Computer Science & Engineering

Computer science is unique within engineering because of the opportunity to see results immediately. In CS, you can write, compile, and run code all in minutes. When you run your code, you see results. You can recognize what goes wrong, what you want to change, and how the results can be better. You can debug and improve your code in real time. Computer science is a dynamic, ever growing field, with a focus on using logic as building blocks to change people’s everyday lives.

Computer science is based in logic and math. How fast can you get the code to run? How can you optimize the algorithm? How can you store the data to save time and space? How should the code be organized so it’s the most efficient? The building blocks from some of your early math classes are used to store variables, write a function to count to ten, and use a graphics library to animate a dot travelling across a screen. These ideas and skills are used to create more and more complex programs, and the student can continuously improve in skills. Students come to computer science for the excitement of seeing a program work and the beauty of simplifying a complex problem into well thought-out code. Students in computer science develop many unique ways to approach, understand, and solve problems in computer science and the real world.

There are endless opportunities in computer science and endless ways in which computer science is and can be integrated into our everyday lives. From app development to web development to networks to security to cryptography to human computer interaction to theory to design and beyond, students can focus on what they love within the major. As students grow, they determine their individual interests within the major. Extracurricular passions can be enhanced using computer science, and the major can be used to improve different parts of your everyday life. The excitement of computer science is the constant change, the constant learning, and the constant improvement. With new languages, growing computing power and space, and the increasing availability of computers to people around the world, computer science students have the chance to apply computer science to their lives to make a difference.

Below, we will share a Student Profile, a Faculty Profile, the Curriculums for Computer Science and Engineering, and some Departmental Opportunities. For more information, please check out the Computer Science website at cse.nd.edu or email pmentor@nd.edu to get in touch with a Computer Science student!
Student Profile

Maribeth Rauh
Computer Science
Senior

Why did you choose to study Computer Science?
Computer Science has a huge variety of applications in an increasing number of fields. I chose to study CS because I felt like it would give me a chance to combine my major with many different things that interested me, like design. I also loved the creativity of CS - wrapping my mind around a new problem and coming up with a way to solve it is fun and rewarding.

What opportunities are available for students studying Computer Science & Engineering?
Tons! Knowing how to code opens so many doors, ranging from technical to completely non technical. CS majors are in huge demand for jobs as varied as consulting, banking, startups, and of course all kinds of tech companies. Besides jobs, there are always all kinds of people looking for someone to help them build an app or website, there are hackathons (programming competitions), and lots of other opportunities to apply your major outside of the classroom in genuinely fun ways.

How do you hope to use your skills after graduation?
I will be working as a software engineer at Google after graduation, working on Maps. I also have noticed that the way CS has taught me to break down, analyze, and solve problems is transferable to many other situations in life.
Faculty Profile

Professor Ramzi Bualuan
Computer Science & Engineering
Professor & Advisor

Background:
Joined the CSE Department in 1993
M.S. in EE from University of Notre Dame
B.S. in EE from the American University of Beirut

How did you become involved in Computer Science and Engineering?
I worked in the industry for 1 year (with Bayer Pharmaceuticals), but missed academia; I was hired by ND to come back to teach, but first in the MIS department; 2 years later the CSE department, a then recently formed new department, hired me to teach C and C++ programming.

What opportunities do CS/CPEG provide for students who study it?
The job prospects for CS and CPEG graduates are really very good, and will continue to be so for a very long time; the need for CS/CPEG skills in the workplace has been well documented, and the opportunities are everywhere, whether it be in the private sector, public sector, military, not-for-profit organizations, graduate school, etc.

What do you like most about your job?
There are so many things I love about my job! Not only as a teacher, but also as the department’s Director of Undergraduate Studies, a position that allows me to get to know a lot of our students. I see the impact that we educators can have on our future generations, and I find that very rewarding. And I love how at a place like ND, I am always challenged to get better because the students are so bright.

Why should students study Computer Science and Engineering?
Almost every area, every part of life, requires computing nowadays; with the skills developed with a CS/CPEG degree, students can help improve the world around them; solutions to many of today’s major challenges, all of which of course require collaborative interdisciplinary work among all fields of engineering, can be made much more efficient and much more precise with the proper knowledge and application of computing techniques.
Curriculum

Color Codes:
Computer Science & Computer Engineering
Only Computer Engineering
Only Computer Science

First Year Courses:
Fall
• MATH 10550 – Calculus I
• CHEM 10171 – Chemical Principles
• EG 10111 - Intro to Engineering I
• Arts and Letters Elective
• Composition
• Physical Education
Spring
• MATH 10560 - Calculus II
• CHEM 10122 - Chemistry II
• EG 10112 - Intro to Engineering II
• PHYS 10310 - Physics I
• University Seminar
• Physical Education

Sophomore Year:
Fall
• CSE 20211 – Fund Computing I
• CSE 20110 Discrete Mathematics
• MATH 20550 - Calculus III
• PHYS 10320 - Physics II
• Philosophy or Theology
Spring
• CSE 20212 – Fund Computing II
• CSE 20221 – Logic Design
• CSE 20189 – Basic Unix for Engineers
• MATH 20580 - Linear Algebra & Diff Eq
• Philosophy or Theology

Junior Year:
Fall
• CSE 30331 – Data Structures
• CSE 30321 – Computer Architecture
• Technical Elective / Free Elective
• CSE Elective / EE 20224 – Intro to EE
• Philosophy or Theology
Spring
• CSE 30341 – Operating Systems
• CSE 30151 – Theory of Computing / EE 20242 - Electronics
• CSE 30332 -Programming Paradigms / EE 20234 – Electric Circuits
• ACMS 30440 – Probability & Stats
• Philosophy or Theology

Senior Year:
Fall
• CSE 40113 – Algorithms / EE 30344 – Signals & Systems I
• CSE Elective
• CSE Elective
• Technical Elective / CSE Elective
• Free Elective
Spring
• CSE 40175 – Ethical and Social Issues
• CSE Elective
• CSE Elective / CSE 40522 – CPEG Capstone Design
• Arts & Letters Elective
Departmental Opportunities

The Notre Dame Computer Club (ACM)
A Student Chapter of the Association for Computing Machinery
The Notre Dame Computer Club has sponsored events like campus-wide programming competitions, hackathons, guest speakers, video game nights, and trips for teams to the ACM regional programming competition. See the website at http://www3.nd.edu/~cseclub/

Hackathons
Universities and companies across the country put on hackathons, or weekend long coding competitions where you can meet other Computer Science students, improve your coding skills, and share new and exciting ideas! To learn more about hackathons please check out https://medium.com/hackathons-anonymous/what-is-a-hackathon-3d5413601c05 & to see upcoming hackathons, see http://www.hackathonwatch.com/

Research
The Computer Science department has many different opportunities for research sponsored by different professors. To learn more about these opportunities or take part in research, check out the current research projects at www.cse.nd.edu/research and ask your professors for more!