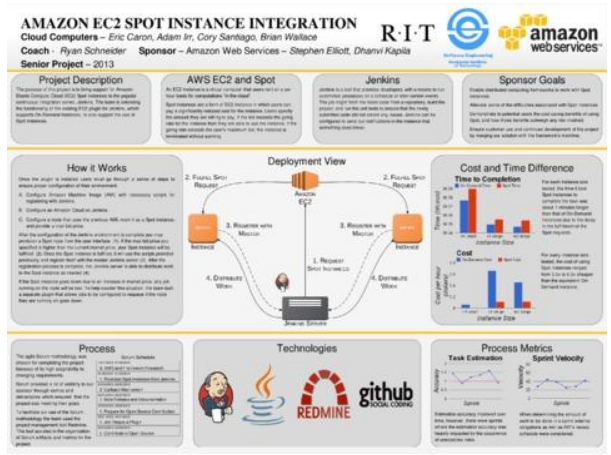
Accredited ABET Engineering Accreditation Commission

The software engineering program culminates with a year-long senior project.









Senior Project Sponsors (previous examples)

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Trillium Health
Two Sigma Investments, LLC
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Wegmans Food Markets Inc.

http://www.se.rit.edu/senior-project

We have a combined undergraduate and graduate program.

- **Get a BS and MS in software engineering in six years**
  - 4 years undergraduate
  - 1 year of co-op
  - 1 year of graduate work

When choosing a career, you need to consider three elements.

$45K - $70k - $100K

Best Jobs in America 2015

CNNMoney/PayScale's top 100 careers with big growth, great pay and satisfying work.

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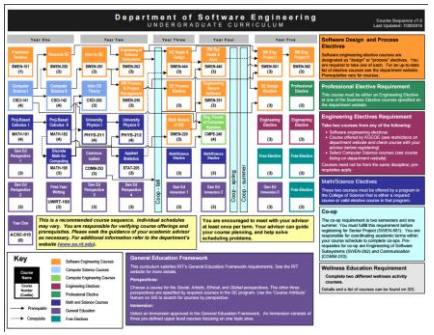
SE is for you.



SE is the 'go to' group when we want talented students to make a software platform sing and dance.

- Dr. Jeremy Haefner, RIT Provost

Do you have a passion to develop quality software that

- Helps people live
- Makes people more productive at work and at home
- Provides entertainment to people
- Keeps people connected to family and friends

If you have any questions, get them answered today, next week, or next month.

- **Ask our students**
  - Society of Software Engineers http://sse.se.rit.edu/
  - What is the student experience?
- **Ask our faculty**
- **Visit our website at www.se.rit.edu**
- **Give us a call – 585-475-5461**
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