ABET
Computing Accreditation Commission

SELF-STUDY QUESTIONNAIRE FOR REVIEW of the COMPUTER SCIENCE PROGRAM

submitted by

University of California, Riverside
Institution

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Date

to the
Computing Accreditation Commission

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Introduction

The *Criteria for Accrediting Computer Science Programs* are divided into seven major *Categories*, each *Criterion* containing a statement of *Intent* and *Standards*. An intent statement provides the underlying principles associated with a Criterion. In order for a program to be accredited, it must meet the intent statement of every Criterion.

Standards provide descriptions of how a program can minimally meet the statements of intent. The word "must" is used within each standard to convey the expectation that the condition of the standard will be satisfied in all cases. For a program to meet the intent of a Criterion, it must either satisfy all the standards associated with that Criterion or demonstrate an alternate approach to achieving the intent of the Criterion.

For each of the following seven sections, corresponding to each of the seven Categories of the *Criteria*, answer all of the questions associated with the standards. If one or more standards are not satisfied, it is incumbent upon the institution to demonstrate and document clearly and unequivocally how the intent is met in some alternate fashion.

If you are having more than one program evaluated, particularly if the programs are on separate campuses, the answers to these questions may vary from one program to another. If this is the case, please use separate copies of each section for each program, and clearly delineate which program is being described.

I. Objectives and Assessments

Intent: The program has documented, measurable objectives, including expected outcomes for graduates. The program regularly assesses its progress against its objectives and used the results of the assessments to identify program improvements and to modify the program's objectives.

Standard I-1. The program must have documented, measurable objectives.

Standard I-2. The program's objectives must include expected outcomes for graduating students.

A. Objectives

Please attach items that support or precede the measurable objectives, e.g.,
1. *Mission statements from institution, college, department, program*
2. *Plans (institution, college, department, etc.)*
3. *All objectives including expected outcomes for graduates (itemize)*
4. *Process for assessments*
5. *Who is involved in assessment and improvement?*
6. *Data from assessments*
7. *Inputs from any supporting Office of Assessment*

1. Indicate below or attach to this document the program's measurable objectives. These objectives must include expected outcomes for graduates.

Objectives:

The objectives for our program were produced after both formal and informal discussions were conducted among all stakeholders. These discussions were naturally interlaced with discussions of program outcomes. The current set of objectives was formalized at the faculty retreat in fall 2005. The guiding philosophy was that the objectives should be few in number, stated as simply as possible, avoid redundancy, and be consistent with the attainment of program outcomes. The current set of objectives is formally stated below.

It is the goal of the BS degree program in Computer Science to prepare graduates for professional practice in both the private and public sectors and for life-long learning, including the possible pursuit of graduate degrees by providing them with:

1) **Background**: The necessary technical competencies, including knowledge of scientific principles and skill at rigorous analysis and creative design.
2) **Breadth**: A broad education that includes knowledge of current issues and trends in society and technology.
3) **Professionalism**: Professional attitudes and ethics and skills for clear communication and responsible teamwork.
4) **Learning environment**: A learning environment that is rigorous, challenging, open, and supportive.

Outcomes:

Graduates of the Computer Science program must demonstrate:

1) an ability to apply knowledge of mathematics, science, and engineering
2) an ability to design and conduct experiments, as well as to analyze and interpret data
3) an ability to design a system, component, or process to meet desired needs
4) an ability to function on multi-disciplinary teams
5) an ability to identify, formulate, and solve engineering problems
6) an understanding of professional and ethical responsibility
7) an ability to communicate effectively
8) the broad education necessary to understand the impact of engineering solutions in a global and societal context

9) a recognition of the need for, and an ability to engage in life-long learning
10) a knowledge of contemporary issues
11) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Relation Between Program Outcomes and Educational Objectives

The program outcomes are related qualitatively to program objectives through the influence matrix shown in Figure 1.

Outcomes/ Objectives	1	2	3	4	5	6	7	8	9	10	11
Background (1)	**H**	**M**	**M**	**H**	**H**		**M**				**H**
Breadth (2)		**H**		**H**		**H**	**H**	**H**	**H**	**H**	
Professionalism (3)				**H**		**H**	**H**	**H**	**H**	**H**	
Learning envir. (4)	**M**							**M**	**H**	**H**	**M**

Figure 1: The role of the 11 program outcomes, shown in the column headings, in achieving the 4 program objectives, which appear as row headings. H=High, M=Medium.

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, systems analysis, and embedded systems.

Computer Science is differentiated from Computer Engineering in that 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 Computer Engineering degree is offered jointly by the Departments of Computer Science and Engineering and Electrical Engineering.

The Information Systems degree 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.

This is Computer Science's first ABET accreditation process. Computer Engineering received 6-year accreditation in 2000 and is undergoing review this year. Information Systems has not yet requested ABET accreditation; because this program is a collaboration of departments in two separate colleges at UCR, preparation for accrediting Information Systems is not yet complete.

2. Describe how the program's objectives align with your institution's mission.

UCR's mission statement is as follows: "The University of California, Riverside, is a research university committed to the creation and transmission of knowledge at the highest level, and to the translation of that knowledge for the public good. Our comprehensive programs and services, excellent faculty and staff, and vibrant and attractive physical environment are designed to: provide a high quality learning environment for undergraduate and graduate students; advance human knowledge and accomplishment through research and scholarship; enhance the public good through community service and initiatives; seek preeminence among U.S. research universities, recognizing UCR's quality in every area."

The vision of the Bourns College of Engineering is to become a nationally recognized leader in engineering research and education. Its mission is to:

- Produce engineers with the educational foundation and the adaptive skills to serve rapidly evolving technology industries.
- Conduct nationally recognized engineering research focused at providing a technical edge for the U.S.
- Contribute to knowledge in both fundamental and applied areas of engineering.
- Provide diverse curricula that will instill our students with the imagination, talents, creativity and skills necessary for the varied and rapidly changing requirements of modern life and to enable them to serve in a wide variety of other fields that requires leadership, teamwork, decision making, and problem solving abilities.
- Be a catalyst for industrial growth in the Inland Empire.

The objectives of UCR's B.S. degree program in Computer Science are directly aligned with UCR's commitment to the transmission of knowledge and to providing a high quality-learning environment for undergraduate students.

Note: On the following page is a table that can be filled out with pertinent information relating to objectives, their measurement, and their effect on the implementation of program improvements.

B. Implementation of Objectives

Please complete the following table with as many objectives as needed.

(Note: The *table* format was somewhat clumsy here, so we have used *bulleting* instead. Note however, that we do cover all elements of the table, “How measured”, “When measured”,” Improvements Identified” and “Improvements Implemented” for all objectives)

- **Objective 1: Background**: The necessary technical competencies, including knowledge of scientific principles and skill at rigorous analysis and creative design.
    - *How measured*: Course evaluations, faculty assessments, senior exit surveys and alumni surveys.
    - *When measured*: Course evaluations and faculty assessments are done for every offering of each course, curriculum assessments are done at least annually (they can be done on an as-needed basis, if circumstances require), and senior and alumni surveys are done annually.
    - *Improvements identified*: The need to work with state-of-the-art tools, the need for more engaging real world programs. The need more lab and “hands on” experiences.
    - *Improvements implemented*: Upgrades and revisions have been made to various courses in recent years. Some *representative* examples include:
        - The CS 161 (Design and Architecture of Computer Systems) class was split into two separate (but coupled) offerings, CS 161-lecture and CS 161-lab. This allows for a much greater lab experience. The students can now experience a complete end-end design of a CPU.
        - The CS 10 class now uses a sequence of highly engaging problems (designed with input from the entire undergraduate instruction committee) that tasks the students in creating a Moon Lander simulation. Similarly, CS 170 (Introduction to Artificial Intelligence), now has an extremely engaging assignment where students use a real robot for final implementations of their projects.
        - In CS 122B (Embedded System Design) the students are now taught state-of the art specification technique like processor network, State Chart (in more depth), Petri Net, UML, etc. Lecture material was added on Loop Analysis, Power Analysis, Data Layout Analysis to reflect their increasing importance in the industry. Additional projects on state-of-the-art tools such as SystemC, Microblaze and Tensilica were added.
- **Objective 2: Breadth**: A broad education that includes knowledge of current issues and trends in society and technology.
    - *How measured:* Course content (student grades), course evaluations, senior exit surveys, alumni surveys, employer surveys, and Board of Advisors review.
    - *When measured*: Course evaluations and faculty assessments are done for every offering of each course, curriculum assessments are done at least annually (they can be done on an as-needed basis, if circumstances require), and senior and alumni surveys are done annually. Alumni surveys are done annually. The Board of Advisors meets formally at least once a year.
    - *Improvements identified*: Greater emphasis on written and oral communication, and more attention to the role of technology in society.
    - *Improvements implemented*: A new required class (ENGR180: Introduction to Technical Writing) was introduced. This class is designed to give students a framework and context

to appreciate and communicate about social and ethical implications in computer science and engineering. Through several assignments, students are shown the important of current issues and trends in society and technology to their future career opportunities. A significant component on social and ethical implications to the capstone project, CS 179. Numerous changes were made to various classes to reflect the hot trends in industry. For example, CS 122B began using state of the art industrial tools such as SystemC, Microblaze and Tensilica.

- **Objective 3: Professionalism**: Professional attitudes and ethics and skills for clear communication and responsible teamwork.
  - *How measured*: Course content (student grades), course evaluations, alumni surveys, employer surveys, senior exit surveys, and Board of Advisors review.
  - *When measured*: Course evaluations and faculty assessments are done for every offering of each course, curriculum assessments are done at least annually (they can be done on an as-needed basis, if circumstances require), and senior and alumni surveys are done annually. Alumni surveys are done annually. The Board of Advisors meets formally at least once a year.
  - *Improvements identified*: We needed to continue to bring up professionalism issues in individual courses, but we also needed to provide an entire course that centers around these issues and would give students a chance to discuss them amongst each other.
  - *Improvements implemented*: We design and implemented a new required course, ENGR 180, Introduction to Technical Writing, which teaches effective oral and written communication. In addition, communication skills are now further emphasized throughout the entire curriculum. Some *representative* examples include:
    - In CS 120B/EE 120B students are required to give two to three oral presentations. These presentations are based on research the students do on a topic assigned by the instructor. These presentations are graded not only on technical content, but on clarity of communication, effectiveness of figure and graphs, effective use of visual aids, etc. The exercise is also used as tool to teach active listening, and students are required to give at least one item of positive feedback, and one item of positive criticism to a speaker at least twice in a quarter.
    - In CS 161 students are tasked with finding a paper on a cutting edge topic from a range of sources, including IEEE Spectrum, and presenting it to their fellow students.
    - In CS 122A, and 122B require students to give two 5-minute presentations, on subjects of their choice having some relation to the course, during the quarter in lab. Students also submit well-structured written reports for every lab assignment.
    - The CS 179 capstone course now requires numerous presentations of different types, ranging from 5-minute informal presentations in class, to demos of their project prototypes and final project, to a lengthier final project talk. Students also must meet weekly with groups to discuss their individual projects and provide suggestions to each other. Students also participate individually in a final interview with the instructor and TA. Students submit reports throughout the quarter, including a project proposal, a concept tradeoff analysis, an implementation tradeoff analysis, project status, final write-up and a 1-page flier.
- **Objective 4: Learning environment**: A learning environment that is rigorous, challenging, open, and supportive.
  - *How measured*: Course content (student grades), course evaluations, alumni surveys, employer surveys, and Board of Advisors review.

- *When measured*: Course evaluations and faculty assessments are done for every offering of each course, curriculum assessments are done at least annually (they can be done on an as-needed basis, if circumstances require), and senior and alumni surveys are done annually. Alumni surveys are done annually. The Board of Advisors meets formally at least once a year.
- *Improvements identified*: The need for more individual attention in labs. The need for more career advisement. The need for better library skills.
- *Improvements implemented*: In fall 2004 we reduced lab size by 25% (from 28 to 21). The CS&E Mentoring Program was introduced in 2004 (cf. Section B, Interaction with Faculty). We petitioned for more resources to be directed to career advising, and where able to revise the responsibilities of the position, reclassified it in terms of payroll title, and renamed the position to Career Development & Placement Officer. This position was created in November 2004 and filled by Aaron Bushong. Library skills are now explicitly introduced and motivated in taught in the CS&E Mentoring Program, and taught and evaluated in ENGR 180.

Standard I-3. Data relative to the objectives must be routinely collected and documented, and used in program assessments.

Standard I-4. The extent to which each program objective is being met must be periodically assessed.

Standard I-5. The results of the program's periodic assessment must be used to help identify opportunities for program improvement.

C. Assessments

For each instrument used to assess the extent to which each of the objectives is being met by your program, provide the following information:

1. *Frequency and timing of assessments*
2. *What data are collected (should include information on initial student placement and subsequent professional development)*
3. *How data are collected*
4. *From whom data are collected (should include students and computing professionals)*
5. *How assessment results are used and by whom*

Attach copies of the actual documentation that was generated by your data collection and assessment process since the last accreditation visit, or for the past three years if this is the first visit. Include survey instruments, data summaries, analysis results, etc.

Course assessment inputs consist of, but is not limited to, for each section of the course: end-of-term course evaluations that are completed by students, average course grades for each section, discussions with the instructors who taught each section, feedback from the cognizant faculty of courses that have the assessed course as a pre-requisite requirement, and the assessment report from the previous course assessment cycle. Program assessment is undertaken by quantitative and qualitative evaluation of our graduates' career success and performance, as reported by our alumni, their employers, and our Board of Advisors members. Additional constituencies are employers in industries and agencies that employ computer science graduates, and graduate schools that accept our students for advanced degrees. These constituencies are consulted directly for some aspects of our assessment program, and they are represented by the CS&E Department's Board of Advisors. The current membership of the Board of Advisors is shown on in Table 1.

Course Assessment

A review of the last assessment report is requested and a response on progress made on suggested actions from the previous review cycle is provided by the cognizant faculty. The cognizant faculty is asked to review and suggest changes to the information on the Course Profile forms, including changes to course topics, course objectives, course outcomes, and possibly course description (changes to course descriptions require a complete review and approval process up to the College Curriculum Committee approval.) Recommendations for actions to improve the course are requested, including suggested resources that might be needed to implement the improvements.

Table 1. Computer Science and Engineering Department Board of Advisors.

Name	Affiliation
Mr. Amit Agrawal	Sony Pictures Imageworks
Mr. J. Robert Beyster	Science Applications International Corporation
Mr. Jim Cable	Peregrine Semiconductor
Dr. Michael Campbell (Board Chair)	The Aerospace Corporation
Mr. Alan Crouch	Intel Corporation
Mr. Son K. Dao	HRL Laboratories LLC
Dr. Umeshwar Dayal	Hewlett-Packard Laboratories
Professor Jean-Luc Gaudiot	University of California, Irvine
Dr. B. Bopinath	Independent
Mr. Matt Grob	Qualcomm Inc.
Mr. John Harrell	Northrop Grumman
Mr. Arman Hovakemian	Naval Surface Warfare Center
Mr. Ancle Hsu	APEX Digital
Mr. Yu-Chin Hsu	Novas Software Inc.
Dr. Anant Jhingran	IBM Almaden
Dr. Stanley J. Krolikoski	ChipVision Design Systems Inc.
Mr. Joachim Kunkel	Synopsys Inc.
Dr. James R. McGraw	Lawrence Livermore National Laboratory
Dr. Scott Morehouse	Environmental Systems Research Institute
Mr. Robert L. Payne	Philips Semiconductor
Dr. Prabhakar Raghavan	Verity Inc.
Mr. Doug Rosen	Microsoft
Dr. Emil J. Sarpa	Sun Microsystems
Mr. Anthony Sarris	Unisys Corporation
Ms. Pat Thaler	Agilent Technologies Inc.
Mr. Geoffrey O. Thompson	Nortel Networks Inc.
Dr. Douglas M. Tolbert	Unisys Corporation
Mr. Kees Vissers	Xilinx Research Inc.
Mr. Ted Vucurevich	Cadence Design Systems
Dr. Hong Wang	Intel Laboratories

In 2003, the Chair of the CS&E Department, Dr. Payne, tasked the Undergraduate Instruction Committee to formulate a quantitative assessment process for PEOs and program learning outcomes. (The department's Undergraduate Instruction Committee is composed of Computer Science and Engineering faculty who volunteer or are appointed to provide a breadth of disciplines and faculty ranks.) The Undergraduate Instruction Committee recommended a process that was presented to the entire faculty for discussion and review. After faculty discussion, the Chair implemented the recommendation. The resultant process is visually depicted in Figure 2, and discussed in detail below. The process consists of two nested cycles or "loops." The inner loop happens every quarter, and the outer loop happens every year.

The Inner Loop: Individual Course and Course Sequence Level

At the end of each quarter, the following data are collected:

A. Grades in homework assignments, lab reports, short tests and examinations. Review of the student performance (grade received) for feedback on whether the course/program objectives are met.

B. Student Evaluation of Teaching. Evaluations administered near the end of each quarter allow students to provide the instructor with anonymous feedback on the effectiveness of the course. The questions in the evaluation forms include questions relevant to the stated program objectives like “Have you learned something you consider valuable?”

C. End-of-course student assessments/surveys. Course surveys are distributed at the end of each course. The course survey is based on the course objectives, and learning outcomes 1-11 from the course objective matrix. Students are asked how well the course learning objectives, and outcomes were achieved.

The Outer Loop: Curriculum and Program Level

At the end of each year, the following data is collected:

D. Senior Exit Surveys. The survey allows the graduating seniors to rank how well the program met the objectives and outcomes. The senior Exit Surveys are distributed to the faculty and analyzed. The Undergraduate Committee then drafts an action plan for improvement.

E. BOA surveys. Each year, EE department organizes a meeting with local industry representatives. The Undergraduate and ABET Committees are tasked with collecting and analyzing the BOA feedback on the courses content, program objectives, etc.

F. Quantitative assessment of the CS 179 Senior Design project using ABET200-based evaluation forms.

G. Alumni Surveys. These surveys are collected from the set of alumni and analyzed with the goal to determine the importance and relevance of the program objectives and outcomes, as well as their achievement.

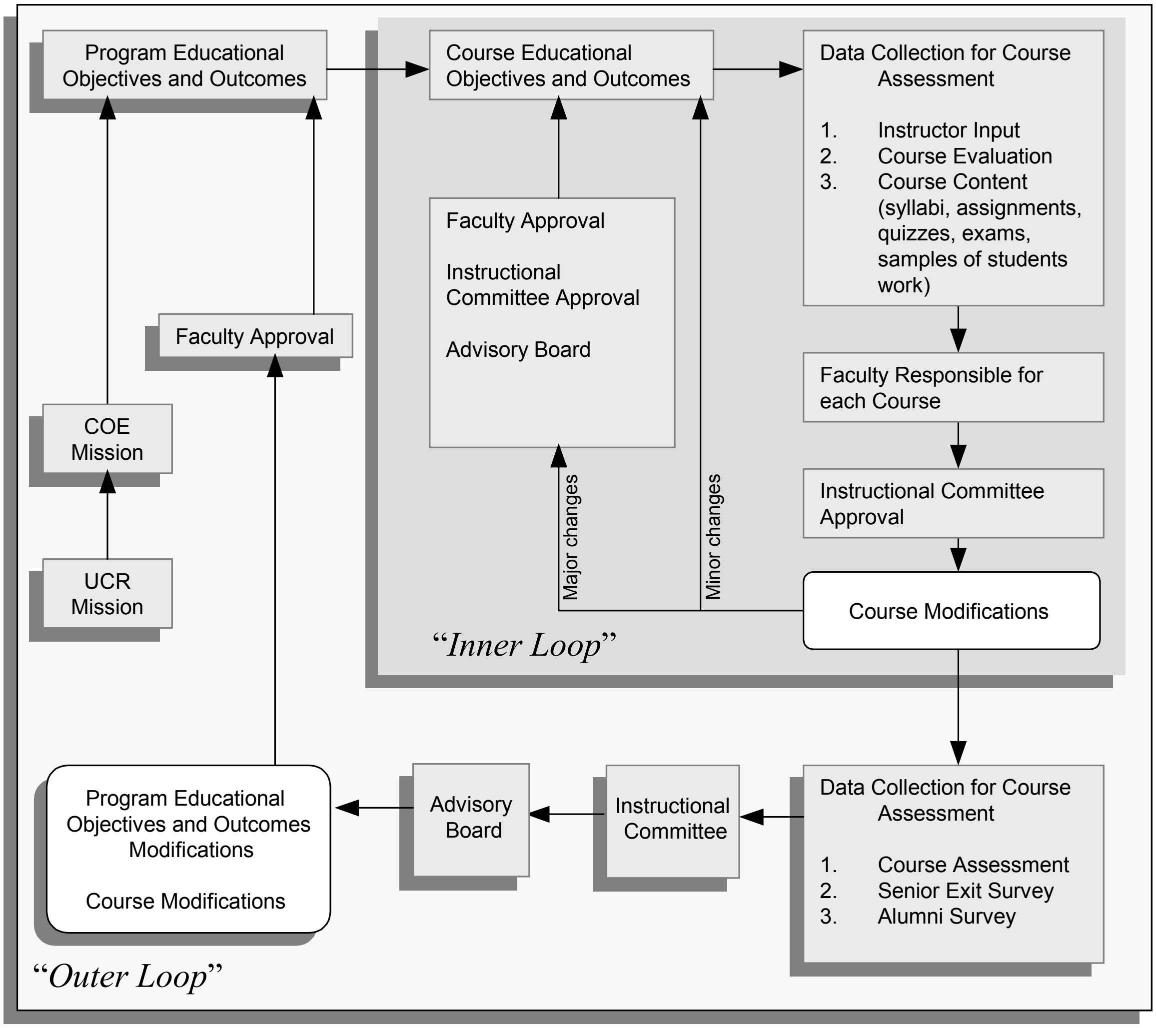


Figure 2. Process for establishment and review of PEOs.

All departments in the Bourns College of Engineering use parallel, compatible processes for evaluating how well a course is achieving its intended objectives, and which outcomes a course is succeeding in addressing. Each course has a course file, which is maintained by the instructor or instructors who teach it. The file contains standard information such as the course outline, a general syllabus, course objectives, the course matrix (a mapping of outcomes per objective – see below for an example), and notations about how the course addresses design and general science.

The course matrix assigns a score of 0 (lowest) to 3 (highest) for each course objective's contribution to each outcome. (The numerical system is based on an idea presented by Fiedler and Brent in the article "Designing and Teaching Courses to Satisfy the ABET Engineering Criteria [*Journal of Engineering Education*, January 2003]. We have adapted it significantly.) This matrix is reviewed after each quarter in which the course is taught to modify priorities or to make adjustments to how certain topics are taught or tested, as discussed in more detail below. The inputs for these decisions are student performance in the classroom, on tests, and on homework. Lower-division Computer Science courses also are evaluated at the midpoint each quarter to ensure that the course is progressing well enough to achieve its objectives.

Objective Outcome Matrix: CS 179, "Project in Computer Science"											
Objective Addresses Outcome: 1-slightly 2-moderately 3-substantially											
Outcome Related Learning Objectives	A	B	C	D	E	F	G	H	I	J	K
Balancing design tradeoffs: cost performance schedule and risk	2	0	3	3	3	0	0	0	0	0	3
Writing project proposals	0	0	0	3	3	0	3	0	0	0	3
Team-project organization and management (including time lines)	0	0	2	3	0	0	3	0	0	0	3
Requirements capture and analysis	2	0	3	3	3	0	0	0	0	0	3
Design and architecture	2	0	0	3	3	0	0	0	0	0	3
Prototyping (possibly via simulation)	3	3	0	3	3	0	0	0	0	0	3
Verification/validation	3	3	0	3	3	0	0	0	0	0	3
Writing and presenting final reports	0	0	0	3	0	0	3	0	0	0	3
Engineering professionalism and responsibility	0	0	0	0	0	3	0	0	0	1	3
Engineering careers and the modern world	0	0	0	0	0	3	0	3	3	3	3

Prior to the start of the term, each instructor prepares a syllabus, a set of eight (or more) specific *course objectives*, and a *course matrix*. Including specific course objectives is a useful tool for distilling the course curriculum, and its relationship to the program learning outcomes. In this regard, the course matrix is a key tool for quantifying the relationship between course objectives (and hence curriculum) and program outcomes.

In addition to the course matrix, another useful tool employed in the course improvement process is the *relevance matrix*, introduced in 2005 to better quantify the program outcome assessment and evaluation of each course. The relevance matrix allows an instructor to correlate the student performance with the course objectives, and hence outcomes (e.g. the average grade for each instrument forms a "row vector" than can multiply the relevance matrix, thus obtaining a vector with each element representing the achievement of the corresponding course objective). These quantitative tools are employed, along with analysis of student exit surveys, for course assessment and evaluation.

A course's **coverage** is a value between 0 and 1, or multiplied by 100 to serve as a percentage, showing the portion of attention given to that objective or outcome relative to all possible attention. Coverage can be applied to both course objectives and departmental outcomes. <u>To determine coverage for a single course objective</u>, the maximum point value for all of the questions related to that course objective is totaled. Then, that number is divided by the maximum point value sum for all the questions on the test.

An Abbreviated Example:

	Question 1	*Question 2*
Max Value	**10**	**5**
Objective 1	**1**	**0**
Objective 2	**1**	**1**
	Outcome A	*Outcome B*
Objective 1	**2**	**3**
Objective 2	**1**	**0**

Coverage of Objective 1 = (10*1) + (5*0) / (10 + 5) = .66
The result will be a statement such as: "66.00% of the points possible in the exam covered Objective 1."

To determine coverage for a single departmental outcome, the maximum point value for all the questions related to a single objective is determined, and then that number is multiplied by the relationship between that objective and the specific outcome. This value is summed for all objectives. The result is divided by the total points possible in the test *the number of objectives*: the maximum correlation between objective and outcome (3).

Coverage of Outcome A:

(Value for Objective 1 + Value for Objective 2) / (Total Val for all Questions * Number of Objectives * Maximum Correlation Value (3))

Value for Objective 1 = [(Value for Question * Relevance to objective) summed for all questions] * Relevance to Outcome, summed for every objective = (10 * 1 * 2) + (5 * 0 * 2) = 20

Value for Objective 2 = (10 * 1*1) + (5 * 1*1) = 15

(20 + 15) / (15 * 2* 3)
35 / 90 = .39

The result will be a statement such as "39% of the points possible in the Exam covered Outcome A."

Of course, to achieve 100% coverage, all questions would need to relate to all objectives, and all objectives would need to correspond completely to all outcomes. Not only is this unrealistic, it would most likely be meaningless. Instead the number must be viewed in context of the coverage of the other objectives or outcomes. Should one outcome have a coverage much lower than the others, then perhaps it needs more attention. Should one coverage be particularly high, then perhaps the focus of the class should be more evenly distributed.

The coverages can also be compared year to year, and it is hoped that they would show slightly increasing coverage rates as the course more closely targeted specific objectives or outcomes. If coverage rates remained static at what seems to be reasonable levels, that would be acceptable, however dramatic dips in coverage amounts would need attention.

The coverage rates for departmental outcomes can also be used to investigate adequate exposure to outcomes over the duration of a student's education. Of course, the number cannot be exact for any given student, but it would reflect the department's overall attention to its goals.

At the end of each course, the instructor writes the *assessment report*, including his/her recommendations for improvement. The feedback loop is "closed" when the next instructor reads the prior assessment report, and "signs-on" to the improvement actions. The instructor sign-on, introduced in 2003-2004, is a key mechanism to propagate the knowledge learned by one instructor forward to the next instructor. The results of all the course outcome assessments are integrated and fed into the outer ("global") feedback loop, along with additional data from senior exit surveys, alumni surveys, and industry board of advisors. These data are analyzed by the ABET Committee with input from the Undergraduate Committee. Thus, specific recommendations for improvement are generated for faculty review. Note the key constituencies in this process include faculty, students, alumni, and industry. The program faculty review occurs at least once every year, typically in early fall quarter. At the faculty review meeting, the recommendations made by ABET Committee are discussed and voted on. If approved by the faculty, specific improvement actions are assigned by the Chair to the relevant faculty committees for implementation, thus closing the feedback loop for the EE program assessment, evaluation, and improvement process. An example of this process in action is given below for the 2004-2006 two year cycle.

Section D below describes how these evaluations are used to improve the program. Before turning to that, however, we describe here other mechanisms, at the College and campus levels, for evaluation of student expectations and achievement.

University of California Undergraduate Experience Survey (UCUES)

The College and the Campus also perform assessments to evaluate student expectations and performance. At the campus level, the most significant assessment tool is the UC Undergraduate Experience Survey, or UCUES. This is a uniform questionnaire, which is administered at all UC campuses. Each campus also is able to add its own questions. The questionnaire is administered every two years, although there is some discussion of converting to an annual format. While UCUES does not enable us to compare our student responses directly with those of non-UC campuses, it does provide a basis for comparison with all of the other UCs with undergraduate programs (note that UC San Francisco has no undergraduate programs).

UCR also conducts an annual senior survey. This survey is not particularly valuable for assessing engineering outcomes because it is general enough to apply to all seniors throughout the campus.

The campus has developed a single relational database (200 fields) to answer queries on student performance and trends, with longitudinal information. There is tiered access to different levels of detail; this protects the privacy of the students for whom data are gathered. As the database is populated with new information, it should be a valuable resource for providing information on the performance of engineering students in non-engineering courses and for evaluating their overall experiences.

Bourns College of Engineering Alumni Survey

The Bourns College of Engineering initiated a College-wide alumni survey (not to be mistaken with the senior exit survey) in 2006 to begin tracking how well our graduates are achieving our program objectives. The College has approximately 600 alumni who graduated between 2000 and 2003, and who thus are in that "window" of interest to ABET – three to five years after completion of the bachelor's degree. We use a single survey tool for all alumni. It is designed to quantify the extent to which our alumni are achieving objectives common to all of the College's degree programs; these include the ability to succeed in graduate school, the ability to succeed in industry, the ability to work in teams, the ability to apply mathematics and engineering principles on the job, and the ability to contribute to the profession through inventions and publications. The current methodology begins with an e-mail message from the dean to the target alumni, followed by a second e-mail containing the actual survey. College staff then follow up by phoning those who do not respond.

The response to the alumni survey so far has been low – less than 10%. Going forward, we expect to increase the response rate by (1) working with UCR's alumni relations office to improve our contact database and (2) making more contacts via phone or a web-based interface. Since each alumnus will be in the survey "window" for three years and the overall population is relatively small, we are confident of obtaining data on a very high percentage of alumni at least once in the five years after graduation. This will provide us with good, quantifiable data on the performance of our alumni with respect to our program objectives. It should be noted, however, that the survey results will always be a trailing indicator because of the long lag time between a change to the curriculum and the ability to measure what impact it has on our alumni's success and effectiveness three to five years after graduation.

Based on the limited returns from the pilot study in 2006, we are seeing high proportions of our alumni achieving the prescribed degree objectives (Table 2). The survey, the tabulated results, and the written comments of the respondents will be available for review during the site visit.

Table 2. Results of 2006 Bourns College of Engineering alumni survey.

Metric	**% of alumni answering yes**
Took admissions test in pursuit of a postgraduate degree	>60
Was accepted to graduate school	~75
Plan to attend, is attending, or has attended graduate school	~70
Have completed an advanced degree	~20
Accepted a job offer within three months of graduation	>60
Accepted a position related to the engineering degree earned	80
Had a starting salary in the range of $40,000 to $60,000	50
Currently earning more than $75,000	>30
Still working in the field in which the engineering degree was earned	80
Have worked on projects with multidisciplinary requirements	70
Have worked on projects that have addressed professional and ethical concerns	60
Are required to apply mathematics and engineering principles on the job	>90
Consider the UCR education reasonably sufficient to conduct their duties	~90
Have collaborated on projects leading to patents or other types of disclosures	40
Have published in professional journals	~30

Bourns College of Engineering Freshman Expectations Survey

The Bourns College of Engineering will begin to administer a new assessment tool in the fall of 2006. All incoming freshmen will receive a questionnaire designed to explore their expectations. In the fall, a second questionnaire will examine how well the actual experience matched the expectations.

Standard I-6. The results of the program's assessments and the actions taken based on the results must be documented.

D. Program Improvement

Describe your use of the results of the program's assessments to identify program improvements and modifications to objectives.
Include:
1. *Any major program changes within the last five years*
2. *Any significant future program improvement plans based upon recent assessments*

Course Reports:
As discussed above, at the end of each course, the instructor writes the *assessment report*, including his/her recommendations for improvement. At the very least, this report is viewed and commented on by the next instructor to teach the class. For our core classes, CS 08, 10,12, 14 and 141, and any other classes that require special attention (classes taught for the first time, classes taught by a new instructor, classes that have undergone major revision) the report is viewed by all members of the undergraduate instruction committee and any other interested parties (any instructors in that area). The report contains both numerical reports (i.e., the *relevance matrix*) and anecdotal annotations from the instructor. The improvements made based on this review range form the mundane and trivial, removing or rewording a question that even high performing students had problems with, to higher level pedagogical discussions. Below is a concrete *representative* example of improvements made based on an examination of a course report.

- CS130: During the Fall 2004 offering the course report suggested that students were performing poorly on exams. The CS 130 committee met to discuss this and decided to directly poll the students to ask them why they felt that this was the case. The students near universally complained that there were not enough example problems done in class, and that this led to poor performance on the exams. The committee suggested the following fixes, which Dr. Zordan immediately implemented:
  - More worked examples of questions were made available during the during the review sessions.
  - The tentative exam problems were shown to the committee and/or teaching assistants before the exam. Questions that were felt not to be representative of the course material were removed or rewritten.
  - Students were given a mini review of note-taking skills.
  - It was emphasized very clearly at the beginning of classes that students would need to be able to solve problems similar to the ones shown in the lecture.

  The net result of these changes was that the students performed at a higher level in general, and at a much higher level for these on these types of problems in the midterms and on the final. In addition the student evaluations for the course indicated a much satisfaction rate. The committee examined the correlation between the Midterm 1 and the final grade for the 2004 and 2005 offerings. The correlation had increased by 6%, suggesting that the instrument in question was becoming a better predicator of the final grade due to the changes made. The other major change made between the two offerings was replacing the middle programming project in lieu of giving more time to the last (more important project). In examining the effectiveness of this change the committee noted that the average grade on this went up from 59% to 93% and the number of student scoring less than 20% (which is equivalent to the points given for turning in a program with your name on it, b/c of documentation pts) went from 32% of the class to 3%. That is, just one person got below a 20% and this person didn't bother to turn in anything for that project. Additional changes made to CS 130 include migrating to a more accessible text (after the committee had debated the rival merits of more than a dozen texts), replacing two smaller projects with a larger project with incremental turn-in steps (and incremental feedback). In each case the grades and student feedback were carefully examined to gauge the effectiveness of the changes.

Student Evaluations:

Each instructor receives (suitably anonomized) student evaluations for each offering. These reports contain both numerical scores and free-text comments. While many of the comments are addressed at the instructor style or manner, useful comments about the course content are taken into account during course revision. The student evaluations are part of the instructor's permanent file and are used during promotion/retention decisions. Below we consider examples of concrete *representative* changes made due to student evaluations:

- CS 161: In the fall quarter of 2004 a problem with CS 161 came to our attention. The student evaluations near universally complained that the workload of the course plus the lab was too high, and as a consequence the quality of the lab experience was lowered. (This assertion was also supported by an analysis of course grades.) Once we had noted it, we also conducted informal interviews with students who had taken the class. We have split the course into a CS 161, with no lab where the focus is on the concepts and the quantitative analysis, and have added a new lab-only course, CS 161L, where the focus is exclusively on the design aspect. The two courses are co-requisite and are run in tandem but the students get 50% more credit for them and two grades. The students can now focus on an end-end design of a CPU in CS 161L.
- CS150: After examining the student evaluations, we observed that students complained about having difficulties with the formal mathematical methods. This led to several changes. Now, the proofs are covered in a more interactive, conversational style, almost always with examples that illustrate the constructions in the proofs. The textbook has also been changed to a more intuitive text. The need for better instruction in formal methods, noted in this class, was the major driving motivation for a curriculum change, expanding the requirement in discrete mathematics from one quarter to two (CS 11 and CS 111.). As a result, the student evaluations for this class in the "have you learned something valuable" category have improved significantly in the last year.

End-of-Course Evaluation:

In addition to the teaching evaluations, we ask the students and the instructors to rate how well the course has succeeded in doing what our syllabi/matrices call for the course to do. We provide this information to the instructor (as part of the course's assessment report) and ask him/her to address it in the final report.

Senior Exit Surveys:

The college uses a consultant, EBI, to survey the exiting seniors. We have taken steps since 2003 to increase the senior participation in this survey by administering it during classroom time in the senior design project (CS 179). EBI analyzes and compares with peer institutions and prepares a report. Internally, this report is analyzed and summarized by the undergraduate instruction committee and a presentation is made to the full faculty at the faculty retreat.

Board of Advisors:
In 2005, the Computer Science and Engineering Department Board of Advisors meeting featured an executive session in which the board members were asked to review and comment on the program's objectives. The board members met with no departmental faculty present (one staff person was present to take notes) and arrived at a framework for recommended changes. The board members then continued to work via e-mail over the summer of 2005 to recommend changes. Late in the summer of 2005, the board presented a report to the department. (A copy of the report is attached to this self-study.) The faculty discussed the recommendations at its fall 2005 retreat.

CS 179 Quantitative Assessment:
The CS 179 capstone design course is evaluated using the same quantitative mechanisms that we use for measuring outcomes from individual courses, i.e., grade books and end-of-quarter surveys. The results from this course take on particular relevance because CS 179 is the capstone course and should demonstrate achievement of multiple outcomes as well as indicate that our graduating seniors are prepared to achieve our program objectives early in their careers.

Alumni Surveys:
The alumni surveys are designed to measure how well we are meeting our objectives. They are conducted by e-mail where possible, with a phone follow up for non-respondents. A (large) subset of the questions is the same for all alumni of the College of Engineering, and these questions are created at a meeting of parties from all departments. In addition, specific questions for computer science are sent to relevant parties. Great care is taken to phrase the questions in an unambiguous and objective fashion. For example, rather than asking if the student "feels" the need for lifelong learning, we measure the number of professional memberships/journal subscriptions etc.

Please see the Assessments section (page 19) for more information on the College alumni survey.

Concrete Examples of Changes made due to our Continuous Improvement Process

- In Fall 2004 we reduced lab size by 25% (from 28 to 21), based on an analysis of student data (both exit survey data and student evaluations), advice from the undergraduate committee and feedback from our teaching assistants.
- We noted in our 2004 exit surveys that students were unhappy with the quality of career advice. After a faculty meeting of the CE faculty, it was decided the best way to address the problem was at the college level rather than the campus level. At the time the College did have a Career Center, staffed part time by Loreta Dalton. However the Center did not have the time, staffing, or expertise to meet the College's needs. We petitioned for more resources to be directed to career advising, and where able to revise the responsibilities of the position, reclassified it in terms of payroll title, and renamed the position to *Career Development & Placement Officer*. This position was created in November 2004 and

filled by Aaron Bushong.

- Based on an analysis of student exit surveys, feedback from employers of our students (including employers that are members of our Board of Advisors) and evidence from student grades, it was noted in 2003 that many of our students had weaknesses in oral and written communication. Many corrective actions were taken, including the creation of a new course offering. However it was strongly felt that we could not "push-off" the problem into a single class. The faculty unanimously decided to integrate oral and written communication into every offering. As a concrete example, consider CS 122B. Originally students were required to write three short independent reports. The shortness of the report meant that many students abandoned any attempt at a narrative, and instead produced little more than a list of bullet points. It was decided to replace this with a single larger report. Students were clearly briefed on the faculty expectation that the report should be a high quality "stand-alone" document, with a clear structure {abstract, introduction, motivation etc}. Students were required to show partial drafts to the faculty and teaching assistants.
- Other actions to improve the program are documented elsewhere in this report. For example, the UCR CS Photorosters system (see page 29) was introduced in direct response to student feedback, and the CS&E Mentoring Program (see pages 31 and 39) was introduced based on consultation with the Board of Advisors and careful examination of student exit surveys.

E. Program Evolution

1. Describe in what respect, if at all, the philosophy and direction of the computer science program has changed at your institution during the last five years, or since the last accreditation visit, whichever is the more recent.

We have instituted as requirements a capstone design-project course and a technical communications course. We have instituted a Committee on Instruction. Also, we have established a Lecturers Committee, which focuses mainly on issues of the lower-division major requirements: introductory programming, data structures, and machine organization.

2. Describe any major developments and/or progress made in connection with the program in the last five years, or since the last accreditation visit, whichever is the more recent, that is not included in your response to Question I.C.

Our instructional methodology, especially at the lower-division, now places much more emphasis on the weekly three-hour labs that we have associated with each course. Also, we put much more heavy emphasis on student-to-student interaction and on trying to make the courses fun. Students seem to work harder and learn better when they find it to be fun.

F. Program Current Status

1. List the strengths of the unit offering the computer science program.

UCR's Bourns College of Engineering is a new, growing, well equipped, and well led unit that has provided a very supportive environment for UCR's undergraduate program in Computer Science.

2. List any weaknesses or limitations of the institution or unit offering the computer science program.

We could always use more resources, especially tech staff. Also, we could use more industrial experience among the faculty offering the courses.

3. List any significant plans for future development of the program.

There are continuous ongoing discussions about what should be required and what should be a technical elective. Those will continue and from time to time, an adjustment will be made. Advice from the Board of Advisors and alumni will play a prominent role. Opinions of current students will play a lesser role.

II. Student Support

Intent: Students can complete the program in a reasonable amount of time. Students have ample opportunity to interact with their instructors. Students are offered timely guidance and advice about the program's requirements and their career alternatives. Students who graduate the program meet all program requirements.

Standard II-1. Courses must be offered with sufficient frequency for students to complete the program in a timely manner.

Frequency of Course Offerings

1. *List below the course numbers, titles, and semester hours of courses required for the major that are offered less frequently than once per year.*

Dept Course #	Title of course	Semester hrs
NONE		

2. *Explain how it is determined when they will be offered, e.g., rotation, odd-numbered years, or whatever.*

Required courses are offered every year. The number of quarters they are offered depends on student demand. The determination of which courses will be offered in which quarter is based on availability/preferences of instructors and the advice of the Office of Student Affairs.

3. List below the course numbers, titles, and semester hours of courses allowed for the major but not required (i.e., either free electives or lists of courses from which students must choose a certain number), that are offered less frequently than once per year.

Dept Course #	Title of course	Semester* hrs
CS133	Computational Geometry	4*2/3
CS134	Video Game Creation and Design	4*2/3
CS160	Concurrent Programming and Parallel Systems	4*2/3
CS168	Intro. to VLSI Design	4*2/3
CS171	Expert Systems	4*2/3
CS185	Commercial Software Development	4*2/3

* UCR is on the quarter system.

4.Explain how it is determined when they will be offered, e.g., rotation, odd-numbered years, or whatever.

Availability of instructors, faculty preferences, and student demand (as relayed from the counselors in the Office of Student Affairs) all play a role. Among other things, we try to keep a balance in terms of the number of electives offered each quarter. Also we tend to offer the upper-division course in a given topic the quarter before the follow-on graduate course is going to be offered.

Standard II-2. Computer science courses must be structured to ensure effective interaction between faculty/teaching assistants and students in lower division courses and between faculty and students in upper division courses.

B. Interaction with Faculty

1. Describe how you achieve effective interaction between students and faculty or teaching assistants in lower-division courses, particularly in large sections.

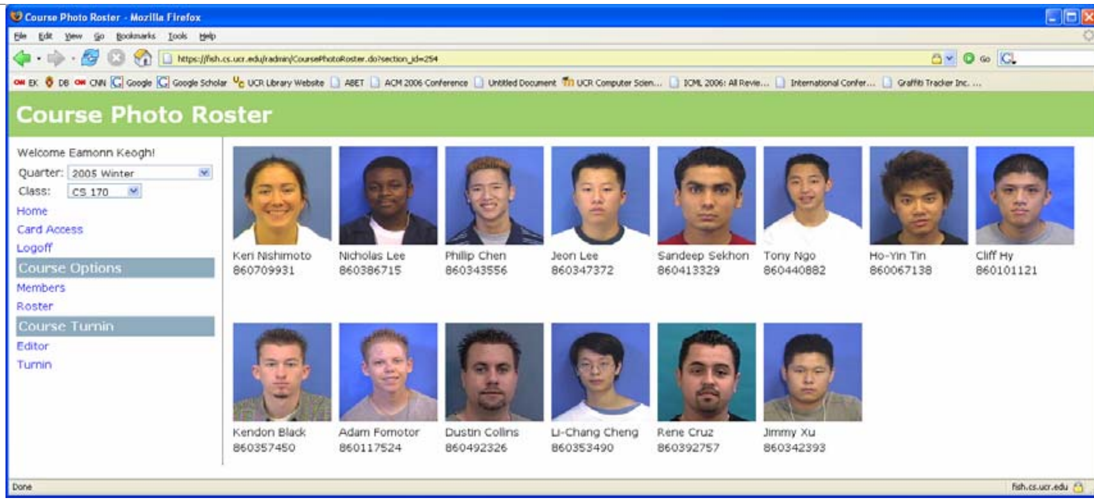
Instructors are required to post office hours (2-3 hours per course) on their doors (as well as in course syllabi). However many of our instructors operate on an "open-door" policy. Teaching assistants must also maintain office hours at different times than the instructor. Instructors and teaching assistants are also available to students by appointment.

We will discuss two concrete programs that we have introduce in the last two years to improve effective interaction between students and faculty, the UCR CS Photorosters system and the UCR CS&E trial mentoring program.

PHOTOROSTERS

In his book *What Matters in College*, Alexander Austin reviewed the literature on college teaching, finding the one thing that made the biggest difference in getting students involved in the under-graduate experience was greater faculty-student interaction (Austin, 1993). A prerequisite to such interaction is that the faculty and teaching assistants should learn the names of all students were possible. A professor who does not know his or her students' names may be perceived as remote, unapproachable and uninterested.

To help faculty and teaching assistants learn student names we have implemented a system called Photorosters. This system allows an instructor to see/print out a roster for his/her class that is augmented by recent high quality photographs.



An example of a Photoroster, showing the students in Dr. Keogh's Winter 2005 CS170 class, Section 1.

While it is difficult to measure the effectiveness of Photorosters directly, we have measured the adoption rate. On March 17th 2006 we sent an email to all faculty/lecturers asking two questions: "*Have you ever used Photorosters? Y/N"* and "*Do you have any comments on Photorosters?*" Of the 17 responses, 16 affirmed using it. The following comments are representative:

- "*I use the roster mainly to learn the names of the students. It helps me when it is time to assign the grades (to take into account other factors, like class participation, etc.)*" Stefano Lonardi.
- "*I find them very useful to learn the names of my students. I guess they are also a way to discourage "extreme cheating" (i.e., the action of sending someone else in your place to take a class).*" Gianfranco Ciardo.
- "*I find that knowing names allows me to call on students in class which bolsters discussion and It gives them a more serious attitude about attendance and contributing in class (because they are not "anonymous").*" Victor Zordan.
- "*Photorosters are an extremely useful way for me to remember the names of students*." Titus Winters.
- "*They are tremendously useful. They really help me learn students' names, which seems to create a very positive class environment*." Frank Vahid.
- "*While they help with learning names, they help more with connecting students' questions in office hours with their answers on exams and homeworks. This really helps to understand their mental models of the topics.*" Christian Shelton.

There was one negative comment. Marek Chrobak said "*They are typically incomplete,*" although Dr. Chrobak did go on to say "*They are certainly very helpful though. I can finally associate names with faces*." Upon investigation we discovered that Dr. Chrobak was a very early adopter of Photorosters and the early version was necessarily somewhat incomplete. Currently the database is more than 99.5% complete.

CS&E MENTORING PROGRAM

The Bourns College of Engineering offers professional staff mentoring (see page 36) and faculty mentoring (page 39). Additionally, the UCR CS&E trial mentoring program was established in Fall 2004 with the goal of improving freshmen retention rates in the computing majors – CE and CS, Several articles on engineering and CS retention emphasized the importance of personal faculty interactions with students.

An email was sent on July 8, 2004, asking faculty if they would be interested in volunteering as faculty mentors for freshmen majors. Twelve CS&E faculty members volunteered. We later described the program to the EE undergraduate advisor, after which two EE faculty members volunteered also (CE is jointly administered by EE and CS&E), raising the total to 14. Prof. Frank Vahid of CS&E served as the organizer of the program.

Each mentor arranged a day/time during which his or her meetings would take place. Incoming freshmen signed up for a mentor during the CS&E orientation on September 20, based primarily on the mentor meeting times fitting the student's schedule. Each mentor had between 8 and 15 students in his/her group. Mentors met with their students as a group. Each mentor met with his/her group four times during the Fall quarter, in the 1^{st}, 3^{rd}, 5^{th}, and 7^{th} weeks, for one hour each meeting. Students who missed a group meeting had to see the CS&E undergraduate advisor to make up the missed meeting. Students who attended the meetings received their winter quarter registration PINs on time. Those who missed meetings and did not make up those meetings had their PINs delayed.

One professor provided mentors with suggested material to cover during each meeting. That material emphasized several items:

A. Helping the students to make friends with each other during the meetings.
B. Providing students with inspirational data on future careers in computing.
C. Providing students with practical information and tips for college success.

Students were asked to complete an evaluation form on the last meeting during the fall.

The mentoring program continued in the Winter 2005 quarter with a single meeting of the mentor with his/her group.

OUR INTERNAL EVALUATION OF THE CS&E MENTORING PROGRAM

Students seemed generally pleased with the mentoring program. A summary of the evaluation forms is attached to this document: 45% said the program was useful, and another 25% said it was somewhat useful. A visual summary of student evaluation of the CS Mentoring Program. Seventy-Five student were polled. The features they liked most were:

1. Study tips, time management, and test taking skills.
2. Mentor resourcefulness and approachability.
3. Opportunities available at UCR in the engineering field.
4. Meeting new students and faculty.

The features they disliked were:

1. Mandatory attendance with registration pin consequences.
2. Time conflicts.
3. Regular meeting times.
4. Information presented too general.

We held a mentor-debriefing meeting on Wed, Nov 24. From the student evaluations, and the comments from mentors, we concluded the following as the key lessons learned and improvements for the future:

- We should repeat the program for new freshmen next year.
- We should have fewer meetings, two, perhaps three.
- Reducing group size would be good.
- We should definitely continue to discuss time management and test-taking skills.
- We should add discussions on choosing among the majors, and on the different research areas of our entire faculty.
- We should consider enforcement options other than delaying regpins.
- We should consider achieving mentoring using a required freshman course.

CURRENT STATUS

The mentoring program was repeated in Fall 2005. Twelve of the 14 mentors agreed to continue with the program, again as volunteers. This time only two meetings were held, covering roughly the same material as last year, but covering that material more briefly. Furthermore, discussion was added about the various majors available. Prof. Marek Chrobak, the CS&E undergraduate advisor, served as the organizer of the mentor program. Materials from this year's meetings, including the agenda and handouts, can be found at:

A. First meeting: http://www.cs.ucr.edu/~marek/MENTORING/MEET1/
B. Second meeting: http://www.cs.ucr.edu/~marek/MENTORING/for_mentors.html

Additionally, a 2-day intensive first-week orientation for freshmen was organized by two faculty, Prof. Frank Vahid (CS&E) and Prof. Sheldon Tan (EE). The 2-day orientation consisted of extensive network among the freshmen, and then breakout sessions involving study habits/motivation, student clubs/organizations, balancing studying and non-studying activities, and an introduction to our lab facilities and computer accounts.

Ryan Mannion, a graduate student of Prof. Frank Vahid, developed a website to streamline the process of signing up for and switching among mentor groups (previously a huge task for the organizer), and for mentors to record mentoree participation. The website is presently at http://www.cs.ucr.edu/~mentor/. A password-protected administrative site is at http://www.cs.ucr.edu/~mentor/admin/.

The faculty discussed the mentoring program in October and agreed that it should continue. However, as attendance had been an issue for both years of the program and the use of registration PIN delays is viewed negatively by students, faculty agreed that the mentoring program should be administered through a course structure. A 1-unit engineering course, "Professional Development and Mentoring," is thus being introduced for next year, and will be required of all computing majors.

Grading will be satisfactory/no-credit. The course is presently going through the approval process and should be in operation and required in Fall 2006. Administering mentoring through a course may also have the benefits of providing teaching credit for professors who participate rather than relying solely on volunteerism. The course structure will utilize the http://www.cs.ucr.edu/~mentor/ website.

SUMMARY FOR CS&E MENTORING PROGRAM

In summary, faculty seems to believe the mentoring program to be useful, and students seem to enjoy the program. Fine-tuning of the program must occur to make it easier to administer, to encourage better attendance, to provide appropriate credit to faculty for participation, and to better achieve the program's goals. Mentoring sophomores, juniors, and seniors may also be considered in the future.

2. Describe how you achieve effective interaction between students and faculty in upper-division courses. Give detailed explanation and/or documentation how you do this for sections with more than thirty students, if applicable.

UNDERGRADUATE RESEARCH

The Computer Science program is committed to giving opportunities to undergraduates to engage in research. The Department feels that this benefits both the faculty and students.

For the former, close interaction with undergraduates allows the faculty to understand more about the undergraduate's strengths and weaknesses, and this information can be feed back into the instructional loop. For the latter, the chance to work with word class researchers can greatly augment the in-class instruction, and give the students a competitive edge in later admission to grad schools or prestigious employment.

The faculty takes great pains to make the students aware of research possibilities. For example:

- Several times a year faculty members give talks to the UCR ACM student chapter, discussing their research and inviting collaboration. Recent talks include Dr. Neal Young (March 2004), Dr. Eamonn Keogh (November 2004), Dr. Victor Zordan (February 2005). The current membership of the UCR ACM student is 86, and typical attendance at these talks is over 60.
- The benefits of student research are extolled in the mentoring program (discussed above).
- The benefits of student research are extolled in some upper division classes.
- Many faculty members prepare posters and other displays highlighting their research in visually interesting and attractive ways and place them outside their offices and labs.

Perhaps the best measures of the success of undergraduate research involvement is the number and quality of papers published with undergraduates.

REPRESENTATIVE PAPERS PUBLISHED IN COLLABORATION WITH UNDERGRADUATES

- **R. Mannion,** H. Hsieh, S. Cotterell, F. Vahid. (2005) System Synthesis for Networks of Programmable Blocks. Design Automation and Test in Europe (DATE), pp. 888-893
- **Swastik Kopparty**, Srikanth Krishnamurthy, Michalis Faloutsos and Satish Tripathi (2002). Split TCP for Ad hoc Networks. IEEE GLOBECOM.
- **Kyle Ellrott**, Chuhu Yang, Frances M. Sladek, Tao Jiang: Identifying transcription factor binding sites through Markov chain optimization. ECCB 2002: 100-109
- Eamonn J. Keogh, **Shruti Kasetty**: On the Need for Time Series Data Mining Benchmarks: A Survey and Empirical Demonstration. Data Min. Knowl. Discov. 7(4): 349-371 (2003).
- **DiLorenzo, P**. C., Zordan, V. B., Tran, D (2004) Interactive animation of cities over time, 17th International Conference on Computer Animation and Social Agents (CASA).
- Sandeep Gupta, **Swastik Kopparty,** and C. V. Ravishankar. (2004). Roads, Codes, and Spatiotemporal Queries. PODS 2004, pp 115-124
- Victor Zordan, **Nicholas Horst** (2003). Mapping optical motion capture data to skeletal motion using a physical model, ACM SIGGRAPH Symposium on Computer Animation.
- Stitt, F. Vahid, **S. Nemetebaksh** (2004). Energy Savings and Speedups from Partitioning Critical Software Loops to Hardware in Embedded Systems. IEEE Transactions on Embedded Computer Systems.

Undergraduate students are encouraged to take positions as laboratory assistants. At UCR, research relationships are fostered between undergraduate students and faculty in faculty research labs and at the Center for Environmental Research and Technology. Students may volunteer, be paid through funded faculty research, through NSF Research Experience for Undergraduates awards, or through a variety of University-wide programs sponsoring undergraduate research. Specific examples of University-wide programs are listed below.

- California Alliance for Minority Participation (CAMP) – The primary goal of CAMP is to double the number of B.S. degrees granted to underrepresented students in science, engineering, and mathematics at the eight general campuses of the University of California. The primary components of CAMP at the University of California Riverside (CAMP-UCR) are a summer enrichment program for entering freshmen, peer counseling, study groups, faculty mentored research experiences, opportunities for participants to give presentations at scientific meetings, and preparation for graduate school. The program is funded jointly by the National Science Foundation and the University of California.
- Mentoring Summer Research Internship Program (MSRIP) – The goal is to prepare and encourage undergraduates from diverse backgrounds to obtain the Ph.D. degree. Students participating in MSRIP may be supported from a variety of sources, though the main funding source is the UC Office of the President. Additional funding sources include CAMP, state, and federal sources.
- Leadership Excellence through Advanced Degrees (UC LEADS) –This state-funded program is designed to attract and prepare students from a broad range of socio-economic, cultural, ethnic, racial, linguistic and geographical backgrounds to enter doctoral degree

programs (preferably at UC) in math and engineering. The long-term goal is to provide students with backgrounds to prepare them to assume leadership careers in industry, government, public service and academia.

- Alliance in Graduate Education for the Professoriate (AGEP) – This is a new NSF program with the goal of developing coordination of university academic outreach programs (MESA-MEP, CAMP, UC LEADS) that assist and develop students seeking careers in science and engineering.
- UCR Research for Undergraduates – In the Fall and Winter quarters, this UC program solicits, accepts, and funds proposals for undergraduate research projects conducted under faculty supervision.

Standard II-3. Guidance on how to complete the program must be available to all students.

C. Student Guidance

Describe what determines the requirements that a student will follow and how the student is informed of these requirements.

The Student Affairs advisors (see Section D below) perform a Satisfactory Academic Progress review annually, during the summer. Each student in the advisor's caseload is reviewed for degree progress. Students are counseled about course selection and academic support services to help them achieve better grades and get back on track with their Course Plan.

Prerequisites to courses are enforced by the Student Information System in accordance with the course approval forms. Should an instructor approve enrollment on an exception basis, the Student Affairs Officers can assist the student with enrollment, given reasonable written documentation (email, or note from the instructor). This documentation is then placed in the student's file.

Substitutions or waivers generally require the approval of the Associate Dean for Undergraduate Education or the Undergraduate Advisor in the major. Documentation of a substitution or waiver of a degree requirement is always included in the student's college file. Advisors are authorized to input the substitution or waiver into the Student Information System.

Technical electives required for the major are selected by the student in consultation with the faculty mentor or Undergraduate Advisor for their major. Several majors, including Computer Engineering and Electrical Engineering, have developed focus areas to allow students to concentrate their studies in one particular area.

The ABET criteria are folded into the degree requirements. The completion of core requirements is monitored by the electronic degree check. The Humanities and Social Sciences requirements are also monitored by the electronic degree check. This process uses the approved breadth list to place completed courses into the appropriate categories for both breadth and depth. The only element which must be manually monitored is the aspect of the depth requirement which necessitates that one of the two upper-division courses be from the same area as another course.

Standard II-4. Students must have access to qualified advising when they need to make course decisions and career choices.

D. Student Advisement

Describe your system of advisement for students on how to complete the program. Indicate how you ensure that such advisement is available to all students.

Students in the College of Engineering are assigned to an Academic Advisor in the Office of Student Academic Affairs based upon the year in school and/or their last name. Students are currently distributed between four sophomore through senior advisors and one freshman advisor.

Each advisor, with the exception of the Freshman Advisor, advises approximately 250 students each year. The Freshman Advisor is responsible for all new freshmen, in addition to continuing freshmen who have not yet earned enough units to achieve sophomore standing. As a result, the Freshman Advisor's caseload is larger than the others'.

The caseload system is designed so that students and Advisors have a relationship throughout the student's career. The Freshmen advisor teaches the student how to navigate the University policies and procedures as well as teaches the student how to best utilize their Advisor and Faculty mentors skills.

In the spring of the freshman year, a student meets with his or her permanent staff advisor to discuss the fall schedule and make the transition to the Sophomore – Senior caseloads. The student now works with the same advisor on all academic issues through graduation. Course scheduling, academic difficulty counseling, petitions for exceptions, and graduation applications all come to the staff Advisor. This continuity allows the student and Advisor to develop a relationship of trust which leads to better service for the student and greater insight for the Advisor on the student's needs and ambitions.

It is the Student Affairs advisor's responsibility to monitor the progress toward completion of degree requirements. All of the engineering disciplines are patterned in sample program plans which form the basis of the four-year suggested course schedules. Advisors are able to assist students with creating a personalized plan to allow for actual course enrollment to vary from the standard plan, with the required courses to be rescheduled into a later term. This becomes particularly useful for students pursuing double majors, minors, changes in program, reduced course loads due to academic difficulty or extracurricular demands (e.g. employment), and students who have changed their major into the College of Engineering from another major on campus.

Bourns College of Engineering Program for Students in Academic Difficulty

Students in academic difficulty are monitored by the Student Affairs advisors on behalf of the Associate Dean. Upon receipt of quarterly grades, the advisors review the academic records of students who achieve less than a 2.0 to determine whether the student should be placed on Academic Probation, placed on Continued Probation, or dismissed from the University. A student in danger of being dismissed has the opportunity to submit an appeal, which is then reviewed by the Associate Dean. If dismissal procedures must be instituted, this is done by the Associate Dean.

Because the College's Academic Difficulty policy only allows for two consecutive quarters in academic difficulty before the student is dismissed from the University, a multilayered process has been established to try and retain these students.

After grades are posted for a quarter, Academic Advisors manually place holds on the registration of each student in academic difficulty to prevent him/her from making any changes to his/her registration (University regulations limit such students to 13.0 units per quarter), for the upcoming quarter prior to completing difficulty procedures. Additionally, no later than the first week of the quarter, email is sent to each student in difficulty to inform him/her of his/her status. The notification clearly states what the student must do to remove registration holds and restore good standing.

Each student in difficulty is required to attend an Academic Success Workshop. Workshops are offered during the first two weeks of every quarter. the College offers a lower-division workshop for those students who have completed less than 90 units and/or no upper-division coursework. An upper-division workshop is offered for those students who are junior or seniors and well into their major having completed upper-division coursework. Approximately 80% of students in difficulty attend a workshop.

The Academic Success Workshop is designed to help students identify what it was that caused them to be in difficulty and equip them with strategies to rectify the problem and improve academic success. In the workshop, facilitators cover topics from how to identify and improve motivation to study strategies, and identify campus/college resources to facilitate the process of academic recovery. In the workshop, students are given a packet of materials to complete that includes an Academic Progress Review, Time Management Plan or Major GPA calculation (depending on class level), a Checklist that identifies various reasons why students end up in difficulty, and instructions for preparing a personal statement (essay).

If a student does not attend an Academic Success Workshop during the first two weeks of the quarter, he/she must then see an Academic Success Counselor (trained paraprofessional) to discuss all of the material covered in the workshop. The student still needs to complete all of the pieces of the packet as provided in the workshop. In addition, Success Counselors are available to all students throughout the quarter for advice.

A student must then set an appointment to meet with his/her academic advisor to discuss the various materials from the workshop and review the personal statement and checklist to further provide the student with support and strategies to resolve the issues that put him/her in academic jeopardy. The student is referred to appropriate campus resources such as the Counseling Center, Career Center, and Learning Center to meet with professionals with expertise to manage his/her personal issues surrounding academic difficulty. The student is also encouraged to visit his/her advisor prior to registration for the next quarter to discuss how things are going and plan an appropriate schedule. If the student does not complete all parts of the packet (time management plan, essay questions, etc.) the student is asked to complete the packet fully and return before the hold is removed. The advisor also reviews the student's complete grade history to be sure that the student is in a successful major choice.

Prior to registering for the subsequent quarter, a student in academic difficulty must complete a course plan and submit it to his/her academic advisor for review and approval. If the course plan is inappropriate the student is advised to come in for guidance or to given advice as to how to better select courses and asked to resubmit.

Additionally a student must complete a follow-up assessment to gauge how helpful the workshop was in helping him/her reach his/her goals for the quarter and if the student has been able to stick to his/her plan for success.

Students who wish, or need, to change their major are encouraged to contact their desired new department for advisory information.

Additional information about BCoE's Academic Standing policy is available online at: http://www.engr.ucr.edu/studentaffairs/policies/acad_stand.shtml.

Bourns College of Engineering Faculty Mentoring Program

While Staff Academic Advisors in the Office of Student Affairs provide academic advising (guidance with registration, campus resources, course planning, etc.), Faculty Mentoring is a different kind of advising assistance. The Faculty Mentor's goal is to promote a strong relationship between students and professors in the department as early as the first quarter of the freshman year. Faculty Mentors are available for students to consult on matters pertaining to career planning, understanding engineering in general, and specifically for gaining a better appreciation of their major. Mentors also provide guidance on what it takes to be successful as an engineering student, and provide suggestions to enable students to gain confidence and self-motivation.

Faculty Mentoring is an opportunity for student and faculty to interact in a less intimidating situation. The program is designed for students to gain greater insight about classes and how course material relates to post graduate goals. This is the time for students to really understand how what they do in the classroom is connected to what Engineers actually do in the real world. Faculty Mentoring helps students to clarify course guidelines, the syllabus, a specific assignment, lecture, discussion, and career goals; better understand comments on papers or assignments; improve grades by providing studying assistance; communicate about expectations; get advice on graduate study or future plans; and make suggestions for self-improvement.

Computer Engineering, Computer Science, and Information Systems freshmen are required to meet with a Faculty Mentor in the first quarter of enrollment as a condition of registration.

Electrical Engineering majors have access to a Faculty Mentor (Advisor) but are not required to meet on a formal basis.

All Bioengineering, Chemical Engineering, and Environmental Engineering majors, regardless of class level are required to meet with their assigned Faculty Mentor as a condition of registration for every quarter of enrollment.

Freshmen in Mechanical Engineering are required to meet with their assigned Faculty Mentor as a condition of registration every quarter of their first year of enrollment.

Instructions for meeting with Faculty Mentors and contact information is provide via e-mail, posted on the College of Engineering Office of Student Academic Affairs' website and available from each staff Academic Advisor. Students are encouraged to contact Faculty Mentors in person or by e-mail to schedule a mentoring session. Before the appointment, each student must obtain a Faculty Mentoring Confirmation slip from the respective department's administrative office. At the end of the meeting, the Faculty Mentor signs the confirmation slip verifying completion of the requirement. The student then brings the signed slip to the Office of Student Academic Affairs for removal of the registration hold.

Professional Development Milestones

The Bourns College of Engineering Professional Development Milestones program was designed to lead students to professional success after graduation. The Professional Development Milestones parallel a student's academic path and allow a student to plan and track his/her professional development as he/she would his/her academic progress.

Earning a college degree is no guarantee of professional success. Interpersonal skills, the ability to communicate effectively, leadership qualities, internship and/or research experience, networking skills, and many other characteristics determine professional success. The Bourns College of Engineering Professional Development Milestones program allows students to gain experience and develop the skills, abilities, and characteristics that determine professional success. Among other milestones, the Bourns College of Engineering strongly encourages all students to complete at least one internship and at least one research experience prior to graduation. The Professional Development Milestones outline a plan that leads a student through each milestone and related activity as he/she makes progress toward professional success in graduate school, industry, research, academia, management, leadership, and/or many other professional endeavors.

E. Access to Qualified Advising

When students need to make course decisions and career choices, what is their procedure for obtaining advising? Do they have adequate access to qualified professionals when necessary?

They first source of advice on course decisions is the College's Student Affairs staff. Their second source is the Department's Undergraduate Advisor (now Marek Chrobak), who will often refer them to the most relevant faculty member, depending on the course or career choices under discussion. Often, however, students will go directly to a faculty member.

Career guidance comes from several sources. The College's Career Services Officer, Aaron Bushong, administers the Professional Development Milestones program (see Section D above) and works one-on-one with students to identify internship and employment opportunities as early as the freshman year. The campus Career Services Center has staff assigned to engineering and the sciences, and they work with the college's Career Services Officer to arrange for job fairs and similar events that enable students to meet prospective mentors and employers.

Additionally, student chapters of professional organizations are active and hold frequent meetings with guest speakers from industry. This provides opportunities for students to build mentoring networks, learn about career prospects, and make contacts that will help them with eventual searches for employment or graduate degree programs.

The organizations active in the College of Engineering are listed below. Additionally, the campus is home to organizations and programs including the African Student Programs; Chicano Student Programs; Native American Student Programs; Asian Pacific Student Programs; Women's Resource Center; Education Opportunity Program/Student Affirmative Action; the Mathematics, Engineering and Science Achievement (MESA) Engineering Program; and the Minority Career Development Program.

- Air and Waste Management Association (AWMA).
- American Institute of Chemical Engineering (AIChE).
- American Society of Mechanical Engineers (ASME).
- Association for Computing Machinery (ACM).
- Institute of Electrical and Electronic Engineers (IEEE).
- Linux Users Group (LUG).
- National Society of Black Engineers (NSBE).
- Society of Automotive Engineers (SAE).
- Society of Hispanic Professional Engineers (SHPE).
- Society of Women Engineers (SWE).
- Tau Beta Pi.

Standard II-5. There must be established standards and procedures to ensure that graduates meet the requirements of the program.

F. Meeting the Requirements

Describe your standards and procedures for ensuring that graduates have met all of the requirements of the program.

The College's Student Affairs advisors, Student Affairs Officers II, serve as both college office advisors and departmental advisors for each of the College's engineering disciplines. As departmental advisors, Student Affairs advisors discuss academic progress with students on a quarterly basis, and at additional times as changes warrant. Advising duties are split between freshmen and sophomore through senior students.

Freshman Advisor: Tara Brown

Sophomore – Senior Advisors:
A – F: Suzanne McCusker
G – K: Lisa Guethlein
L – P: Sonia De La Torre
Q – Z: Thomas McGraw

Since departmental and college advising is provided from one centralized staff, separate certification at the department level is not performed.

Once students file their Applications for Graduation (normally three weeks prior to the beginning of the graduation quarter), the Student Affairs Officer performs a preliminary degree check to assess completion of all University, College, major, and ABET requirements.

Students also have access to their own degree audit via a secure web interface. Bourns College of Engineering students are especially adept at utilizing this tool to assess their own degree progress. The audit takes the place of the preliminary as well as the final degree check that were formerly performed manually. As such, hardcopy tracking of graduation requirements is no longer done.

Upon receipt of final grades, a final degree check is performed, and students are cleared to graduate if they have satisfied all listed requirements. If the requirements are not satisfied, the student is notified by the Registrar's Office and asked to contact their College Office.

Transfer credit is honored and recognized for comparable subjects as determined by course articulation. Transfer credit is determined by faculty review. Each academic department has exclusive responsibility for the evaluation of transfer courses in its discipline, for the benefit of the campus as a whole. In each academic department, the Undergraduate Faculty Advisor is charged with reviewing any courses in their department submitted to the campus for consideration. Requests for course articulation are sent to the department by the Office of Student Academic Affairs and are accompanied by a course syllabus, course description, course name and table of contents of the text, and any lab assignments. Courses are reviewed for comparability of engineering topics, lecture material, laboratory assignments (as appropriate), and prerequisites. In this way, each academic department is of service to the campus, and consistency is maintained. Individual academic departments do articulate courses outside their own field of expertise and recognizes the existing articulation completed by faculty in the respective academic departments. This ensures transfer credit for each student is treated equitably, regardless of the student's major.

The Office of Student Academic Affairs, specifically Thomas McGraw, maintains the documentation and collection of these course articulation requests within for College of Engineering on the campus Student Information System database. The campus Articulation Officer, Thea Labrenz, serves as the manager of this database of comparable courses, which interfaces with the statewide database, ASSIST, available via the World Wide Web. The database contains all approved comparable courses for use by all campus departments and California Community Colleges, and further contributes to consistency and efficiency.

III. Faculty

Intent: Faculty members are current and active in the discipline and have the necessary technical breadth and depth to support a modern computer science program. There are enough faculty members to provide continuity and stability, to cover the curriculum reasonably, and to allow an appropriate mix of teaching and scholarly activity.

If different programs have different faculty members, please identify which faculty members are associated with which program(s), and the percentage of time allotted, if they are associated with more than one.

Standard III-1. There must be enough full-time faculty members with primary commitment to the program to provide continuity and stability.

D. Faculty Size

The purpose of this section is to determine whether you have sufficient faculty to offer courses often enough for students to complete the program in a timely manner.

In Section II you gave the course numbers of courses required for the major which are offered less frequently than once per year, and those allowed for the major but not required, and explained how it is determined when they will be offered. Explain (if applicable) any difficulties you have offering required or optional courses frequently enough, particularly as they might be affected by faculty size.

No such difficulties at this time.

It should be noted that the CS&E Department offers lower-division courses for non-computing majors (CS5, Introduction to Computer Programming, CS6, Effective Use of the World Wide Web, and CS8, Introduction to Computing). These courses are taught by lecturers and have no impact on faculty workload.

B. Faculty with Primary Commitment

1. Indicate the number of faculty with primary commitment to the program, that is, who regularly teach courses in the computer science segment of the program: __26___.

The purpose of the next question is to ascertain the continuity and stability provided by the faculty with primary commitment to the program.

2. Please list below the number (FTE) of faculty with primary commitment to the program in each academic rank, broken down within rank by tenure status.

	Full Professor	Associate Professor	Assistant Professor	Instructor or Lecturer	Other Faculty
Tenured	12	5		2	2
Untenured			7		

Standard III-2. Full-time faculty members must oversee all course work.

Standard III-3. Full-time faculty members must cover most of the total classroom instruction.

C. Faculty Oversight

Full-time faculty must oversee all computer science course work allowed towards the major. That means each course must be either taught or coordinated by a full-time faculty member with primary commitment to the program. For those courses with sections not taught by full-time faculty during the last or current academic year, list the course numbers below and the name of the full-time faculty coordinator. (The last academic year is the academic year prior to the year in which this report is prepared.)

Dept Course #	Full-time Faculty Coordinator
CS14	Thomas Payne
CS153	Thomas Payne
CS161L	Walid Najjar
CS120B	Frank Vahid

Standard III-4. The interests and qualifications of the faculty members must be sufficient to teach the courses and to plan and modify the courses and curriculum.

Standard III-5. All faculty members must remain current in the discipline.

Standard III-6. All faculty members must have a level of competence that would normally be obtained through graduate work in computer science.

Standard III-7. Some full-time faculty members must have a PhD in Computer Science.

D. Interests, Qualifications, and Scholarly Contributions

The Criteria states that the interests, qualifications, and scholarly contributions of the faculty must be sufficient to teach the courses, plan and modify the courses and curriculum, and to remain abreast of current developments in computer science. This information should be contained in the faculty vitas attached to this report and need not be repeated here. A sample vita questionnaire is attached in Section G below. Although it is not necessary to follow this format, it is important that whatever format is followed contain all the information asked for. And, to make things easier for the visiting team, please see that all faculty vitas are in the same format, whichever format is used.

This is an appropriate place to insert a description of general departmental or institutional activities that promote faculty currency, if such exist.

Faculty members have resources from initial complements, "various donors" funds, and contract and grant awards to travel to meetings and conferences in their disciplinary areas or in engineering education. Some additional funds are available from the College, the campus, and the Faculty Senate. These resources are sufficient to assure that professors are able to maintain currency in their fields.

Faculty are eligible for sabbaticals. They frequently attend and present at conferences and workshops worldwide.

To address faculty's currency in pedagogy, the UCR Office of Instructional Development has established a Scholarship of Teaching lecture series for faculty and instructor to enhance the quality of teaching throughout the campus. Presentations highlight

- The effective use of current and emerging instructional methodologies and technologies.
- Strategies for the introduction of active learning, peer to peer learning, and collaborative approaches in teaching.
- Pedagogical approaches to enhance student engagement and optimize student learning outcomes.
- Effective approaches to teaching and learning in and outside of the classroom.
- The engagement of teaching community in the collaborative, scholarly examination of

their practice as teachers.

- The development of assessment tools to measure student learning outcomes.
- The development of a campus culture of evidence regarding our academic programs.

Some lectures are presented by faculty or administrators from UCR, and some by outside presenters. Many deal with new teaching resources and technologies available for use at UCR. For a complete list of all topics presented in the 2005-2006 academic year, please see http://www.oid.ucr.edu/OIDSpeakerSeries.html.

Standard III-8. All full-time faculty members must have sufficient time for scholarly activities and professional development.

E. Scholarly Activities

Describe the means for ensuring that all full-time faculty members have sufficient time for scholarly activities and professional development.

For ladder-track faculty, the teaching load is relatively light. For full-time lecturers, the teaching load is three courses per quarter, but these are not three unique courses. Typically, we expect a faculty member to devote 40% of his/her time to teaching, 40% to research, and 20% to service. The research and service components in particular afford opportunities to remain abreast of developments in the professor's research field and in pedagogy.

Standard III-9. Advising duties must be a recognized part of faculty members' workloads.

F. Support for Advising

Advising duties must be a recognized part of faculty members' workloads, which means that faculty with large numbers of advisees must be granted released time. Explain your advising system and how the time for these duties is credited.

We have a staff to handle routine advising, and a faculty member who is designated our Undergraduate Advisor (currently Marek Chrobak). The requests for advice that come to the rest of the faculty are very special cases and/or voluntary participation in our faculty mentoring program.

G. Information Regarding Faculty Members

On separate pages, please furnish the following information for all faculty members that teach courses allowed for the major, including those who have administrative positions in the department (chair, associate chair, etc.). Use the form given below as guidance. This form need not be followed exactly, but all requested information should be supplied. Please use a common format for all vitas. Please limit information to no more than three pages per person, if at all possible. Please place the form(s) for administrator(s) first, followed by the others in alphabetical order.

Biographical sketches for faculty are appended.

A breakdown of faculty effort devoted to teaching, research, service, and other activities for the most recent academic year is as follows:

	%	F05	W06	S06	Teaching	Research	Other	
Laxmi Bhuyan	100	203A	213	161	30	50	20	Buyout
Marek Chrobak	100	215	150		40	40	20	Ugrad Advisor
		111						
Michalis Faloutsos	100	260	240	164	40	40	20	Instruction Comm.
		302/1	302/1	302/1				TA oversight
Brett Fleisch	100							on leave to NSF
Dimitrios Gunopulos	100	236	133		40	40	20	Sabbatical W/S
		179						
Harry Hsieh	100	220	122.2	269	40	40	20	
Tao Jiang	100							Sabbatical FWS
Vana Kalogaraki	100	253	153		40	40	20	
			179					
Eamonn Keogh	100		205	235	40	40	20	ABET Comm
Srikanth Krishnamurthy	100	164	260	257	30	50	20	Buyout
Stefano Lonardi	100	234	218	150	40	40	20	
Mart Molle	100	204	177	179	40	40	20	Grad Advisor
Walid Najjar	100			260	40	40	20	
		161L/2	161L/2	161L/2				
				203B				
Thomas Payne	100		152	201	20	20	60	Chair
Teodor Przymusinski	100	152	180	152	40	40	20	search comm.
		287/1	287/1	287/1				colloquium
Chinya Ravishankar	100	165	255		30	40	30	Assoc dean
Vassilis Tsotras	100	166			40	40	20	Sabbatical W/S
Frank Vahid	100	122A	!20B	179	40	40	20	
		61						
Jun Yang	100	161	161		40	40	20	
			203A					
Victor Zordan	100	130	260	134	40	40	20	
Christian Shelton	100	179M	170	272	40	40	20	
Neal Young	100	141	141	141	40	40	20	
			260					
Guru Parulkar	100				40	40	20	on leave to NSF

Gianfranco Ciardo	100	260.3	237		30	40	30	Assoc Chair
		150						
Brian Linard	100	12.1	61	61	100	100	100	
		12.2	12.1	12.1				
		6	6	6				
Kris Miller	100	10.1	10.1	10.1	100	100	100	
		10.2	10.2	10.2				
		10.3	5	5				
Jason Villarreal	50	100	21	100	50	50	50	
Victor Hill	11			183				
Ann Gordon-Ross	50	14	14	14	50	50	50	
Titus Winters	50	153	179	153	50	50	50	
Brian Gratton	22	120B		120B	33		33	
Doug Tolbert	11		245			33		
Y.C. Hong	0				0	0	0	
Essia	12.6			12.2			50	

IV. Curriculum

Intent: The curriculum is consistent with the program's documented objectives. It combines technical requirements with general education requirements and electives to prepare students for a professional career in the computer field, for further study in computer science, and for functioning in modern society. The technical requirements include up-to-date coverage of basic and advanced topics in computer science as well as an emphasis on science and mathematics.

(Curriculum standards are specified in terms of semester hours of study. Thirty semester hours generally constitutes one year of full-time study and is equivalent to 45 quarter-hours. A course or a specific part of a course can only be applied toward one standard.)

A. Title of Degree Program

Give the title of the degree program under review, as specified on the transcript and diploma.

Transcript:	Bachelor of Science in Computer Science
Diploma:	Bachelor of Science in Computer Science

B. Credit Hour Definition

One semester hour normally means one hour of lecture or three hours of laboratory per week. One academic year normally represents from twenty-eight to thirty weeks of classes, exclusive of final examinations. Please describe below if your definitions differ from these.

Three quarters of ten weeks. Nominal load is 15 units with each unit being an hour per week of lecture, or an hour per week of discussion, or an three hours per week of lab. Only CS145, CS150 and CS151 have a discussion rather than a lab.

C. Prerequisite Flow Chart

Attach a flow chart showing the prerequisite structure of computer science courses required or allowed towards the major.

The normal sequence of courses for a Computer Science undergrad is as follows. Courses marked with an asterisk (*) are optional but recommended. Credit hours for required courses are in parentheses. This grid shows 179 units of required content. Engineering 10, Engineering 92, or another elective in the freshman year puts the total over 180.

Year 1

Fall Quarter	Winter Quarter	Spring Quarter
MATH 9A (4) *First Year Calculus* ENGL 1A (4) *English Composition* BREADTH (4) *Humanities/Social Sciences* ENGR 10* *Intro to CS&E* ENGR 92* *Freshman Seminar*	MATH 9B (4) *First Year Calculus* ENGL 1B(4) *English Composition* CS 10 (4) *C++ Programming* BREADTH (4) *Humanities/Social Sciences*	MATH 9C (4) *First Year Calculus* ENGL 1SC (4) *English Composition for Sci/Eng* CS 12 (4) *C++ Programming II* BREADTH (4) *Humanities/Social Sciences*

Year 2

Fall Quarter	Winter Quarter	Spring Quarter
CS/MATH 11 (4) *Intro to Discrete Structures* CS 61 (4) *Assembly Language Programming* PHYS 40A (5) *Physics (Mechanics)* BREADTH (4) *Humanities/Social Science*	CS/MATH 111 (4) *Finite Mathematics* CS/EE 120A (5) *Logic Design* CS 14 (4) *Data Structures* PHYS 40B (5) *Physics (Heat/Waves/Sound)*	MATH 10A (4) *Multivariable Calculus* CS/EE 120B (5) *Embedded Systems* PHYS 40C (5) *Physics (Electricity/Magnetism)*

Year 3

Fall Quarter	Winter Quarter	Spring Quarter
CS 141 (4) *Algorithms* CS 161/161L (4) / (2) *Computer Architecture* MATH ELECTIVE (4)	CS 153 (4) *Operating Systems* CS 150 (4) *Theory of Auto & Formal Language* TECHNICAL ELECTIVE (4)	MATH 113 (5) *Linear Algebra* ENGR 180 (3) *Technical Communications* ENGINEERING ELECTIVE (4) *EE 2 Recommended* TECHNICAL ELECTIVE (4)

Year 4

Fall Quarter	Winter Quarter	Spring Quarter
STATISTICS 155 (4) *Probability/Stat. for Sci/Eng* TECHNICAL ELECTIVE (4) TECHNICAL ELECTIVE (4) BREADTH (4) *Humanities/Social Sciences*	CS 152 (4) *Compilers* TECHNICAL ELECTIVE (4) BREADTH (4) *Biological Science*	CS 179 (4) *Project in Computer Science* TECHNICAL ELECTIVE (4) MATH ELECTIVE (4) *BREADTH (4)* *Humanities/Social Sciences*

Computer Science Major

1. **Lower-division requirements (59 units)**
   a) CS 010, CS 012, CS 014, CS 061
   b) CS 011/MATH 011
   c) MATH 009A, MATH 009B, MATH 009C, MATH 010A
   d) PHYS 040A, PHYS 040B, PHYS 040C
   e) One course of 4 or more units in an engineering discipline outside the field of computer science to be selected in consultation with a faculty advisor. (Either a lower-division or an upper-division course may be used to satisfy this requirement.)
   f) ENGL 01SC
2. **Upper-division requirements (84 units minimum)**
   a) CS 141, CS 150, CS 152, CS 153, CS 161, CS 161L, CS 179 (E-Z)
   b) CS 120A/EE 120A, CS 120B/EE 120B
   c) CS 111/MATH 111
   d) ENGR 180
   e) MATH 113
   f) STAT 155
   g) Two courses from MATH 046, MATH 120, MATH 126, PHIL 124
   h) At least 24 units of technical electives to be chosen from an approved list of courses which currently includes CS 100, CS 122A, CS 122B, CS 130, CS 133, CS 134, CS 145, CS 151, CS 160, CS 162, CS 164, CS 165, CS 166, CS 168, CS 170, CS 171, CS 177, CS 179 (E-Z) (4 units maximum), CS 180, CS 181, CS 183, CS 185, CS 193 (4 units maximum), EE 140, MATH 120, MATH 135A, MATH 135B. The technical electives selected must be distinct from those used to satisfy the requirements specified in 2.a)–g) above.

D. Course Requirements of Curriculum (term by term and year by year)

1. Required and elective courses. In the tables on the following pages, list the courses in the order in which they are normally taken in the curriculum, classified in the appropriate categories. The data should clearly indicate how the program meets the Intent of the Curriculum Category of the Criteria for Accrediting Computer Science Programs. These tables are designed for a semester calendar; they may be easily altered for a quarter calendar.

2. Required courses. List courses by department abbreviation (Math, Chem, CS, etc.), number, title, and number of semester hours. Apportion the semester hours for each course by category.

3. Elective courses. Designate these courses "elective." If an elective is restricted to a particular category, then tabulate the semester hours in that category and indicate the category in the listing, e.g. "elective—science." In addition, be sure that you have supplied information elsewhere in this document indicating how you ensure that students take the course in the specified category (e. g. advisement, graduation check sheets, etc.). For free electives (i.e., those not restricted to a particular category), list the semester hours under the heading "Other." Use footnotes for any listings that require further elaboration.

4. Individual courses may be split between or among curriculum areas if the course content justifies the split. For example, a discrete mathematics course may have some of its semester hours under mathematics and some under computer science. In such cases, assign semester hours to categories in multiples of one-half semester hour.

		Category (credit hours)					
		Category (quarter hours)					
	Course (Dept., Number, Title)	Computer Science Core	Computer Science Advanced.	Mathematics	Science	General Education	Other
First Quarter Freshman Year	MATH 9A, First-year calculus			4			
	ENGL 1A, English Composition					4	
	ENGR 10, Intro to CS&E (optional)				2		
	ENGR 92, Freshman Seminar (optional)				1		
	Humanities/ social sciences					4	
Second Quarter Freshman Year	MATH 9B, First-year calculus			4			
	ENGL 1B, English Composition					4	
	CS10, C++ Programming	4					
	Humanities/social sciences				4		
Third Quarter Freshman Year	MATH 9C, First-year calculus			4			
	ENGL 1SC, English Composition for Sci/Eng					4	
	CS12, C++ Programming II	4					
	Humanities/social sciences					4	
SUBTOTALS		8	0	12	7	20	

		Category (credit hours)					
		Category (quarter hours)					
	Course (Dept., Number, Title)	Computer Science Core	Computer Science Advanced.	Mathematics	Science	General Education	Other
First Quarter Sophomore Year	CS/MATH 11, Intro to Discrete Struct.	4					
	CS61, Assembly Language Prog.	4					
	PHYS40 A, Physics (Mechanics)				5		
	Humanities requirement					4	
Second Quarter Sophomore Year	CS/MATH 111, Discrete Struct.	4					
	CS/EE 120A, Logic Design	5					
	CS14, Data Structures	4					
	PHYS 40B, Physics (Sound/Wave/Heat)				5		
Third Quarter Sophomore Year	MATH10A, Multi-variable Calculus			4			
	CS/EE120B, Embedded Systems		5				
	PHYS 40C, Physics (electricity, magnet)				5		
SUBTOTALS		21	5	4	15	4	

		Category (credit hours)					
		Category (quarter hours)					
	Course (Dept., Number, Title)	Computer Science Core	Computer Science Advanced.	Mathematics	Science	General Education	Other
First Quarter Junior Year	CS141, Algorithms		4				
	CS161, Computer Architecture		4				
	CS161L, Computer Arch. Lab		2				
	MATH elective			4			
Second Quarter Junior Year	CS153, Operating Systems		4				
	CS150, Theory of Auto & Formal Language		4				
	Technical Elective		4				
Third Quarter Junior Year	MATH 113, Linear Algebra			5			
	ENGR 180, Tech Communics						3
	ENGR elective						4
	Tech elective		4				
SUBTOTALS		0	26	9	0	0	7

		Category (credit hours)					
		Category (quarter hours)					
	Course (Dept., Number, Title)	Co mpu ter Scie nce Cor e	Comp uter Scien ce Adva nced.	Ma the ma tics	Scie nce	Gen eral Edu cati on	Other
First Quarter Senior Year	STAT 155, Prob & Stat for Sci/Eng						4
	Tech elective		4				
	Tech elective		4				
	Humanities/social sciences elective					4	
Second Quarter Senior Year	CS152, Compilers	4					
	Tech elective		4				
	BIOL elective				4		
Third Quarter Senior Year	CS179, Project in Computer Science		4				
	Tech elective		4				
	Math elective			4			
	Humanities/social sciences elective					4	
SUBTOTALS		4	20	4	4	8	4

General

Standard IV-1. The curriculum must include at least 40 semester hours of up-to-date study in computer science topics.

1. *If it is not obvious from the above tables that the curriculum includes at least 40 semester hours (60 quarter hours) of computer science topics, please explain.*

Obvious. As shown in the preceding tables, the curriculum provides 20 quarter hours of core computer science instruction and 58 quarter hours of advanced computer science. Note that the senior-year Compilers course, CS 152, while designated with an upper-division course number, is listed as a core course. This was done in consultation with an outside advisor who has ABET expertise.

Standard IV-2. The curriculum must contain at least 30 semester hours of study in mathematics and science as specified below under Mathematics and Science.

2. *If it is not obvious from the above tables that the curriculum includes at least 30 semester hours (45 quarter hours) of study in mathematics and science, please explain.*

Obvious. Mathematics curriculum requirements total 28 credits, and science totals at least 21 credits. The science calculation includes the optional ENGR 10 course, Introduction to Computer Science and Engineering, and the optional ENGR 92, Freshman Seminar. Combined, those two introductory courses amount to 3 credits.

Standard IV-3. The curriculum must include at least 30 semester hours of study in humanities, social sciences, arts and other disciplines that serve to broaden the background of the student.

3. *If it is not obvious from the above tables that the curriculum includes at least 30 semester hours (45 quarter hours) of study in humanities, social sciences, arts, and other disciplines that serve to broaden the background of the student, please explain.*

Per the General Catalog, the College requires 44 units of Humanities and Social Science breath courses in addition to English Composition.

Standard IV-4. The curriculum must be consistent with the documented objectives of the program.

Describe the consistency between the documented objectives of the program and the curriculum. How does the curriculum contribute to the achievement of the documented objectives?

As is clear from a review of the course syllabi, we set course objectives for each course. These course objectives are mapped to program outcomes. The program outcomes, in turn, are mapped to program objectives (see Table 1, page 7). This map, plus the evaluation of the relevance of course work to the objectives and outcomes, enables us to maintain a focus on the relevance of each course to the larger objectives.

The technical courses, especially those in CS, lead to the "background" in scientific principles and skill in rigorous analysis and creative design.

The 45+ units of Humanities and Social Science cover the "breadth" objective.

The professional and ethical attitudes are emphasized through the curriculum. Clear communication is stressed in Engineering 180. Teamwork is stressed in CS179 and elsewhere.

The learning environment objective has two do with how we intend to deliver the curriculum rather than the structure of the curriculum.

Computer Science

Standard IV-5. All students must take a broad-based core of fundamental computer science material consisting of at least 16 semester hours.

4. *If it is not obvious from the above tables that the curriculum includes a broad-based core of fundamental computer science material consisting of at least 16 semester hours (24 quarter hours), please explain.*

Obvious.

Standard IV-6. The core materials must provide basic coverage of algorithms, data structures, software design, concepts of programming languages and computer organization and architecture.

5. *The core materials must provide basic coverage of the following five areas. Please indicate below the approximate number of semester hours in the core devoted to each topic. (This material can be gathered from your course descriptions, but it will ease the job for the visiting team if you do this in advance.)*

Area	Semester hours	Area	Semester hours
Algorithms	4 * 2/3	Data structures	4 * 2/3
Software Design	8 * 2/3	Concepts of Programming Languages	4 * 2/3
Computer Organization and Architecture	12 * 2/3		

Standard IV-7. Theoretical foundations, problem analysis, and solution design must be stressed within the program's core materials.

6. *The following areas must be stressed within the program's core materials. Indicate the course numbers of courses embodying a significant portion of these areas.*

Area	Courses (Dept., Number)
Theoretical Foundations	CS/Math 11 and 111, CS150, Stat 155
Problem Analysis	CS141, CS152, CS153
Solution Design	CS152, CS153, CS179

Standard IV-8. Students must be exposed to a variety of programming languages and systems and must become proficient in at least one higher-level language.

7. *To what programming languages and operating systems are students exposed?*

Linux and Windows. C++, VHDL, and Assembler. Most learn Python on their own. Students are expected to learn other languages depending on the electives they elect and who is teaching them.

8. *In what higher-level language(s) do students become proficient?*

C++ at a minimum.

Standard IV-9. All students must take at least 16 semester hours of advanced course work in computer science that provides breadth and builds on the core to provide depth.

9. *If it is not obvious from the tables above that students take at least 16 semester hours (24 quarter hours) of advanced computer science, please explain.*

Obvious. Advanced computer science course work totals 58 quarter hours, not including the senior-level Compilers course, which is listed as a core course.

10. List below the advanced areas in which your students may study. Make clear by the use of "and", "or", and parentheses which areas are required and which may be chosen from (e. g., A and two of (B or C or D)).

Architecture and OS and compilers and algorithms and automata and five of (networks or databases or graphics or embedded systems or computational geometry or software engineering or security or computer games or AI or expert systems or modeling and simulation).

Mathematics and Science

Standard IV-10. The curriculum must include at least 15 semester hours of mathematics.

11. If it is not obvious from the tables above that students take at least 15 semester hours (23 quarter hours) of mathematics beyond pre-calculus, please explain.

Obvious. Starting with freshman calculus, the total mathematics requirement is at least 28 quarter hours. If pre-calculus is required, students are encouraged to take it during the summer prior to the freshman year. If they take it in the freshman year, they can catch up with the curriculum by taking a heavier load or by taking summer courses.

Standard IV-11. Course work in mathematics must include discrete mathematics, differential and integral calculus, and probability and statistics.

12. If it is not obvious from course titles in the above tables, then explain below which required courses contain discrete mathematics, differential and integral calculus, and probability and statistics.

Statistics 155, "Probability and Statistics for Science and Engineering" (4 quarter-hours), addresses the requirement for probability and statistics. The discrete mathematics and differential and integral calculus are stated and are obvious.

Standard IV-12. The curriculum must include at least 12 semester hours of science.

13. If it is not obvious from the tables above that students take at least 12 semester hours (18 quarter hours) of science, please explain.

Obvious. Science totals at least 21 credits. The science calculation includes the optional ENGR 10 course, Introduction to Computer Science and Engineering, and the optional ENGR 92, Freshman Seminar. Combined, those two introductory courses amount to 3 credits.

Standard IV-13. Course work in science must include the equivalent of a two-semester sequence in a laboratory science for science or engineering majors.

14. If it is not obvious from the tables above and from course descriptions and/or your catalog that the science requirement includes a full year (two-semester or three-quarter) sequence in a laboratory science for science and engineering majors, please explain.

Obvious. The sophomore Physics 40ABC sequence totals 15 credit hours and covers mechanics, heat, waves, sound, electricity, and magnetism. All three classes have lecture, discussion, and laboratory sessions.

Standard IV-14. Science course work additional to that specified in Standard IV-13 must be in science courses or courses that enhance the student's ability to apply the scientific method.

Additional Areas of Study

15. If it is not obvious from the tables above and from course descriptions and/or your catalog that the remainder of the science requirement is met with science courses or courses that enhance the student's abilities in the application of the scientific method, please explain. (Mathematics, statistics, and courses normally considered part of the computer science discipline should not be included here).

Obvious.

Standard IV-15. The oral communications skills of the student must be developed and applied in the program.

Standard IV-16. The written communications skills of the student must be developed and applied in the program.

16. Each student's oral and written communications skills must be developed and applied in the program, i.e., in courses required for the major. This information should be included in course descriptions; please give course numbers below.

Communications skills	Developed in	Applied in
Oral	Engineering 180	CS179
Written	English 1SC and Eng 180	everywhere including CS179

Standard IV-17. There must be sufficient coverage of social and ethical implications of computing to give students an understanding of a broad range of issues in this area.

17. Social and ethical implications of computing must be covered in the program. This information should be included in course descriptions; please give course numbers below.

	Covered in Course(s) (Dept., Number)
Social and Ethical Implications	Engineering 180 and CS 179

The Computer Science program is committed to giving opportunities to undergraduates to engage in research. The Department feels that this benefits both the faculty and students.

For the former, close interaction with undergraduates allows the faculty to understand more about the undergraduate's strengths and weaknesses, and this information can be feed back into the instructional loop. For the latter, the chance to work with word class researchers can greatly augment the in-class instruction, and give the students a competitive edge in later admission to grad schools or prestigious employment.

The faculty takes great pains to make the students aware of research possibilities. For example:

- Several times a year faculty members give talks to the UCR ACM student chapter, discussing their research and inviting collaboration. Recent talks include Dr. Neal Young (March 2004), Dr. Eamonn Keogh (November 2004), Dr. Victor Zordan (February 2005). The current membership of the UCR ACM student is 86, and typical attendance at these talks is over 60.
- The benefits of student research are extolled in the mentoring program.
- Many faculty members prepare posters and other displays highlighting their research in visually interesting and attractive ways and place them outside their offices and labs.

Undergraduate students are encouraged to take positions as laboratory assistants. At UCR, research relationships are fostered between undergraduate students and faculty in faculty research labs and at the Center for Environmental Research and Technology. Students may volunteer, be paid through funded faculty research, through NSF Research Experience for Undergraduates awards, or through a variety of University-wide programs sponsoring undergraduate research. Specific examples of University-wide programs are listed below.

In addition to contributing to retention and advancement, research opportunities open a window to the teaching of ethics. Students learn about the context and consequences of their research while working on projects. Additionally, those who work on projects that involve human or animal subjects must go through our Institutional Review Board training, and they gain experience with the process of establishing and abiding by ethical research protocols. As engineering research continues to blur the line between humans, other organisms, and machines, this will be an increasingly important type of experience for our students to have.

Computer Science students are exposed to social and ethical issues in a broader context in English 1B in the freshman year. This course includes readings on political theory from Rousseau, Machiavelli, and others. One writing assignment asks the students to evaluate the individual's duty to the state, political leadership, the role of technology on the quality of life, and/or the role of government.

E. Course Descriptions

1. For each required or elective computer science course that can be counted in the curriculum being reviewed for accreditation, include a two-page or three-page course outline at this point in the Self-Study. If your documentation does not exactly follow this format, be sure that all of the requested information (if applicable) is present, and please in any case adhere to a common format for all course descriptions.

Note that the outline format calls for information on the content of the course in the areas of algorithms, data structures, software design, concepts of programming languages, computer organization and architecture. This is not intended to suggest that every course must have some coverage of each of these topics. For a given course, please include the information from a listed area only if the course has significant content in that specific area.

Course syllabi containing all of the requested information are appended to this self-study report.

2. ***Course display for the visit.*** *The course outline for each required or elective computer science course must also be included in a display of course materials that is available for study at all times during the evaluation visit. The course material display must include at least the following for each course that can be counted in the computer science segment of the curriculum being evaluated.*

- *Course name and number, number of credits, meeting times, etc.*
- *Textbook and other required material (e.g. manuals, reference booklets, standards and documents)*
- *Instructor's name and contacts*
- *Syllabus/schedule (provide hardcopy and URL if only available on-line)*
- *Introductory pages that include course objectives, pedagogical approach, assessment methods (and how these relate to the program objectives if appropriate)*
- *Course policies*
- *Introductory sheet that indicates course locations or sites that show evidence of writing, presentations, ethics etc. as appropriate*
- *Assignments and projects, tests, exams and important handouts*
- *Student work (examples of graded high/medium/low quality work as well as tests/exams etc.)*
- *Any feedback mechanisms/examples to students that might be on-line*
- *Any substantive electronically posted communication, threaded discussion, or teamwork etc.*
- *Course evaluations (measures of success that include, for example, the results of student surveys and the achievements of students in current or subsequent courses)*
- *Proposed or changes as a result of formative surveys*
- *Recent "late-breaking" developments not discussed in this report.*

- *Every effort will be made to provide any additional materials requested by the ABET team. Dr. Eamonn Keogh (Chair of ABET committee) and Victor Hill (System Administrator and head of technical support for ABET) will be on standby to procure any additional material at a moments notice.*

If a course is taught wholly on-line by a non-resident faculty member then data about that faculty member must be included in the Self-Study or provided in separate documents for credentialing purposes. In addition, for wholly on-line courses or a complete degree program, the results of an electronic CAC survey to that group of students regarding their experiences in the program (comparative to the usual on-site class visit) should be made available to the visiting team.

If available, please provide the location of URL's on a CAC-visit Website or site containing a set of URL links that would allow an evaluator to retrieve specific data directly (if not provided in hardcopy) as indicated above. These should be available before the time of the visit.

Note: In addition to the display materials, it would be very helpful to the visiting team if all assessment documentation could be available in the same location as the display materials. It is also very helpful if the display room contains computers with network connections.

These materials will be available for examination at the time of the visit.

V. Laboratories and Computing Facilities

Intent: Laboratories and computing facilities are available, accessible, and adequately supported to enable students to complete their course work and to support faculty teaching needs and scholarly activities.

In Section VI you will be asked to describe the planning and acquisition processes for laboratory equipment. Please do not repeat any of that information here; simply refer to that section, if necessary, to avoid duplication.

A. Computing Facilities

1. Describe the computing facilities used by students in the program. Indicate the types of software available in each category. Specify any limitations that impact the quality of the educational experience.

Institutional computing facilities:

Computer facilities and services are available from several sources for use by the programs of The Marlan and Rosemary Bourns College of Engineering and its students, faculty, and staff:

1. Campus-wide Computing and Communications (C&C) unit, managed by a full-time professional staff.
2. The College, through its programs of Chemical/Environmental Engineering, Computer Science and Engineering, Electrical Engineering, and Mechanical Engineering, and its Research units.

Computing and Communications (C&C)

The C&C unit as a whole (which includes Academic Computing, Institutional Computing, Microcomputing, and Communications) is under the direction of an Associate Vice-Chancellor, who reports to the central administration. The Academic Computing, Microcomputing, and Communications sub-units have primary responsibility for providing network access and general computing facilities and services to the UC Riverside campus. They provide:

- Microcomputer facilities in labs at various campus locations, utilizing PCs and Macintosh computers. These may be used on a scheduled basis for campus courses, as well as on a drop-in basis. Access hours are posted and, during these times, lab assistance and software check-out are available.
- Access to the computers of the San Diego Supercomputing Center, available to all campus researchers, with the financial support of the National Science Foundation, through the Academic Computing sub-unit.
- Support and maintenance of the campus computer networks and world-wide Internet access via the CalREN2 regional gigabit network. All Bourns College of Engineering computing facilities have access to these services.
- On-campus wired and wireless connectivity. Most of the campus is "wired for

wireless," enabling portable computers to connect to the network. Additionally, the campus network backbone consists of 10 GB fiber-optic connections, with a minimum of 1 GB capacity to each building on campus. The campus has more than 500,000 feet of fiber-optic conduit, which enables the addition of fiber connectivity essentially on demand.

- Campus-wide site licensing for various software packages.
- Consultation on systems, statistical computing, microcomputing, and instructional technology.
- A microcomputing support group.

Computing and Communications, in conjunction with the UCR Office of Instructional Development, operates media and technology in the classrooms at UCR. All UCR classrooms are designed to Fundamental Classroom Standards established by the Classroom Technology Advisory Group. These standards are:

- Classrooms must contain the capability to present materials from a wide variety of sources, including (at a minimum) VHS video, DVD, a personal computer, and the Internet.
- Classrooms must contain a chalkboard or whiteboard that is available and viewable at the same time digital or analog presentations are underway.
- Classrooms must contain a combination of LCD projectors and/or lighting controls that allow students to take notes and view presentation material at the same time.
- Classrooms must be "self service" thus allowing instruction to occur without the aid of student operators and without the delivery of equipment.
- Based on the academic discipline, sound systems and data projection resolution requirements may drive certain classroom minimum standards.

All classrooms are equipped with a multimedia controller, maintained by Computing and Communications, for operation of a laptop computer, projector, and audio equipment. Internet connectivity is via wireless network. Each controller has a "Help" button for the instructor to use if there is a problem with the equipment. A help desk is staffed full time, and at least one field technician is available on campus during instructional hours. Either the help desk (working remotely) or the field technician (in the classroom) can quickly resolve any problem that occurs. In a survey (most recently conducted in 2005), 95.2% of instructors responded that UCR's available classroom technology either "Completely" or "Mostly" met their pedagogical needs.

UCR has just implemented "clicker" technology in its classrooms. Clickers (known also as Personal Response Systems or PRS) are an emerging technology that allows real-time interactions between the instructor and their students. The interactions are usually in the nature of queries by the instructor with students responding electronically to those queries. The student responses are digitally collected both as a group and individually and the information (data) reflects the individuals' and/or group's consensus to the queries. These data can be immediately displayed as visual feedback, not only to the instructor but also to the queried audience. Information obtained in this way can be manipulated pedagogically and administratively via statistical analysis of the queried data to support programmatic goals of a course, a department or a campus wide initiative.

In actual use on this campus this technology has been shown to:

- Increase attendance (sometimes dramatically)
- Coax participation from normally non-participative students
- Create a more engaging lecture environment
- Computing and Communications has partnered with several academic departments to pilot the use of this technology. After three successful pilot programs, C&C has now equipped all UCR General Assignment classrooms with the hardware and software necessary to utilize this technology.

This technology is new and just now being adopted by instructors. It could become an excellent resource for capturing data for measurement of course objectives and program outcomes in the future.

Computing and Communications has taken a lead role in providing high-performance computing in support of the campus research enterprise. Three programs are under development:

1. A centrally managed, standardized/dedicated cluster of processors, in which researchers pay an annual fee for essentially unlimited use.
2. A collaborative computational cluster, in which each PI can buy a certain amount of hardware, which Computing and Communications with manage. The PI has priority access to the equipment that he or she acquired, plus access to the entire cluster as available.
3. A high-performance computer. The campus (Computer Science and Engineering Department) has a proposal pending now for a Cray system.
4. Departmentally maintained clusters, centrally managed.

Computing and Communications competes in the regular campus budget process for the funding of its permanent staff positions and its equipment purchases. It is also the principal recipient of Instructional Use of Computing funds, which are allocated to the campus annually by the UC Office of the President for the operation, support, and maintenance of computing resources. Although there may be quotas assigned, the campus community is not charged for the bulk of these computing services. Research programs supported by grants are assessed recharges for computing time and consultation services.

While all of the above services and facilities are available to the general campus community, the supported computing labs tend to be crowded and in heavy demand, limiting accessibility except for scheduled lab periods. The programs in engineering make prescribed use of only one of them – a 35-station PC Laboratory in Mathematics (Sproul Hall 2225) used for Matlab computing assignments within a linear algebra course required in the Computer Science program. While it continues to maintain a cooperative relationship with the campus C&C unit, the College provides all of its own computing resources, and is dependent upon C&C only for intra-campus and Internet network access.

Bourns College of Engineering

The computing facilities used by the Bourns College of Engineering are owned and managed by the College and its sub-units. Commodity PCs are now the machines of choice for most of the computing tasks, including instruction, office work and network service. The research laboratories have a variety of workstations (Sun, DEC, SGI) appropriate for their specialized requirements.

Systems administration for the College is handled primarily within its component units. Each department has at least one full-time professional systems administrator and several part-time student assistants. These groups collaborate closely to manage and coordinate their own facilities as well as the integrated computing facilities of the College, such as the networking infrastructure. The systems staff for Chemical/Environmental and Mechanical Engineering also has responsibility for the administrative computing facilities for the Dean's office and Student Affairs.

The Center for Research in Intelligent Systems (CRIS), one of the research units of the College of Engineering, promotes interdisciplinary research for developing computer systems that are flexible, adaptive, and intelligent. Its Visualization and Intelligent Systems Lab (VISLAB) computer facility employs one full time administrative assistant and one part-time system administrator.

The research unit CE-CERT (College of Engineering Center for Environmental Research and Technology) employs one full-time programmer/analyst and several part-time student assistants to perform computer system administration. Further, CE-CERT employs a full-time development engineer to assist staff and students with computer interfacing to analytical instruments and data acquisition hardware and software, in connection with laboratory experiments for some of the upper division engineering courses and student projects.

Program computing facilities:

The Department of Computer Science and Engineering maintains servers and teaching labs to support CS, CE, and EE courses, as well as a number of service course in the computing area.

Servers are primarily rack mount 1U servers with between 1 and 8 GB of RAM, and processors that range between 2.4-3.0 GHz Intel Xeons, to 2.0 GHz dual core Opterons. These servers are connected to UPS to provide clean power and provision for graceful shutdown in an emergency, and are monitored 24/7 for network availability and service provision. All of them are remotely accessible via protocols supported by their operating systems and are additionally manageable via remote console. These servers run a variety of operating systems and provide a range of services as noted below.

There are 3 additional storage servers: 1 FAS 250 Network Appliances Filer with 1 TB of disk space, used to store critical files, and two RAID units running with capacities of 6.4 and 4.0

TB respectively.

Servers running CentOS Linux provide web, email (IMAP and POP), FTP, SQL database, DNS, DHCP, authentication, printing, centralized system logging, rdate, and disk backup services. Quarterly backups are maintained offsite.

Servers running Windows Server 2003 provide domain services and remote login capability via terminal services for instructional purposes. Out of seven servers, two are domain controllers with mirrored root drives.

A 4-way 2.0 GHz Opteron Compute Server with 8 GB of RAM running CentOS Linux provides a complement of free Unix software utilities for software development, productivity, etc, as well as remote desktop services using the NX protocol. There are two secondary compute servers with roughly half the computational resources of the primary server.

Except for the Linux compute servers and public Windows 2003 terminal servers, only system administrators may log in to the other Windows and Linux servers. Any CS student or student taking a CS service course may login (over the network) to the compute servers, either via SSH, or using the NX protocol.

The Computer Science and Engineering Department has seven instructional labs. All but one (in EBU II, room 226) are reserved at least some portion of hours during the weekdays for scheduled labs associated with all lower and upper division Computer Science classes or service courses. All students taking CS courses have 24 hour, 7 day access to the CS computing labs. Each lab has 22 operational computers, plus spares, to accommodate classes of 21 at a time. Spares assure that every student has access to a working computer during classes. Broken computers are quickly repaired and returned to service. The oldest computers in these labs are approximately three years old.

Instructional labs are located in EBU II, rooms 127, 129, 132, 133, 135, 136, and 226. PCs in these labs run Linux as their local operating system and access Windows applications via Terminal Services. A full range of free software is provided under the Linux operating system, as well as proprietary software for specific courses such as Maya and Renderman for graphics courses and Xilinx, Cadence, and Synopsys software for embedded systems courses. Windows Terminal servers provide access to software such as Aldec Active HDL for embedded systems courses and Microsoft Visual Studio 2005 for programming courses. These labs are equipped with 24 PCs and an HP networked laser jet printer.

Other computing facilities:

The campus is "wired for wireless," enabling wireless connectivity from classrooms, commons areas, and libraries. In 2005, UCR was ranked 16th in Intel's "Most Unwired College Campuses" survey.

Additionally, UCR is part of the Southern California dark fiber Optical Network Initiative (ONI) for Internet2, one of only four UC campuses with this status (Santa Barbara, San Diego, and Davis are the others). The fully redundant dual "dark fiber" pathways to Internet2 provide

6 gigabits per second of connectivity. Previously, UCR's capacity was 310 megabits per second; hence, the dark fiber upgrade represents a 20-fold increase in capacity. The City of Riverside is building optical fiber infrastructure to help attract industry; this will enable UCR to collaborate with companies on projects that require significant computing power.

Other departments, interdisciplinary research laboratories, and individual faculty research laboratories have computing resources available to support student work. The major interdisciplinary research laboratories are the College of Engineering-Center for Environmental Research and Technology (CE-CERT), the Center for Research in Intelligent Systems (CRIS), the Center for Nanoscale Science and Engineering (CNSE), and the Center for Bioengineering. Student involvement in these laboratories is principally through paid work as research assistants on sponsored research projects, or through capstone senior design projects. As noted earlier, we encourage all students to have at least one on-campus or off-campus research experience as an undergraduate. Students' access to the computing and experimental resources of the labs is tied to their role in the projects.

We will not provide an exhaustive list of computing and experimental resources of the labs here. The major facilities at CE-CERT include systems for experimental and modeling analysis of atmospheric chemistry, fuel synthesis and composition, and emissions analysis. These experimental resources are connected with computing systems for data storage, data validation, and data analysis, including major resources for modeling of emissions and atmospheric chemistry. Major resources in CRIS include cameras for detecting and identifying individuals and activities indoors and outdoors, in support of a research agenda aimed at developing "smart" systems capable of recognizing individuals and anomalous behavior. Major CNSE resources include a clean room nanofabrication facility, advanced microcscopy resources, and advanced materials sythesis laboratories.

2. Describe the computing facilities planning, acquisition, and maintenance processes and their adequacy. Include discussion of these topics for university-wide computing facilities available to all students (if used by your majors), your own laboratories and equipment (if applicable), and facilities controlled by other departments and/or schools (if used by your majors).

Our students use departmental facilities. We charge a $20 course materials fee, which equips our instructional labs with desktop equipment. This is designed to be sufficient to replace that equipment every three years. In two years, we have replaced four of the six laboratories, an indication that the fee is set properly.

We get an annual equipment budget of roughly $40,000 to cover servers, software licenses, etc. When it is time to make a purchase we do a thorough technology survey looking for the sweet spot in the current pricing. We then negotiate the best deal we can.

We have been using Linux as our main operating system since 1993 and tend to prefer open-source software. However, we maintain full support for Windows via Windows Terminal Servers and by running Windows under VMware on Linux desktops.

5. *Discuss how you assess the adequacy of your laboratory and computing support.*

The department chair and systems administrator meet frequently with faculty, lecturers, teaching assistants, and students to discuss equipment (among other topics).

A professor (usually Dr. Payne, the department chair) meets with teaching assistants weekly, and facilities are one of the topics of discussion. The systems administrator for Computer Science and Engineering, Victor Hill, also attends this meeting. This enables the department to quickly address any problems or opportunities pertinent to equipment and facilities.

Mr. Hill also meets with student groups, such as ACM, to discuss computing systems and to assure that any upcoming needs can be addressed.

Students are asked about the adequacy of facilities on their senior exit survey, and appropriate actions are taken in response to their comments.

6. *Please attach any equipment replacement plans to this report.*

As noted above, equipment replacement is handled on an ongoing basis based on a 3-year turnover cycle.

The CS&E department operates on a budget of approximately $90,000 per fiscal year. This excludes salary and benefits for permanent employees (faculty, administrative and technical staff) and provisional academic personnel such as lecturers, teaching assistants and adjunct professors. In addition to this allocation, CS&E established lab fees in 2005, which provide roughly $25000 per quarter towards replacement of equipment in instructional labs. Additional funds are requested and justified to the Dean on an as needed basis.

Standard V-1. Each student must have adequate and reasonable access to the systems needed for each course.

B. Student Access

State the hours the various facilities are open. State whether students have access from dormitories or off campus by direct access, modem, etc., and describe this access quantitatively.

Students have 24/7 card access to the labs, and our main servers both Windows and Linux are Internet accessible. Dorm rooms are on the campus backbone, and there is citywide cable and DSL access to the Internet.

One near-term innovation will be NX access to the Linux servers. By running a free, easily installed NX server under Windows, OS X, or Linux students can remotely get the same look, feel, and access to data that they get from our lab machines.

Standard V-2. Documentation for hardware and software must be readily accessible to faculty and students.

C. Documentation

Describe documentation for hardware and software systems available to students and faculty in the computer science program. Explain how students and faculty have adequate and timely access to the documentation.

In addition to the standard online documentation (e.g., Help files, OEM materials) that is available everywhere, we have local wiki-based FAQs detailing the local facilities. These describe how students and faculty can access those facilities and use software that is commonly used in the program. These are available on-line. Our experience is that students use both our posted on-line documentation and web searches for the information they need.

CS&E Department staff provide periodic tutoring for students in the use of software systems.

Standard V-3. All faculty members must have access to adequate computing facilities for class preparation and for scholarly activities.

D. Faculty Access

Describe the computing facilities available to faculty for class preparation and for scholarly activities. Include specifics regarding resources in faculty offices.

New faculty get startup packages that allow them to purchase excellent facilities. Every four years, each UCR faculty member gets a $2000 to upgrade office computing facilities. The Department's tech staff will assist in the maintenance of a faculty member's equipment.

Standard V-4. There must be adequate support personnel to install and maintain the laboratories and computing facilities.

E. Support Personnel

1. *What support personnel are available to install, maintain, and manage departmental hardware, software, and networks?*

The Department's Tech Staff consists of two full-time employees plus part-time graduate student assistants.

2. *Describe any limitations due to this level of support?*

More staff is always desirable, but current staffing levels are adequate to cover present needs. The demands on the staff's time include instructional support and network-level support (e.g., virus protection) for the department. Each PI's research group generally handles its own research needs at the sub-network level. Computing and Communications provides campuswide connectivity and backbone services for networking and connectivity beyond the campus.

3. *Are any faculty members expected to provide hardware, network, or software support? If so, describe this expectation including how such expectations are addressed in evaluation, tenure, promotion, and merit pay decisions, and indicate what, if any, released time is awarded for this effort.*

No. However, it is expected that their graduate students will handle some of the administration chores for their research labs.

Standard V-5. Instructional assistance must be provided for the laboratories and computing facilities.

F. Instructional Assistance

Describe the nature and extent of instructional assistance available to students in the laboratories.

The Tech Staff maintain the machines in the instructional labs, present information that is useful to students using laboratory facilities at Departmental technical seminars, and both maintain and develop instructional software which is used in instructional labs, including modules for our Moodle installation, lab lockdowns for proctored tests, and software for electronic submission of assignments. (Moodle is an open-source alternative to Blackboard. We have customized Moodle extensively to help enforce our course protocols. Moodle is in place for 100% of our lower-division CS courses and a rising number of upper-division courses.)

Teaching assistants are assigned to supervise and serve as resources in the undergraduate laboratories. Every course has a 3-hour lab requirement, and a teaching assistant is available throughout that period to help with any problems or questions that arise.

VI. Institutional Support and Financial Resources

Intent: The institution's support for the program and the financial resources available to the program are sufficient to provide an environment in which the program can achieve its objectives. Support and resources are sufficient to provide assurance that an accredited program will retain its strength throughout the period of accreditation.

Standard VI-1. Support for faculty must be sufficient to enable the program to attract and retain high-quality faculty capable of supporting the program's objectives.

Standard VI-2. There must be sufficient support and financial resources to allow all faculty members to attend national technical meetings with sufficient frequency to maintain competence as teachers and scholars.

Standard VI-3. There must be support and recognition of scholarly activities.

A. Faculty Stability

1. Evidence of the long-term stability of a program is provided by its ability to both attract and retain high quality faculty. Describe how your program does this. Some topics the description might address are sabbatical and other leave programs, salaries, benefits, teaching loads, support for and recognition of scholarly activity (including financial support for attendance at professional meetings), departmental and institutional ambiance, etc.

UCR is very competitive with other research universities with regard to teaching loads, startup packages, sabbatical policies, salaries, benefits, and recognition of scholarly activity. There are central funds for attending meetings. There is a very collegial atmosphere within the Department of Computer Science and Engineering. We strive to keep it that way.

2. Give counts of the total number of faculty and the number of resignations, retirements, and new hires for each of the last five years. Indicate whether there are significant problems attracting and retaining faculty, and if so, the causes.

Year	Total Faculty*	Resignations	Retirements	New Hires
2000-2001	17	0	0	3
2001-2002	20	0	1	3
2002-2003	22	2	0	3
2003-2004	24	0	0	4
2004-2005	25	1	0	1

* The figures in this column will not necessarily agree with the previous year's total faculty minus separations plus new hires. This is because new hires are counted in the total faculty for the year in which they were hired, and separations are considered to take effect as of the next year.

1. Faculty Professional Activities

Summarize the professional activities of your faculty, attendance at meetings, university and professional honors won by individuals, etc. Just summarize here; details should appear in individual faculty vitas.

Faculty attend numerous top research conferences. As noted in the biographical sketches, many have been conference chairs or topic chairs at prestigious international conferences, symposia, and meetings. Three members of the faculty have won the College of Engineering Distinguished Teaching Award.

Examples of significant program activity include:

- Best Paper, International Conference on Communications, Toronto, Canada, 1986 (Molle)
- Outstanding Contribution Award, IEEE Computer Society, 1996; Fellow of IEEE; Fellow, World Innovation Foundation, Fellow of ACM (Bhuyan)
- The best paper award, 15th International Conf. on Genome Informatics (GIW), Yokohama, Japan, 12/2004 (Jiang)
- Best Paper Award, IEEE Transactions on VLSI, 2000 (Vahid)
- Best Paper Award, Design Automation and Test in Europe conference, 2000; Best Paper, Workshop on Compilers and Operating Systems for Low Poser (COLP), 2001; "Best Architecture Papers of the Year" selection, special issue of IEEE Trans. on Computers, 2005 (Vahid)
- Best Paper Award WUSS 97; Best Paper Award Runner-Up KDD 97; Best Paper Award SIGMOD 2001 (Keogh)
- Outstanding Contribution Award at the 1st Int. Conf. on Principles of Knowledge Representation and Reasoning (KR'89), Toronto, May 1989 (Przymusinski)
- Program Co-Chair, ACM SIGKDD 2006 (Gunopulos)
- Program Co-Chair in the 15th Int. Conf. on Scientific and Statistical Database Management '03; Program Vice-Chair in the 2005 IEEE International Conference on Data Mining (ICDM); Program Vice-Chair in the 2004 IEEE International Conference on Data Engineering (ICDE). (Gunopulos); Program Co-Chair in the 2000 ACM SIGMOD Workshop on Research Issues in Data Mining and Knowledge Discovery (DMKD), held in cooperation with SIGMOD'2000, Dallas Program Committee member in: ICML 02, SIGKDD 02, PODS 02, SDM 02, SIGMOD 01, ICML 01, SIGKDD 01, SDM 01, ICDE 00, DMKD 99, KDD 98, PODS 05, ICDE 04, SIGKDD 05, ICDE 05, PODS 05, PKDD 2006, CIKM 2006, SSTD 2007, SIGMOD 2007; Associate Editor in IEEE Transactions in Data and Knowledge Engineering, in ACM Transactions of Knowledge Discovery from Data, member of the Editorial Board in Elsevier Information Systems Journal. (Gunopulos)
- Program Committee co-Chair, "10th IEEE International Symposium on Object and component-oriented Real-time distributed Computing", Santorini, Greece, May 2007. (Kalogeraki)
- General co-Chair, "14th International Workshop on Parallel and Distributed Real-Time Systems (WPDRTS)", Rhodes, Greece, April 2006. (Kalogeraki)
- Program Committee Chair, "IEEE International Conference on Pervasive Services", Santorini, Greece, July 2005. (Kalogeraki)
- Program Committee co-Chair (with L. DiPippo), "13th International Workshop on Parallel and Distributed Real-Time Systems (WPDRTS)", Denver, Colorado, April 2005. (Kalogeraki)

- Technical Co-Chair for Workshop on Satellite Based Information Services (WOSBIS) 1999, held in association with GLOBECOM 1999 in Rio De Janeiro, Brazil. (Krishnamurthy)
- Program committee member for String Processing and Information Retrieval, SPIRE 2005 (Glasgow, UK); SIAM Conference on Data Mining, SDM'06 (Bethesda, MD); Asia Pacific Bioinformatics Conference, APBC 2006 (Taiwan); Workshop on Knowledge Discovery in the Web, WEBKDD 2005 (Chicago, IL); String Processing and Information Retrieval, SPIRE 2005 (Buenos Aires, Argentina); IEEE Int. Conference on Tools with Artificial Intelligence, ICTAI 2005 (Hong Kong); Symposium on Combinatorial Pattern Matching, CPM 2004 (Istanbul, Turkey); IEEE Symposium on Bioinformatics and Bioengineering, BIBE 2004 (Taichung, Taiwan) (Lonardi)
- Program Committees: ISSS/CODES (1999-2005), CASES (2003, 2004), HPCA (2003, 2007). (Najjar)
- Program Committee Member for ICML 2006, KDD 2006, UAI 2003, 2005, 2006 (Shelton)
- Vice Chair Embedded System Architecture track, The International Conference on
- Embedded And Ubiquitous Comput ing (EUC) Seoul, Korea in August 2006. (Yang)
- Program Committees: 2006 ACM-SIAM Symposium on Discrete Algorithms (SODA); 2004 Approximation Algorithms for Combinatorial Optimization Problems (APPROX); 2004 Randomization and Computation (RANDOM). (Young)
- 2005-2006, Program Committee Member, AAIM'06, Hong Kong, June 2006, and Program Committee Member, AAIM'07, Portland, June 2007. (Chrobak)
- General Chair, QEST 2006, Riverside, CA; ICATPN, June 1999, Williamsburg, VA. (Ciardo)

Standard VI-4. There must be office support consistent with the type of program, level of scholarly activity, and needs of the faculty members.

2. Office Support

Describe the level and adequacy of office support. The description should address secretarial support, office equipment, and the total group supported by this equipment and staff.

The tables below present information on the Bourns College of Engineering staffing and Computer Science & Engineering Department staffing. The following definitions are used. Note that the staffing levels per student are not entirely accurate for CS&E because faculty in this department also support the Computer Engineering course.

Administrative personnel:

- Dean and Associate Deans (Mark Matsumoto and Chinya Ravishankar counted as .50 FTE each)

Faculty:

- All faculty (excludes the Dean and Associate Deans' 50% appointments)

Other faculty excluding student assistants:

- Lecturers
- Adjunct Professors

- Professional Research Series (visiting and non-visiting titles)
- Postgraduates/Visiting Postdoctoral Researchers
- Junior Specialists
- Readers

Student teaching assistants:
- All graduate teaching assistants.

Student research assistants:
- All graduate research assistants.

Technicians/specialists:
- Development Engineers
- Programmer Analysts
- Staff Research Associates
- Laboratory Helpers and Assistants
- Physical Plant Superintendents

Office/clerical employees:
- Senior Analyst (Dean's Executive Assistant-E. Montoya)
- Assistant Analysts and Analysts
- Student Affairs Officers
- Computer Resource Spec. II
- Student Assistants I & II

Other:
- Assistant Deans
- Directors & Managers (Functional Area)
- Admin/Coord/Officer (Functional Area)
- Specialist (Functional Area)
- Deputy Director (CE-CERT)
- Management Service Officers (MSOs)
- Administrative Specialist (N. Jahr)
- Prin. & Senior Administrative Analysts
- Student Affairs Officers III & IV (Asst. Director & Director of MESA)
- Senior Writer

Bourns College of Engineering

	HEAD COUNT		FTE	RATIO TO FACULTY
	FT	PT		
Administrative	1	2	2.00	
Faculty (tenure-track)	65	4	66.60	
Other Faculty (excluding student Assistants)	29	30	40.98	
Student Teaching Assistants (Grad Only)	17	88	61.00	0.9159
Student Research Assistants (Grad Only)	9	141	79.50	1.1937
Technicians/Specialists	35	8	38.50	0.5781
Office/Clerical Employees	29	105	52.57	0.7893
Others	20	5	22.46	0.3372

Undergraduate Student Enrollment	1251	23	1,262.50	18.9565
Graduate Student Enrollment	300	23	311.50	4.6772

Computer Science and Engineering

	HEAD COUNT FT	HEAD COUNT PT	FTE	RATIO TO FACULTY
Administrative				
Faculty (tenure-track)	23	1	23.50	
Other Faculty (excluding student Assistants)	3	5	4.16	
Student Teaching Assistants	12	45	34.50	1.47
Student Research Assistants	3	44	25.00	1.06
Technicians/Specialists	2		2.00	0.09
Office/Clerical Employees	3	13	6.81	0.20
Others	1		1.00	0.04

Undergraduate Student Enrollment	316	14	323.00	13.74
Graduate Student Enrollment	133	6	136.00	5.79

Standard VI-5. Adequate time must be assigned for the administration of the program.

3. Time for Administration

Describe the adequacy of the time assigned for the administration of the program.

The Department Chair, ABET Coordinator, Associate Chair, and others who taken on significant service duties are provided with teaching release time to enable them to fulfill their duties. The table presented in response to Standard III-9 in this document identifies faculty who are receiving release time.

Standard VI-6. Upper levels of administration must provide the program with the resources and atmosphere to function effectively with the rest of the institution.

4. Adequacy of Resources

Describe the adequacy of the resources and the atmosphere provided by the upper administration for the program to function effectively with the rest of the institution.

We are fortunate to be designated a “growth campus” within the UC system. Enrollment, faculty, and facilities are expanding here. Nevertheless, resources are limited, and competition can be stiff.

The Department now occupies space in a new, 95,000-square-foot building (Engineering II). The campus plans to construct a Materials Science and Engineering Building in 2008, and long-range plans call for more engineering construction. This continued growth gives us little reason to worry about adequacy of physical facilities over the next several years.

Equipment budgets are generally adequate when Moore's law is taken into account (i.e., a dollar keeps being able to buy more computing power).

Staffing is more of a concern. The department's faculty size and student body are growing, but the staff has not. Additionally, as a matter of policy we are encouraging the hiring of faculty with joint appointments and/or affiliations with research centers, which can complicate some administrative matters. Full-time, dedicated staff are under continuous pressure, and we have seen some staff members depart to take higher-paying jobs in other departments. We rely heavily on work-study undergraduate workers for many administrative functions.

The dean has been relatively successful in bringing resources to the College, and we have an ongoing dialog with the dean about the division of responsibilities between the responsibility and the dean's office.

F. Leadership

Positive and constructive leadership at the college/school level and within the program's department are especially important to the program's quality. Evaluate this leadership and the interaction between these levels of administration.

Until recently CS&E reported to a Dean who was an excellent administrator and a distinguished computer scientist. As of September 2005, we have a new dean who is still learning his way around this campus and the UC system in general. His research field is materials science and engineering. We are expecting great things from him.

Standard VI-7. Resources must be provided to acquire and maintain laboratory facilities that meet the needs of the program.

G. Laboratory and Computing Resources

Briefly describe the resources available for the program to acquire and maintain laboratory facilities. Include information on how the institution determines the adequacy of these resources.

We have recently moved into a new building and have excellent space. We also have a reasonable equipment budget, for which we apply on a year-by-year basis by providing a rank-ordered list of proposed purchases, and additionally use course materials fees to keep instructional lab facilities up to date.

Standard VI-8. Resources must be provided to support library and related information retrieval facilities that meet the needs of the program.

H. Library Resources

Briefly describe the resources available for the support of the library and related information retrieval facilities. Include information on how the institution determines the adequacy of these resources.

UCR has a dedicated Engineering Librarian, Michele Potter. Ms. Potter has been in this role approximately 10 years. In consultation with the UCR Librarian, Ms. Potter agrees to a budget for acquisition of books and journals in electronic and paper formats. The adequacy of these resources overall has been good, although some years are more generous than others.

Ms. Potter consults frequently with faculty on acquisitions, particularly periodicals. If she determines that a resource such as a journal is used very lightly or not at all, she will contact the faculty member who originally requested the subscription before canceling it.

The Science Library is eight years old and has excellent capacity for storage of books and periodicals in paper format, as well as excellent resources for interlibrary loan and on-line access to materials. These are discussed under Criterion VII, Institutional Facilities, in greater detail.

Standard VI-9. There must be evidence that the institutional support and financial resources will remain in place throughout the period of accreditation.

I. Continuity of Institutional Support

Discuss and show evidence of continuity of institutional support for the program in the past, and problems that have existed or are anticipated in this area, if any.

Budgeting for the UC system, the campus, and the College are based on projections of enrollment and other factors looking forward at least five years. Actual budgets fluctuate based on the state budget and actual enrollment vs. projections. Overall, however, the process is designed to provide reasonable continuity of funding and to assure that the instructional budget, in particular, is protected so we can meet our obligations to the students.

VII. Institutional Facilities

Intent: Institutional facilities, including the library, other electronic information retrieval systems, computer networks, classrooms, and offices, are adequate to support the objectives of the program.

Standard VII-1. The library that serves the computer science program must be adequately staffed with professional librarians and support personnel.

5. A. Library

1. Library Staffing.

Assess the staffing of the library (or libraries) that serves the computer science program. Is the number of professional librarians and support personnel adequate to support the program?

Supply documentation if possible.

Quite adequate. The Science Library has a professional staff of 7 librarians, all of whom provide reference assistance to engineering students, faculty and staff. Of these librarians, one has subject responsibility for engineering and can help students, faculty and staff with more in depth questions. The Engineering Librarian also conducts tutorials and classes on engineering information topics, and maintains Web pages and path-finders to assist engineering students, faculty and staff in finding the information they need.

The Science Library offers a full range of reference services, including walk-up, telephone, and electronic mail reference services as well as reference by appointment. The Science Library reference desk is staffed 60 hours per week when school is in session and 40 hours per week during inter-session periods. In addition to these standard services, engineering students can get additional reference help from the Engineering Librarian. The Engineering Librarian is available for extended consultation on Senior Design or other research projects. Phone and in-person services are available 9 a.m.-8 p.m. Monday-Thursday, 9 a.m.-5 p.m. on Friday and 1 p.m.-5 p.m. on Saturday and Sunday. A chat reference consortium with the other UC libraries, currently being piloted, has the potential to extend the reference hours to 9 p.m. nightly.

Incoming freshman typically get a library orientation session in their introductory classes. They might also have additional information literacy instruction in classes that require outside research, such as senior design classes. One-on-one or group tutorials are available for any research topic that might be desired and helpful.

Standard VII-2. The library's technical collection must include up-to-date textbooks, reference works, and publications of professional and research organizations such as the ACM and the IEEE Computer Society.

2. Library Technical Collection

Assess the adequacy of the library's technical collection and of the budget for subscriptions, as well as new acquisitions. The library must contain up-to-date textbooks, reference works, and publications of professional and research organizations, such as the ACM and the IEEE Computer Society. It should also contain representative trade journals. Supply documentation, if possible. Assess the process by which faculty may request the library to order books or subscriptions.

Books and Journals

Engineering books are acquired as part of the Science Library's approval plan, ordered from catalogs or suggested by students, faculty and staff. Recently, the library has begun to purchase e-books for engineering and currently maintains a collection of more than 500 electronic books. The library currently subscribes to 121 engineering journals in print, and UCR students have access to more than 1,800 journals online. UCR has access, for example, to all of the journals and proceedings of both IEEE and ACM. Faculty, staff and students may suggest new monographs, journals or other media to be purchased by the library.

Journal Databases Available to Students

UC Riverside students have access to a number of journal databases to assist them in their research in engineering and in other areas of study. The California Digital Library has licensed, across all of the UC schools, INSPEC, Compendex and the Web of Science as well as SciFinder Scholar for chemistry and chemical engineering and Biosis or MEDLINE for biotechnological literature. UCR also licenses Water Resources Abstracts locally.

Other Collections

The Science Library maintains a collection of videotapes applicable engineering in the Media Library. The Media Library has viewing stations and viewing rooms and will check video materials out to instructors to use in their classes.

Standard VII-3. Systems for locating and obtaining electronic information must be available.

3. Library Electronic Access

Assess the library's systems for locating and obtaining electronic information.

The library's own catalog, the California State Library, and our resources for researching journal articles and similar resources all are available on-line. Access is available from any computer connected to the UCR network, including those logged in from remote locations. The home pages for the Science Library's Engineering and Computer Science resources are presented below; to view them on-line, visit http://library.ucr.edu/engineering.

UCR LIBRARIES

About the Libraries ▼ Services ▼ Help ▼ Find ▼ Contact Us ▼ Site Index ▼

Home » Help » Subjectguides » Engineering [Print View]

Connect from Home
Instructions

Books & Journals

Scotty Catalog (UCR)
View your Scotty Record
Renew Materials
Create/Change Library PIN

Melvyl Catalog (All UC Libraries)
E-Journals & E-Books

Finding Articles

Databases by Subject
Databases A-Z

Course Reserves

E-Reserves (Library)
iLearn (Blackboard)

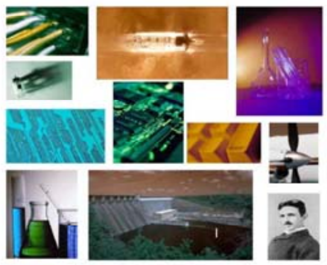
Internet Sites

INFOMINE
(Scholarly Internet Resources)

Ask a Librarian
Click for help

Engineering Information

New Books	Research Databases	Web of Science + cite searching	Compendex/Engineering Village (Guide) Inspec (Guide)	Journals/ E-journals



Search Tools for Engineering

Compendex (Engineering Articles)
Search

- Engineering Resource Pages (lots of info)
- EngNetBase -many CRC titles online.
- Kirk-Othmer / Ullmann's
- EE Senior Project Archive

- O'Reilly Safari
- Computer Science Page
- Library Flash Introduction
- Interlibrary Loans (Get stuff from other libraries)
  - illsci@ucr.edu
    name, dept, status, email

Subject Specialist - Michele Potter

Last modified: 11/5/2005 2:01 PM by M. Potter

UCR Library Website Page 1 of 2

UCR LIBRARIES

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Home » Help » Subjectguides » Compsci » Index.html [Print View]

Computer Science Information

New Books	Research Databases	Web of Science Who has cited who?	Inspec	Journals/ E-journals

Connect from Home
Instructions

Books & Journals

Scotty Catalog (UCR)
View your Scotty Record
Renew Materials
Create/Change Library PIN

Melvyl Catalog (All UC Libraries)
E-Journals & E-Books

Finding Articles

Databases by Subject
Databases A-Z

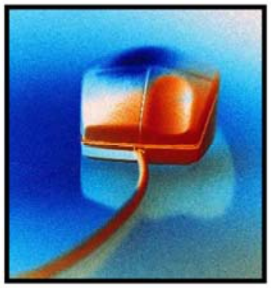
Course Reserves

E-Reserves (Library)
iLearn (Blackboard)

Internet Sites

INFOMINE
(Scholarly Internet Resources)

Ask a Librarian
Click for help



- Computer Science INFOMINE Resources

  Enter Infomine Query: [ ] Search

- Engineering Resource Pages (lots of info)
- EngNetBase -many CRC titles online.
- O'Reilly Safari
- ACM Digital Library - All Journals and Proceedings
- IEEE - All Journals and Proceedings

Subject Specialist - Michele Potter

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http://library.ucr.edu/?view=help/subjectguides/compsci/index.html 5/25/2006

Standard VII-4. Classrooms must be adequately equipped for the courses taught.

E. Classroom Equipment

Describe the equipment typically available in classrooms where you teach your courses. Assess its adequacy for the purpose.

Computing and Communications, in conjunction with the UCR Office of Instructional Development, operates media and technology in the classrooms at UCR. All UCR classrooms are designed to Fundamental Classroom Standards established by the Classroom Technology Advisory Group. These standards are:

- Classrooms must contain the capability to present materials from a wide variety of sources, including (at a minimum) VHS video, DVD, a personal computer, and the Internet.
- Classrooms must contain a chalkboard or whiteboard that is available and viewable at the same time digital or analog presentations are underway.
- Classrooms must contain a combination of LCD projectors and/or lighting controls that

allow students to take notes and view presentation material at the same time.

- Classrooms must be "self service" thus allowing instruction to occur without the aid of student operators and without the delivery of equipment.
- Based on the academic discipline, sound systems and data projection resolution requirements may drive certain classroom minimum standards.

Every classroom on campus has a 3000-lumen video projector connected to a PC that is on the campus backbone. In addition each classroom is equipped with clicker-based audience-response capabilities.

Additional information about classroom resources and connectivity is presented under Criterion V.

Standard VII-5. Faculty offices must be adequate to enable faculty members to meet their responsibilities to students and for their professional needs.

F. Faculty Offices

Discuss and assess the adequacy of faculty offices.

Every professor has a private office of approximately 150 square feet in Engineering Building II. All offices have at least a desk, one or two chairs for visitors, and a white board. Every floor of Engineering II with offices also has conference rooms for faculty to meet with one another or with groups of students when an individual office is insufficient. Additionally, some lobby and common areas have white boards and tables for impromptu discussions or brainstorming sessions.

Some lecturers are assigned two to an office. This is not because of space constraints, but because they work together as a team and prefer to have this degree of access to each other.

Appendix I. Information Relative to the Entire Institution

A. General Information

Institution	**University of California, Riverside**
Department	**Department of Computer Science and Engineering**
Street	**900 University Avenue**
City	**Riverside**
State	**CA**
Zip	**92521**
URL	**www.ucr.edu**

Name and Title of Chief Executive Officer of Campus (President, Chancellor, etc.)

France A. Córdova	Chancellor
(Name)	(Title)

B. Type of Control

Private, non-profit	
Private, other	
Federal	
State	x
Municipal	
Other (specify)	
Affiliation, if private	

Check more than one, if necessary. If the above classifications do not properly apply to the institution, please describe its type of control.

UC is state funded but is a separate corporation run by a governor-appointed board of regents.

C. Regional or Institutional Accreditation

Name the organizations by which the institution is now accredited, give dates of most recent accreditation. Attach a copy of the most recent accreditation action by any organization accrediting the institution or any of its computer-related programs.

	Initial	Recent
American Chemical Society	1959	2004
Association of American Medical Colleges and American Medical Association	1977	2005
Commission on Teacher Credentialing	1959	1996 (next is expected in 2007-08)
Western Association of Schools and Colleges	1956	In progress through 2009
Graduate School of Education School Psychology Program	2004	2004
Graduate School of Management by AACSB International	2003	2003

D. Enrollment

Total enrollment for the entire institution (FTE)	14,351.7
Total faculty for the entire institution (FTE)	609 tenure-track, 189 other (excluding teaching assistants)

6. E. Funding Process

Describe the process for allocating institutional funds to the computer science program.

The University of California, Riverside has a multi-step budget development process. The major steps in the annual process are:

February: Campus Budget Call Letter is distributed and meetings held with academic units to discuss faculty renewal models
March: Comprehensive Planning Documents are submitted to the Executive Vice Chancellor
April: Individual unit hearings with senior UCR management
May: Input and feedback from Faculty Senate Committee on Planning and Budget to EVC
June: Final unit budgets announced

In response to the February Budget Call Letter, the Dean's Office in the Bourns College of Engineering requests budget proposals from each academic department in the College. These proposals include undergraduate and graduate student projections, course load information, staffing requirements and needs for additional supply, travel and miscellaneous expenses. Any additional resources requested are presented in the context of departmental Five-Year Plans. In this way, departments demonstrate their progress in attaining Five-Year goals and request the resources required for the next year to maintain that progress. In most cases, departmental current year (Permanent) budgets are the starting points for the next fiscal year's budgets. UC Permanent Budget resources do not have expiration dates and are used to fund long-term commitments from the University. In addition to Permanent funds, departments can request Temporary funds from the Dean's Office either during the budget proposal cycle or during the fiscal year for exceptional (one-time) expenses. The Dean's Office evaluates annual departmental funding requests and submits a combined budget proposal from the College in late March to the EVC's Office. After the final College budget is announced in June, any additional resources approved are allocated to the departments beginning the start of the fiscal year, July 1st. Temporary funding requests approved during the fiscal year are allocated at the time of approval or are reimbursed to departments after expenses are incurred. Each department is responsible for monitoring its expenses and projected ending balances during the fiscal year.

7. Promotion and Faculty Tenure

Summarize the promotion and tenure system and the system for merit salary adjustments. (Give an overview of actual practice; do not reproduce an entire section from the faculty handbook.)

Assistant professors are reviewed every two years for merit raise, associate and full professors every three. There is a uniform system-wide salary scale, but nearly all computer scientists have an off-scale increment that was part of their sign-up package. Assistant professors and only assistant professors are untenured.

Appendix II. General Information on the Unit Responsible for the Computer Science Program

If you are having more than one program evaluated, particularly if the programs are on separate campuses, the answers to these questions may vary from one program to another. If this is the case, please use separate copies of this section for each program, and clearly delineate which program is being described.

A. Computer Science Program Unit

Name	Department of Computer Science and Engineering
URL	www.cs.ucr.edu

If the computer science program unit is not a department reporting to an administrative officer (e.g., Dean of College of Arts and Sciences) who in turn reports to president, provost, or equivalent executive officer, describe the unit.

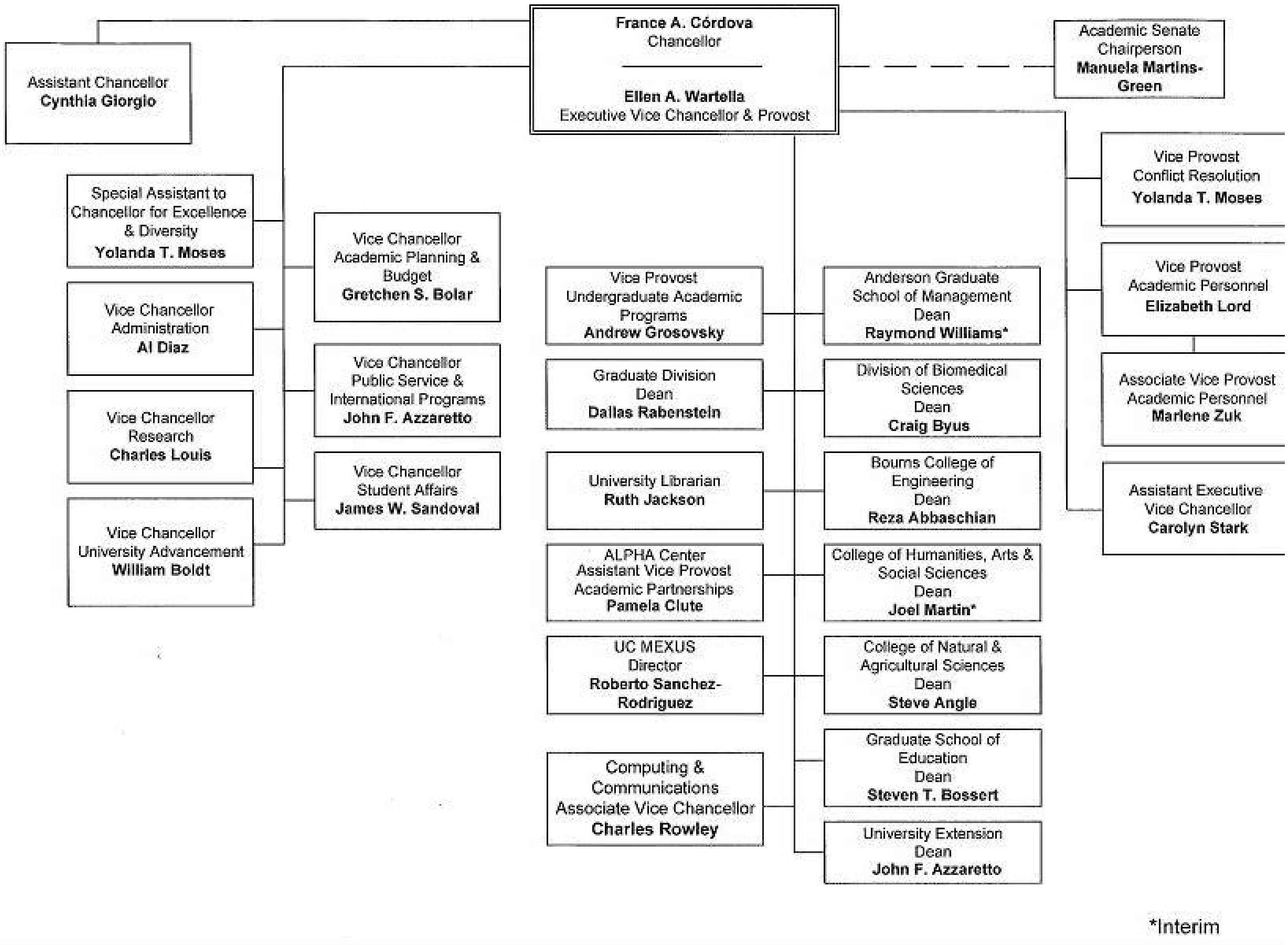
CS&E reports to the Dean of Engineering

B. Administrative Head of Computer Science Program Unit

Thomas Payne	Associate Professor and Chair
(Name)	(Title)

C. Organization Chart

Attach an organization chart showing how the unit fits into the administrative structure of the institution.



France A. Córdova
Chancellor
Ellen A. Wartella
Executive Vice Chancellor & Provost
Academic Senate Chairperson Manuela Martins-Green
Assistant Chancellor Cynthia Giorgio
Special Assistant to Chancellor for Excellence & Diversity Yolanda T. Moses
Vice Chancellor Administration Al Diaz
Vice Chancellor Research Charles Louis
Vice Chancellor University Advancement William Boldt
Vice Chancellor Academic Planning & Budget Gretchen S. Bolar
Vice Chancellor Public Service & International Programs John F. Azzaretto
Vice Chancellor Student Affairs James W. Sandoval
Vice Provost Undergraduate Academic Programs Andrew Grosovsky
Graduate Division Dean Dallas Rabenstein
University Librarian Ruth Jackson
ALPHA Center Assistant Vice Provost Academic Partnerships Pamela Clute
UC MEXUS Director Roberto Sanchez-Rodriguez
Computing & Communications Associate Vice Chancellor Charles Rowley
Anderson Graduate School of Management Dean Raymond Williams*
Division of Biomedical Sciences Dean Craig Byus
Bourns College of Engineering Dean Reza Abbaschian
College of Humanities, Arts & Social Sciences Dean Joel Martin*
College of Natural & Agricultural Sciences Dean Steve Angle
Graduate School of Education Dean Steven T. Bossert
University Extension Dean John F. Azzaretto
Vice Provost Conflict Resolution Yolanda T. Moses
Vice Provost Academic Personnel Elizabeth Lord
Associate Vice Provost Academic Personnel Marlene Zuk
Assistant Executive Vice Chancellor Carolyn Stark
*Interim

D. Computer-Related Undergraduate Degree Programs

List all undergraduate computer-related degree programs offered by the institution, beginning with the program(s) being evaluated.

Program Title	Years Required	Degree Awarded	Administrative Unit	If accredited, by whom
Computer Sciences	4	BS	CS&E	
Computer Engineering	4	BS	CS&E and EE	ABET
Information Systems	4	BS	CS&E	

Are these programs adequately differentiated in all university information? Explain how.

Yes. In the CS&E entry in UCR's General Catalog and on the CS&E web page, descriptions of the three programs are presented in sequence.

Appendix III. Finances

A. Finances Related to the Computer Science Program(s)

For the computer science program, indicate below the funds expended during the fiscal year immediately preceding the visit [1].

	Institutional Funds	Non-recurring or Outside Funds
Administrative Salaries	$ -0-	$ -0-
Faculty Salaries	$1,771,282	$ -0-
Non-teaching Professionals' Salaries[2]	$ 383,244	$ 126,386
Support Personnel Salaries & Wages		
Secretarial (Clerical)	$ 179,089	$ 26,915
Technician	$ 119,686	$ 10,514
Other (specify)	$ 64,938	$ -0-
Graduate Students	$ 529,194	$ 363,744
Operating Expenditures (Excluding research operations and travel)	$ 903,008	$ 256,812
Capital Equipment Expenditure: (BC60) (Including value of allocated time for teaching and research):		
Teaching	$ 11,938	$ 9,763
Research		
Computer Expenditures: (total, including value of allocated computer time for teaching and research)		
Hardware	$ 43,089	$ 172,569
Software	$ 6,604	$ 5,582
Allocated time	*	*
Travel Expenditures (non-research funds)	$ 11,623	$ 96,398
Scholarship Awards (if administered by the Computer Science Program Unit)	$ -0-	$ -0-
Library (if administered by Computer Science Program Unit)	$ -0-	$ -0-
Research (if separately budgeted)		$1,429,003
Other (specify)		
Total	$4,023,697	$2,497,687

* Allocated time included in above expenditures.

[1] It is understood that some of the data may have to be estimated to cover the entire fiscal year. In such case, unless the differences are insignificant, an updated report should be provided for the evaluation team at the time of the visit.

[2] Non-teaching professionals would include research professors, faculty members on paid sabbatical leave, post-doctoral research associates, and other degreed professionals.

B. Operating and Computing Expenditures for the Five Fiscal Years Immediately Preceding that Reported in III A

1. Operating expenses for the computer science program unit.

Fiscal Year	2003	2004	2005	2006	2007
Institutional Funds	$3,878,119	$4,020,700	$4,039,349	$4,023,697	
Outside Funds	$2,074,983	$2,922,762	$2,875,675	$2,497,687	

Note: Outside Funds includes non-recurring and research expenses.

2. Computer hardware/software capital expenditures (excluding equipment used primarily for research) for the computer science program unit.

Fiscal Year	2003	2004	2005	2006	2007
Institutional Funds	$43,432	$63,673	$66,722	$61,631	
Outside Funds	$161,392	$145,798	$117,361	$150,028	

Note: Including budget categories 46 & 60 for computer/software & equipment.

C. Additional Funding

If additional funds, other than those listed in Table A above, are available to faculty to support scholarly activities such as travel to technical meetings, e.g., consulting support, give the number of faculty for whom this type of support is appropriate and an estimate of the amount of support available.

Not applicable.

Appendix IV. Computer Science Program Personnel and Policies Towards Consulting, Professional Development, and Recruiting

A. Term of Appointment of Administrative Head

9 month______ 12 Month yes_____ Other (specify) ________________

B. Number of Personnel Associated with Program

	Full-time Number	Part Time Number	Part Time FTE	Total FTE
Faculty	26	4		
Non-teaching Professionals	5			
Administrative				
Computer Lab Personnel:				
Professionals	2			
Technicians				
Secretarial, Accounting, etc.	1			
Graduate Teaching Assistants				
Graduate Research Assistants				
Graduate Students				
Undergraduate Students				

C. Policies

Provide a brief description to give an overview.

1. *Describe policy toward private consulting work, sponsored research projects, and extra compensation.*

The University allows one day per week of private consulting. Sponsored research is the life blood of our graduate program and bringing in such funding is most strongly encouraged in the College of Engineering. Faculty can not directly increase their salary through such funding, but they can get up to three months of summer salary, and such funding is favorably reflected in their merits/promotions and off-scale increments.

2. *State the standard teaching, administrative, research, and other loads on the faculty, in general terms.*

The nominal distribution of effort is 40% teaching, 40% research, 20% professional and university service. The nominal teaching load is three courses per year for assistant professors up to the year they go up for promotion, and four courses per year for associate and full professors – efforts are underway to reduce that to three. There is a buyout option by which faculty can spend research money to be relieved of a course. There is also course relief for assuming certain service duties, e.g., the department chairmanship, the graduate advisor, etc.

3. *Describe policies and procedures for recruiting faculty for the computer science program. Describe any barriers to hiring the appropriate faculty.*

The Department tries to recruit the best faculty it can, and gets excellent support from the University. The policies change a bit from year to year, but the Department has a recruitment committee which reviews applications proposes interviewees to the faculty and the administration, arranges interviews, and proposes whom to make offers to. Those are proposed first to the department's faculty, and if the faculty support that offer, the chair proposes the offer up the line via the Dean.

Appendix V. Computer Science Program Enrollment and Degree Data

If you are having more than one program evaluated, particularly if the programs are on separate campuses, the answers to these questions may vary from one program to another. If this is the case, please use separate copies of this section for each program, and clearly delineate which program is being described.

Give below enrollment figures for the first term of the current and five previous academic years and the number of undergraduate and graduate degrees conferred. (The current year is the year in which this report is being prepared.) List data beginning with the most recent year first. If part-time students are involved, give the number as FTE/actual number, e.g., 10/40.

Institution as a Whole

Year	AY	FT/ PT	Enrollment Year					Total UG	Total Grad	Degrees Conferred*			
			1st	2nd	3rd	4th	5th			BS	MS	PhD	Other
Current	2005	FT	4202	3220	3831	3318		14571	2002	3080	393	159	
		PT											
1	2004	FT	4806	3452	3459	3372		15089	1964	2894	360	141	
		PT											
2	2003	FT	5247	3150	3572	3311		15280	1965	2513	310	121	
		PT											
3	2002	FT	4940	2988	3221	2975		14124	1758	2245	285	116	
		PT											
4	2001	FT	4693	2516	2876	2629		12714	1662	1971	229	94	
		PT											
5	2000	FT	4261	2281	2605	2289		11436	1579	1786	217	115	
	**	PT											

Bourns College of Engineering

Year	AY	FT/ PT	Enrollment Year					Total UG	Total Grad	Degrees Conferred*			
			1st	2nd	3rd	4th	5th			BS	MS	PhD	Other
Current	2005	FT	423	237	264	348	2	1274	291	243	108	36	
		PT											
1	2004	FT	547	300	259	411		1517	302	239	27	6	
		PT											
2	2003	FT	512	354	333	455		1654	270	237	19	4	
		PT											
3	2002	FT	594	384	320	451		1749	208	182	20	0	
		PT											
4	2001	FT	666	282	275	393		1616	179	124	16	1	
		PT											
5	2000	FT	529	199	256	287		1272	144	84	7	1	
	**	PT											

Unit offering Computer Science Program(s)—give total enrollment even if not all students are in the program for which accreditation is requested.

Year	AY	FT/PT	Enrollment Year					Total UG	Total Grad	Degrees Conferred			
			1st	2nd	3rd	4th	5th			BS	MS	PhD	Other
Current	2005	FT	61	60	40	119	2	282	124	80	25	8	
		PT											
1	2004	FT	76	69	88	165		398	141	138	22	3	
		PT											
2	2003	FT	122	128	147	240		637	131	115	13	4	
		PT											
3	2002	FT	196	155	181	279		811	103	112	16	0	
		PT											
4	2001	FT	239	155	195	251		840	88	71	15	1	
		PT											
5	2000	FT	227	125	167	176		695	79	44	7	1	
		PT											

If the unit offering the Computer Science Program(s) offers more than one degree, please complete an additional table for each program for which accreditation is requested:

Program	Computer Engineering

Year	AY	FT/PT	Enrollment Year					Total UG	Total Grad	Degrees Conferred			
			1st	2nd	3rd	4th	5th			BS	MS	PhD	Other
Current	2005	FT	66	20	44	32		162		24			
		PT											
1	2004	FT	79	48	31	48		206		20			
		PT											
2	2003	FT	72	62	45	45		224		9			
		PT											
3	2002	FT	95	72	32	25		224		6			
		PT											
4	2001	FT	107	39	19	15		180		3			
		PT											
5	2000	FT	79	14	10	14		117		2			
		PT											

Appendix VI. Admission Requirements

A. Admission of Students

1. Describe the criteria and procedures used for admitting students to the computer science program(s).

UCR seeks to recruit and retain an academically strong student body that has demonstrated the rigorous preparation needed for admission to a major research institution and reflects the diversity of our state and region. Admission to UCR requires (1) satisfaction of the University of California minimum admission requirements and (2) selection by UCR according to the principles of Comprehensive Review, as determined by the UCR faculty.

Meeting UC minimum admission requirements will not guarantee admission to UCR. Applicants who seek to increase their likelihood for admission should strive for achievement well beyond UC minimum requirements. Final determination of admission will be made within the context of campus enrollment goals.

There are three paths to satisfying the university's minimum admission requirements for freshman students: Eligibility in the Statewide Context, Eligibility in the Local Context, and Eligibility by Examination Alone.

1. Eligibility in Statewide Context
This is the path by which most students attain UC eligibility. To be eligible in the statewide context, students must satisfy the subject, scholarship, and examination requirements described below.

Subject Requirement Students must complete or have validated 15 units of high school courses to fulfill the subject requirement. At least 7 of those 15 units must be taken or validated in the last two years of high school. (A unit is equal to an academic year or two semesters of study.) This sequence of courses, called the "a-g" Subject Requirement, is as follows:

A. History/Social Sciences....................2 years
B. English....................4 years
C. Mathematics .... 3 years required, 4 years recommended
D. Laboratory Science.................... 2 years required, 3 years recommended
E. Language other than English .... 2 years required, 3 years recommended
F. Visual and Performing Arts .... 1 year
G. College Preparatory Electives .... 1 year

The University will accept only those "a-g" courses that appear on the official UC Certified Course List for the California high school the student attended. The UC-certified course list is available at www.ucop.edu/doorways/list.

Scholarship Requirement The Scholarship Requirement defines the grade point average (GPA) students must attain in the "a-g" subjects and the scores from the SAT Reasoning Test (or ACT Assessment plus Writing) and SAT Subject Tests that must be earned to be eligible for admission to the university. Students qualifying for admission in the statewide context must present an “a-g” GPA and test score total that meets the criteria on the Eligibility Index in this section.

Honors Courses The university assigns extra points for up to four yearlong university-certified honors level, Advanced Placement, and/or UC-designated International Baccalaureate courses taken in grades 10, 11, and 12: A=5 points, B=4 points, C=3 points. College-level courses in the “a-g” college preparatory subjects that are transferable to the university are also assigned honors grade points. A maximum of two yearlong courses taken in grade 10 are assigned honors points. Grades of D are not assigned extra honors points. (Extra points will be awarded to 10th graders only when they take honors courses that have been certified by the university as honors-level courses.) Acceptable honors-level courses include Advanced Placement courses, specific Standard Level and all Higher Level International Baccalaureate courses, and college courses that are transferable to the university.

Examination Requirement Students must submit the following test scores taken no later than December of the senior year:

- Either the SAT Reasoning Test or the ACT Assessment plus Writing. The critical reading, mathematics, and writing scores on the SAT Reasoning Test must be from the same sitting. Students must report each test score from the ACT Assessment plus Writing and the composite score.
- Two SAT Subject Tests in two different areas: history/social studies, English (literature only), mathematics (Level 2 only), science, or languages.

2. Eligibility in the Local Context
Under the Eligibility in the Local Context (ELC) path, the top 4% of students at each participating California high school are designated UC eligible and guaranteed admission to one of UC's nine general campuses, though not necessarily at their first-choice campus.

To be considered for ELC, a student must complete 11 specific units of the subject requirement by the end of the junior year. The 11 units include 1 unit of history/social science, 3 units of English, 3 units of mathematics, 1 unit of laboratory science, 1 unit of language other than English, and 2 units chosen from among the other subject requirements. With the assistance of each participating high school, the university will identify the top four percent of students on the basis of GPA in the required course work.

The university notifies ELC students of their status at the beginning of their senior year. A student designated UC eligible through ELC must submit the UC undergraduate application during the November filing period and complete remaining eligibility requirements by appropriate deadlines — including the subject and examination requirements — to be considered fully eligible.

3. Eligibility by Examination Alone
To qualify for Eligibility by Examination, students must satisfy the same examination requirement as students who are eligible in the statewide context. That is, students must complete the ACT Assessment plus Writing or the SAT Reasoning Test, and two SAT Subject Tests. Students must achieve a test score total, calculated according to the UC Eligibility Index, of at least 3450 (nonresidents must present a total of 3550 or higher). Additionally, students

who take the SAT Reasoning Test must score at least 580 on each of its three components; students who take the ACT Assessment plus Writing must score at least 25 in mathematics, science, reading and english/writing. All students qualifying by this path must score at least 580 on each of their two SAT Subject Tests.

Students may not qualify for Eligibility by Examination if they have completed a transferable college course in any academic subject covered by the SAT Subject Tests. An applicant who is currently attending high school may qualify for admission to the university by examination alone without completing a high school program.

High School Proficiency Examination If a student does not have a high school diploma, the university will accept the Certificate of Proficiency awarded by the State Board of Education upon successful completion of the California High School Proficiency Examination. The university also will accept proficiency examinations from other states, or the General Education Development (GED) Certificate, in place of a diploma. However, a student must still meet the subject, scholarship and examination requirements.

Nonresidents of California

Two paths to UC eligibility exist for nonresidents at the freshman level. The first is the same as described under Eligibility in the Statewide Context and the second is the same as described under Eligibility by Examination Alone, with the following exception:

Scholarship Requirement Students whose GPA is 3.40 or above satisfy the minimum scholarship requirement if they achieve the test score total indicated in the Eligibility Index under Nonresidents.

In addition to the general UC admissions requirements, the Bourns College of Engineering includes the following criteria:

Algebra..2 years
Plane Geometry... 1 year
Trogonometry (often contained in Precalculus or Algebra II, strongly suggested)............1-2 years
Chemistry or Physics, with laboratory (preferably both).. 1 year

2. Describe procedures, including the evaluation of transfer credits, for students admitted to the program as transfer students.

a. From within the institution

Students who wish to change majors into CS within UCR must have a 2.5 GPA in CS 10, CS 12, and Math 9A, and in addition must be able to finish their degree within 216 total units and may not have a grade lower than C- for any course required by the major.

b. From another institution

General Requirements for All Transfer Admits:

- A cumulative GPA of at least 2.80.
- A GPA of 2.5 or more in a minimum of 2 sequences, excluding English Composition, such as Math 9A, 9B, 9C, or Phys 40A, 40B, 40C.
- Completion of the following course sequences prior to enrollment:
  - One year of college level English Composition (English 1A, 1B, 1C)
  - One year of single variable calculus (Math 9A, 9B, 9C)

Additional Requirements for Computer Science Majors:

The following course(s) *must* be completed prior to enrollment:

- one course in computer programming (CS 10)
- one course in object oriented programming (CS 12)
- one course in calculus based physics with lab (Phys 40A)

A minimum of THREE (3) additional approved courses from the list below:

- two courses in calculus based physics with labs (Phys 40B, 40C)
- one course in data structures (CS 14)
- one course in machine organization and assembly language programming (CS 61)
- one course in introduction to discrete structures (CS/Math 11)
- one course in calculus of several variables I (Math 10A)

3. Explain the policy of the institution in admitting students with conditions and state how the conditions must be made up.

We do not admit students with conditions. There are provisions given to some students at the time of application (for instance must complete CS 61 prior to enrollment) and if the student does not meet the provisions admission is rescinded.

4. Describe the general policy and methods of the unit offering computer science program(s) in regard to admission with advanced standing.

The same policies would apply as for a student transferring in from outside the University or within the University.

5. Describe any special admission requirements for entry into the "upper division" in the computer science program(s).

Not applicable.