for the courses involved. Graded Satisfactory (S) or No Credit (NC). May be repeated for a maximum of three quarters.

LING 195. Senior Thesis (2-4) Thesis, 6-12 hours. Prerequisite(s): senior standing or consent of instructor. Independent research and preparation of a thesis completed under the supervision of a faculty member. Course is repeatable to a maximum of 12 units.

LING 195H. Senior Honors Thesis (2-4) Thesis, 6-12 hours. Prerequisite(s): invitation by faculty to pursue honors work in Linguistics; senior standing or consent of instructor. Intensive study, research, and preparation of a thesis in consultation with a faculty member. Grades are deferred until presentation of the thesis at the end of the final quarter. Satisfactory (S) or No Credit (NC) grading is not available. To be taken during two or three successive quarters; course is repeatable to a maximum of 12 units.

Related Courses

Refer to departmental listings for course descriptions.

Anthropology
ANTH 120 (Language and Culture)
ANTH 123 (Linguistic Anthropology)
ANTH 165 (Cognitive Anthropology)
ANTH 259 (Anthropological Linguistics)

Education
EDUC 172 (Reading and Language Development)
EDUC 177A (Language Development in Content Areas)
EDUC 177B (Language Development in Content Areas)
EDUC 201A (Theories and Processes of Reading)

English
ENGL 112 (History of the English Language)

French (Comparative Literature and Foreign Languages)
FREN 104 (Phonetics)

Mathematics
MATH 144 (Introduction to Set Theory)

Philosophy
PHIL 125 (Intermediate Logic)
PHIL 126 (Advanced Logic)
PHIL 132 (Philosophy of Language)

Psychology
PSYC 110 (The Brain and Behavior)
PSYC 134 (Cognitive Processes)
PSYC 135 (Psycholinguistics)
PSYC 163 (Cognitive Development)

Spanish
SPN 105 (Phonology of the Spanish Language)
SPN 106A, SPN 106B (Structure of the Spanish Language)
SPN 207 (History of the Spanish Language)

Computer Engineering

The Marlan and Rosemary Bourns College of Engineering

Thomas Payne, Ph.D., Co-Chair
Xiang-Dong "Sheldon" Tan, Ph.D., Co-Chair
Advising Office, A159 Bourns Hall
(951) 827-ENGR (3647);
student.engr.ucr.edu

Committee in Charge
Thomas Payne, Ph.D. (Computer Science and Engineering)
Xiang-Dong "Sheldon" Tan, Ph.D. (Electrical Engineering)
Reza Abbaschian, Ph.D.
Dean, The Marlan and Rosemary Bourns College of Engineering, ex officio

Major

The Computer Engineering major stresses the study of core computer science and electrical engineering topics. It prepares students for careers in the design of complex systems involving computer hardware, computer software, electronics and electrical signals for communications, networking, desktop computing, and embedded computing.

The major is offered jointly by the departments of Computer Science and Engineering, and Electrical Engineering.

The objective of the Computer Engineering program is to produce graduates who:

• have a mastery of the fundamental areas required for designing and using computers and engineered systems that contain computers

• have an ability to apply principles of engineering, mathematics, science, and statistics to the use, design, and interfacing of computers

• are able to apply modern design methodologies and state-of-the-art tools to design problems common to modern computer engineering practice

• have had extensive, relevant laboratory and hands-on experience to strengthen their understanding of scientific, logical, statistical, and engineering principles

• have a well-rounded and balanced education through required studies in elected areas of the humanities and social sciences

• are adept at both oral and written communication

• possess the high-quality undergraduate education necessary to progress to the M.S. and Ph.D. level or succeed in a career in industry

• understand the social, cultural, ethical, and environmental context of their work

The Computer Engineering B.S. degree at UCR is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; (410) 347-7700. For more details, visit **www1.cs.ucr.edu**.

The Intersegmental General Education Transfer Curriculum (IGETC) does not meet transfer requirements for Engineering.

All undergraduates in the College of Engineering must see an advisor at least annually. Visit **student.engr.ucr.edu** for details.

University Requirements
See Undergraduate Studies section.

College Requirements
See The Marlan and Rosemary Bourns College of Engineering, Colleges and Programs section.

The Computer Engineering major uses the following major requirements toward the satisfaction of some of the college's Natural Science and Mathematics breadth requirements.

1. MATH 008B or MATH 009A

2. PHYS 040A, PHYS 040B, PHYS 040C

Major Requirements
1. Lower-division requirements (68 units):

   a) ENGR 001G

   b) CS 010, CS 012 or CS 013, CS 014, CS 061

   c) CS 011/MATH 011

   d) EE 001A, EE 01LA, EE 001B

   e) MATH 008B or MATH 009A, MATH 009B, MATH 009C, MATH 010A, MATH 046

   f) PHYS 040A, PHYS 040B, PHYS 040C

   g) One course of 4 or more units in Chemistry to be selected in consultation with a faculty advisor.

2. Upper-division requirements (85 units minimum)

   a) CS 100, CS 141, CS 161, CS 161L; one course from CS 153 or CS 160

   b) CS 120A/EE 120A, CS 120B/EE 120B; one course from CS 122A or EE 128

   c) CS 111/MATH 111

   d) EE 100A, EE 100B, EE 110A, EE 110B

   e) ENGR 180W

   f) MATH 113

   g) EE 114 or STAT 155

   h) Five courses (at least 20 units) as technical electives from the following set of Computer Science and Engineering, and Electrical Engineering upper-division courses

   CS 100, CS 122A, CS 122B, CS 130, CS 133, CS 150, CS 152, CS 153, CS 160, CS 162, CS 164, CS 165, CS 166, CS 168, CS 170, CS 177, CS 179 (E-Z), CS 180, CS 181, CS 183, CS 193

   EE 105, EE 115, EE 128, EE 132, EE 140, EE 141, EE 144, EE 146, EE 150, EE 151, EE 152, EE 175A, EE 175B

   The technical electives selected from h) must include either CS 179 (E-Z) or both

EE 175A and EE 175B. The selection of the remaining technical electives must be planned, in consultation with a faculty advisor, to include at least one coherent sequence of two classes from either Computer Science and Engineering or Electrical Engineering. The technical electives must be distinct from those used to satisfy the upper-division requirements specified in items a) and b) above.

Students may petition for exceptions to the above degree requirements. Exceptions to Computer Science course requirements must be approved by the Computer Science and Engineering undergraduate advisor or chair, and exceptions to Electrical Engineering course requirements must be approved by the Electrical Engineering undergraduate advisor or chair. Exceptions to other requirements require the approval of the undergraduate advisors or chairs of both departments.

Visit the Student Affairs Office in the College of Engineering or **student.engr.ucr.edu** for a sample program.

Computer Science and Engineering

Subject abbreviation: CS
The Marlan and Rosemary Bourns
  College of Engineering

Laxmi N. Bhuyan, Ph.D., Chair
Department Office,
  351 Engineering Building Unit II
(951) 827-5639; **www1.cs.ucr.edu**

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Rajiv Gupta, Ph.D.
Tao Jiang, Ph.D. *President's Chair*
Eamonn Keogh, Ph.D.
Srikanth Krishnamurthy, Ph.D.
Mart L. Molle, Ph.D.
Walid Najjar, Ph.D.
Chinya Ravishankar, Ph.D.
Vassilis Tsotras, Ph.D.
Frank N. Vahid, Ph.D.
Neal Young, Ph.D.

Professors Emeriti
Yang-Chang Hong, Ph.D.
Lawrence L. Larmore, Ph.D.
Thomas H. Payne, Ph.D.
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Victor Zordan, Ph.D.

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Harsha Madhyastha, Ph.D.
Iulian Neamtiu, Ph.D
**

Adjunct Professor
Douglas Tolbert, Ph.D.

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Matthew J. Barth, Ph.D. (Electrical Engineering)
Bir Bhanu, Ph.D. (Electrical Engineering)
Ilya Dumer, Ph.D. (Electrical Engineering)
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Anastacios Mourikis, Ph.D., (Electrical Engineering)
Erik Rolland, Ph.D. (Accounting and Information Systems)
Amit Roy Chowdhury, Ph.D. (Electrical Engineering)
Thomas Stahovich, Ph.D. (Mechanical Engineering)
Xiang-Dong "Sheldon" Tan, Ph.D. (Electrical Engineering)
Zhengyuan "Daniel" Xu, Ph.D. (Electrical Engineering)

Major

The Department of Computer Science and Engineering offers three majors at the undergraduate level. UCR's offerings of all three majors are unique compared to many schools in the emphasis on theoretical foundations and practical applications.

The **Computer Science** major stresses the study of core and advanced computer science topics. It prepares students for a large variety of careers in computing, including software engineering, networks, databases, graphics, algorithms, security, system analysis, and embedded systems.

The **Computer Engineering** major stresses the study of core computer science and electrical engineering topics. It prepares students for careers in the design of complex systems involving computer hardware, computer software, electronics and electrical signals for communication, networking, desktop computing, and embedded computing. The major is offered jointly by the Departments of Computer Science and Engineering, and Electrical Engineering. See Computer Engineering in this catalog.

The objective of the B.S. degree program in Computer Science is to prepare graduates for professional practice in both the private and public sectors and for life-long learning, including the option for graduate degrees, by providing them with:

- Background: the necessary technical competencies, including knowledge of scientific principles and skill at rigorous analysis and creative design

- Breadth: a broad education that includes knowledge of current issues and trends in society and technology

- Professionalism: professional attitudes and ethics and skills for clear communication and responsible teamwork

- Learning environment: a learning environment that is rigorous, challenging, open, and supportive

The **Business Informatics** major covers the core of computer science and basic business and

management topics. It prepares students for careers in design and management of computer and information systems, system and network administration, and e-commerce. It is also useful for careers that apply information technology to support business processes.

The objective of the B.S. degree program in Business Informatics is to prepare graduates for professional practice in both the private and public sectors and for life-long learning, including the option for graduate degrees, by providing them with:

- Background: the necessary technical competencies, including knowledge of scientific principles and skill at rigorous analysis and creative design

- Breadth: a broad education that includes knowledge of current issues and trends in society and technology

- Professionalism: professional attitudes and ethics and skills for clear communication and responsible teamwork

- Learning environment: a learning environment that is rigorous, challenging, open, and supportive

All undergraduates in the College of Engineering must see an advisor at least annually. Visit **student.engr.ucr.edu** for details.

University Requirements
See Undergraduate Studies section.

College Requirements
See The Marlan and Rosemary Bourns College of Engineering, Colleges and Programs section.

The **Computer Science** major uses the following major requirements toward the satisfaction of some of the college's Natural Sciences and Mathematics breadth requirements and one of the college's English Composition breadth requirements.

1. ENGR 180W

2. MATH 008B or MATH 009A

3. PHYS 040A, PHYS 040B, PHYS 040C

The **Business Informatics** major uses the following major requirements toward the satisfaction of the college's Social Sciences breadth requirements and one of the College's Natural Science and Mathematics breadth requirements.

1. ECON 002, ECON 003

2. MATH 008B or MATH 009A

3. SOC 150

Major Requirements
Computer Science Major
1. Lower-division requirements (56 units)

   a) ENGR 001-I

   b) CS 010, CS 012 or CS 013, CS 014, CS 061