

# GRADUATE PROGRAMS IN ENGINEERING

Biomolecular Engineering & Bioinformatics - Computational Media -  
Computer Engineering - Computer Science - Electrical Engineering -  
Games & Playable Media - Serious Games - Scientific Computing & Applied  
Mathematics - Statistics & Applied Mathematics - Statistical Science

## Biomolecular Engineering & Bioinformatics M.S., Ph.D.

<https://grad.soe.ucsc.edu>  
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Bioinformatics is the use of computers and statistics to make sense out of the huge mounds of data that are accumulating from high-throughput biological and chemical experiments, such as sequencing of whole genomes, DNA microarray chips, two-hybrid experiments, and tandem mass spectrometry.

The M.S. program is designed for students who desire focused training in computational biology and prepares students for career advancement in the biotechnology and biomedical research fields. The program duration is typically one to two years.

Our department considers bioinformatics and computational biology to be essentially synonymous, but some people make a distinction between two flavors of bioinformatics: tool and method development (bioinformatics) and applying existing tools to new biological questions (computational biology). You can do either style of bioinformatics at UCSC, but we feel that the best work results from people who do both: developing new methods and applying them to new biological questions.

The PhD program is formulated as the BMEB track of the umbrella Program in Biomedical Sciences and Engineering (BMEB PBSE).

The track builds upon UCSC's renowned presence in computational biology and genomics. Graduate students do their thesis training and research in the UC Santa Cruz environment, central hub of collection, aggregation and dissemination of genome-scale data through the UCSC Genome Browser. UC Santa Cruz is also home to unique genome facilities and resources including the UCSC Paleogenomics Lab, the Nanopore Group, the Institute for the Biology of Stem Cells, the Genomics Institute.

To see more information about the PBSE BMEB doctoral track, visit <https://pbse.ucsc.edu/bmeb>.

## Computational Media M.S., Ph.D.

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Computational Media is all around us — video games, social media, interactive narrative, smartphone apps, computer-generated films, personalized health coaching, training and more.

To create these kinds of media, to deeply understand them, to push them forward in novel directions, requires a new kind of interdisciplinary thinking. The graduate degrees in Computational Media at UC Santa Cruz provide knowledge and practical training for students interested in this varied and emerging field.

The M.S. is designed to help you build on your existing strengths and move into new areas. The Ph.D., on the other hand, is designed for those who are already actively working in computational media and want to develop new knowledge that will change what is possible and how we understand it. The Ph.D. will provide you with an interdisciplinary foundation and supportive research community for moving your work forward.

## Computer Engineering M.S., Ph.D.

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Areas of research include: Networks (wireless networks, high-speed networks, sensor networks, algorithms and protocols for computer communication, quality of service); Robotics (autonomous vehicles, sensor fusion, exoskeletons, medical robots, biomolecular control); Computer System Design (CAD of VLSI, computer architecture, parallel and distributed systems, VLSI and FPGA design, placement and routing, fault diagnosis); Sensing and Interaction (computer vision, remote sensing, telemetry, computer-based collaboration, assistive and rehabilitative technology, human-computer interaction).

The computer science and engineering faculty members enjoy a close relationship with the applied mathematics and statistics, computer science, electrical engineering, and computational biology faculty members. Faculty members carry out joint research projects, supervise students, and teach courses outside their own departments. The department has many ties to nearby industry, employing computer

professionals as visiting faculty members and arranging for students to gain practical research experience through work in industrial labs.

Students start the program with core courses in computer architecture and algorithms and then proceed to thoroughly study their area of specialization. The M.S. degree can be completed in one to two years. A Ph.D. degree is usually completed in five to six years. After completing the course requirements, students must pass an oral qualifying exam and write a dissertation. Part-time study is available for students desiring to continue working in industry during their studies.

## Computer Science M.S., Ph.D.

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The nominal time for the Ph.D. program is five years for a full time student. Students admitted to the Ph.D. program come with financial support in the form of a combination of fellowship, teaching assistantship, and/or graduate research assistantships.

The nominal time for the M.S. thesis track program is two years for a full time student. This track is for students interested in advanced studies and carrying out independent research as well as those contemplating to pursue a Ph.D. degree. The nominal time for the M.S. project track program is one year for a full time student. This track is for students interested in advanced studies to better prepare themselves in the information technology workforce. Students in the M.S. programs are not guaranteed any form of financial support from the department. It is the student's responsibility to ensure that they have sufficient funds for completing the M.S. degree program. Most M.S. students manage their finance by working as interns at companies in the bay area during the summer months.

Graduate students work in close collaboration with faculty members in different areas of research including machine learning, database systems, data science, big data, data analytics and visualization, privacy and security, distributed systems, operating systems, storage systems, realtime systems, mobile computing, cloud computing, human computing, software engineering, programming languages, algorithms and complexity, artificial intelligence, technology for social good, natural languages, human-computer interaction, and computer vision.

THE DIVISION OF GRADUATE STUDIES

<https://gradadmissions.ucsc.edu>



UC SANTA CRUZ



## Electrical Engineering M.S., Ph.D.

<https://grad.soe.ucsc.edu>

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The Department of Electrical Engineering at the University of California, Santa Cruz offers M.S. and Ph.D. degree programs in the following areas: Electronic Circuits and Energy Systems; Photonics and Electronic Devices; Signals, Image Processing, and Communications.

Electrical Engineering faculty are affiliated with several state-funded, federally funded, and nationally recognized centers, providing opportunities for research and training. Some of these are the Center for Biomimetic MicroElectronic Systems, Center for Adaptive Optics, Center for Biomolecular Science and Engineering, Center for Information Technology Research in the Interest of Society (CITRIS), the Institute for Quantitative Biology (QB3), and the Institute for Regenerative Medicine (CIRM).

The department also has ties to nearby industry, employing electrical engineering professionals as visiting and adjunct faculty and arranging for students to gain practical research experience through work in industrial labs. We encourages students to seek practical training as part of their graduate education.

Students begin the program with the completion of courses in a core area of interest and then proceed to do research in their area of specialization. The M.S. degree can be completed in two years. M.S. students must complete a master's thesis or pass the comprehensive exam. A Ph.D. degree is usually completed in four to six years. Ph.D. students are required to take a preliminary exam within their first two years of study. After completing the course requirements, students must pass an oral qualifying exam and write a dissertation. Part-time study is possible for students working in industry while going to school.

## Games & Playable Media, Serious Games M.S.

<https://gpm.soe.ucsc.edu>

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Among the top-ranked programs in the world, the UCSC MS in Games & Playable Media and MS in Serious Games are 5 quarter, intensive programs in which students are offered unparalleled access to a game industry experience. There are currently two Masters degrees offered within our program; Master of Science in Games and Playable Media and a Master of Science in Serious Games. Both programs are five quarter (15 months) degrees focused on combining technical and design innovation—to create novel possibilities for the games of today, to enable new types of games, and to explore a wide variety of next-generation playable experiences.

Both degree programs will admit students who have a strong and diverse portfolio that showcase your creative skills. A background in computer science and knowledge of games is strongly recommended but not required. Target students include industry professionals seeking new knowledge (e.g., advanced AI techniques) and/or wanting to experience new roles (e.g., engineers seeking a move into design) as well as talented recent undergraduates who have completed technically-focused game degrees or computer science degrees.

## Scientific Computing & Applied Mathematics M.S.

<https://grad.soe.ucsc.edu>

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The Department of Applied Mathematics offers an M.S. program in scientific computing and applied mathematics (SciCAM). SciCAM students learn a combination of cutting-edge computational methods for modern high-performance computing architectures and applied mathematical modeling. The department also offers a designated emphasis in Scientific Computing.

The M.S. is ideally suited to meet the increasing need for graduates in the rapidly growing markets of computational mathematics and modeling, high-performance computing and data science. Such computationally knowledgeable and experienced modelers are highly sought after in industry and government agencies.

Program Features: 1-year (accelerated) and 2-year (normal) tracks available; Vast choice of elective courses allows for various specializations; Research and coursework tracks are both available; Hands-on approach to scientific computing and applied mathematics; Practical applied mathematical modeling with real world applications; Small classes, great student-to-faculty ratio; Diverse, friendly and supportive faculty; Potential for internships in Silicon Valley; Scholarships available.

Students in the SciCAM M.S. program interested in an academic career will be strongly encouraged to apply to the SAM Ph.D. program. Applications are reviewed in the standard academic cycle, so that students interested in applying to the SAM program are encouraged to discuss this option with the graduate director in the fall of each year.

## Statistics & Applied Mathematics M.S., Ph.D.

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*Note: The Statistics and Applied Mathematics program will change to two separate programs: Statistical Sciences, and Applied Mathematics. You will be asked to choose from one of these programs in the application.*

The Applied Mathematics and Statistics Department at UCSC offers master's and doctoral programs in Statistics and Applied Mathematics, or Applied Mathematics and Statistics, depending on chosen emphasis. The goal of these programs is to help students develop into independent scholars who are prepared for productive careers in research, teaching, and industry. The department also offers a designated emphasis in Statistics.

The M.S. and Ph.D. programs are freestanding and independent, so that students can be admitted to either. Students completing the M.S. program may proceed into the Ph.D. program, and students in the Ph.D. program can receive a M.S. degree upon completion of M.S. requirements, including the capstone research project.

Each Ph.D. student will be required to have knowledge of statistics and applied mathematics equivalent to that required for the M.S. degree. In addition, Ph.D. candidates will be required to complete coursework beyond the M.S. level.

The department of Applied Mathematics and Statistics attempts to provide financial support, in the form of Fellowships, Teaching and Research Assistantships, to all students admitted into its graduate programs, with priority typically given to Ph. D. students.

## Statistical Sciences

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Students in the Statistical Science program learn to develop and use statistical methods to provide a probabilistic assessment of the variability in different data structures. This knowledge is applied to the quantification of the uncertainties inherent in the discoveries, summaries and conclusions that are drawn from the data analysis.

The Ph.D. program provides mastery of fundamental concepts in statistical theory and methods, as well as analytical and computational skills to build modern statistical models, implement them, and effectively communicate their results. Through the process of learning these skills, the students develop the ability to conduct independent research.

The M.S. program has its own identity. It places emphasis on the application of statistical methods to the solution of relevant scientific, technological and engineering problems, with the goal of preparing students for professional careers.