

# WHY CHOOSE

UNIVERSITY OF CALIFORNIA SANTA BARBARA

## COMPUTER ENGINEERING



THE CONVERGENCE OF EDUCATION AND ENGINEERING

In naming UCSB one of its 25 “hottest colleges,” *Newsweek* states “If there’s a more beautiful campus than this one at the edge of the Pacific, we haven’t seen it...”



## WHY STUDY COMPUTER ENGINEERING

Ever wonder how an iPod really works? A combination of specialized audio decompression circuits, delicate touch sensors, nonvolatile flash memory, tiny embedded processors, and layer upon layer of complex software were carefully choreographed to make a system so useful that everyone covets it, yet simple enough for a child to operate. An impressive feat indeed, and the type of problem that computer engineers enjoy solving! Building these systems requires expertise that crosses the traditional boundaries of computer science and electrical engineering. The Computer Engineering program at UCSB prepares students to do exactly that. Offered jointly by the departments of Electrical and Computer Engineering (ECE) and Computer Science (CS), the Computer Engineering major trains you to understand the workings of high-speed processors, study and build wireless networks, design circuits using the latest tools, and write software systems that are robust against catastrophic failures. And before you are all done, you will put these concepts together in a senior capstone project that will impress both your peers and your potential employers.

why choose U.C. Santa Barbara

“..For many students, that would seal the deal, but UCSB also boasts Nobel Prize winners on its faculty, top research centers in science and technology and an extensive study-abroad program.”

## ARE YOU IN DEMAND?

**Starting salaries for the class of 2008**

**Computer Engineering National Average\* \$60,280**

**UC Santa Barbara Average: \$61,550**

**Computer engineers** are expected to have a 5% employment growth over the next decade according to the United States Bureau of Labor Statistics. As computer and semiconductor manufacturers contract out more of their engineering needs to both domestic and foreign design firms, much of the growth in employment of hardware engineers is expected in the computer systems design and related services industry. According to our recent surveys, **UCSB Computer Engineering students have starting salaries just above the national average.**

\* According to the 2008 National Association of Colleges and Employers

## WE ARE QUALIFIED

Computer Engineering undergraduates at UCSB receive the finest engineering education in a friendly setting that boasts:

- Campus ranking of 12th in the list of U.S. public universities by *U.S. News and World Report*
- State-of-the-art teaching and research laboratories
- True four-year programs
- Excellent student to faculty ratio (10-to-1)
- Senior Capstone course that brings all of your design education and experience together in a final project
- Many undergraduate research opportunities with a group of world-renowned, friendly faculty focused on productive research

# Computer Engineering

# why I chose...



**Jason Oberg** : Entered as a Freshman

## **Why did you choose to study at UCSB?**

I chose UCSB because of the many good things I heard about it. I have a lot of friends here, and I heard that it was a great school for one, it was one of the best schools I got into, and that pretty much was my main motivation for it.

## **What made you realize that you wanted to study engineering?**

I started realizing engineering was a good choice for me during my senior year in high school, since I liked math and physics. I applied as an engineering major, but didn't really realize that this is what I really wanted to do until the end of my freshman year.

## **What kind of work do computer engineers do?**

The work is a hybrid between computer science and electrical engineering – getting a taste of both. That's the most general way to put it, it's more complex if you go farther into it. My work is generally above the transistor level and below the software level.

## **What is your favorite experience at UCSB?**

All the research I get to do. I have had a lot of hands-on work with many of my professors, who I've had classes with — getting to see what's going on with new research projects at the College has been great. I worked with one Professor on underwater modems, trying to figure out an efficient way

to create them and make them “plug and play”. Currently, I am working on hardware security, data flow tracking and hardware, with Professor Sherwood.

## **Any advice for a current high school student preparing to apply to engineering programs?**

Take math courses, including AP calculus; if you come in with this background you can really make your load a lot easier. By taking chemistry and physics in high school, the courses will be easier, since you have seen some of the material before.

## **What are your plans for the future?**

I haven't decided yet whether to go into a PhD program or a Masters program. I think eventually it would be cool to be a college professor but it is not what I am striving for initially. If I pursue a PhD, I would like to go into industry afterwards and work for a while.

# what's going on...

With 20 full-time faculty and almost 200 undergraduates, it is impossible to quickly summarize everything that is going on in the program. Here is a glimpse:



**Capstone 189 Projects**

The Computer Engineering Capstone Project gives students the opportunity to put their education into practice. Students design and engineer innovative hardware and software systems using techniques from robotics, distributed systems, circuit design, networking, and real-time systems to tackle problems and create a final “tangible” project. Final projects are presented at a full-day, industry-sponsored event where student groups present their projects and awards are made for best projects.



**Best Electrical and Computer Engineering 189 Project**

Award went to “HiCam” a remotely-controlled blimp with a controllable camera and interactive host-resident software. A ground station PC allowed for remote operation of the blimp with commands being sent to the blimp via Bluetooth wireless transmission that controlled the motors as well the camera. The commands were then processed and executed and the image data transmitted back to the user.



**Best Computer Science 189 Project**

Awarded to “Picard”. By leveraging the power of new, large scale computing systems and programming technologies, the students attempted to tackle the Netflix Prize, a recommendation algorithm competition. The group built a fully distributed data mining application using MapReduce, and running it on Amazon’s EC2 through RightScale’s server management environment. The students explored how emerging technologies can be used in concert to solve challenging data-intensive problems at scale.

## Education Highlights

### BS/MS Programs

Outstanding students can earn a baccalaureate and master’s degree in five years. This is nearly a year shorter than pursuing a master’s degree program after earning a bachelor’s degree.

### Engineering honors program

Privileges include: priority registration, residential housing, scholars floors, research opportunities, and honors courses. The College also has a chapter of Tau Beta Pi, the national engineering honors society.

### Research/Internships

Many opportunities exist for undergraduates to be involved in research and receive either course credit or a salary. Many even get their work published in top research journals read around the world.

### Professional Societies

Active student chapters of professional societies include the Association for Computing

Machinery, Engineers Without Borders, Institute of Electrical and Electronic Engineers, and the Society of Women Engineers.

### Special Programs

The college coordinates a diverse range of programs for student support, including mentoring, tutoring services, study skills workshops, and career planning. We also partner with the MESA (Mathematics Engineering Science Achievement) Center on campus, which offers special services to first-generation college students.

### Scholarships

Numerous scholarships are available to continuing students in the college. [www.engineering.ucsb.edu/current\\_undergraduates/scholarships](http://www.engineering.ucsb.edu/current_undergraduates/scholarships)

### Entrepreneurial Courses

The Technology Management Program provides classes in management, entrepreneurship, and marketing where students can earn a Technology Entrepreneurship Certificate. [www.tmp.ucsb.edu](http://www.tmp.ucsb.edu)

# what you do...

## Inventive Solutions

Computer engineering students study the design of digital hardware and software systems, including: communications facilities, computers of all types and sizes, and devices that contain computers. For them, system design is focused on devices and their interfaces with users and other devices. An important area within computer engineering is the development of embedded systems. The average car sold today, for example, has more than 15 interconnected microprocessors that control everything from the car's anti-lock brakes to its entertainment system. Devices such as cell phones, digital audio players, digital video recorders, alarm systems, X-ray machines, and laser surgical tools all require integration of hardware and software, and are all brought to us by inventive and hard-working computer engineers.

## What you will study in Computer Engineering

- Freshmen are introduced to their major in "Ten Puzzling Problems in the Practice of Computer Engineering" (ECE 1 course) in their first year at UCSB.
- Students receive a solid foundation in mathematics, physics, electrical theory, computer hardware and software; balancing fundamental principles in science and engineering with the practical skills necessary to apply them. A broad selection of design sequences and technical electives encourage students to pursue special interests that promote the integration of computer hardware and software through computer science and electrical engineering courses.
- Senior elective sequences include courses in the following areas: computer-aided hardware design, computer systems, multimedia computing, computer networks, computer operation systems and computer languages, real-time computing, or very large-scale circuit design.
- Computer Engineering majors culminate their studies with a capstone senior project, showcasing their breadth of knowledge and creativity.

## Oh, the places you can go...

### Education Abroad Program

The College encourages its students to participate in the U.C. Education Abroad Program to enhance their educational experience. Participants stay registered at UCSB while abroad and make timely progress towards their degrees. Nearly all participants say their EAP experiences were life-changing, career-enhancing, and the highlight of their education.

<http://eap.ucop.edu>

**"My year in Japan was AMAZING! My time abroad enriched my electrical engineering studies and solidified my proficiency in the Japanese language."**

Shaym Natarajan (middle row, center) – Computer Engineering major  
EAP Student at Tohoku University, Sendai, Japan



# why I transferred...

**Maximiliano Ramirez Luna**  
Transfer Student

## **Why did you choose to study at UCSB?**

The reason I chose UCSB was because I thought it offered more than other campuses did. For example, it has the Technology Management Program. I want to be an entrepreneur after I graduate and start my own company; I thought this program was something really important for a school to have. This TMP certificate can help me towards my goal while not taking away too much from my engineering studies. I thought that was a great aspect of UCSB.

## **Which school did you attend before coming to UCSB?**

I transferred from Santa Barbara City College (SBCC). I thought they prepared me very well. They have a special program to transfer here which helped me cross enroll, so I was able to get classes here at UCSB while I was still at SBCC. This really helped in the transition from going from a semester to a quarter system, and a different academic atmosphere.

## **Did you participate in any summer programs?**

Last summer I did an internship at Lawrence Berkeley National Laboratory, where I assisted the head safety engineering officer in coming up with a program to inspect electrical equipment, and made a database to keep track of all inspected equipment to ensure that nobody got shocked or electrocuted by their lab equipment.

## **Have you participated in any activities to enhance your education?**

I think clubs are very important, for example I'm part of SACNAS, the Society for the Advancement of Chicanos and Native Americans in Science, and am also part of Los Ingenieros. These engineering and science clubs help students grow their network and also provide help with studying, tutoring, scholarships, and internships. I've made a lot of friends in the short amount of time I've been here, and being a part of those clubs and getting involved on campus have definitely played a big role.

## **What kind of advice would you tell a prospective transfer student about preparing for UCSB?**

I feel that I was very lucky and I had very good advisors at SBCC because I was also involved with SACNAS there, and the advisors had connections here at UCSB. I was able to talk to UCSB advisors and students, so by the time I got here, I felt that I was completely prepared for anything UCSB threw at me.



# Admissions

The College of Engineering seeks to enroll well-prepared students who exceed UC's minimum academic requirements, students who will bring passion, creativity and dedication to their college experience.

Given the strength of its programs and its national reputation, it is not surprising that UCSB's College of Engineering receives applications from more qualified students than can be admitted. Each applicant must apply to a specific major, and those with the strongest qualifications are admitted. The exact level of performance required to gain admission to the College varies from year to year and from major to major depending on the size and quality of the applicant pool and the number of available enrollment spaces. The College accepts applications for the fall term only and gives preference to freshmen and upper-division transfer students (those who have completed at least 90 transferable quarter units).

## High School Preparation

When admitting freshmen, the College considers: GPA in college preparatory courses and standardized test scores (with an emphasis on mathematics grades and scores); completion of coursework beyond the university's A-G requirements; advanced placement; and honors courses, especially in science and mathematics. For more information about applying to UCSB as a freshman see:

[www.admissions.ucsb.edu/](http://www.admissions.ucsb.edu/)

### SAT Reasoning Test (or ACT plus Writing) and two SAT Subject Tests

#### UC A-G courses:

- A. Two years of history or social science
- B. Four years of college-preparatory English
- C. Three years of mathematics (four years recommended) to include pre-calculus or calculus
- D. Two years of laboratory science (three years recommended) to include two of the following: biology, chemistry or physics
- E. Two years of language other than English (three years recommended)
- F. One year-long approved arts course from a single discipline (dance, drama, music or art)
- G. Two semesters of college-preparatory electives beyond the requirements above

For course information specific to your California High School see: <https://doorways.ucop.edu/list/>

### Opportunities to get a head-start on your freshman year:

UCSB offers many opportunities for incoming students, from the Freshman Summer Start Program where students can get an early start on classes, to summer bridge programs which offer hands-on work with scientific research projects. For a complete list of summer opportunities, see:

[www.engineering.ucsb.edu/prospective\\_undergraduates/summerop\\_fresh](http://www.engineering.ucsb.edu/prospective_undergraduates/summerop_fresh)



## Transfer Preparation

For general University of California Admissions information, please see: [www.universityofcalifornia.edu/admissions/undergrad\\_adm/paths\\_to\\_adm/transfer.html](http://www.universityofcalifornia.edu/admissions/undergrad_adm/paths_to_adm/transfer.html)

California Community College students should refer to [www.assist.org](http://www.assist.org) for course articulations and information on the California Community College Transfer Admissions Guarantee.

### Required Courses:

One year calculus for engr.	Intro. to computer programming
Differential equations	Course in Computer Programming Methods
Linear algebra	Circuits and Devices
Fundamentals of Logic Design	Three semesters calculus-based physics
One course general chemistry and lab	

When admitting transfer students, the College considers the amount of preparatory coursework completed, grades earned in those courses, and cumulative transferable GPA. Consequently, transfer students should focus on completing all engineering preparatory courses offered at their college with the best grades possible and then finishing their General Education requirements after matriculation to UCSB. IGETC is not recommended for this major. Successful recent transfer applicants had completed more than 75% of the preparation for the major courses with a GPA of 3.0 or above. **The average time to degree for an engineering transfer student at UCSB is 2.5 to 3 years.**

### Opportunities for transfer students:

- Shorten your time to degree by attending UCSB the summer before you begin your first fall quarter as a transfer student
- Participate in the Summer Transitions Program for new transfers
- Engage in scientific research through a summer enrichment program

For a complete list of transfer student opportunities, see:

[www.engineering.ucsb.edu/prospective\\_undergraduates/summerop\\_trans](http://www.engineering.ucsb.edu/prospective_undergraduates/summerop_trans)

### College of Engineering Transfer Admission Advising

[admissions@engineering.ucsb.edu](mailto:admissions@engineering.ucsb.edu)  
(805) 893-6139

**Need More Information?**  
Electrical and Computer Engineering  
Building 380, Room 101  
[ugradinfo@ece.ucsb.edu](mailto:ugradinfo@ece.ucsb.edu)  
(805) 893-8292  
[www.ce.ucsb.edu](http://www.ce.ucsb.edu)