BACKGROUND INFORMATION

A. Contact Information

Peter Reiher has primary responsibility for this report and is the point of contact for the department.

Name: Prof. Peter Reiher
Mailing Address: 399 Engineering VI
                  UCLA
                  405 Hilgard Ave.
                  Los Angeles, CA 90095
Telephone: (310) 825-8332
Fax: (310) 794-5056
Email: reiher@cs.ucla.edu

B. Program History

The Computer Science Department was created in 1969 and the Bachelor of Science in Computer Science and Engineering was established in 1982. The last general review of the program was in 2012.

The Computer Science Department has made several changes in the requirements for its degree in Computer Science and Engineering (CS&E) since the last ABET general review in 2012. First, students have been given more flexibility in which Computer Science upper division electives they may take to obtain their degree. The widening scope of the field motivates students interested in its particular aspects (such as bioinformatics, machine learning, or Internet commerce) to choose electives particular to their needs. These changes were introduced in 2017.

Second, the department dropped the requirement for students to take an undergraduate course in chemistry. Also, students now need only take one physics lab, rather than two. These changes reflected our perception of the needs of the students, while still adhering to ABET requirements for class and lab work in the sciences. These changes were introduced in 2017.

Third, as our undergraduate enrollment has increased, we have seen more incoming freshmen who have no high school experience with programming. We have added classes (such as CS 30, introduced in 2017) and provided extra assistance to help such students get up to the level required to succeed in our upper division classes.

The Computer Science Department has also introduced a number of new upper division elective courses since the last general review, based on expertise of new faculty members, developments in the field, and student interest. These courses include:

- CS 137A (Prototyping Programming Languages, first taught in winter 2015)
- CS 137B (Programming Language Design, first taught in spring 2015)
- CS 145 (Introduction to Data Mining, first taught in fall 2014)
- CM146 (Machine Learning, first taught under another number in winter 2017)
- CS 168 (Computational Methods for Medical Imaging)
- CS 182 (Systems Biomodeling & Simulation, first taught in spring 2018)

**C. Options**
The Computer Science and Engineering degree does not include options, tracks, or concentrations.

**D. Program Delivery Modes**
The CS&E program is offered only in day courses on the UCLA campus.

**E. Program Locations**
The CS&E program is offered only at the UCLA campus.

**F. Public Disclosure**
Information concerning the UCLA Computer Science Department’s Program Education Objectives (PEOs) and Student Outcomes (SOs) can be found on the Department’s web site at:

https://www.cs.ucla.edu/objectives-outcomes-enrollment-data/

Information on the Department’s annual student enrollment and graduation data is available at:

https://www.seasoasa.ucla.edu/enrollment-degree-statistics-new/

**G. Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions Taken to Address Them**
The Final Statement from the ABET CAC/EAC team resulting from the evaluation completed in 2013 listed two concerns.
1). Concerning Criterion 4, Continuous Improvement, the statement indicated concern about the consistency of application of rubrics used to evaluate student outcomes, and inconsistent division of data between students in our Computer Science program and Computer Science and Engineering program, possibly leading to inaccurate results for students in one of these programs.

Our department addressed these concerns by setting performance indicators and level criteria for each class being evaluated, giving us regular updates on the extent to which our students were achieving the desired outcomes. The UCLA Samueli CourseWeb site, which is used to gather ABET data for the department, was enhanced to support them. We also divided our students by program (CS and CS&E) in counting how many students achieved each level. These actions were decided on immediately after the 2012 ABET program review of our department, but did
not go into effect on the web site until the winter quarter of 2014, when we began to gather data with these tools.

2). Concerning Criterion 5, Curriculum, the statement indicated concern about whether our students obtained “major design experience based on the knowledge and skills acquired in earlier coursework and incorporating appropriate engineering standards and multiple realistic constraints” in all projects.

Our department addressed these concerns both by showing that many of the students’ reports from the capstone design class did address constraints and incorporate standards, but also by setting up a template for student reports in the capstone design class that would ensure that these issues would be addressed by all students taking the class. This template went into use during the quarter of the 2012 ABET visit and has been used ever since then.
CRITERION 1. STUDENTS

A. Student Admissions

1. Admission Requirements

Freshman applicants to UCLA Samueli School of Engineering must first meet the minimum eligibility requirements for the University including the subject requirement, scholarship requirement, and the examination requirement.

Applicants must satisfy the subject requirement by completing a minimum of 15 college-preparatory courses (a-g courses) with at least 11 finished prior to the beginning of the senior year. The 15 courses are:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. History/social science</td>
<td>2 years</td>
</tr>
<tr>
<td>b. English</td>
<td>4 years</td>
</tr>
<tr>
<td>c. Mathematics</td>
<td>3 years</td>
</tr>
<tr>
<td>d. Laboratory science</td>
<td>2 years</td>
</tr>
<tr>
<td>e. Language other than English</td>
<td>2 years</td>
</tr>
<tr>
<td>f. Visual and performing arts</td>
<td>1 year</td>
</tr>
<tr>
<td>g. College-preparatory elective (chosen from the subjects listed above or another course approved by the university)</td>
<td>1 year</td>
</tr>
</tbody>
</table>

Applicants must satisfy the scholarship requirement by earning a grade point average (GPA) of 3.0 or better (3.4 for a nonresident of California) in these courses with no grade lower than a C.

Applicants must satisfy the examination requirement by taking the ACT with Writing or the SAT Reasoning Test by December of their senior year. The UC system no longer requires SAT subject tests. However, applicants to UCLA Samueli are strongly encouraged to take the SAT Math Level 2 subject test and are also encouraged to take an SAT subject test in a science (Physics, Chemistry, or Biology) that is closely related to the student's intended major.

Because admission to UCLA Samueli is competitive, merely meeting the minimum eligibility requirements of the University is rarely sufficient for admission to an engineering major. Other academic accomplishments and personal achievements are considered in the admissions decisions.

2. Admission Process

UCLA Samueli applicants must apply online via the University of California (UC) website.
Each year, UCLA considers many more excellent applicants for freshmen admission than it can possibly admit. The goal of the campus’ admissions review process is to single out from a large and growing pool of academically strong applicants those unique individuals who have demonstrated the intellectual curiosity, tenacity, and commitment to community service expected of the UCLA graduate. These select applicants are the ones who would contribute the most to UCLA’s dynamic learning environment; they are also the applicants who would make the most of being immersed in it. Although high school grade point average and standardized test scores are important indicators of academic achievement used in UCLA’s admissions review, they only tell part of the story.

As a public, land grant institution of higher learning, UCLA has a mandate to serve the State of California by educating its future leaders in research, industry, and the arts. California’s future depends heavily on this important charge. While California law prohibits the consideration of an applicant’s race and/or gender in individual admission decisions, the University also has a mandate to reflect the diversity of the state’s population in its student body. Student diversity is a compelling interest at UCLA. It contributes to a rich and stimulating learning environment, one that best prepares leaders-in-the-making for the challenges and opportunities of California, the nation, and beyond.

Selection is based on a comprehensive review of all information—both academic and personal—presented in the application. All applications are read twice, in their entirety, by professionally trained readers. After independently reading and analyzing a file, the reader determines a comprehensive score that is the basis upon which the student is ultimately admitted or denied. In addition, admissions managers conduct multiple checks for consistency and completeness throughout the reading process. While this evaluation process is based on human judgments rather than a system that quantifies factors and incorporates them into a numerical formula, the extensive reader training, comprehensive reading of files, as well as other monitoring procedures, ensure that the process is highly reliable. Formal tests of reliability are conducted regularly to assure quality control.

The admission review reflects the readers’ thoughtful consideration of the full spectrum of the applicant’s qualifications, based on all evidence provided in the application, and viewed in the context of the applicant’s academic and personal circumstances and the overall strength of the UCLA applicant pool. Using a broad concept of merit, readers employ the following criteria, which carry no pre-assigned weights:

a. **The applicant’s full record of achievement in college preparatory work in high school**, including the number and rigor of courses taken and grades earned in those courses. Consideration will be given to completion of courses beyond the University's a-g minimums; strength of the senior year course load; and performance in honors, college level, Advanced Placement (AP), and International Baccalaureate Higher Level (IBHL) courses to the extent that such courses are available to the applicant. In assessing achievement levels, consideration will be given to individual grades earned, to the pattern of achievement over time, and to an applicant’s achievement relative to that of others in his or her high school, including whether he or she is among those identified as Eligible in the Local Context.
b. **Personal qualities of the applicant**, including leadership ability, character, motivation, tenacity, initiative, originality, creativity, intellectual independence, responsibility, insight, maturity, and demonstrated concern for others and for the community. These qualities may not be reflected in traditional measures of academic achievement. They may be found elsewhere in the application and judged by the reader as positive indicators of the student's ability to succeed at UCLA and beyond.

c. **Likely contributions to the intellectual and cultural vitality of the campus.** In addition to a broad range of intellectual interests and achievements, consideration will be given to evidence of an applicant’s ability and desire to contribute to a campus that value cultural, socioeconomic, and intellectual diversity. This includes the likelihood that the student would make meaningful and unique contributions to intellectual and social interchanges with faculty and fellow students, both inside and outside the classroom.

d. **Performance on standardized tests**, including the ACT plus Writing or SAT Reasoning, and any AP or IBHL examinations the applicant may have taken. Applicants who have not had the opportunity to take AP or IBHL courses or who have chosen not to take the examinations for these courses will not be disadvantaged. Test scores will be evaluated in the context of all other academic information in the application and preference will be given to tests that show a demonstrable relationship to curriculum and to Academic Senate statements of competencies expected of entering college students. Under no circumstances does UCLA employ minimum scores or "cut-offs" of any kind.

e. **Achievement in academic enrichment programs**, including, but not limited to, those sponsored by the University of California. This criterion will be measured by time and depth of participation, by the academic progress made by the applicant during that participation, and by the intellectual rigor of the particular program.

f. **Other evidence of achievement.** This criterion will recognize exemplary, sustained achievement in any field of intellectual or creative endeavor; accomplishments in the performing arts and athletics; employment; leadership in school or community organizations or activities; and community service.

g. **Opportunities.** All achievements, both academic and non-academic, are considered in the context of the opportunities an applicant has had, and the reader’s assessment is based on how fully the applicant has taken advantage of those opportunities. In evaluating the context in which academic accomplishments have taken place, readers consider the strength of the high school curriculum, including the availability of honors, AP, and IBHL courses, and the total number of college preparatory courses available, among other indicators of the resources available within the school. When appropriate and feasible, readers look comparatively at the achievements of applicants in the same pool who attended the same high school and therefore might be expected to have similar opportunities to achieve.

h. **Challenges.** For an applicant who has faced any hardships or unusual circumstances, readers consider the maturity, determination, and insight with which he or she has responded to and/or overcome them. Readers also consider other contextual factors that bear directly on
the applicant's achievement, including linguistic background, parental education level, and other indicators of support available in the home.

In applying the criteria above, readers carefully consider evidence provided in the personal statement, as well as in the academic record and list of honors and achievements. It is important that the student as an individual comes through in the personal statement.

UCLA is among the most selective universities in the country and is becoming more competitive for freshman applicants each year. For Fall 2017, UCLA received more than 102,000 freshmen applications. For Fall 2018, UCLA received more than 113,000 freshmen applications. Generally the campus is able to admit less than one in five freshman applicants for the fall term.

UCLA Samueli admits students by declared major, with more emphasis on science and math programs. For Fall 2017, UCLA Samueli received more than 23,000 applications for freshmen admission. For Fall 2018, there are more than 26,000 applicants for freshmen admission.

B. Evaluating Student Performance

Academic Counselors, as well as students, utilize a computerized degree audit system called DARS (Degree Audit Reporting System). DARS allows counselors and students to monitor major, university and grade point requirements.

Students are encouraged to utilize DARS in conjunction with curriculum planning worksheets that are provided by the Office of Academic and Student Affairs (OASA). The worksheets provide a section for students to note term offerings and requisites for courses. The requisites and term offerings are posted by OASA in the UCLA Samueli Announcement and updates are posted on curriculum webpages.

Undergraduate students are prevented from enrolling in courses with enforced requisites (as listed in the UCLA General Catalog or the online Schedule of Classes) if those requisites have not been met. Some courses have requisites that are not strictly enforced. These courses allow enrollment but inform the student that the course requisite has not been met.

Academic Counselors in OASA monitor students’ academic standing. Each term academic audits are run to monitor students’ performance as compared to the minimum academic standard of a 2.000 grade point average (GPA). The following notices are sent to students who do not meet the academic standard:

- **Academic Probation (AP)** – students are placed on probation if their term or overall GPA falls between 1.5 and 1.99.

- **Subject to Dismissal (STD)** – students are subject to dismissal if their GPA in any one term is less than 1.5 OR if they do not earn at least a C (2.0) average in any one term when they were on probation OR if they do not end probation by the end of the next term. Subject to Dismissal does not mean that a student is going to be immediately dismissed;
however, it requires the student make an appointment to meet with an OASA Academic Counselor who will advise the student on ways to improve performance and explain the conditions under which the student will be allowed to continue.

The notices sent to students in academic difficulty either encourage these students, or require them (dependent upon the severity of their poor academic standing) to see an Academic Counselor for advising.

Academic audits are also run to monitor students who meet the Dean’s Honors list. Students following the engineering curricula are eligible to be named to the Dean’s Honors List each term. Minimum requirements are a course load of at least 15 units (12 units of letter grade) with a grade point average equal to or greater than 3.7. Students are not eligible for the Dean’s Honors List if they receive an Incomplete (I) or Not Passed (NP) grade or repeat a course. Only courses applicable to an undergraduate degree are considered toward eligibility for Dean’s Honors.

Students are encouraged to meet with their UCLA Samueli Academic Counselors or contact them through MyUCLA Message Center. Academic information is available to students in various formats such as the UCLA Samueli Announcement (catalog), Enrollment Instructions, and a list of Frequently Asked Questions. Information is available in hard copy and on the OASA web site.

C. Transfer Students and Transfer Courses

1. Admission Requirements

Admission to an UCLA Samueli major as a transfer applicant is competitive. The University requires applicants to have attained junior-level standing (60 semester/90 quarter transferable units completed) by the end of the spring term prior to transfer. All applicants must also have a minimum 3.4 or higher grade point average earned in transferable courses, and completion of the following course requirements by spring prior to transfer:

- Two transferable courses in English composition/critical thinking and writing.
- One transferable math course that has a prerequisite of intermediate algebra or higher.
- Four transferable college courses in at least two of the following subject areas: art and humanities, social and behavioral sciences, physical and biological sciences.

Applicants must also have completed the following required preparation specific for UCLA Samueli majors:

- Mathematics
  - Calculus I and II
  - Calculus III (Multivariable)
  - Differential Equations (not required for Mechanical Engineering and Aerospace Engineering)
  - Linear Algebra
- Calculus-based Physics courses with labs in the following areas:
  - Mechanics
Electricity & Magnetism
Waves, Sound, Heat, Optics, and Modern Physics

Chemistry
- 2 terms of General Chemistry with Labs
- Exceptions: Applicants to Electrical Engineering only require one term of General Chemistry. Applicants to Computer Engineering, Computer Science, and Computer Science & Engineering are not required to take General Chemistry
- Applicants to Bioengineering and Chemical Engineering are also required to take 2 terms of Organic Chemistry

Computer Programming
- 1 course in either C++, C, Java, or MATLAB
- Applicants to Computer Engineering, Computer Science, Computer Science & Engineering, and Electrical Engineering must take a Programming course in C++

2. Admissions Process

UCLA Samueli applicants must apply online via the University of California website. All coursework and grades are self-reported, and must be submitted online no later than November 30th. Applications are only accepted for students who wish to start school in the fall term. The Office of Undergraduate Admission evaluates all transfer applicants to UCLA. Those who have applied to an UCLA Samueli major are referred to the Office of Academic and Student Affairs (OASA) for selection.

Applicants who have met the UC eligibility requirements and completed the UCLA Samueli major prep requirements are evaluated for admission to the major they have indicated on their application. The number admitted depends on the number of spots available in the major, which is affected by how many freshmen were admitted to that major two years prior, as well as changes of major from other UCLA Samueli majors and UCLA’s College of Letters & Science. The quality of the applicant’s academic performance in the major prep courses is the most important factor in determining the admission decision.

3. Accepting Transfer Credit

Courses from California Community Colleges (CCC) that have been articulated for credit can be viewed at the Articulation System Stimulating Inter-institutional Student Transfer (ASSIST) website. ASSIST is the official repository of articulation for California’s colleges and universities. Course evaluators from the UCLA Office of Admission determine transferability of course credit for courses that were taken outside of CCC. For courses completed at other schools, such as other UC’s, CSU’s, out of state schools, etc. Students must submit course evaluation requests along with course syllabi to OASA for faculty evaluation. Once the necessary documentation is received, OASA submits the materials to faculty for review. Upon review, the student is notified whether the course has been deemed equivalent. OASA internally tracks all evaluations and decisions.

All non-UC transferable coursework receives no credit. For all coursework that is determined to be UC-transferable, The UCLA Office of Admission notes this information, along with
other related course information, in its UCLA Samueli-accessible transfer credit database. UCLA Samueli records the coursework in its internal databases to reflect satisfaction of applicable UCLA Samueli requirements. UCLA Samueli, along with the UCLA Office of Admission, maintains an articulation database, which reflects the status of courses that have been evaluated by UCLA faculty. If transfer coursework for which a student would like to receive degree-applicable credit is not reflected on ASSIST.ORG, the student must submit a course evaluation request form, along with the applicable course syllabus/outline(s), electronically to the Office of Academic and Student Affairs to receive an evaluation of said course(s) for credit. Only transfer courses taken at University of California campuses are counted in the UCLA grade point average.

D. Advising and Career Guidance

This section has two major subsections. The first describes the advising resources provided to undergraduates. The second describes the career guidance provided to undergraduates.

1. Advising by Academic Counselors, Faculty, Peer Counselors, and Peer Mentors

All undergraduate UCLA Samueli students are assigned and have access to an academic counselor, a faculty advisor, and a peer mentor. These resources are visible to the student on their “My Advisors” page within the Course Web course management tool. The subsections that follow describe these resources in detail.

Academic Counselors in the Office of Academic and Student Affairs (OASA)

New Student Advising

New Student Orientation is an extensive introduction to the academic and campus life at UCLA. Orientation sessions for first year students are 3 days and include a 2-night stay in the residence halls. Orientation sessions include: Information on course planning, fulfilling graduation requirements, enrolling in Fall Quarter classes, workshops and presentations on UCLA’s student services, such as housing, financial aid, and extracurricular activities.

On the second day of New Student Orientation, incoming UCLA Engineering students meet with OASA Academic Counselors to receive an UCLA Engineering overview and advising session. Students who participate in the overview and advising sessions are given access to enroll in a study list for the fall quarter. All UCLA Engineering incoming freshman are required to attend New Student Orientation and to participate in an advising session prior to enrolling in fall classes.

Students who are absolutely unable to attend the New Student Orientation, may request academic advising with an OASA online via the MyUCLA Message Center. The counselors also provide detailed instructions on how to register via UCLA’s online registration system and the students are given a date and time that they may begin registration. The counselors will later review what each student has enrolled in to make sure that it was done correctly. Students are required to complete a quiz during the departmental session to support the importance of the information covered.
Attending orientation allows incoming undergraduates the opportunity to meet fellow students and ask academic counselors questions in person pertaining to their first year at UCLA. Students familiarize themselves with academic policies and deadlines, gain an understanding of what UCLA requirements their Advanced Placement (AP) or transfer credit fulfills, register for classes, and become better prepared to enter UCLA as engineering majors.

For freshmen, counselors will evaluate their AP scores and record them on the students’ record of interview so the student can see how their credits may satisfy degree requirements. Transfer and freshmen students are encouraged to submit a course evaluation request for all college course work not completed at UCLA to see how these courses may fulfill degree requirements. Course evaluation requests can be submitted once a student submits a Statement of Intent to Register (SIR).

Transfer orientation is a one-day event that is more concentrated and focuses primarily on academics. Academic counselors provide a course plan. Students are encouraged to see an academic counselor before the start of their second quarter to discuss how the transition to UCLA is going which helps determine the course load for the next quarters.

Continuing Students

The Office of Academic and Student Affairs (OASA) provides academic advising and counseling for continuing engineering undergraduate students by appointment or during weekly drop in advising hours. OASA counseling and academic advising services include providing guidance with policies and procedures, advice on curriculum requirements, identification of resources for tutoring and study skill improvement, guidance to secure research and internship opportunities and the review of petitions. OASA works with the Office of External Affairs to publicize the large number of scholarships available to engineering students. Many of these scholarships are also administered by OASA.

OASA also serves as a gateway to a myriad of campus resources such as: UCLA Career Center, Counseling Psychological Services (CAPS), Arthur Ashe Student Health and Wellness Center, Financial Aid Office, Dashew Center for International Student and Scholars, Financial Aid. OASA welcomes any engineering undergraduate student to stop by 6426 Boelter Hall for help with their concern.

Academic counselors are assigned by major. Students can meet with their academic counselor for advising by appointment or on a walk-in basis in the UCLA Samueli Office of Academic and Student Affairs, 6426 Boelter Hall or communicate with their counselors through the MyUCLA Message Center system.
OASA utilizes the UCLA Lobby Student Card Swipe and MyUCLA Message Center systems to track student contact.

In addition to new student advising, email communications and outreach events, the following cases were recorded:

Fall 2017: 3,316 student visits to OASA and 1,159 student cases were responded to by electronic message.

Winter 2018 (as of 3/21/18): 3,533 student visits to OASA and 1,283 student cases were responded to by electronic message.
OASA Workshops

In addition to outreach events, the Office of Academic and Student Affairs (OASA) offers a multitude of workshops and information sessions each quarter to support student success. These workshops and information sessions include topics on changing majors and study abroad, as well as, interactive class planning workshops and skill building sessions on S.M.A.R.T. Goals and Time Management.
The following table, which is posted on the OASA website, lists the UCLA Samueli OASA Undergraduate Academic Counselors and contact information.

<table>
<thead>
<tr>
<th>Fall 2017 OASA Workshops</th>
<th>Attendees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change of Major Workshop</td>
<td>62</td>
</tr>
<tr>
<td>Mech/BAC Career Fair</td>
<td>334</td>
</tr>
<tr>
<td>HSEAS/SRC Writing Workshop</td>
<td>50</td>
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<tr>
<td>HSEAS Career Fair Prep</td>
<td>176</td>
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<tr>
<td>Mech@UCLA Kick-off</td>
<td>114</td>
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<tr>
<td>ME Career Fair</td>
<td>115</td>
</tr>
<tr>
<td>Degree Auditors Meet and Greet</td>
<td>43</td>
</tr>
<tr>
<td>Smart Goals Workshop</td>
<td>10</td>
</tr>
<tr>
<td>Time Management Workshop</td>
<td>5</td>
</tr>
<tr>
<td>Study Abroad Workshop</td>
<td>45</td>
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<tr>
<td>Class Planning Strategies Workshop</td>
<td>57</td>
</tr>
<tr>
<td>Undergrad Research Program Information</td>
<td>63</td>
</tr>
<tr>
<td>SS Week Study Break at OASA</td>
<td>203</td>
</tr>
<tr>
<td>Total</td>
<td>1277</td>
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</table>

<table>
<thead>
<tr>
<th>Winter 2018 OASA Workshops</th>
<th>Attendees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change of Major Workshop</td>
<td>34</td>
</tr>
<tr>
<td>HSEAS Career Fair Prep</td>
<td>118</td>
</tr>
<tr>
<td>URP Orientation</td>
<td>34</td>
</tr>
<tr>
<td>Degree Auditor Meet and Greet</td>
<td>130</td>
</tr>
<tr>
<td>REU Workshop</td>
<td>83</td>
</tr>
<tr>
<td>ACE Career Fair</td>
<td>152</td>
</tr>
<tr>
<td>URP End of Quarter Meeting</td>
<td>24</td>
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<tr>
<td>SS Week Study Break at OASA</td>
<td>454</td>
</tr>
<tr>
<td>Total</td>
<td>1029</td>
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<tr>
<td>UNDERGRADUATE</td>
<td>COUNSELOR</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------</td>
</tr>
<tr>
<td>All majors 6426 BH</td>
<td>Peer Counselors</td>
</tr>
<tr>
<td>Aerospace Engineering 6426 BH</td>
<td>Michel Moraga, Vanessa Hernandez, Jan LaBuda</td>
</tr>
<tr>
<td>Bioengineering 6426 BH</td>
<td>Erkki Corpus, Ashley Grossfeld, Victoria Moraga</td>
</tr>
<tr>
<td>Chemical Engineering 6426 BH</td>
<td>Ashley Grossfeld, Erkki Corpus, Juana Ramirez</td>
</tr>
<tr>
<td>Civil Engineering 6426 BH</td>
<td>Vanessa Hernandez, Erkki Corpus, Ashley Grossfeld, Jan LaBuda</td>
</tr>
<tr>
<td>Computer Engineering 6426 BH</td>
<td>Cynthia Moraga</td>
</tr>
<tr>
<td>Computer Science 6426 BH</td>
<td>Alma Haas, Angelina Barger, Mary Anne Geber, Jan LaBuda, Cynthia Moraga, Michel Moraga, Victoria Moraga, James Washington</td>
</tr>
</tbody>
</table>
### Faculty Advisors

<table>
<thead>
<tr>
<th>Department</th>
<th>Advisors</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science &amp; Engineering</td>
<td>Alina Haas, Angelina Bargeron, Mary Anne Geber, Jan LaBuda, Cynthia Moraga, Michel Moraga, Victoria Moraga, James Washington</td>
<td>If you have a UCLA logon ID, please send your inquiry here: CS_CSE_Message Center. If you do NOT have a UCLA logon ID, please send your inquiry here: Message_Center_NO_UCLALogin.</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>Mary Anne Geber, Alina Haas, Jan LaBuda, Cynthia Moraga, Victoria Moraga, Julieta Ramirez, James Washington</td>
<td>If you have a UCLA logon ID, please send your inquiry here: EE_Message_Center. If you do NOT have a UCLA logon ID, please send your inquiry here: Message_Center_NO_UCLALogin.</td>
</tr>
<tr>
<td>Materials Engineering</td>
<td>James Washington, Erkki Corpuz, Jan LaBuda</td>
<td>If you have a UCLA logon ID, please send your inquiry here: MSE_Message_Center. If you do NOT have a UCLA logon ID, please send your inquiry here: Message_Center_NO_UCLALogin.</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>Michel Moraga, Angelina Bargeron, Vanessa Hernandez, Jan LaBuda</td>
<td>If you have a UCLA logon ID, please send your inquiry here: MAP_Message_Center. If you do NOT have a UCLA logon ID, please send your inquiry here: Message_Center_NO_UCLALogin.</td>
</tr>
<tr>
<td>Undeclared Engineering</td>
<td>Angelina Bargeron, Erkki Corpuz, Mary Anne Geber, Ashley Crossfeld, Alina Haas, Vanessa Hernandez, Jan LaBuda, Cynthia Moraga, Michel Moraga, Victoria Moraga, Julieta Ramirez, James Washington</td>
<td>If you have a UCLA logon ID, please send your inquiry here: IESEAS_Undeclared_Message_Center. If you do NOT have a UCLA logon ID, please send your inquiry here: Message_Center_NO_UCLALogin.</td>
</tr>
</tbody>
</table>
Faculty advisors are assigned to each new UCLA Samueli student at the beginning of their first quarter. The faculty advisors are initially assigned at random (but within the student’s department). After the initial assignment, the student can switch to any faculty advisor in their department with a mouse click on their “My Advisors” page.

The faculty advisor’s responsibility is to advise the student on the various opportunities within their chosen field of study, including but not limited to internships, graduate studies, undergraduate research, selection of an area of specialization within the major, future areas of growth in the industry, and general advice about succeeding at the university.

UCLA Samueli faculty are required to set aside and publicize at least three hours per quarter during which they will provide advice to their undergraduate advisees. Most faculty do this during the second week of each quarter. UCLA Samueli students are required to meet with their faculty advisor at least once a year, or they cannot register for classes in the following year.

After each advising visit, students are given the opportunity to complete a short survey on the faculty advising system. As of 3/21/18, for Fall 2017 faculty advising, 31.8% (336 out of 1055) of undergraduates completed this survey. Of these respondents, 50.6% met for about 15 minutes, 35.1% met for about 30 minutes, and 14.3% met for more than 30 minutes. 67% reported that “It was nice to meet with my advisor and I got some really good advice.” 28.6% reported that “It was nice to meet with my advisor.” The remaining 4.5% felt that “The meeting was not helpful.” The survey also provides a space for a free response answer to provide feedback. The 59 written responses to this question are dominated by strongly positive comments about the faculty advisors.

Peer Counselors

UCLA Samueli graduate students are available to assist undergraduates with academic advising in OASA. As students who have successfully completed undergraduate programs, the peer counselors are able to share experiences and give guidance on engineering topics and aspects of the graduate/professional school application process.

Peer Mentors

Each new UCLA Samueli student is assigned an undergraduate student mentor when they enroll at UCLA. Student mentors are volunteers who have been trained by professional UCLA staff from both OASA and the Counseling and Psychological Services office to provide a useful service to their fellow undergraduates.

As with faculty advisors, peer mentors are initially assigned at random but according to department. After the initial assignment, students can change their mentor on their “My Advisors” web page.

Student organizations within each department organize orientations and social events to facilitate mentor-mentee interaction. The student mentors help the UCLA Samueli students
feel welcome at UCLA, and to get them involved with UCLA Samueli by introducing them to the student engineering clubs and organizations right away. This engagement is important because most new freshmen don’t start taking engineering courses until the second year, and participation in the Engineering student groups is an effective way to get them involved with UCLA Samueli early. Student mentors also provide guidance to the new students on succeeding at UCLA based on their recent experiences. Students are not required to meet regularly with their mentors, but it is highly recommended.

Engineering Student Resource Center

The Engineering Student Resource Center’s mission is to develop recruitment activities that support the educational pipeline from local community colleges to UCLA Samueli and provide support, resources, and advocacy for all UCLA Samueli transfer students.

The Center will host a welcome and orientation tailored to the Engineering transfer student, including introduction to their MentorSEAS mentor. During the school year, the Center offers professional development and networking workshops and panel discussions. Undergraduate peer advisors provide guidance and direction for our transfer students and help our students connect with the appropriate campus resources. The Engineering Transfer Center will offer study tables for upper-division major courses with high transfer student enrollment.

The Degree Audit Reporting System (DARS)

To enhance both advising and the degree audit process, UCLA Samueli utilizes a campus wide computerized degree audit system called DARS (Degree Audit Reporting System). Students use an interactive web version of the DARS audit to view the credit they have received. The audit helps students determine remaining requirements.

UCLA Samueli students considering a change of major can run a model another major to determine how their credit will be applied. There is no limit on the number of audits run, but only the most recent five are kept. The DARS audit incorporates completed and in-progress UCLA course work and transfer course work for each student. Students are able to use DARS to check their three required UC GPAs (Cumulative, Upper Division Required, and Major Field Upper Division).

2. Career services for UCLA Samueli majors:

   a. Overview of Career Services

The UCLA Career Center has the primary responsibility for providing career advising and guidance to UCLA Samueli students.

With more than 60 total staff including graduate interns and UCLA student employees, half of the staff are dedicated to the direct delivery of career counseling and other direct services to undergraduate students. The UCLA Career Center is one of the largest and most comprehensive career centers in the nation. Year round, on a daily basis, the Career Center
provides full-service career development and job search resources to engineering students. Engineering majors are encouraged by their faculty and academic departments to use the Career Center and engage in career advising. The Career Center also reaches out to Engineering students via email, social media, and targeted marketing campaigns to publicize their advising services, workshops, programs, info sessions, career fairs, on campus interviews, and more.

Over the past three years the Career Center has reorganized to provide more major-and industry-specific career services to the campus. For the School of Engineering, the Career Center provides counseling by career advisors who have expertise in engineering and technology sectors, while also working closely with school leadership, faculty, and students to ensure that the services provided are hitting the mark. In Fall 2017, UCLA Samueli created a new position, titled Director of Undergraduate Internship Program, to provide more school resources to collaborate with the Career Center. Through these collaborative efforts, there is more intentional outreach to specific class levels and engineering majors. For instance, the Career Center is invited to present in introductory engineering courses in order to introduce all new students to the Career Center and to encourage early engagement with career education and earlier connection to employers and internship opportunities. The Career Center also encourages early engagement by participating in Engineering Welcome Day and connecting directly with engineering student organizations to provide resources and to collaborate on programming. Lastly, the Director and the Career Center offered 13 programs specific to engineering this academic year.

The third floor of the Career Center houses 19 rooms dedicated to a robust Campus Recruiting Program. To the benefit of the School of Engineering, the Career Center hosts hundreds of employers every quarter (fall, winter, and spring) who are intent on specifically hiring Bruins for their engineering and technical positions. For UCLA Samueli students, this means direct access to all of the nation’s largest engineering firms and employers of engineers. Some of employers that recruit heavily at the Career Center include Apple, Amazon, Sandia National Laboratories, JPL, Lockheed Martin, Hulu, Blizzard Entertainment, Arista Networks, Navair, Facebook, Boeing, Oracle, Cisco, Google, Hewlett-Packard, Honda, Lawrence Livermore, Microsoft, Northrop Grumman Corporation, Raytheon, Sony, and Yahoo.

Each year the UCLA Career Center hosts a number of special events designed specifically for School of Engineering and its constituent departments. The number of events has increased significantly in recent years due to a higher level of collaboration between the Career Center staff with the School of Engineering. The twice annual Engineering & Technical Fair (E&T) which hosts more than 100 employers in fall and winter and the “Inside Engineering” workshops which have covered the Public Sector and Auto Industry, are an example of the increased collaboration. One of the most successful programs in fall quarter was “How to Crack the Code” with over 50 attendees primarily from the Computer Science department. Many of the workshops provided by the Career Center include panels of engineers in industry who offer career development and job search guidance to UCLA Samueli majors. Other panels include feature employers who provide job search advice “straight from source” and network with students after the event.

b. Annual First Destination Survey
Additionally, the Director of UIP hosts drop-in advising hours every Thursday of the quarter in appointments at ESRC once a week at the beginning of the quarter (weeks 1-4) effective spring 2017. There have been close to 100 students who have utilized this service. Undergraduate Internship Program (UIP) is located.

The Career Center's First Destination Survey provides comprehensive and reliable data, which can be used to accurately inform and shape career expectations of engineering students. In years past the Career Center has surveyed graduating undergraduate students in all departments each quarter. In order to achieve a high survey turnout and the most accurate data, the School of Engineering has worked with the Career Center to incorporate the First Destination Survey questions into all of the School's departmental Senior Exit Surveys, ensuring a 95% plus response rate to the First Destination Survey questions. The information collected relates to graduate school plans, career plans, and salary. The survey also gathers data pertaining to learning outcomes and students' preparation for life after UCLA.

The UCLA Career Center utilizes data on national trends and shares any relevant data with campus departments, but maintains that the aggregated national data are insufficient for advising students on topics such as potential starting salary and “popular” employers for UCLA students. The First Destination Survey provides UCLA’s individual schools and academic departments with timely and accurate information not only about the aforementioned items but also timely data, including graduate schools, jobs by employment sector and geographic area, and topics such as what resources graduates used to find their job and hard data to support the premise that job searching early does indeed lead to “better” offers. A wide array of survey data specific to UCLA Samueli majors (e.g., overall response rates by major, salary information, and popular employers) as well as the actual survey instrument are available upon request.

**c. Career Counseling for Engineering Majors**

UCLA Samueli students have access to individual career counseling appointments throughout the entire calendar year at the Career Center where they offer two types of appointments:

**CAREER COUNSELING SESSIONS** are available year round Monday - Friday, 9am – 4pm and can be scheduled online at any time. Engineering students have the option of choosing a Career Counselor with expertise engineering and technology fields. Students register for appointments by selecting from a variety of available time slots to see a professional Career counselor, who becomes their ongoing counselor. Additional appointments as necessary are scheduled directly with that same counselor. All career topics including, but not limited to, career counseling, pre-professional/grad school, mock interview, personal statement, resume and cover letter development and job or internship search.

**DROP IN APPOINTMENTS** are available Tuesday - Thursday, 10am to 2pm. These appointments are available year round on a first come, first served basis. Topics covered include job or internship search, resume and cover letter reviews.

Given the demand of engineering students for career education, UCLA Samueli opened a new Engineering Student Resource Center (ESRC), where the new Director of Undergraduate Internship Program (UIP) is located. The Career Center began to offer drop in appointments at ESRC once a week at the beginning of the quarter (weeks 1-4) effective spring 2017. There have been close to 100 students who have utilized this service. Additionally, the Director of UIP hosts drop-in advising hours every Thursday of the quarter for engineering students.
from 1-4pm. During the 2017-2018 academic year, the Director has met with close to 190 engineering students. Students come to drop-ins regarding a variety of topics ranging from general career advising to seeking assistance with finding internship opportunities. Students who need more extensive career advising are encouraged to meet with the Career Counselor who serves as a liaison to the School and Engineering.

Self-Assessment Tools:

Although UCLA career counselors have a variety of career development tools at their disposal to assist engineering students seeking career clarity, two of the most popular and effective tools are the Myers Briggs Type Indicator® (MBTI®) and STRONG Interest Inventory (SII®). Both of these assessments are provided free of charge by the Career Center and provide students with significant insight into their personality as it relates to career pathways. The clarity gleaned from these reports helps focus students on the type of work and environment that suits them best.

The MBTI® is designed to help students understand their personality and the ways they relate to people around them. The SII® helps students identify optimum career choices based on their interests and includes additional related occupations and concise job descriptions.

d. Career Development Workshops

All engineering students have access to numerous engineering specific workshops to advise them on all aspects (self-exploration, practical job search topics, etc.) of their career development. The Career Center’s workshop line-up is reimagined each year in order to stay current with the needs of our students and employers. Workshops are presented during the academic year in an order that aligns with the internship and hiring cycles of employers, and in keeping with the needs of our students to engage with career exploration. The range of career development and readiness workshops offered during the 17-18 academic year fall into the following pillars:

Core Workshops: Resume, LinkedIn, Prep for the Career Fair
Industry Exploration: Inside Engineering
Networking: STEM Networking Night, Tech Talks
Skill Development: How to Ace The Technical Interview

The Career Center has a robust calendar of events; a complete list is available upon request.

e. Career Fairs

The Career Center offers eleven career fairs during the academic year. Major annual fairs that provide opportunities for engineering students to interact with employers include: Hire UCLA Fairs, Admit UCLA Fair (a graduate degree program and professional school fair), Engineering & Tech (E&T) Fairs, Health School Fair (only happens in spring quarter), and Industry Nights which include Financial Services, Investment Banking, Consulting, and Computer Science Night. In the fall of 2017, 6,437 undergraduate students attended Career Center-organized fairs. Over 3,000 were engineering students who were presented with opportunities primarily around
internships and full time, post graduate employment. As stated previously, the twice annual Engineering & Technical Fair (E&T) which hosts more than 100 employers in fall and winter

All of the Career Center events are heavily marketed and advertised to engineering students, particularly the E&T Fairs. Using MyUCLA kiosk system that ties to current student data housed in the Registrar’s Office, the Career Center can track attendance at all of their events. A roster of employers as well as student attendance broken down by major, class rank, gender, etc. for any recent career can be generated.

f. Employer Relations and Customer Service

BruinView™ Job Listings
At any given moment, the UCLA Career Center has thousands of high quality job and internship opportunities available to UCLA students and alumni who have signed up for BruinView™. In 2016-2017 there were a total of 27,155 unique job postings, 5,186 active employers, and 13,532 active students (1,875 engineering). Although. Engineering students are eligible to apply to any job, there were 903 specifically seeking UCLA Samueli students. There is constant flow of job postings in varying times of the academic year.

All of these resources for students are managed and accessible to UCLA Samueli majors via our proprietary “Career Services Management Systems” branded, BruinView™. BruinView™ for engineering students is a searchable job listing database where thousands of jobs are posted not only in California, but nationally and internationally.

With the ability to store up to ten resumes, ten cover letters, and ten additional job search documents such as unofficial transcripts or writing samples, UCLA Samueli students have a true “one-stop” portal for all of their career development and job search needs. Once an engineering student has uploaded his or her documents, they can apply for jobs directly through BruinView™. Each employer details which application documents they require (resume, cover letter, etc.). Students can then retrieve the appropriate materials for each application, create an email cover letter and submit the application. Employers may also link directly to their employment sites, conveniently allowing UCLA Samueli students to apply directly to their internal application systems (applicant tracking systems).

BruinView™ Campus Interviewing for Engineers
The UCLA Career Center provides currently enrolled engineering students the opportunity to interview with hundreds of employers who visit the campus during the fall, winter and spring quarters. Positions range from full-time jobs to paid internships and tend to be in the fields of business, engineering and technology. Campus interviews are conducted within the Career Center for three cycles each year, from early October through early December (Fall semester), late January through Spring Break, and early April through mid-May. During the Fall 2017 recruiting season alone, the Career Center hosted 130 individual employing organizations (80 were Engineering Companies) that conducted 1,891 interviews (593 for engineering students). This is in addition to 109 company-specific “Information Sessions” hosted by employers to educate students about their respective career options. These Information Sessions were attended by over 1,800 students.
E. Work in Lieu of Courses

Credit given in lieu of actual coursework is limited to Advanced Placement exam credit, International Baccalaureate Higher-Level exams, UCLA’s own English composition exam, and some limited credit for internships. Each of these is described in detail below.

Credit for Advanced Placement Tests. Students may fulfill part of the school requirements with credit allowed at the time of admission for College Board Advanced Placement (AP) Tests with scores of 3, 4, or 5. Students who have completed 36 quarter units after high school graduation at the time of the examination receive no AP Test credit. AP Test credit for freshmen entering Fall 2017 fulfills UCLA Samueli requirements as indicated in the table in the next page.

Credit for International Baccalaureate (IB) Higher-Level Exams UCLA awards college credit for higher-level (HL) exams only. IB examinations, AP examinations, and college courses taken prior to or after enrolling at UCLA may be duplicative. In these cases, credit is awarded for only one. The table describing college credit available for IB HL exams follows the table describing AP credit.

Students participating in internships have the option to receive course credit by enrolling in ENGR 95, limited to freshmen/sophomores, or ENGR 195, limited to juniors/seniors, 2-4 units. Supervision is provided by the organization for which the students is doing the internship and the grade is assigned by faculty based on the student’s written report documenting work/duties performed. P/NP grading. Credit may not be applied toward major requirements.
Table Showing HSSEAS credit for AP courses

<table>
<thead>
<tr>
<th>Subject</th>
<th>Score 3</th>
<th>Score 4</th>
<th>Score 5</th>
</tr>
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<tbody>
<tr>
<td>Art History</td>
<td>8 units EX</td>
<td>8 units EX</td>
<td>8 units EX</td>
</tr>
<tr>
<td>Art, Studio</td>
<td>8 units EX</td>
<td>8 units EX</td>
<td>8 units EX</td>
</tr>
<tr>
<td>Biology</td>
<td>8 units EX</td>
<td>8 units EX</td>
<td>8 units EX</td>
</tr>
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<td>Chemistry</td>
<td>8 units EX</td>
<td>8 units EX</td>
<td>8 units EX</td>
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<td>Computer Science A</td>
<td>2 units EX</td>
<td>2 units EX</td>
<td>2 units EX</td>
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<td>Computer Science AB</td>
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<td>4 units EX</td>
<td>4 units EX</td>
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<td>Computer Science Principles</td>
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<td>8 units EX</td>
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<td>Economics (Micro)</td>
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<td>Economics (Macro)</td>
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<td>English Literature</td>
<td>8 units EX, satisfies Entry Level Writing</td>
<td>Eng Comp 3 + 3 units EX, satisfies Entry Level Writing</td>
<td></td>
</tr>
<tr>
<td>English Language</td>
<td>8 units EX, satisfies Entry Level Writing</td>
<td>Eng Comp 3 + 3 units EX, satisfies Entry Level Writing</td>
<td></td>
</tr>
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<td>Environmental Science</td>
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<td>4 units EX (Geog Env)</td>
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<td>4 units EX (Geog Human)</td>
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<td>Government, Comparative</td>
<td>4 units EX</td>
<td>4 units EX</td>
<td>4 units EX</td>
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<td>Government, U.S.</td>
<td>4 units EX, satisfies Am Hist 6 institutions</td>
<td>4 units EX, satisfies Am Hist 6 institutions</td>
<td>4 units EX, satisfies Am Hist 6 institutions</td>
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<td>History, European</td>
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<td>8 units EX</td>
<td>8 units EX</td>
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<td>8 units EX, satisfies Am Hist 6 institutions</td>
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<tr>
<td>History, World</td>
<td>8 units EX</td>
<td>8 units EX</td>
<td>8 units EX</td>
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Δ unit max for both Calculus exams

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<thead>
<tr>
<th>Subject</th>
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<th>Score 5</th>
</tr>
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<tbody>
<tr>
<td>Calculus AB</td>
<td>4 units EX</td>
<td>4 units EX</td>
<td>4 units which may be applied to Math 31A</td>
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<tr>
<td>Calculus BC</td>
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<td>8 units EX</td>
<td>Math 31A + 4 units which may be applied to Math 31B</td>
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<td>Music Theory</td>
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Δ unit max for all Physics exams

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<td>Physics 1</td>
<td>8 units EX</td>
<td>8 units EX</td>
<td>8 units EX</td>
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<tr>
<td>Physics 2</td>
<td>8 units EX</td>
<td>8 units EX</td>
<td>8 units EX</td>
</tr>
<tr>
<td>Physics B</td>
<td>8 units EX</td>
<td>8 units EX</td>
<td>8 units EX</td>
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<tr>
<td>Physics C: Mechanics</td>
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<td>4 units EX</td>
<td>4 units which may be used to satisfy Phys IA**</td>
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<tr>
<td>Physics C: E&amp;M</td>
<td>4 units EX</td>
<td>4 units EX</td>
<td>4 units which may be used to satisfy Phys IA**</td>
</tr>
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<td>Psychology</td>
<td>4 units EX (Psych 10 (4 units EX))</td>
<td>4 units EX (Psych 10 (4 units EX))</td>
<td>4 units EX (Psych 10 (4 units EX))</td>
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<td>Statistics</td>
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<td>4 units EX</td>
<td>4 units EX</td>
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<td>Chinese Language &amp; Culture</td>
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<td>8 units EX (Elementary)</td>
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<td>French 5 (EX) + 4 units EX</td>
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<td>8 units EX (Elementary)</td>
<td>8 units EX (Elementary)</td>
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<td>Latin (Vergil or Literature)</td>
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<td>Latin 3 (EX)</td>
<td>Latin 3 (EX)</td>
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<td>Spanish Language</td>
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<td>Spanish 4 (EX) + 4 units EX</td>
<td>Spanish 5 (EX) + 4 units EX</td>
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<td>Spanish Literature</td>
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<td>8 units EX</td>
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<td>IB Examination</td>
<td>Credit at UCLA</td>
<td>Title/Course</td>
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<td>Biology</td>
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<td>Chemistry</td>
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<td>Classical Languages</td>
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<td>- Classical Greek</td>
<td>5-7 GREEK</td>
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<td>- Latin</td>
<td>5-7 LATIN</td>
<td>1 and 2</td>
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<td></td>
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<td>2</td>
<td>4.0</td>
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<td>Film</td>
<td>5-7 FILM&amp;TV</td>
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<td>- Asia and Oceania</td>
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<td>Asia/Oceania</td>
<td>8.0</td>
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<td>- Europe &amp; the Islamic World</td>
<td>5-7 HIST</td>
<td>Europe/Islamic World</td>
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<td>- Europe &amp; the Middle East</td>
<td>5-7 HIST</td>
<td>Europe/Middle East</td>
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<td>- Medieval Europe &amp; the Islamic World</td>
<td>5-7 HIST</td>
<td>Europe/Islamic World</td>
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<td>ESL</td>
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<td>5-7 ENGLISH</td>
<td>ESL</td>
<td>8.0</td>
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<td>- French</td>
<td>5-7 FRENCH</td>
<td>1 and 2</td>
<td>8.0</td>
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<td>- German</td>
<td>5-7 GERMEN</td>
<td>1 and 2</td>
<td>8.0</td>
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<td>- Spanish</td>
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<td>Mathematics</td>
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<td>Calculus</td>
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<td>Surv of Music</td>
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<td>IB Diploma (2002 and later)</td>
<td>30 or higher NONDEPT</td>
<td>up to 30 units depending on credit awarded for individual AP/IB HL exams</td>
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F. Graduation Requirements
For the Bachelor of Science Degree in Computer Science and Engineering, the degree requirements are as follows:

Computer Science and Engineering B.S.

Capstone Major

Preparation for the Major

Required: Computer Science 1, 31, 32, 33, 35L, M51A; Electrical and Computer Engineering 3, 10, 11L; Mathematics 31A, 31B, 32A, 32B, 33A, 33B, 61; Physics 1A, 1B, 1C, and 4AL or 4BL.

The Major

Required: Computer Science 111, 118, 131, M151B, M152A, 180, 181, Electrical and Computer Engineering 102, 110, 111L; one course from Civil and Environmental Engineering 110, Electrical and Computer Engineering 131A, Mathematics 170A, or Statistics 100A; one capstone design course (Computer Science 152B); 4 units of elective courses selected from Electrical and Computer Engineering 113, 115A, 115C, 132A, 141; 12 units of elective courses selected from Computer Science 100 through CM187; and 12 units of technical breadth courses selected from an approved list available in the Office of Academic and Student Affairs.

Students who want to deepen their knowledge of electrical engineering are encouraged to select that discipline as their technical breadth area.

Credit is not allowed for both Computer Science 170A and Electrical and Computer Engineering 133A unless at least one of them is applied as part of the technical breadth area. Four units of either Computer Science 194 or 199 may be applied as an elective by petition.

A multiple-listed (M) course offered in another department may be used instead of the same computer science course (e.g., Electrical and Computer Engineering M116C may be taken instead of Computer Science M151B). Credit is applied automatically.

University Requirements

The University of California has two requirements that undergraduate students must satisfy in order to graduate: (1) Entry-Level Writing or English as a Second Language and (2) American History and Institutions. These requirements are discussed in detail in the Undergraduate Study section of the UCLA General Catalog.

School Requirements

UCLA Samueli has seven requirements that must be satisfied for the award of the degree: unit, scholarship, academic residence, writing, technical breadth, ethics, and general education.
Unit Requirement

To receive a bachelor’s degree in any UCLA Samueli major, students must complete a minimum of 180 units. The maximum allowed is 213 units. After 213 quarter units, enrollment may not normally be continued in the school without special permission from the associate dean. This regulation does not apply to Departmental Scholars.

Scholarship Requirement

In addition to the University requirement of at least a C (2.0) grade-point average in all courses taken at any University of California campus, students must achieve at least a 2.0 grade-point average in all upper-division University courses offered in satisfaction of the subject and elective requirements of the curriculum. A 2.0 minimum grade-point average in upper-division mathematics, upper-division core courses, and the major field is also required for graduation. Grade point averages are not rounded up.

Academic Residence Requirement

Of the last 48 units completed for the B.S. degree, 36 must be earned in residence in UCLA Samueli on this campus. No more than 16 of the 36 units may be completed in summer sessions at UCLA.

Writing Requirement

Students must complete the University Entry-Level Writing or English as a Second Language (ESL) requirement prior to completing the school writing requirement. Students admitted to the school are required to complete a two-term writing requirement—Writing I and engineering writing. Both courses must be taken for letter grades, and students must receive grades of C or better (C- grades are not acceptable).

Writing I

The Writing I requirement must be satisfied by completing English Composition 3, 3D, 3DS, 3E, or 3SL with a grade of C or better (C- or a Passed grade is not acceptable) by the end of the second year of enrollment. The Writing I requirement may also be satisfied by (1) scoring 4 or 5 on one of the College Board Advanced Placement Examinations in English, (2) a combination of a score of 720 or better on the SAT Reasoning Test, Writing section (last administered in January 2016) and superior performance on the English Composition 3 Proficiency Examination, (3) completing a course equivalent to English Composition 3 with a grade of C or better (C- or a Passed grade is not acceptable) taken at another institution, or (4) scoring 5, 6, or 7 on an International Baccalaureate Higher Level Examination. Students whose native language is not English may need to take English Composition 1A, 1B, and 2I before enrolling in a Writing I course. All courses in the sequence must be passed with a grade of C or better (C- or a Passed grade is not acceptable).

Engineering Writing
The engineering writing requirement is satisfied by selecting one approved engineering writing (EW) course from the UCLA Samuei writing course list or by selecting one approved Writing II (W) course. The course must be completed with a grade of C or better (C- or a Passed grade is not acceptable). Writing courses are published in the Schedule of Classes. Writing courses also approved for general education credit may be applied toward the relevant general education foundational area.

**Technical Breadth Requirement**

The technical breadth requirement consists of a set of three courses providing sufficient breadth outside the student’s core program. A list of UCLA Samuei Faculty Executive Committee-approved technical breadth requirement courses is available in the Office of Academic and Student Affairs, and deviations from that list are subject to approval by the associate dean for Academic and Student Affairs. None of the technical breadth requirement courses selected by students can be used to satisfy other major course requirements.

**Ethics Requirement**

The ethics and professionalism requirement is satisfied by completing one course from Engineering 183EW or 185EW with a grade of C or better (C- or a Passed grade is not acceptable). The course may be applied toward the engineering writing requirement.

**General Education Requirements**

General education (GE) is more than a checklist of required courses. It is a program of study that (1) reveals to students the ways that research scholars in the arts, humanities, social sciences, and natural sciences create and evaluate new knowledge, (2) introduces students to the important ideas and themes of human cultures, (3) fosters appreciation for the many perspectives and the diverse voices that may be heard in a democratic society, and (4) develops the intellectual skills that give students the dexterity they need to function in a rapidly changing world.

This entails the ability to make critical and logical assessments of information, both traditional and digital; deliver reasoned and persuasive arguments; and identify, acquire, and use the knowledge necessary to solve problems.

Students may take one GE course per term on a Passed/Not Passed basis if they are in good academic standing and are enrolled in at least three and one-half courses (14 units) for the term. For details on P/NP grading, see Grading in the Academic Policies section of the UCLA General Catalog or consult the Office of Academic and Student Affairs.

GE courses used to satisfy the engineering writing and/or ethics requirements must be taken for a letter grade.

**Foundations of Knowledge**

General education courses are grouped into three foundational areas: Foundations of the Arts and Humanities, Foundations of Society and Culture, and Foundations of Scientific Inquiry.
Five courses (24 units minimum) are required. Engineering writing requirement courses also approved for GE credit may be applied toward the relevant GE foundational areas. Students must meet with a counselor in the Office of Academic and Student Affairs to determine the applicability of GE Cluster courses toward the engineering writing or GE requirements. Courses listed in more than one category can fulfill GE requirements in only one of the cross-listed categories.

**Foundations of the Arts and Humanities**

Two 5-unit courses selected from two different subgroups:
- Literary and Cultural Analysis
- Philosophical and Linguistic Analysis
- Visual and Performance Arts Analysis and Practice

The aim of courses in this area is to provide perspectives and intellectual skills necessary to comprehend and think critically about our situation in the world as human beings. In particular, the courses provide the basic means to appreciate and evaluate the ongoing efforts of humans to explain, translate, and transform their diverse experiences of the world through such media as language, literature, philosophical systems, images, sounds, and performances. The courses introduce students to the historical development and fundamental intellectual and ethical issues associated with the arts and humanities and may also investigate the complex relations between artistic and humanistic expression and other facets of society and culture.

**Foundations of Society and Culture**

Two 5-unit courses, one from each subgroup:
- Historical Analysis
- Social Analysis

The aim of courses in this area is to introduce students to the ways in which humans organize, structure, rationalize, and govern their diverse societies and cultures over time. The courses focus on a particular historical question, societal problem, or topic of political and economic concern in an effort to demonstrate how issues are objectified for study, how data is collected and analyzed, and how new understandings of social phenomena are achieved and evaluated.

**Foundations of Scientific Inquiry**

One course (4 units minimum) from the Life Sciences subgroup or one course from Bioengineering CM145/Chemical Engineering CM145, Chemistry and Biochemistry 153A, or Civil and Environmental Engineering M166/Environmental Health Sciences M166:
- Life Sciences

This requirement is automatically satisfied for Bioengineering and Chemical Engineering majors. The requirement is satisfied for Civil Engineering majors by the natural science requirement.
The aim of courses in this area is to ensure that students gain a fundamental understanding of how scientists formulate and answer questions about the operation of both the physical and biological world. The courses also deal with some of the most important issues, developments, and methodologies in contemporary science, addressing such topics as the origin of the universe, environmental degradation, and the decoding of the human genome. Through lectures, laboratory experiences, writing, and intensive discussions, students consider the important roles played by the laws of physics and chemistry in society, biology, Earth and environmental sciences, and astrophysics and cosmology.

Foundations Course Lists
Creating and maintaining a general education curriculum is a dynamic process; consequently, courses are frequently added to the list. For the most current list of approved courses that satisfy the Foundations of Knowledge GE plan, consult an academic counselor or see http://www.registrar.ucla.edu/Academics/GE-Requirement.

Intersegmental General Education Transfer Curriculum
Transfer students from California community colleges have the option to fulfill UCLA lower-division GE requirements by completing the Intersegmental General Education Transfer Curriculum (IGETC) prior to transfer. The curriculum consists of a series of subject areas and types of courses which have been agreed on by the University of California and the California community colleges. Although GE or transfer core courses are degree requirements rather than admission requirements, students are advised to fulfill them prior to transfer. The IGETC significantly eases the transfer process, as all UCLA GE requirements are fulfilled when students complete the IGETC courses. Students who select the IGETC must complete it entirely before enrolling at UCLA. Otherwise, they must fulfill the UCLA Samueli GE requirements. The school does not accept partial IGETC.

Process for ensuring completion of Degree Requirements
Declaring the Degree-Expected Term:
Declaring the term in which degree requirements will be completed initiates the steps that lead to award of a degree. The degree-expected term is the term in which a student expects to complete all degree requirements. Declaration of candidacy and verification of the degree-expected term is processed through MyUCLA. A student must declare this term to receive a final degree audit. Engineering students must identify the term in which completion of degree requirements is expected by the time 172 units have been completed. Students may declare or change the degree expected term through MyUCLA until the second week of the quarter prior to the degree expected term. The last day to declare candidacy for the current term (with fee depending on units completed) is Friday of the second week of classes, Friday of the second week of A Session for the summer term. After this date, a late fee applies in addition to the candidacy fee. Declaration of candidacy after week two may result in a degree-award date for the following term and additional penalty fees.

UCLA Samueli Degree Audit Process and Policies:
UCLA Samueli Degree Auditors generate individual degree audits for each degree candidate which includes a list of satisfied and remaining degree requirements. UCLA Samueli Degree Auditors reconcile the internal list of degree candidates with UCLA Registrar’s Office data of degree candidates on a quarterly basis. The degree audit contains valuable information including reminders of UCLA Samueli policies, deadlines and procedures, information about degree conferral, diplomas, degree verification, the Senior Exit Survey, and minimum GPA requirements for graduation.

UCLA Samueli undergraduates must complete all course work and meet a minimum 2.000 grade point average (GPA) in Cumulative, Upper Division Required, and Major Field Upper Division course work GPAs. These grade point averages include University of California (UC) course work completed for a letter grade. The Cumulative GPA includes all UC course work. The Upper Division Required GPA includes all UC Upper Division required course work. The Major Field Upper Division GPA includes the course work for all UC Upper Division Core and Major Field coursework. Once students’ final grades are posted by the UCLA Registrar’s Office, degree auditors verify all degree requirements are met. After the degree candidate list is final, a query is run to identify any students who may qualify for Latin Honors. Lastly, Degree Audit information is entered and stored in UCLA Samueli’s internal database for record keeping and the final degree award list is sent to the UCLA Registrar’s Office for posting.

UCLA Samueli Undergraduate Student Process to receive a Degree Audit:

Required steps to take ONE QUARTER before the degree expected term in order to initiate the degree audit process are as follows. Please note that students are ultimately responsible for confirming degree requirements are met.

**STEP 1**
Confirm the correct degree-expected term has been declared through MyUCLA. Students may declare a degree-expected term via MyUCLA until second week of the quarter prior to the degree-expected term. Please note declaring a degree-expected term after earning a total of 172 total units OR after second week of the current term will result in a late fee and may require the student to file in-person at the UCLA Registrar’s Office, 1113 Murphy Hall.

**STEP 2**
Run a Degree Audit Report through the Degree Audit Reporting System (DARS) to sign, print, and return to Office of Academic Student Affairs (OASA) at 6426 Boelter Hall.

- Logon to MyUCLA
- Run a new DARS report through the Degree Audit Reporting System
- Select the option “Open All Sections” to review all sections
- Review the DARS for accuracy
• Confirm Technical Breadth Area is accurate
• For Bioengineering, Chemical Engineering, Civil and Environmental Engineering, Electrical and Computer Engineering, and Materials Science and Engineering Majors students must also declare an Option/Pathway/Track. Options/pathways for Electrical and Computer Engineering apply to pre-Fall 14 catalogs only.) If this is not listed correctly, log on to MyEngineering to declare/or update your Technical Breadth Requirement Area and Tracks. Please note that this may take at least 24 hours to update.

• Review each section for accuracy, including that General Education courses enrollment reflects courses in the correct Foundation and Category.
• If a course is listed under “Available Courses” and should meet a course requirement, please submit an Internal UCLA Samueli Undergraduate Student Petition for consideration. If a petition is pending for course substitution, it is the student’s responsibility to enroll in a backup course until petition is approved.
• Before moving to Step 3 below, if anything (e.g. credit missing, course falling under Available Courses, etc.) on the DARS report looks incorrect please see an academic counselor or send a message to the Degree Auditor Queue in Message Center.

STEP 3
All degree candidates are required to file a UCLA Samueli Statement of Degree Candidacy (SDC) form to the Office of Academic and Student Affairs (OASA) at 6426 Boelter Hall along with a hard copy of the DARS report that is signed and dated by the student.

Winter and Spring Degree Candidates

Winter & Spring degree candidates must file a UCLA Samueli Statement of Degree Candidacy (SDC) form during Week 3 - Week 5 one term before the degree-expected term. For example: If a student anticipates completing all degree requirements during the spring term, then the student would file a Statement of Degree Candidacy (SDC) form during the winter term, Week 3, Week 4 and no later than Week 5.

Summer and Fall Degree Candidates

Summer & Fall degree candidates interested in participating in the spring UCLA Samueli Commencement Ceremony must file a Special Request Form during Week 1 of the spring quarter. Summer & Fall degree candidates not interested in participating in the spring UCLA Samueli Commencement Ceremony, must still file a UCLA Samueli Statement of Degree Candidacy (SDC) form during Week 3 - Week 5 one term before the degree expected term. For example: If you plan to complete your requirements during the summer term, please file your Statement of Degree Candidacy (SDC) form during the spring term during Week 3, Week 4 and no later than Week 5.

STEP 4
If the Statement of Degree Candidacy (SDC) and DARS report were submitted within Week 3 - Week 5 during the previous term, each student will receive an individual degree audit via e-mail from degree_auditor@ea.ucla.edu, which contains a list of satisfied and remaining requirements.
The Degree Auditors will attempt to send all degree audits before the start of the final term. If you do not receive a degree audit please be sure to check spam and junk mail filters. When the audit is received please review for accuracy and note the following:

- Utilize the degree audit as a checklist for any remaining requirements
- Save for your records
- If there are any discrepancies with a degree audit please immediately contact the UCLA Samueli Degree Auditor through the Degree Auditor Queue in Message Center, as each student is ultimately held responsible for the accuracy of the degree audit.

**STEP 5**
Before the start of the final term and once enrolled in final quarter’s courses, please run an additional DARS report to compare with the audit provided and verify that all sections are now satisfied. If there is any issue please see a Degree Auditor immediately in the Office of Academic and Student Affairs, 6426 Boelter Hall (BH) to further review.

- **Double Majors or Minors Students** who intend to graduate with a minor or a double (second major) should have filed and been approved for a Request to Double Major/or Minor at OASA 6426 BH before following the degree audit process
- **Majors and Minors housed in the College of Letters and Science**, note that those departments may not approve a student once 150+ units are completed
- **Two Minors housed in UCLA Samueli (Bioinformatics & Environmental Engineering)** must be admitted to these programs before your final term
- **Once you have completed your degree, you may not add a double major or minor**

**STEP 6**
After receiving the degree audit, please complete the Senior Exit Survey, which is REQUIRED for Commencement tickets (see UCLA Samueli Commencement tickets). Students may gain access to the survey once they have initiated Step 3.

Once students receive a degree audit it is required to seek assistance directly from a Degree Auditors regarding any discrepancies. It is the authority of the degree auditor to confirm all degrees and authorize the UCLA’s Registrar’s Office to grant a diploma. It is not in the student’s best interest to contact other OASA counselors for questions pertaining to your degree/diploma finalization, instead questions or concerns should be directed to the UCLA Samueli Degree Auditor Queue in Message Center.

**G. Transcripts of Recent Graduates**
We will provide the requested transcripts and materials explaining their interpretation once requested by the Team Chair.
CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

A. Mission Statement

UCLA

http://www.ucla.edu/about/mission-and-values

UCLA's primary purpose as a public research university is the creation, dissemination, preservation and application of knowledge for the betterment of our global society. To fulfill this mission, UCLA is committed to academic freedom in its fullest terms: We value open access to information, free and lively debate conducted with mutual respect for individuals, and freedom from intolerance. In all of our pursuits, we strive at once for excellence and diversity, recognizing that openness and inclusion produce true quality. These values underlie our three institutional responsibilities.

Learning and teaching at UCLA are guided by the belief that undergraduate, graduate and professional school students and their teachers belong to a community of scholars. This community is dedicated to providing students with a foundational understanding of a broad range of disciplines followed by the opportunity for in-depth study in a chosen discipline. All members of the community are engaged together in discovering and advancing knowledge and practice. Learning occurs not only in the classroom, but also through engagement in campus life and in communities and organizations beyond the university.

Discovery, creativity and innovation are hallmarks of UCLA. As one of the world's great research universities, we are committed to ensuring excellence across a wide range of disciplines, professions and arts while also encouraging investigation across disciplinary boundaries. In so doing, UCLA advances knowledge, addresses pressing societal needs and creates a university enriched by diverse perspectives where all individuals can flourish.

Civic engagement is fundamental to our mission as a public university. Located on the Pacific rim in one of the world's most diverse and vibrant cities, UCLA reaches beyond campus boundaries to establish partnerships locally and globally. We seek to serve society through both teaching and scholarship, to educate successive generations of leaders, and to pass on to students a renewable set of skills and commitment to social engagement.

UCLA endeavors to integrate education, research and service so that each enriches and extends the others. This integration promotes academic excellence and nurtures innovation and scholarly development.
Samueli School of Engineering

https://Samueli.ucla.edu/Samueli-school-story/.

UCLA Samueli is a tightly knit community of 180 full time faculty members, 3,500 undergraduate and 3,000 graduate students, and 40,000 active alumni. Known as the Birthplace of the Internet, UCLA Samueli is also where countless other fields took some of their first steps – from artificial intelligence to reverse osmosis, from mobile communications to human prosthetics.

Counted among our luminaries are 38 current members of the National Academy of Engineering, three Turing award winners, one national Medal of Science recipient and one Nobel Prize laureate. We lead multinational aerospace companies, build skyscrapers and found $18 billion tech ventures. We row in the Olympics, build robots that compete in international soccer matches and win Academy Awards.

We are consistently ranked in the Top 10 among U.S. public engineering schools. Our online master’s program ranks in the Top 3.

But what really sets UCLA Samueli apart from other engineering schools is our sense of community – fostered on campus and carried on through alumni relationships over the ensuing decades.

Maybe it’s the near-constant sunshine we get throughout the year, or the mild climate in general, but people tell us we’re a friendly place. Students look out for one another, and faculty build teamwork into the curriculum. We’re a community of high achievers, but that achievement is never at the expense of others.

That may explain why our alumni like to stay so connected with the school. Whether it’s mentoring current students, participating in our Leaders in Technology Speaker Series, sponsoring a student club, or simply attending our Annual Reunion, UCLA Samueli alumni stay close.

UCLA Computer Science Department

http://www.cs.ucla.edu/mission-statement/

The Computer Science Department strives for excellence in creating, applying, and imparting knowledge in computer science and engineering through comprehensive educational programs, research in collaboration with industry and government, dissemination through scholarly publications, and service to professional societies, the community, the state, and the nation.

The Department offers a bachelor of science degree in both computer science (CS) and computer science and engineering (CS&E). The key difference between the CS and CS&E degrees is that the latter is designed to accommodate those students who desire a strong foundation in computer science, but who also have a strong interest in computer system hardware. The CS and CS&E
programs are accredited by the Computing Accreditation Commission of ABET. The CS&E program is accredited by the Engineering Accreditation Commission of ABET.

**A. Program Educational Objectives**

The program educational objectives can be found with our mission statement at


They are:

- For CS—make valuable contributions to design, development, and production in the practice of computer science and related engineering or application areas, particularly in software systems and algorithmic methods. For CS&E—make valuable contributions to design, development and production in the practice of computer science and computer engineering in related engineering areas or application areas, and at the interface of computers and physical systems.
- Demonstrate strong communication skills and the ability to function effectively as part of a team.
- Demonstrate a sense of societal and ethical responsibility in all professional endeavors.
- Engage in professional development or postgraduate education to pursue flexible career paths amid future technological changes.

**B. Consistency of the Program Educational Objectives with the Mission of the Institution**

The first educational objective of the Computer Science and Engineering program is to:

- make valuable contributions to design, development and production in the practice of computer science and computer engineering in related engineering areas or application areas, and at the interface of computers and physical systems.

UCLA’s mission as an institution includes:

“providing students with a foundational understanding of a broad range of disciplines followed by the opportunity for in-depth study in a chosen discipline.”

This educational objective directly relates to “in-depth study in a chosen discipline”. Further, our inclusion in our objective of use of “related engineering or application areas” is consistent with the institution’s desire for students to obtain understanding of a broad range of disciplines.

The program’s second educational objective is:
• Demonstrate strong communication skills and the ability to function effectively as part of a team.

This objective assists our students in achieving other parts of the university’s mission, such as “free and lively debate conducted with mutual respect for individuals,” which requires strong communications skills. The university’s mission to disseminate knowledge also requires our students to develop such skills. Another element of the university’s mission states that “all members of the community are engaged together in discovering and advancing knowledge and practice.” Teamwork and the ability to operate with others in achieving a common goal, as our program’s second educational objective addresses, is necessary for this element of UCLA’s mission to succeed.

The program’s third educational objective is:

• Demonstrate a sense of societal and ethical responsibility in all professional endeavors.

UCLA’s mission is oriented towards achieving strong positive impacts on society, as stated in the first sentence of our mission statement: “UCLA's primary purpose as a public research university is the creation, dissemination, preservation and application of knowledge for the betterment of our global society.” Other elements of the university’s mission statement mention “civic engagement” and “addressing pressing societal needs” and “seek(ing) to serve society.” The Computer Science and Engineering program’s third educational objective in closely in line with this element of the institutional mission. The institutional mission also discusses issues such as “mutual respect for individuals,” “freedom from intolerance,” and “openness and inclusion.” Our educational objective’s intention to develop students’ sense of ethical responsibility is clearly in line with this element of the university’s mission.

The program’s fourth educational objective is:

• Engage in professional development or post-graduate education to pursue flexible career paths amid future technological changes.

The university’s mission statement speaks of “pass(ing) on to students a renewable set of skills,” consistent with our department’s educational objective of helping students pursue flexible career paths and deal with technological change. Our university wishes to build a “community of scholars” and “engagement in campus life and communities and organizations beyond the university.” Our objective speaks to these desires in terms of developing student’s professional development.

C. Program Constituencies

Our major constituencies are the faculty, current students enrolled in the major, alumni, employers of our graduates, and graduate programs in computer science, computer engineering,
or related areas. These major constituencies are represented on our Computer Science Advisory Board, described below.

For the majority of our current students and alumni, their major objective is a successful career in computing or some related area. Our first educational objective is to teach our students how to make solid technical contributions in the field of computer science and engineering, which will allow our students and alumni to flourish in their chosen careers, one of their primary needs. This educational objective also benefits the needs of the employers of our graduates and institutions offering graduate degree programs that our alumni attend. Communications skills, our second major educational objective, also benefit all these groups. Computer science and engineering professionals who are unable to communicate well or function as part of a team will achieve much less and face limitations in their careers. Students who have these skills, beyond technical ability, are also better prepared for graduate school or working in industry. Our third objective, development of a sense of societal and ethical responsibility, will benefit both our constituency groups as a whole and the individual members, since it will lead to our students to make choices that benefit the entire group and make the best use of each student’s abilities. Our fourth objective is to ensure that our students will be able to adapt to the changes in technology and job opportunities in their fields, which will not only ensure our alumni’s continuing relevance and employability, but will provide industry and graduate educational institutions with computer scientists and engineers able to recognize new opportunities and adapt to new challenges.

**D. Process for Review of the Program Educational Objectives**

Our constituencies are represented on the Computer Science Department Advisory Board, which meets annually on-site. The most recent meeting was on February 20, 2018. The attendees include representatives of all of the constituencies mentioned above. Many of the members are included in several constituencies, such as alumnus and employer representative. Program Educational Objectives (PEOs) are periodically reviewed at both an Advisory Board meeting and at faculty meetings devoted to the undergraduate program (typically annually), and at undergraduate town hall meetings. The most recent faculty meeting discussing these accreditation issues was on June 5, 2018. Other input to the process comes from a broader segment of our consistencies through surveys of employers, alumni, and graduating seniors. The results of these surveys are also provided to the Advisory Board and faculty for consideration of both (a) the appropriateness of the PEOs and (b) an evaluation of how well the objectives are being met.

The level of achievement of PEOs is ascertained mainly through alumni surveys, exit surveys of graduating seniors, and the Advisory Board. Advisory Board members are familiar with our graduates through a variety of means. Some are recruiters of our students, some are in a position to know how well our students fare in their companies, and some are alumni themselves. A number of advisory board members are in multiple categories. The presentation slides from recent Advisory Board meetings and minutes summarizing the meetings will be made available at the site visit.
Exit surveys of graduating seniors have been carried out periodically starting in Fall 2003. Copies of survey summaries will be made available at the site visit.

We also obtain input from current students through an annual town hall meeting in which the general student population participates and both asks questions about the program and expresses their opinions. The most recent undergraduate town hall meeting was on January 18, 2018. Copies of the presentations from town hall meetings will be part of the materials made available at the site visit.

Our PEOs remain largely unchanged since they were revised in 2008. We have divided the first objective into separate sub-objectives for our two programs, to better differentiate what each of those programs seeks to achieve. They have been reviewed regularly but not modified since that time.

**Advisory Board Members**

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<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
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<tbody>
<tr>
<td>William R. Goodin</td>
<td>UCLA Electrical Engineering Department</td>
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<tr>
<td>James Anhalt III</td>
<td>Blizzard Entertainment</td>
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<tr>
<td>John Busch</td>
<td>John R. Busch Consulting</td>
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<td>Lorraine Fesq</td>
<td>Jet Propulsion Laboratory/Caltech</td>
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<td>Francis J. Nickels III</td>
<td>Riot Games</td>
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<td>Dorab Patel</td>
<td>Matchcraft</td>
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<td>Maria H. (Lolo) Penedo</td>
<td>Northrop Grumman</td>
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<td>Diana Skaar</td>
<td>Google</td>
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<td>Taboola</td>
</tr>
<tr>
<td>Ben Zamanzadeh</td>
<td>Data Pop Inc.</td>
</tr>
<tr>
<td>Alfonso Cardenas</td>
<td>UCLA CS Department Faculty</td>
</tr>
<tr>
<td>Milos Ercegovac</td>
<td>UCLA CS Department Faculty</td>
</tr>
<tr>
<td>David Smallberg</td>
<td>UCLA CS Department Faculty</td>
</tr>
<tr>
<td>Christen Anderson</td>
<td>UCLA Undergraduate Student</td>
</tr>
<tr>
<td>Mihir Mathur</td>
<td>UCLA Undergraduate Student</td>
</tr>
<tr>
<td>Garima Lunawat</td>
<td>UCLA Undergraduate Student</td>
</tr>
</tbody>
</table>
CRITERION 3. STUDENT OUTCOMES

A. Student Outcomes
The student outcomes listed below are documented on the department’s web site, at https://www.cs.ucla.edu/objectives-outcomes-enrollment-data/

CS and CS&E Student Outcomes for Computer Science

a) An ability to apply knowledge of mathematics, science, and engineering
b) An ability to design and conduct experiments, as well as to analyze and interpret data
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d) An ability to function on multidisciplinary teams
e) An ability to identify, formulate, and solve engineering problems
f) An understanding of professional and ethical responsibility
g) An ability to communicate effectively
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) A recognition of the need for, and an ability to engage in life-long learning
j) A knowledge of contemporary issues
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

B. Relationship of Student Outcomes to Program Educational Objectives
Contributions of student outcomes to the attainment of the PEOs are summarized in Table 3.1 below, where an “X” in a cell indicates that the corresponding student outcome contributes significantly to the Program Educational Objective. For the purpose of this table, the four bulleted educational objectives for our program are numbered 1-4, as shown below:

1. For CS&E—make valuable contributions to design, development and production in the practice of computer science and computer engineering in related engineering areas or application areas, and at the interface of computers and physical systems
2. Demonstrate strong communication skills and the ability to function effectively as part of a team.
3. Demonstrate a sense of societal and ethical responsibility in all professional endeavors.
4. Engage in professional development or post-graduate education to pursue flexible career paths amid future technological changes.
### Table 3.1. Relationship of student outcomes to educational objectives

<table>
<thead>
<tr>
<th>Student Outcomes</th>
<th>Educational Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>a). An ability to apply knowledge of mathematics, science, and engineering</td>
<td>X</td>
</tr>
<tr>
<td>b). An ability to design and conduct experiments, as well as to analyze and interpret data</td>
<td>X</td>
</tr>
<tr>
<td>c). An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability</td>
<td>X</td>
</tr>
<tr>
<td>d). An ability to function on multidisciplinary teams</td>
<td>X X</td>
</tr>
<tr>
<td>e). An ability to identify, formulate, and solve engineering problems</td>
<td>X</td>
</tr>
<tr>
<td>f). An understanding of professional and ethical responsibility</td>
<td>X X</td>
</tr>
<tr>
<td>g). An ability to communicate effectively</td>
<td>X X</td>
</tr>
<tr>
<td>h). The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context</td>
<td>X X</td>
</tr>
<tr>
<td>i). A recognition of the need for, and an ability to engage in life-long learning</td>
<td>X</td>
</tr>
<tr>
<td>j). A knowledge of contemporary issues</td>
<td>X X X</td>
</tr>
<tr>
<td>k). An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</td>
<td>X</td>
</tr>
</tbody>
</table>

Our first educational objective contributes fairly clearly to all of our student outcomes, except that it does not directly address life-long learning. Most of these contributions should be fairly clear, except perhaps for outcomes f) and j). We feel that proper design and implementation must touch upon professional and ethical responsibilities (outcome f), and that a knowledge of contemporary issues (outcome j) is vital for such proper design and implementation, particularly in a fast-moving field like computer science and engineering.
Our second educational objective focuses directly on communication and teamwork, and thus is properly evaluated by the student outcomes related to those achievements, which are g) and d), respectively.

Our third educational objective involves ethical responsibility. Obviously, student outcome f) is relevant here, as is student outcome h). We also view outcome j) as important in evaluating our success with this objective, again because of the fast-changing nature of our field. New developments and changing societal attitudes reflect new light on the ethical aspects of our field, as seen clearly by emerging societal concerns about ethical data gathering and mining, for example.

Our fourth educational objective concerns our students’ ability to continue learning throughout their careers. Student outcome i) directly addresses this objective. Again, outcome j) is also relevant, since proper understanding of contemporary issues implies not just issues at the moment students are in our program, but throughout their lives. Unless students maintain awareness of contemporary issues related to our field, they cannot effectively keep their professional knowledge up to date.

C. Process for the Establishment and Revision of the Student Outcomes
The department faculty, in consultation with the department’s Undergraduate Advisory Board, developed these outcomes shortly after our last ABET evaluation. Changes are suggested and approved via discussion among faculty, which then makes a final determination.

Our faculty has not suggested further changes to the overall student outcomes for the program since our adoption of this set, though how individual classes impact particular outcomes is reviewed annually by instructors in charge of the classes and changed occasionally as a result of those reviews.

D. Enabled Student Characteristics
We assume “student characteristics” are the same as student outcomes. We will treat each outcome in turn.

a) An ability to apply knowledge of mathematics, science, and engineering
We enable students to obtain this outcome by including requirements for serious mathematics, science, and engineering courses in their curriculum. These classes provide the necessary foundations in these fields to allow students to properly apply this knowledge to the kinds of problems they are likely to encounter in their careers. We give them actual experience in such application of this knowledge to problems through projects in upper division classes and, more extensively, through capstone design classes that incorporate elements of these fields.

b) An ability to design and conduct experiments, as well as to analyze and interpret data
This outcome requires a degree of statistical knowledge, in addition to a strong understanding of the field in which they are experimenting and the nature of the data they are producing or observing. We ensure students have the statistical sophistication to properly understand
experimental outcomes in complex fields by requiring classwork in statistics. We ensure that they understand the field of computer science well enough to design and perform useful experiments through various elements of our upper division classes. In particular, CS 111, a required class on operating system principles, includes lectures and readings on proper experiment design and data interpretation, as well as a practical exercise requiring application of those concepts. Subsequent classes offer further opportunities to apply good experimental design, with the capstone courses offering an extensive example of how to perform valid and insightful experiments in computer science.

c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
Most of the engineering and computer science classes in our program contribute to achieving this student outcome. Obviously, classes that teach students the elements of hardware and software do so, as do upper division classes that describe how those elements can be deployed to build systems that can analyze bioinformatic data, create sophisticated computer graphics, parallelize large computations, secure complex systems, and build large software projects. These upper division classes exercise these abilities through projects requiring hardware and software design. Again, the capstone courses give students a more extensive design task that exercises the skills we have helped them develop in earlier classes.

d) An ability to function on multidisciplinary teams
Several of our upper division classes feature team projects or assignments, which give the students experience in working as a group. For instance, CS 111 has a team exercise, and our ethics and engineering writing courses also emphasize teamwork. Our capstone design class (CS 152B) is inherently team oriented, with a strong element of the class focusing on functioning effectively in a team. We are experimenting with introducing teamwork earlier in the curriculum, in E 96, which is intended to provide freshmen with early experience in many important aspects of engineering, including teamwork.

e) An ability to identify, formulate, and solve engineering problems
Most of our upper division classes require students to develop these abilities, in the context of various sub-disciplines of computer science. While certainly true in many of the required CS classes (again, especially the capstone design course), students get a wider range of such experiences in the computer science electives. Depending on individual student interests and desired skill development, they may learn to work on problems in bioinformatics, data mining, programming language design, computer security, computer vision, and many other specialized disciplines. The focus on these abilities in the required courses ensures that no student in the program has missed the opportunity to learn how to deal with engineering problems, regardless of which electives they chose.

f) An understanding of professional and ethical responsibility
Classes like Engineering 183EW and Engineering 185EW are specifically focused on professional and ethical issues in engineering. All undergraduates in the Computer Science and Engineering program are required to take one of these classes, ensuring that our students have substantial understanding of the ethical issues of their field, how the field impacts our society,
and how to behave as responsible professional computer scientists. However, our focus on professionalism and ethics is not limited to these courses. Topics related to those vital aspects of an engineer’s role recur in both required computer science courses and electives. For instance, CS 136, Introduction to Computer Security, spends substantial amounts of time discussing computer privacy issues, and their implications.

g) An ability to communicate effectively
This outcome encompasses both oral and written communications. Oral presentations are a significant part of the capstone design classes and classes like 183EW and 185EW. Some of the computer science electives also use projects that include an oral presentation component. Written communications are developed in these classes, as well as in other upper division classes that require students to submit papers or to include substantial written descriptions of solutions and results of exercises and experiments. Students who successfully petition to use units of CS 194 or CS 199 to fulfill one of their electives are required to produce a written description of their work as part of this class, and frequently also have substantial oral communications with their advisor and other students working on related elements of a project.

h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
Again, 183EW and 185 EW have strong orientations towards developing such breadth in education, but many upper division classes also devote time to these issues. Classes like CS 111 emphasize how practical economic issues and questions of what human users find acceptable drive development of complex systems. The capstone design courses frequently take problems provided by local industry as the students’ tasks, complete with realistic constraints on how much solutions cost, whether they fit into societal needs and expectations, their environmental impacts, and other issues of this kind.

i) A recognition of the need for, and an ability to engage in life-long learning
Computer science and engineering is a fast moving field, so motivating the need for life-long learning in our students is not difficult. Our classes are updated frequently to include the latest developments in programming languages, data analysis techniques, useful system design elements, and other recent changes in the field. Our instructors not only include these new issues, but point out that they are new, and that more new issues and approaches will continue to emerge, so a successful practitioner in computer science and engineering must continue to learn new skills and tools throughout his career. An obvious example is in our computer security class, where new techniques to attack systems and new vulnerabilities arise weekly, if not daily. This class points out fresh problems and solutions in this area, and motivates students to continue to learn about them on their own. Another example is a recent redesign of CS 144, our course on web development. The instructor in charge recognized that standard industry practices for web development had changed, so we needed to teach new tools and techniques for building client-side web applications. By emphasizing the tools of today, we instruct our students in the need to learn the tools of tomorrow when that day arrives.

j) A knowledge of contemporary issues
Nowadays computer science touches upon almost all aspects of our lives. New issues arise regularly that have direct connections to our field, such as issues of privacy related to data
mining, biomedical issues arising from our ability to sequence the human genome, the energy costs of mining cryptocurrency, the impact of robotics on industrial workplaces, and the possibly disturbing promise of AI taking over many tasks traditionally performed by humans. As a result, it is both easy and necessary to introduce contemporary issues of our field into many of our classes, and our instructors regularly do so. Engineering 183EW and Engineering 185 EW, typically taken late in a student’s career, ensure that such issues are examined in depth, but our students will have gotten a great deal of exposure to contemporary issues and their impacts on our field in their upper division classes both before and after taking these general engineering classes.

k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
Of course, our capstone design class requires students to make use of these skills, but the use of projects and exercises in most of our upper division classes ensures that our students bring a deep existing understanding of the tools and techniques available to them into this design class. Our students are exposed to new programming languages, new hardware design techniques, modern parallel and distributed processing approaches, application of AI techniques to a wide range of problems, graphics packages and tools, and a wide range of other tools, skills, and techniques throughout their education. The capstone design course gives them the opportunity to deploy their knowledge in larger practical problems, but their toolboxes should already be well filled coming into this class.

Our departmental commitment to issues of professional responsibility, involvement in contemporary issues in the field and in our culture, life-long learning, and development of communication skills can also be seen in the excellent achievements of our undergraduate students outside the classroom, particularly in their high levels of participation in and development of computer-science related honors and professional societies. The student-run chapter of Upsilon Pi Epsilon, the computer science honors society, recently received that society’s national Best Large Chapter Award, while our student-run chapter of the ACM received the Student Chapter Excellence Award for Outstanding School Service, in both cases for the second year in a row. These organizations each have hundreds of undergraduate student members, who teach classes for the campus at large, perform outreach to local high schools, run various programming and security competitions, provide student-managed tutorials for many of our undergraduate classes, and hold events to sponsor diversity and disseminate knowledge about critical issues in computer science. That these organizations are almost entirely run by the students themselves serves as evidence that we have successfully motivated them to continue their learning process outside of our classrooms and to develop their ability to communicate and reach out to the rest of society to share their knowledge and skills. We are exceptionally proud of our students’ achievements not merely in pure academics, but in becoming mature members of our profession.
CRITERION 4. CONTINUOUS IMPROVEMENT

A. Student Outcomes

It is recommended that this section include (a table may be used to present this information):

1. A listing and description of the assessment processes used to gather the data upon which the evaluation of each student outcome is based. Examples of data collection processes may include, but are not limited to, specific exam questions, student portfolios, internally developed assessment exams, senior project presentations, nationally-normed exams, oral exams, focus groups, industrial advisory committee meetings, or other processes that are relevant and appropriate to the program.

2. The frequency with which these assessment processes are carried out

3. The expected level of attainment for each of the student outcomes

4. Summaries of the results of the evaluation process and an analysis illustrating the extent to which each of the student outcomes is being attained

5. How the results are documented and maintained

1. Assessment processes

Table 1 shows the student outcomes we seek for our undergraduate computer science program, with the performance indicators and level of achievement we wish to attain for each outcome.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Meets or Exceeds Goal</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>70%</td>
<td>An ability to apply knowledge of mathematics, science, and engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Performance Indicators:</td>
</tr>
<tr>
<td></td>
<td>(1) Uses techniques from discrete mathematics to solve problems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Below Expectations: Cannot identify an appropriate technique.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moving Toward Expectations: Identifies an appropriate technique, but has serious errors in its application.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meets Expectations: Identifies an appropriate technique, but has minor errors in its application.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exceeds Expectations: Correctly uses appropriate techniques from discrete mathematics.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) Analyzes the performance of an algorithm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Below Expectations: Cannot structure an attempt at analysis.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moving Toward Expectations: Attempts to analyze the performance of an algorithm, but does so with serious errors.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meets Expectations: Analyzes the performance of an algorithm with minor errors.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exceeds Expectations: Correctly analyzes the performance of an algorithm.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) Implements software</td>
<td></td>
</tr>
<tr>
<td>Below Expectations: Implements software that fails in most cases. Moving Toward Expectations: Implements software that meets a specification in most typical cases, but fails in many cases. Meets Expectations: Implements software that meets a specification with minor errors. Exceeds Expectations: Implements software that meets a specification correctly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. 70% An ability to design and conduct experiments, as well as to analyze and interpret data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance Indicators:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Designs experiments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below Expectations: Test plan covers at most a couple of boundary and error cases. Moving Toward Expectations: Test plan covers some boundary and error cases, but many cases are missing. Meets Expectations: Test plan has minor flaws with some missing cases. Exceeds Expectations: Formulates a software test plan that thoroughly covers both typical cases and boundary and exceptional cases.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Analyzes and interprets results of experiments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below Expectations: Cannot determine how to proceed when a failure is detected Moving Toward Expectations: Frequently needs guidance in using test results to determine a cause of failure or the nature of a remedy Meets Expectations: Occasionally needs guidance in using test results to determine a cause of failure or the nature of a remedy Exceeds Expectations: Correctly recognizes successful tests, and for those that fail, determines the cause of failure and a remedy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. 70% * An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance Indicators:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Developed good design strategy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below Expectations: No design strategy, haphazard approach to achieving goal Moving Toward Expectations: Has some strategy, but collected results failed to substantiate conclusions made</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Meets Expectations: Independently developed an average design strategy that supported some of the goal and conclusions made.
Exceeds Expectations: Developed a design strategy, decomposition of work into subsections, results substantiate all conclusions and most of the goal was achieved.

(2) Integrated information from different areas or fields to approach the design with a global view

Below Expectations: Unable to relate prior knowledge (scientific principles or previously published work) to the design problem. Has no concept of the process as a sum of its parts. Focuses on only one solution to the problem.
Moving Toward Expectations: Occasionally use prior knowledge to design individual pieces of equipment or systems. Inadequately compares other options.
Meets Expectations: Used prior knowledge to design individual systems or equipment competently. Understood and compared multiple solutions to a problem but may not always arrive at the best result independently.
Exceeds Expectations: Understands how areas interrelate and demonstrates ability to integrate prior knowledge into a new problem. Independently develops several potential solutions and finds optimum.

(3) Is aware of, seeks out, and uses diverse realistic constraints

Below Expectations: No consideration of realistic constraints and does not show interest in those constraints.
Moving Toward Expectations: Included minor or cursory consideration of realistic constraints.
Meets Expectations: Included some consideration of realistic constraints.
Exceeds Expectations: Developed a solution that includes a thorough and well-researched consideration of realistic constraints. Discussed experiments and results with an understanding of how realistic constraints may affect what type of data they were capable of collecting and what could logically be concluded from the data.

(4) Applies engineering and/or scientific principles correctly and appropriately in the design process

Below Expectations: No applications of engineering and/or scientific principles.
Moving Toward Expectations: Needs guidance to apply engineering and/or scientific principles, and does so incompletely or incorrectly.
Meets Expectations: Applied engineering and/or scientific principles, but sometimes incorrectly.
Exceeds Expectations: Correctly applied engineering and/or scientific principles to design practical processes.

d. 70% An ability to function on multidisciplinary teams

e. 70% An ability to identify, formulate, and solve engineering problems

Performance Indicators:

(1) Specifies a problem with correctness and performance requirements
<table>
<thead>
<tr>
<th>Below Expectations</th>
<th>Produces a poorly organized, vague, or incomplete problem specification from which it would be almost impossible to design a solution.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving Toward Expectations</td>
<td>Produces a problem specification from which it would be difficult to design a solution.</td>
</tr>
<tr>
<td>Meets Expectations</td>
<td>Produces a problem specification that is vague or incomplete in a few areas.</td>
</tr>
<tr>
<td>Exceeds Expectations</td>
<td>Produces a clear, thorough problem specification.</td>
</tr>
</tbody>
</table>

(2) Designs and implements a solution to a problem that meets correctness and performance requirements

<table>
<thead>
<tr>
<th>Below Expectations</th>
<th>Cannot design or implement a solution that meets more than a few requirements.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving Toward Expectations</td>
<td>Designs and implements a solution that meets some requirements, but has serious correctness or performance problems.</td>
</tr>
<tr>
<td>Meets Expectations</td>
<td>Designs and implements a solution that meets most requirements, with minor correctness or performance problems.</td>
</tr>
<tr>
<td>Exceeds Expectations</td>
<td>Designs and implements a solution that meets all requirements.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>f.</th>
<th>70%</th>
<th>An understanding of professional and ethical responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>g.</td>
<td>70%</td>
<td>An ability to communicate effectively</td>
</tr>
<tr>
<td>h.</td>
<td>70%</td>
<td>The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context</td>
</tr>
<tr>
<td>i.</td>
<td>70%</td>
<td>A recognition of the need for, and an ability to engage in life-long learning</td>
</tr>
<tr>
<td>j.</td>
<td>70%</td>
<td>A knowledge of contemporary issues</td>
</tr>
<tr>
<td>k.</td>
<td>70%</td>
<td>An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</td>
</tr>
</tbody>
</table>

Performance Indicators:

(1) Use appropriate tools

<table>
<thead>
<tr>
<th>Below Expectations</th>
<th>Is unaware of appropriate tools or their use.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving Toward Expectations</td>
<td>Has difficulty using appropriate tools effectively.</td>
</tr>
<tr>
<td>Meets Expectations</td>
<td>Can use a basic set of features of appropriate tools.</td>
</tr>
<tr>
<td>Exceeds Expectations</td>
<td>Effectively uses software tools appropriate for a task.</td>
</tr>
</tbody>
</table>

**Table 1. Student Outcomes and Performance Indicators**

Each performance indicator is evaluated at least annually in one or more courses. In each offering of the course in question, some specific work done by a student is used to evaluate the student’s performance against the indicator. This work is chosen by the instructor teaching the course that quarter. The instructor also describes the various achievement levels that students must reach to achieve the different levels against our expectations. Table 2 shows which courses are used to evaluate each performance indicator, with a brief description of the kind of work typically used to evaluate the indicator.
<table>
<thead>
<tr>
<th>Indicator</th>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a1</td>
<td>CS 180 - Introduction to Algorithms and Complexity</td>
<td>A problem on one of the exams in the class</td>
</tr>
<tr>
<td>a2</td>
<td>CS 180 - Introduction to Algorithms and Complexity</td>
<td>A problem on one of the exams in the class</td>
</tr>
<tr>
<td>a3</td>
<td>CS 111 - Operating Systems Principles</td>
<td>A project performed by individual students</td>
</tr>
<tr>
<td>a3</td>
<td>CS 118 - Computer Network Fundamentals</td>
<td>A project performed by individual students</td>
</tr>
<tr>
<td>a4</td>
<td>CS 152A - Introductory Digital Design Laboratory</td>
<td>A project performed in the lab by individual students</td>
</tr>
<tr>
<td>b1</td>
<td>CS 32 - Introduction to Computer Science II</td>
<td>A programming homework assignment</td>
</tr>
<tr>
<td>b2</td>
<td>CS 111 - Operating Systems Principles</td>
<td>A project performed by individual students</td>
</tr>
<tr>
<td>c1</td>
<td>CS 130 - Software Engineering</td>
<td>A programming homework assignment performed by groups</td>
</tr>
<tr>
<td>c1</td>
<td>CS 152B - Digital Design Project Laboratory</td>
<td>An exam question</td>
</tr>
<tr>
<td>c2</td>
<td>CS 130 - Software Engineering</td>
<td>A programming homework assignment performed by groups</td>
</tr>
<tr>
<td>c2</td>
<td>CS 152B - Digital Design Project Laboratory</td>
<td>An exam question</td>
</tr>
<tr>
<td>c3</td>
<td>CS 130 - Software Engineering</td>
<td>A programming homework assignment performed by groups</td>
</tr>
<tr>
<td>c3</td>
<td>CS 152B - Digital Design Project Laboratory</td>
<td>An exam question</td>
</tr>
<tr>
<td>c4</td>
<td>CS 130 - Software Engineering</td>
<td>A programming homework assignment performed by groups</td>
</tr>
<tr>
<td>c4</td>
<td>CS 152B - Digital Design Project Laboratory</td>
<td>An exam question</td>
</tr>
<tr>
<td>d</td>
<td>ENG 183 - Engineering and Society</td>
<td>A team project</td>
</tr>
<tr>
<td>d</td>
<td>ENG 185 - Art of Engineering Endeavors</td>
<td>A multidiscipline team project</td>
</tr>
<tr>
<td>e1</td>
<td>CS 130 - Software Engineering</td>
<td>A programming homework assignment performed by groups</td>
</tr>
<tr>
<td>e1</td>
<td>CS 152B - Digital Design Project Laboratory</td>
<td>An exam question</td>
</tr>
<tr>
<td>e2</td>
<td>CS 130 - Software Engineering</td>
<td>A programming homework assignment performed by groups</td>
</tr>
<tr>
<td>e2</td>
<td>CS 152B - Digital Design Project Laboratory</td>
<td>An exam question</td>
</tr>
<tr>
<td>f</td>
<td>ENG 183 - Engineering and Society</td>
<td>An exam question</td>
</tr>
<tr>
<td>f</td>
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Table 2. Methods used to evaluate performance indicators

2. Frequency of Evaluation
The performance indicators evaluated in Computer Science classes (as shown in Table 2) are evaluated annually. For indicators for which more than one class is used to evaluate them, each class is evaluated annually. The performance indicators evaluated by Engineering classes (as shown in Table 2) are also evaluated annually, but since they are used for similar purposes for other engineering departments’ ABET evaluations in addition to the CS department’s, we do not receive per-department breakdowns of student performance from these classes every year. For two years in the current ABET evaluation cycle we did receive per-department breakdowns for these Engineering classes. They showed that per-department results were substantially similar to all-School results.

3. Expected level of attainment
We expect 70% or more of our students to achieve levels of “meets expectations” or “exceeds expectations” on each performance indicator. Where a performance indicator is evaluated in more than one class, we expect that level of achievement in all classes for which it is measured.

4. Summaries of results
In summary, we attained our goals for student performance for almost all performance indicators in almost all courses each year. Typically we would have a small number (2-4) performance indicators in particular courses that did not reach the target level. Often they were close. In other cases, there were very few students enrolled in the course in question, leading to much weight being placed on the performance of one or two students, which gave us little confidence in the accuracy of the measurement. Regardless, when performance indicator levels did not meet the target, we took remedial action. In most cases, we did not observe failure to achieve the target level for the same performance indicator in the same course two years in a row, suggesting that the remedial measures we took when a course failed to bring students up to
the desired level were effective. In one or two cases over the course of the 6 year evaluation period, it took more than two offerings of the course to bring the achieved levels up to our target. For instance, in the winters of 2015, 2016, and 2017, CS students in CS 152A did not achieve 70% or better levels of meeting or exceeding expectations on performance indicator c1. However, these three offerings of this class had 3, 3, and 2 CS students in them, respectively, and achieved 67% levels in 2015 and 2016, meaning two of the three students were at the desired level. In 2017, one student of the two taking the class failed to reach that level. Given that the failure to achieve the level represents the performance of exactly one student, it is unclear if these results are meaningful. This performance indicator was also measured for another class, CS 130, and our targets were met for that class. Nonetheless, we took remedial actions to improve student performance on this indicator in CS 152A and continue to investigate methods of obtaining better performance for CS students on this performance indicator in this class.

We present full results for each course that was evaluated, organized by year, below. Some outcomes were measured in classes not taught by the Computer Science Department. Since these classes taught students in all departments in Samueli, we do not have CS-only breakdowns of the outcomes in these classes for all years. These results are discussed in a separate section. The school-wide outcomes and individual CS breakdowns for selected years will be made available at the visit.

Note that there are no evaluation data for 2012-2013, and little data for 2013-2014. In part this was due to changing our set of evaluated classes, based on feedback from our previous site visit. A more important reason is that just before our previous ABET evaluation visit, our undergraduate enrollment grew substantially. This resulted in our students having difficulty enrolling in the Computer Science Department classes they needed to graduate. The ABET evaluators for the previous cycle noted this problem and suggested that we should address it, so we did so. We gave priority to handling our students’ problems with obtaining the classes they needed over immediately obtaining fresh outcome evaluation data.

We worked with OASA administrators to develop a better system for determining class demand for required classes in our program. In the first two weeks of the Winter Quarter of 2013, we used this information to add sections to courses to accommodate more students. A challenge, though, was finding larger classrooms for the lectures (since the campus-wide competition for larger rooms is fierce) and persuading the faculty to teach larger lectures than they had ever taught before. We improved the process for Spring Quarter 2013 by acting on the demand data a month before the quarter started instead of during the first two weeks of the quarter. It was much easier to switch to larger rooms before the rest of the campus was doing the same thing. When adding new sections, especially lab sections, we had the luxury of time to survey the students for the times that would let us accommodate the most people. There were only a few classes that required any action after the start of the quarter. The same kind of advance work during the summer reaped the same rewards for the Fall quarter.

Once the urgent problem of ensuring our students could enroll in the classes they needed, despite an explosion in their numbers, we then turned our attention to gathering the student outcome data. This did not bear fruit immediately, but by 2014-2015, we started to get more sets of data
from our evaluated classes. By 2015-2016, and subsequently, we have obtained full data on student outcomes from these classes.

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</tr>
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**Student Outcomes for 2016-2017**
This class was taught in the spring quarter. Evaluations were not available at the time of report submission, but will be available at the site visit.

### Student Outcomes for 2017-2018

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<thead>
<tr>
<th>PI</th>
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<th>ME</th>
<th>EE</th>
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</tbody>
</table>

*This class was taught in the spring quarter. Evaluations were not available at the time of report submission, but will be available at the site visit.*
5. Documentation and maintenance of the results

The results from these performance indicator evaluations are gathered on a common web site maintained by UCLA Samueli for all departments. The faculty member in charge of the course during the quarter under evaluation uploads the material (exam question, project description, etc.) used for the evaluation, counts of students performing at each level, and samples of student work at each level. For classes in which the combined group of students either meeting or exceeding expectations did not reach our target (as defined in Table 1), the instructor also provides comments on why the target was not met and suggestions on how to improve the course so that a higher proportion of students meet the target.

The results stored on this web site are available to the particular instructor of a class, as well as the departmental ABET coordinator and the department’s Undergraduate Vice Chair. The ABET coordinator and Vice Chair meet annually to review the results, paying particular attention to those classes where the target was not met or where student evaluations of the instructor indicates a potential issue with meeting the targets in the future. As needed, remedial steps are recommended for future instructors of the classes in question.

We also gather student input on each class via a survey. This survey typically asks general questions about the instructor and the class and provides students an opportunity to give specific comments about the class. These surveys are gathered online and made available to the instructor and the Undergraduate Vice Chair in the following quarter. Where student surveys show reason to be concerned about a class, regardless of whether the more formal performance indicators have been impacted, the Undergraduate Vice Chair consults with the faculty member in charge of the class to determine if changes are required.

In previous years, we had difficulty getting a large proportion of the students in a class to fill out this survey. During the current ABET cycle, we received permission from our Dean to allow students to get a modest amount of grade credit (typically 1% of their final grade) merely for filling out the class survey. The credit is not based on how the students rated the class, but only on submitting a completed survey. This credit is assigned at the discretion of the instructor in charge, but this approach has proven to be very effective in obtaining high percentages of survey completions by our students.

In addition to this class-based input to our continuous improvement process, we have regular meetings that provide further input. We hold annual town hall meetings for our undergraduates, run by the Undergraduate Vice Chair and attended as well by the ABET coordinator and other faculty. These meetings address a wide range of student concerns, some of which are unrelated to ABET or even academic issues, but invariably issues of the content of the curriculum and effectiveness of key undergraduate classes are discussed. The Undergraduate Vice Chair considers changes and improvements to the curriculum and other aspects of the department’s academics taking into account concerns and suggestions arising from these meetings. Where necessary, the Vice Chair formalizes a proposal for the faculty as a whole, presents the plan at a faculty meeting, and solicits a vote of the faculty on how to proceed.
We also have an annual meeting of our Advisory Board. This group consists of alumni, local industry members, and other outside parties who are interested in and influential in our department’s operations. The Advisory Board covers a wide range of topics, including some that are not directly relevant to ABET accreditation, such as the graduate program. However, it always discusses important issues of undergraduate studies, including curriculum, size and composition of the undergraduate student body, preparation of undergraduates for industry careers, and academic achievements of our undergraduates. The Advisory Board often suggests changes and improvements in our undergraduate program, which are considered by the Undergraduate Vice Chair. In some cases, he adopts their proposals. In others, suggested changes require general faculty approval. In these cases, the Vice Chair consults with relevant faculty and, should the consensus be that the proposal should be considered by the faculty as a whole, it is discussed at a faculty meeting, possibly leading to further action.

We also survey our graduating seniors to determine their feelings about their undergraduate education at the time they are completing it. In earlier years we had difficulty persuading many of them to fill out such a survey. Recently we tied completion of this survey to obtaining tickets to the graduation ceremony, which was very successful in raising the rate of survey completion. We review the survey results to determine if they indicate any changes we should consider in our program.

We annually contact alumni from the class that graduated five years in the past to request that they fill out a similar survey, based on having some time after program completion to better evaluate how well it prepared them. Unfortunately, few of our alumni fill out this survey. Personal appeals from faculty members they worked with during their time at UCLA have not helped raise the response rate. We have, to date, found no analog to our approaches for the in-class survey or graduating senior survey that works equally well for the alumni survey, though we continue to explore options.

We also make use of less regular and formal inputs. Undergraduate students occasionally bring concerns or ideas to the Vice Chair or other faculty members, outside the more formal annual town hall meeting. Alumni and visiting industry recruiters offer us suggestions on what they are looking for in graduates from our program. We observe changes made in other departments at UCLA and at other universities to determine if there are improvements we should make to our own department. Further, some suggested improvements arising from the sources mentioned above require more study before we can determine if they are likely to be beneficial for our department, in which case we typically task one of our faculty to gather further data from various sources to assist us in deciding how to proceed.

The procedures for evaluating student outcomes evaluated by classes taught in the Engineering program, rather than by the Computer Science department, are somewhat different. These procedures are outlined in the subsection below.

**Evaluation of Student Outcomes From Engineering 183EW and 185EW**

Engineering 183EW and 185EW are primarily responsible for the following ABET Outcomes:
3(d) – An ability to function on multidisciplinary teams
3(f) – An understanding of professional and ethical responsibility
3(g) – An ability to communicate effectively
3(h) – The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
3(i) – A recognition of the need for, and an ability to engage in life-long learning
3(j) – A knowledge of contemporary issues

Inputs for continuous improvement for Engr 183EW and 185EW are somewhat limited. We do not have access to town halls that the departments use, so we are primarily limited to the following items:

• **Student Evaluations from the Office of Instructional Development**

The Student Evaluations from the Office of Instructional Development are perhaps the best input we have. Although there are numerical markers, they are not as specific and do not lead to definitive ideas on where improvements can be made. On the other hand, many of the prose statements are very specific and many are actionable.

At the outset, we must note that some of the responses in the OID Student Evaluations are just to get a 1% increase in their grade (e.g., “☺” doesn’t add much to the evaluation of the course), and some of the responses border on whining without any significant input.

But many of the responses do have substance, and in many cases suggest areas where improvement may be made, such as

“The case studies in this class were extremely interesting and introduced the real ethical and unethical decisions that are made in the engineering industry. That's really the only good part about the course. Other than that, the course is a glorified history class that safely explores the ethics of decision-making using the most clear-cut scenarios. Not once were we presented with a case that had any nuance to make one really ponder whether a decision was ethically justified. Also, it seems that with the number of frameworks available and the ability to mold them to a situation, you can justify almost anything as ethical or unethical. Add more case studies, more nuance, or change the class to focus more on technical writing. Please do something to make this class more stimulating.”

We try to show nuance in the case studies that we present, where appropriate. Even in cases where the ultimate results were disastrous (e.g., DC-10, Fukushima), the initial decisions were not necessarily unethical. We emphasize this, but point out how weak engineering decisions, even if ethical, can lead to disastrous results if not continually evaluated in the light of experience or new research (= Lifelong Learning).

**ACTION:** We think that we will try to come up with a case study that has a good amount of nuance to it – the Citicorp Center case. LeMessurier’s efforts were extraordinary in blowing the whistle on himself, but there are some troubling actions on his part and on the acts of his firm’s employees that are questionable to some degree. For example, the proximate cause of the problem was the decision by a junior engineer to switch from welded connections to bolted. However, this decision was unaided by the knowledge that LeMessurier himself considered the chevron (angled) steel members to be columns (which required a safety factor of 2:1) whilst the junior engineer erroneously assumed them to be trusses (which only required a safety factor of 1:1). This demonstrates a serious communications failure in the firm, one that has never been satisfactorily addressed.

In addition, the Ford Pinto case, as expressed in the textbook (in reality, all engineering ethics textbooks and the general media) present the case improperly and it’s time for a reset that acknowledges the fact that the so-called “smoking gun” memo had nothing to do with the initial design of the vehicle, was written in response to a federal government request for input on the use of cost-benefit analyses in regulatory decision making (indeed, the so-called values put on life, injury, and car loss were from the government), and was apparently never seen by the design staff or senior management within Ford.

**Student ABET Evaluations**

We find it difficult to find any actionable material in these numbers. We always do well (~90%), so where’s the material that we can base improvements on? There’s nothing in our ABET questions on the level of the specificity of “Can you solve a problem using Ohm’s Law?” But perhaps we should rewrite our questions to have a little more specificity, but we don’t want to list to get too long, since at some level the responses would not be given any serious thought.

**Input from individual students throughout the quarter**

A number of students have asked to write ethical case studies on incidents that are more recent than the majority of the canonical case studies usually identified as ethical cases suitable for discussion in class.

Since this was not an unreasonable request, we have reevaluated the use by all students of more recent cases, such as the BP Mocando well blowout, the Guidant defibrillator case, Endovascular Technologies’ aortic stent, and so forth. Although the available information and discussion is slimmer in recent cases, requiring a bit more research effort, it clearly shows that ethical failures in engineering design and management are still with us.
Unfortunately, the results of this change are mixed. Newer cases seem to create a higher level of interest than do 50-year-old cases, but newer cases are easier to simply Google, without taking time to inquire in the technical literature, authoritative government reports (e.g., NTSB, Congressional hearings, etc.). We will try to narrow the ability of students to simply use Google searches and demand a higher level of research in the preparation of the reports.

• Input from Teaching Assistants

“I have been thinking a little about how I would like to improve my discussion. The main thing I've been asking myself is "What do I want the students to learn in the time that we have?" The two things that I conclude are writing skills and the ability to make good ethical judgments.

I think the improvement in writing skills comes mostly from writing the two essays and giving them feedback on each one. I don't think it would be very practical to have English lessons. What would be helpful is to do more exercises on how to make strong logical arguments (I think parts of chapter 4 and 5 of the book). This would include exercises in how to take information, analyze it, and synthesize a logical argument from it. It could also look like analyzing various logical arguments, and determining its strengths/ weaknesses. We do it a little when we look over old papers, but it would be helpful to have it as a separate exercise. It would also help to look over two papers of different quality that are on the same topic, so that the students can see how the same information can be utilized in vastly different manners...

While we do teach the students a normative ethics framework, i think the examples we use make it very clear what went wrong. In real life, the decisions that lead to a failure are not so clear and are usually a culmination of decisions. As a result, I think students come out of the class with a good understanding of how to judge bad decisions, but not how to make good ones. It would be interesting to take more time to discuss the importance of making good decisions from a personal standpoint, as well as to have simulations/debates. One of the values I see in the class is that there are people from all over with different experiences and thus, moral standpoints. I would love it if people could hear more from each other and learn from each other. While this wouldn't be as educative from an academic standpoint, I think it would be far more valuable to help each student grow as an individual.”

We have begun to stress more advanced writing techniques, including argumentation, audience, etc. We used to teach these topics, but the current representative of Writing Programs placed a higher emphasis on evaluating old papers rather than teaching new ways of approaching a writing assignment. We have returned to the old ways, with a minor improvement in writing results. We need to stress this more, especially in relation to the ethical analyses and ethical argumentation chapters in the textbook.

• Evaluation of test questions
Occasionally test questions do not work out the way you expected them to. For example, the following question from the Fall 2017 Engr 185EW exam was answered wrong by virtually all students:

“During your patent search, you find someone who owns the intellectual property rights for a design that you wish to use. Since that are using the concept in a totally different application, you are allowed to use the design as you do not violate the claim.

a. True
b. False”

The answer is True.

We threw out the question when grading the exam. The concept was clearly not conveyed properly during lecture. In subsequent quarters we will place greater emphasis on showing by definitive example how patents can take on a new life when applied in a manner not envisioned by the original patent application.

• **Departmental Exit Surveys**

Based on one set of Departmental Exit Surveys, we observed:

1) the questions are worded much better than the quarterly ABET Evaluation questions in that they ask about the students’ view of the importance of a topic *and* the students’ view of whether those goals *had been accomplished*; and 2) they generally show a 20 point difference between what the students express as what they feel is the importance of a topic (e.g., Teamwork) and what they feel as what they’ve actually been taught. In general, the graduating students’ responses about the importance of the ABET Outcomes closely mirrors employer’s views on the same criteria.

**B. Continuous Improvement**

Most commonly, when per-class data shows that we are not meeting our target for a performance indicator, the faculty member in charge of the class analyzes the reasons for the failure and adjusts the class to improve future performance. In other cases, when several faculty members teach the course in different quarters, they meet as a group to discuss such improvements.

For larger changes, the procedure is more elaborate. As outlined above, the ABET coordinator and the Undergraduate Vice Chair meet annually to review the evaluations of student outcomes, class surveys, and the surveys of recent graduates and alumni. The Vice Chair also discusses potential changes with the ABET coordinator based on the meetings of the Advisory Board and the Student Town Hall. Some discussions are carried out via email, others in person. Further, the Computer Science Department holds an annual retreat to discuss matters of importance for the upcoming year. During that retreat, the ABET coordinator presents recent results from the data sources discussed above and leads a discussion among the faculty on any changes to the program that we should make in response to this data.

These discussions often lead to ideas for improvement in our program. In some cases, the ideas are specific to a particular class, in which case they are then discussed with the faculty who are
in charge of and teach that class to determine if they believe the idea will improve their class. For more general issues (such as whether a class should be added to or removed from our required curriculum), the Undergraduate Vice Chair consults our departmental Undergraduate Program Committee. If discussions with that committee suggest that we should proceed, the Undergraduate Vice Chair will prepare a presentation for the general faculty at one of the department’s regular faculty meetings. If the issue is made clearer by more data, he will sometimes also prepare materials to be sent out to the faculty ahead of the meeting. The faculty will discuss the proposal. Some proposals can be settled by an informal sense of the faculty consensus. Others require a formal vote, typically because university rules demand such a vote to make important changes in the program, such as altering the curriculum. In these cases, we will hold a formal written vote of the faculty to determine if a change should be made.

We now describe several improvements we have made to our department’s undergraduate program based on different paths motivated by different types of data.

1. **Redesign of CS 111** – CS 111 is our operating systems principles course. It is required for all CS majors. The course had been overhauled around a decade ago, but had not been substantially changed since then. One of our alumni, who had spent his entire career working in operating system development and who also assisted with teaching the class, described to the faculty in charge of the class why our existing approach to teaching the material was no longer consistent with the uses students would actually find for it in industry. This led our faculty who taught CS 111 to thoroughly redesign the course. We carefully outlined the topics and lessons we felt should be covered by the course, mapped them into a set of lectures that would fit into our quarter system, chose a new textbook after reviewing all the major alternatives, found some supplemental readings and wrote some others that we felt were insufficiently discussed in the textbook, and created a new set of projects that better matched both our perceptions of what a modern CS student should know about operating systems and what would be useful to them in their future careers. Project redesign required substantial software development. Also, we expected that the new projects would require more hardware support. Therefore, we requested (and received) funding from the university to purchase the needed hardware and support a student to help develop the software.

We started teaching the revised course in Fall 2016. The response to it from the students has generally been good, after some initial difficulties in getting the new materials in place. There are still some issues with some of the projects, which we continue to work on to improve.

2. **Redesign of CS 144** – CS 144 is a course on the World Wide Web and software development for that environment. When originally developed some ten years ago, this course focused on primarily server-side issues, but over time the bulk of functionality has been moved to the client side. This has led to new models and tools for web development. The faculty member in charge of the course recognized this change and the need to update the course. We also received feedback from alumni surveys suggesting we needed to concentrate more on application development of this kind. For example, one comment we received about our program during an alumni board meeting was:

“There was very little focus on web and app development which dominate the industry now.”

As a result, we have redesigned this course to focus on client-side software and tools. To quote Dr. John Cho, the faculty member who performed the redesign:
“I decided to revamp the class to teach our students on "new models" of web development, such as functional and asynchronous programming which has became [sic] much more popular due to its usefulness in the context of non-blocking API calls and in parallel and distributed systems. I also decided to introduce "modern tool chains" in the class projects, such as JSON-based MongoDB, Node.JS JavaScript engine, and Docker container virtualization engine. Through these revisions, I hoped to equip our students with the theory and the practice needed by modern web application developers.”

These changes were instituted as of the 2018 offering of the course. If student feedback on the new version of CS 144 is available before this report is due, we will incorporate it into the report, to provide evidence of the effect of this change.

3. **Changes in required non-CS classes** – Students in town hall meetings had complained that they were required to take science classes that were not relevant to computer science, but put heavy demands on their time. Our Undergraduate Vice Chair set up further meetings with representatives from student organizations (like the local student chapter of the ACM and Upsilon Pi Epsilon, the engineering honor society) to further discuss the issue. Based on their comments, we examined the set of science classes required for our degree, and determined that perhaps requiring our students to take chemistry and two physics lab courses might be unnecessary. After checking to make sure that our program would still meet ABET requirements for the total units in math and science, as well as the general requirement to expose students to core science topics and science labs, we decided to take a closer look at whether these requirements would truly be necessary for today’s computer scientists. We surveyed the other campuses of the UC system to find out which of them required chemistry as part of degree programs similar to our CS&E program, and determined that none of them had that requirement except UCLA. We also looked at the undergraduate requirements similar programs at peer institutions offering such degrees, such as Stanford, MIT, CMU, the University of Washington, and several others, and determined that few of them required chemistry of their students in these programs. We therefore began the necessary actions to remove the class from our requirements (which involved formal departmental votes and other university-level procedures). Starting in 2017, our CS&E undergraduates were no longer required to take this class. Students have individually commented positively on this change. Also, at the undergrad town hall meeting in winter 2018, a survey of student participants in the meeting showed overwhelming support for this change.

Similarly, our students had complained about the physics labs we required, which required a lot of work compared to the number of credits they gave. They also complained that these labs were not very relevant to their academic interests. In addition to classwork in physics (which we felt was still highly beneficial to our students), we required two physics labs, one essentially on mechanics and the other on electromagnetism. Based on student input, we originally thought of dropping the requirement for the mechanics lab, since electromagnetism seemed more relevant to computer science. However, discussions with our faculty pointed out that some students, such as those specializing in robotics, might find the mechanics lab more relevant to their future needs. Therefore, we settled on allowing students to take either of the two labs that they preferred. This change also became effective in 2017. A survey of students at the winter 2018 undergrad town hall meeting showed strong approval for this change.

These discussions led our faculty to consider whether more liberty in the particular sciences we required might be better for our students. For example, undergraduates interested in the
burgeoning field of bioinformatics might find much more use for a class in biology than one in physics. We are currently considering whether to replace the requirement for physics and a physics lab with a requirement to choose from one of several science courses (and associated labs) that best fit the student’s interests. We surveyed students at the winter 2018 town hall meeting about this possible change. The results were somewhat ambivalent, with reasonable support for the value of offering flexibility in undergraduate science options, but nearly equal feeling that a strong physics background was particularly valuable for computer science majors. Due, in part, to the unclear signals sent by our students we will continue to investigate this possible change before deciding if it is the correct choice.

4. **Broadening choice of CS electives** – For some years our undergraduate program required students to take Computer Science elective courses chosen from a set of particular classes. For example, they were required to take one class from among CS 143 (Databases), CS 161 (Artificial Intelligence), and CS 174A (Computer Graphics). There were other similar requirements to take one class from among a small set of three or four. The original motivations for these restrictions no longer seemed relevant to our field, and students had expressed unhappiness about not having more liberty in tailoring their computer science electives to match the path they wished to pursue. Based on their input, we have removed the restrictions on choices of electives from among the courses offered in the Computer Science department. We did not reduce the number of such classes required, but gave students more liberty in choosing which ones to take. This change became effective as of Fall 2017. Students at the 2018 undergrad town hall meeting were strongly supportive of this change.

5. **Changes to assist less experienced freshmen** – Over the past few years our undergraduate enrollment has grown significantly, matching general student interest in the field of computer science. One result has been we have enrolled more freshmen who, while well prepared in general for higher education, had less experience in computer science than some of their peers. This proved particularly common for female students and students from underrepresented communities, though it occurred across the entire entering student body. This lack of existing experience put these students at a disadvantage compared to students whose high schools had offered substantial classwork in programming and other aspects of computer science, even though these students were otherwise the intellectual equals of their peers. Based on suggestions from several current students who had experienced these problems, we recently instituted several new programs in our department that are meant to help less prepared students. For example, we are now offering a class in Python (CS 97) for students with no programming experience at all, to be taken before our normal introductory programming sequence. Python is commonly felt to be an easier path into programming for those with no previous programming experience than other languages. We have also hired several undergraduate students to act as “learning assistants,” particularly to help with students taking CS 31, the first course in that programming sequence. These changes went into effect in Fall 2017. Student feedback on these changes was generally positive, but not as strongly so as some of our other changes, possibly because feedback tends to come from upper classmen, rather than freshmen. Since these changes only went into effect quite recently, relatively few of our students have had an opportunity to benefit from them, and since they directly affect students at the beginning of their program, most of our existing students do not expect to benefit from them in the future. Nonetheless, the positive feedback suggests that an important subset of our incoming students will benefit from these changes, so we plan to continue them. Our alumni board was also supportive of these measures.
6. **Changes in CS 118** – CS 118 is our introductory networking class. In Winter 2015, only 58% of the CS&E students in the class met or exceeded expectation on performance indicator a3 (“An ability to apply knowledge of mathematics, science, and engineering - Implements software”). The professor’s comment on these results was: “We would like to make further improvement in the next offering of the course by doing more problem solving exercises in class.”

A different professor taught CS 118 the next time this performance indicator was evaluated in this class, in Winter 2016. He incorporated the suggestion above in his approach to the class. This change worked well for our CS students, but did not help with the performance of CS&E students. Analysis of their performance on the material used to evaluate this outcome suggested a particular problem, that they were not grasping issues related to window size in transport protocols, suggesting in turn a wider concern about how well they understood important issues like flow control in network protocols. The instructor suggested more use of detailed examples of key protocol features in lectures. Wen taught again in Winter 2017 (by a third professor, taking the earlier comment into account as well), the CS&E student achievement level on this indicator was 80%, suggesting that the improvement was effective.

7. **Changes in the units for CS 35L** – CS 35L is a laboratory class required of all our students early in their careers, typically after taking the introductory programming sequence, but before moving on to upper division CS classes. It covers a variety of practical software development tools and techniques, such as the use of makefiles, debuggers, change control systems, etc. Previously, CS 35L was a 2 unit class (as opposed to the typical 4-5 units for other CS classes). There was longstanding student unhappiness, expressed in multiple town hall meetings, about the workload required by this class, and the small number of units associated with that work. Since the skills developed in the class are vital to doing practical work in computer science, and are extensively used in our upper division classes, we could not significantly reduce the workload. University restrictions on the number of units required to complete our program limited our ability to increase the units for 35L, but we were able to increase it from 2 units to three units. Students at our most recent town hall meeting were generally happy with this change, but not terribly enthusiastic. We think they still regard the workload as unacceptable for a three unit class.

8. **Introduction of new classes** – Our town hall meetings with undergraduates and other feedback from these students have identified a number of class subjects that our students wanted to have included in our curriculum that were not already being offered. To some extent, we are limited in meeting these requests not just by our judgment on the suitability of the requested classes for our program, but also by the availability of qualified faculty to teach them. However, the students’ interest in new classes are taken into account in our planning of the undergraduate program whenever possible. For example, we have had several student requests over the past few years to offer undergraduate courses in machine learning. Since we were able to add faculty who specialized in this area, we are now offering a new upper division elective, CS 146, in machine learning. Winter 2018 is the first quarter that the class has been offered, so we do not have student feedback on it yet, but it has attracted over 200 students, so clearly the interest is indeed high. Based on student requests and consultation with alumni, we also plan to add an upper division course in distributed systems, starting in spring 2019. We also have used feedback from our Advisory Board to guide the choice of new classes. For example, this board
encouraged the expansion of our program in bioinformatics. It also supported our introduction of CS 145, Data Mining, in Fall 2014.

9. **Changes in CS 32** – Even when we meet our targets for student outcomes in a class, we try to continue to improve the class, with one of our goals in those improvements being an even higher level of student outcomes. We are particularly concerned when we see a decline in student outcomes for a class, even if the lower level is still above our target. One example is in CS 32, one of the classes in our introductory programming sequence. Outcome b1 (an ability to design experiments) is measured in this class. For a couple of years, we achieved 89-90% levels of meeting or exceeding expectations on this outcome. In 2016-2017, the level dropped to 80%, still well above our target of 70%, but a significant drop nonetheless. Perhaps more disturbing, the drop was caused by a large increase in the number of students whose performance on this outcome was below expectations, suggesting serious failure to instruct this group of students in how to design experiments. The instructor of the class felt that students had not received sufficient instruction in considering error cases, boundary cases, and other unusual outcomes in their experiment design, and planned to spend more time discussing these issues in lecture. In the next measured offering of this course (2017-2018), the level for outcome b1 went back up to nearly 88%, suggesting that the change had been effective.

There are also Samueli-wide elements of continuous improvement related to the Computer Science degree program. For example, faculty throughout UCLA Samueli recognize the value in giving our students early exposure to the practice of engineering design. While capstone projects and major assignments in upper division classes in the various departments do offer students significant design experience, these classes occur late in a student's career. By introducing students to the necessity for proper design early in their program, we believe they will better understand why issues of design and engineering trade-offs are being taught throughout their entire program. Further, early experience in design is likely to give students a better flavor of what engineering actually is. This experience can energize and excite young students, particularly those who come into the program without a clear idea of what the engineering disciplines are really about.

To give our students such early design experience, UCLA Samueli began to offer E96, Introduction to Engineering Design, in 2016. This class is designed primarily for freshmen entering engineering programs. Different sections of the class give students exposure to some basic principles of engineering design in various disciplines. Each section poses some simple (but realistic) engineering design task that teams of students must complete during the course of a single quarter. We have offered sections of E96 that concentrate on design problems in electrical engineering, computer science, and other engineering disciplines. So far, our experience has been that our early career students are energized and excited by actually tackling a real engineering design challenge in the first year of studies, rather than having to absorb a great deal of classwork before getting their hands on an actual problem in their field. Currently, E96 is an elective class, but we are studying whether it would be a valuable addition to the engineering program for undergraduate students in all our departments.

The Computer Science department has taught a section of E96 twice in the past two years. This section concentrated on a design problem in building and securing a device for the Internet of Things. Attendance was light for the first offering, but the students were enthusiastic. The
second offering had much higher enrollment and equally enthusiastic students. We plan to teach this section of E96 again in the upcoming academic year of 2018-2019.

UCLA Samueli has recently begun a large effort aimed at greatly increasing the quantity and quality of hands-on design experiences available to our undergraduates. A major part of this effort centers on the development of a new student-focused Makerspace, a 9000 sq. ft facility containing a full machine shop, equipment for welding and woodworking, 3D printers, laser cutters, electronics testing and circuit board fabrication, fume hoods, and other fabrication and testing equipment. The Makerspace is capable of supporting student work in all engineering majors. This space will support formal classroom activities as well as informal student-driven creative work, associated with student groups and clubs or completely independent of them. Additionally, there will be Makerspace-oriented versions of the E96 Introduction to Engineering Design courses described above, in which first year students are introduced to basic theoretical concepts, design principles, and equipment for fabricating and testing, in all of the engineering majors, for example: Aerospace Engineering (rocketry), Mechanical Engineering (go-karts), Computer Science and Electrical Engineering (virtual reality programs interfaced with electronic apparatus), Chemical Engineering (cooling towers for chemical synthesis of soap), and others.

C. Additional Information

We will provide full copies of the assessment materials for all classes at the time of the visit, as well as student and alumni surveys. We will also include minutes of the student town hall meetings and Advisory Board at that time.
CRITERION 5. CURRICULUM

A. Program Curriculum

Table 5-1 below describes the plan of study for students in the UCLA Computer Science department’s Computer Science and Engineering degree program. There is only one curricular path. UCLA is on the quarter system.
<table>
<thead>
<tr>
<th>Course</th>
<th>Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.</th>
<th>Subject Area (Credit Hours)</th>
<th>Engineering Topics Check if Contains Significant Design (Y)</th>
<th>General Education</th>
<th>Other</th>
<th>Last Two Terms the Course was Offered: Year and, Semester, or Quarter</th>
<th>Maximum Section Enrollment for the Last Two Terms the Course was Offered</th>
</tr>
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<tbody>
<tr>
<td><strong>Freshman Year – 1st Quarter</strong></td>
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<td>Computer Science 1 - Freshman Computer Science Seminar</td>
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<tr>
<td>English Composition 3 – English Composition, Rhetoric, and Language</td>
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<tr>
<td>Mathematics 31A – Differential and Integral Calculus</td>
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<td>Physics 1A – Mechanics</td>
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<td>Computer Science 33 - Introduction to Computer Organization</td>
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<td>Mathematics 32A – Calculus of Several Variables</td>
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<tr>
<td>Physics 1B – Oscillations, Waves, Electric and Magnetic Fields</td>
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### Sophomore Year – 1st Quarter

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<th>Terms</th>
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<td>Computer Science 35L - Software Construction Laboratory</td>
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<tr>
<td>Computer Science M51A or Electrical and Computer Engineering A16 - Logic Design of Digital Systems</td>
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<td>4</td>
<td>W18, S18</td>
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<tr>
<td>Mathematics 32B – Calculus of Several Variables</td>
<td>R</td>
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<td>W18, S18</td>
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<tr>
<td>Physics 1C – Electrodynamics, Optics, and Social Relativity</td>
<td>R</td>
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### Sophomore Year – 2nd Quarter

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<tr>
<td>Mathematics 33A – Linear Algebra and Applications</td>
<td>R</td>
<td>4</td>
<td>W18, S18</td>
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<tr>
<td>Mathematics 61 - Introduction to Discrete Structures</td>
<td>R</td>
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<tr>
<td>Physics 4AL – Mechanics Laboratory</td>
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<td>OR</td>
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<td>Physics 4BL – Electricity and Magnetism Laboratory</td>
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### Sophomore Year – 3rd Quarter

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<td>Computer Science 180 - Introduction to Algorithms and Complexity</td>
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<td>Electrical and Computer Engineering 3 - Introduction to Electrical Engineering</td>
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<td>Mathematics 33B – Differential Equations</td>
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### Junior Year – 1st Quarter

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<tr>
<td>Computer Science 111 - Operating Systems Principles</td>
<td>R</td>
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<td>Electrical and Computer Engineering 10 - Circuit Theory I</td>
<td>R</td>
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<td>F17, W18</td>
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<td>OR</td>
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<td>Electrical and Computer Engineering 10H - Circuit Theory I Honors</td>
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<td>Electrical and Computer Engineering 11L - Circuits Laboratory I</td>
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*HSSEAS GE Elective*
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<td>Computer Science 131 - Programming Languages</td>
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<td>Computer Science 118 - Computer Network Fundamentals</td>
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<td>Computer Science M151B or Electrical and Computer Engineering M116C - Computer Systems Architecture</td>
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<td>Electrical and Computer Engineering 110 - Circuit Theory II OR</td>
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<td>Electrical and Computer Engineering 110H - Circuit Theory II Honors (first offering F17)</td>
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<td>Computer Science 152B – Digital Design Project Laboratory</td>
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<td>Computer Science 181 - Introduction to Formal Languages and Automata Theory</td>
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<td>ISSEAS GE Elective*</td>
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<td>Technical Breadth Course*****</td>
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<td>Course</td>
<td>Indicate Whether Course is</td>
<td>Subject Area (Credit Hours)</td>
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<td>TOTALS-ABET BASIC-LEVEL REQUIREMENTS</td>
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<tr>
<td>OVERALL TOTAL CREDIT HOURS FOR COMPLETION OF THE PROGRAM</td>
<td>180</td>
<td>27.5</td>
<td>46.6</td>
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<tr>
<td>PERCENT OF TOTAL</td>
<td>27.2%</td>
<td>47.8%</td>
<td>13.3%</td>
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<td>Minimum Semester Credit Hours</td>
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<tr>
<td>Minimum Percentage of Total Credits Required for Graduation</td>
<td>25%</td>
<td>37.5%</td>
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</tr>
</tbody>
</table>

1. For courses that include multiple elements (lecture, laboratory, recitation, etc.), indicate the maximum enrollment in each element. For selected elective courses, indicate the maximum enrollment for each option.
2. Enrollment numbers are obtained at the end of week 3 of the quarter.
3. Required courses are required of all students in the program, elective courses (often referred to as open or free electives) are optional for students, and selected elective courses are those for which students must take one or more courses from a specified group.
   ** Probability Elective options are detailed on a later page
   *** Computer Science Elective course options are detailed on a later page
   **** Electrical and Computer Engineering Elective course options are detailed on a later page
   † Multiple-listed courses (identified by a capital M before the course number) are courses offered jointly by more than one department. Enrollments for these courses reflect all of the students enrolled in the class.
   †† Concurrent courses (identified by a capital C before the course number) are pairs of courses, usually within a single department or program, for which credit is given at two levels—undergraduate and graduate. Enrollments for these courses reflect all of the students enrolled in the class.

Instructional materials and student work verifying compliance with ABET criteria for the categories indicated above will be required during the campus visit.
List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Course Title</th>
<th>Math &amp; Basic Sciences</th>
<th>Engineering Topics Check if Contains Significant Design (Y)</th>
<th>General Education</th>
<th>Other</th>
<th>Last Two Terms the Course was Offered: Year and, Semester, or Quarter</th>
<th>Maximum Section Enrollment for the Last Two Terms the Course was Offered:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required, Elective or a Selected Elective by an R, an E or an SE.</td>
<td>Civil and Environmental Engineering 110 – Introduction to Probability and Statistics for Engineers</td>
<td>4</td>
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<td>S17, S18</td>
<td>LEC-135, DIS-LEC-197,DIS-5</td>
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<td></td>
<td>Mathematics 170A – Probability Theory</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>W18, S18</td>
<td>LEC-113, DIS-LEC-121,DIS-2</td>
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<tr>
<td></td>
<td>Statistics 100A – Introduction to Probability</td>
<td>4</td>
<td></td>
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<td></td>
<td>W18, S18</td>
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<tr>
<td><strong>PROBABILITY ELECTIVE:</strong></td>
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<tr>
<td>Students must take 1 of the below listed probability courses.</td>
<td>Civil and Environmental Engineering 110 – Introduction to Probability and Statistics for Engineers</td>
<td>4</td>
<td></td>
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<td>S17, S18</td>
<td>LEC-135, DIS-LEC-197,DIS-5</td>
</tr>
<tr>
<td></td>
<td>Mathematics 170A – Probability Theory</td>
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<td></td>
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<td></td>
<td>W18, S18</td>
<td>LEC-113, DIS-LEC-121,DIS-2</td>
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<tr>
<td></td>
<td>Statistics 100A – Introduction to Probability</td>
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<td>W18, S18</td>
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<tr>
<td><strong>COMPUTER SCIENCE ELECTIVES:</strong></td>
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<tr>
<td>Students must take 5 upper division computer science elective courses (20 units) from CS 00-187</td>
<td>Computer Science 112 - Modeling Uncertainty in Information Systems</td>
<td>SE</td>
<td>4</td>
<td></td>
<td></td>
<td>W16, W17</td>
<td>LEC-68,DIS-35 LEC-82, DIS-4</td>
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<tr>
<td></td>
<td>Computer Science or Electrical and Computer Engineering M117 - Computer Networks: Physical Layer.</td>
<td>SE</td>
<td>4</td>
<td></td>
<td></td>
<td>W18, S18</td>
<td>LEC-170, DIS-LEC-171,DIS-3</td>
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<tr>
<td></td>
<td>Computer Science or Electrical and Computer Engineering M119 - Fundamentals of Embedded Networked Systems. (first offering S18)</td>
<td>SE</td>
<td>4</td>
<td></td>
<td></td>
<td>S18</td>
<td>LEC-18,DIS-18</td>
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<tr>
<td></td>
<td>Computer Science CM121 or Chemistry and Biochemistry 160A - Introduction to Bioinformatics.</td>
<td>SE</td>
<td>4</td>
<td></td>
<td></td>
<td>F16, F17</td>
<td>LEC-63,DIS-63 LEC-84,DIS-84</td>
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<td></td>
<td>Computer Science CM122 or Chemistry and Biochemistry 160B - Algorithms in Bioinformatics and Systems Biology.</td>
<td>SE</td>
<td>4</td>
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<td>W17, W18</td>
<td>LEC-117,DIS-6 LEC-127,DIS-6</td>
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<td></td>
<td>Computer Science CM124 or Human Genetics CM124 - Computational Genetics.</td>
<td>SE</td>
<td>4</td>
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<td>S17, S18</td>
<td>LEC-97,DIS-55 LEC-105,DIS-4</td>
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<td>Parallel and Distributed Computing</td>
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<td>Prototyping Programming Languages.</td>
<td>SE</td>
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<td>SE</td>
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<td>C138 -</td>
<td>Database Systems.</td>
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<td>C139 -</td>
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<td>C140 -</td>
<td>Introduction to Data Mining.</td>
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<td>- Introduction to Machine Learning.</td>
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<td>C142 -</td>
<td>Fundamentals of Artificial Intelligence.</td>
<td>SE</td>
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<tr>
<td>C143 -</td>
<td>Mathematical Modeling and Methods for Computer Science.</td>
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<td>W16, F16</td>
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<tr>
<td>C144 -</td>
<td>Data Communication Systems Laboratory.</td>
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<td>C145 -</td>
<td>Real-Time Three-Dimensional Animation.</td>
<td>SE</td>
<td>4</td>
<td>Not Offered</td>
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<td>C146 -</td>
<td>Introduction to Computer Graphics.</td>
<td>SE</td>
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<td>F17, W18</td>
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<td>C147 -</td>
<td>Introduction to Computer Graphics: Three-Dimensional Photography and Rendering.</td>
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<td>Course</td>
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<tr>
<td>Computer Science C174C - Computer Animation.</td>
<td>SE</td>
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<td>Computer Science 183 - Introduction to Cryptography.</td>
<td>SE</td>
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<td>Computer Science or Bioengineering or Computational and Systems Biology M184 - Introduction to Computational and Systems Biology.</td>
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</tr>
<tr>
<td>Computer Science or Computational and Systems Biology M185 - Research Opportunities in Computational and Systems Biology.</td>
<td>SE</td>
<td>4</td>
<td>W17, W18</td>
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</tr>
<tr>
<td>Computer Science or Bioengineering or Computational and Systems Biology CM186 - Computational Systems Biology: Modeling and Simulation of Biological Systems.</td>
<td>SE</td>
<td>4</td>
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<tr>
<td>Computer Science or Bioengineering or Computational and Systems Biology CM187 - Research Communication in Computational and Systems Biology.</td>
<td>SE</td>
<td>4</td>
<td>S17, S18</td>
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**ELECTRICAL AND COMPUTER ENGINEERING**

**ELECTIVE:** Students must take 1 upper division Electrical and Computer Engineering elective (4 units) from ECE 113, 115A, 115C, 132A, or 141)

<table>
<thead>
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<th>Course</th>
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<td>Electrical and Computer Engineering 113 - Digital Signal Processing</td>
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<tr>
<td>Electrical and Computer Engineering 115A – Analog Electronic Circuits I</td>
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<td>F17, S18</td>
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<tr>
<td>Electrical and Computer Engineering 115C – Digital Electronic Circuits</td>
<td>SE</td>
<td>4</td>
<td>W18, S18</td>
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<tr>
<td>Electrical and Computer Engineering 132A – Introduction to Communication Systems</td>
<td>SE</td>
<td>4</td>
<td>W18, S18</td>
</tr>
<tr>
<td>Electrical and Computer Engineering 141 – Principles of Feedback Control</td>
<td>SE</td>
<td>4</td>
<td>W18, S18</td>
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</tbody>
</table>
1) Describe how the curriculum aligns with the program educational objectives.

For the Computer Science and Engineering degree, our first educational objective is “make valuable contributions to design, development and production in the practice of computer science and computer engineering in related engineering areas or application areas, and at the interface of computers and physical systems.”

Our curriculum provides a balance of theory, experience, and practice to help students learn how to design computer systems, how to move those designs into actual implementation, and how to produce implementations that meet real needs in industry and society. Our general science, mathematics, and engineering classes provide an understanding of basic underlying principles of engineering in general and computer science in particular. For example, our requirement for a class in probability and statistics provides our students with the core knowledge required to build a system that must deal with uncertainty and variation in its inputs and behaviors, which is commonly required in complex computer systems. The mathematics requirement for discrete mathematics provides the background to understand how to organize and operate on digital information, another key requirement for building successful computer systems.

Our CS&E students are required to develop a deep understanding of the fundamental architectural elements of computer hardware, from low level elements like gates up to high level elements like memory management units. Many of our CS&E students will pursue careers that lead them to work closely with hardware, so such knowledge is vital. Even for students who will spend their careers exclusively working on software, understanding of some of the fundamental characteristics of the hardware they rely upon will guide them into making good choices in their designs and implementations.

Our required classes in the major provide solid experience with computer programming, a critical skill for successful development of software and understanding its interactions with hardware. CS 35L provides practical hands-on experience with tools in common use in computer science and engineering, such as compilers, virtual machines, revision control tools, graphical and command line interfaces, and debuggers. Mastery of such tools is a requirement for successful development and production of software systems. Upper division classes such as CS 111 (Operating System Principles) and CS 118 (Computer Networks) teach our students how the core building blocks of computer systems are implemented and how a computer scientist can use them to achieve different goals. For example, CS 118 makes clear why particular transport protocols are suitable for particular applications and network conditions, allowing a student to make good design choices.

Classes with a more theoretical content, such as CS 180 (Introductions to Algorithms and Complexity) give our students the required knowledge to understand how algorithms chosen in the design phase will perform long before they are implemented, so poor choices can be avoided early in the design process, rather than having to be remedied in later stages, when changes become difficult and expensive.
Because the field in which our CS&E graduates will work is increasingly broad, spanning many sub-disciplines, we offer our students a wide range of computer science electives, which allows them to tailor a program for particular application areas. Students can take courses in computational biology, to prepare them for work in that important and critical application area, or they can concentrate on design of applications for ordinary users, or they can learn about how to design and implement systems with vital security properties. Many of these courses, such as CS 174A (Introduction to Computer Graphics), CS 144 (Web Applications), and M 184 (Introduction to Computational Biology), pay particular attention to applying the course material to real world applications that our students might work on in their careers.

Further engineering breadth, along with flexibility in matching student needs, is provided by the engineering technical area. This three unit requirement will expose them to an engineering discipline outside of the field of computer science, allowing them to understand how to apply computer science knowledge to fields like civil engineering or nanotechnology. Students in the CS&E program are typically interested in working in intersections between such fields and computer science, so this engineering technical area provides them with extra preparation in working with engineers from other disciplines.

Another of our program’s educational objectives is “Demonstrate strong communication skills and the ability to function effectively as part of a team.” Our curriculum addresses this educational objective both with introductory classes on writing (ENGCOMP 3) and with later classes that provide practical experience in communications, both written and oral (ENG183EW and ENG185EW). These latter classes also require team participation. Further, both required classes in the core CS curriculum (such as CS 111) and many of our electives (such as CS 170A) use team projects, as do capstone design classes. Many upper division classes require reports or presentations, including CS 111 (Operating System Principles), CS 118 (Computer Networking), CS 131 (Programming Languages), and CS 152A (Digital Design Laboratory). The capstone design classes also require writing and oral presentation to further develop these skills in our students.

A third educational objective is “Demonstrate a sense of societal and ethical responsibility in all professional endeavors.” This objective is directly addressed in our curriculum in ENG183EW, Engineering and Society. This course focuses on societal issues in engineering and includes case studies on ethical issues. However, societal and ethical issues are present in many of our other courses. CS 136 (Computer Security), for instance, spends significant amounts of time discussing issues of privacy in computer systems. CS 144 (Web Applications) and CS 143 (Database Systems) include discussions of providing suitable security for the systems covered in the class.

Our fourth educational objective is “Engage in professional development or post-graduate education to pursue flexible career paths amid future technological changes.” A large percentage of engineers work in several different areas throughout their careers. We believe that engineers with a solid grounding in computer science, and with additional training in other engineering subjects, are positioned to have the flexibility to make unique contributions in a variety of areas in the new global environment. A number of courses include contributions to life-long learning skills through assignments that require students to find and report on current or emerging topics.
Sustained achievement also requires solid grounding in fundamental concepts and knowledge that transcends a changing technology. Our curriculum is strong in this regard and prepares students to learn independently and enter new areas. This is not so much evident in course topics, but in how the courses are taught as documented in our online CourseWeb system, which includes periodic assessments of course contributions.

2) Describe how the curriculum and its associated prerequisite structure support the attainment of the student outcomes.

The UCLA Computer Science and Engineering degree program has the following desired student outcomes:

a) An ability to apply knowledge of mathematics, science, and engineering
b) An ability to design and conduct experiments, as well as to analyze and interpret data
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d) An ability to function on multidisciplinary teams
e) An ability to identify, formulate, and solve engineering problems
f) An understanding of professional and ethical responsibility
g) An ability to communicate effectively
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) A recognition of the need for, and an ability to engage in life-long learning
j) A knowledge of contemporary issues
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

a). An ability to apply knowledge of mathematics, science, and engineering
We require multiple quarters of mathematics, including discrete mathematics and probability and statistics, to provide a solid background in mathematics. Similarly, required courses and lab work in physics provide a science background. Various computer science courses and the required engineering technical breadth courses taken outside our department provide engineering background. All of these elements of the curriculum are used by our students in their upper-division classes, giving them extensive experience in applying mathematics, science, and engineering principles to various issues and problems in computer science.
b). An ability to design and conduct experiments, as well as to analyze and interpret data
In addition to the experimental experience provided by the required physics lab, computer science labs like CS 152A involve practical experimentation. Several required upper division classes, such as CS 111, also involve experimentation and working with data. For example, one project in CS 111 involves testing and measuring the performance of multiple threads sharing locks on a single data structure. Upper division electives, such as classes in data mining and bioinformatics, also involve experimentation and significant data analysis. All classes involving experimentation also require students to report on their results, requiring them to not merely describe the raw results, but to interpret them in the context of the actual goal of the experiment.
Our students will have performed experiments in both physics and multiple disciplines within computer science before they complete their degree.

c). An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

Various required upper division classes require building software and hardware systems with particular specified goals. For example, CS 136 has substantial material concerning designing code with important security properties, which has ethical and safety implications. CS 130 involves projects with many real-world constraints related to economics, business decisions, or energy use. The capstone design class for the CS&E program (CS 152B) requires extensive design and implementation. This class requires students to work with realistic engineering constraints and to apply principles of proper engineering developed in earlier classes in the curriculum.

d). An ability to function on multidisciplinary teams

Various required classes in our program require students to work in teams. One of the projects in CS 111 is a team project, for example. Upper division electives are often graded largely on the basis of a team project. In addition, the capstone design course (CS 152B) uses team-oriented projects, ensuring that no student complete our degree program without having been a member of a team working on a substantial project with serious requirements. E96, a new non-required course being experimented with in our department and the college as a whole, introduces freshmen to working on a project in a team, giving them early experience in this important element of their future careers.

e) An ability to identify, formulate, and solve engineering problems

In our students’ freshmen year, they take mathematics and science courses that provide a substrate for working on engineering problems. They also take a sequence of introductory computer science classes that prepare them specifically for handling problems in the realm of computer science. CS 1 gives them a broad overview of the field, while CS 31 and 32 ensure that our students have mastered fundamental programming skills necessary to solve problems in computer science. CS 33 hones those skills and describes many fundamental characteristics of computer systems. Without an understanding of those characteristics, our students could not understand the realistic range of possible solutions to those problems. The upper division required classes taken in the subsequent years add depth to their understanding of how computer hardware and software work, and thus how they can be used effectively to solve problems. Electives and the capstone design course, in their later program years, give practical experience in identifying and understanding engineering problems and their solutions in the realm of computer science.

f) An understanding of professional and ethical responsibility

CS 1, a seminar for freshmen offered in their first quarter, lays out the field of computer science, including what it means to be a professional in that field. Later classes, such as CS 35L, provide core background in the tools that a professional uses to ensure proper engineering approaches to building systems, such as change control systems that keep careful track of how software has been altered in the course of its development, and debuggers that help guide a developer to the root causes of problems in software. As the student moves through our program, he encounters other classes that provide examples of the kinds of tasks professionals perform in our field, and how they do so in an ethical and responsible manner. We ensure that our students have had a solid exposure to the importance of ethics in our field by explicit and extensive discussion of
ethical issues in classes like Engineering 183 EW and Engineering 185EW. g) An ability to communicate effectively
All undergraduate programs at UCLA, including Computer Science, have requirements for students to take classes in composition, giving them general experience in writing. CS 1, one of the first classes our students take, has a written component, and subsequent classes build on that. Many class projects in upper division classes require students to write about their results or the system they have worked on. Later in their program, students will take Engineering 183 EW or Engineering 185EW, which not only involve writing, but provide students with feedback on their written materials and require them to submit revisions based on that feedback. The capstone courses build on these skills, giving students an opportunity to perform substantial technical writing about a project they have worked on. There is a similar flow of coursework giving students experience in oral presentations, again culminating in a substantial requirement for oral presentations in the capstone courses. The E 96 classes we are experimenting with add both written and oral communications experience on technical subjects early in the student’s academic career.

h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
Our curriculum touches upon issues of these kinds in most of its classes. Students are required as part of all UCLA undergraduate degree programs to take classes in several areas that provide cultural, economic, and societal contexts, as described in section 1F of this report. Engineering 183 EW and Engineering 185 EW expose students to real world problems with global and environmental impacts. Additional breadth in engineering is provided by the technical breadth requirement, which can be met by taking classes in a wide range of technical subjects. The capstone design class poses problems for students that require more than merely technical thought, reflecting real world constraints on the technical solutions, akin to the situations our students will face after graduation.

i) A recognition of the need for, and an ability to engage in life-long learning
At the beginning of their program, students take CS 1, which presents fresh new results in various areas of computer science. So from the beginning our students are exposed to the reality of the field: things change rapidly, and those who don’t change with them are left behind. Throughout the program we highlight new results and the changing landscape of computer science, which again instructs students in the need to regard their education as ongoing, and not merely a matter of the four years they spend at UCLA. Particular attention is paid to these issues in the courses taught at the UCLA Samueli level, as well.

j) A knowledge of contemporary issues
Again, the early examples from CS 1 often highlight both recent technical developments in the field and new ways in which computer science impacts on our society and the world as a whole. Other classes reinforce this focus within their particular technical areas later in the program, such as discussions of the growing importance of AI in CS 161 and issues of data privacy in CS 136. Engineering 183 EW and Engineering 185 EW specifically highlight contemporary issues in the context of how they intersect with engineering.

k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
Such an ability depends, first, on knowledge, and eventually mastery, of these techniques, skills, and tools. Then students must demonstrate that mastery in a serious context that requires their use in non-trivial ways. Students begin to learn important skills (such as programming) in their
freshman year in CS 31, 32, and 33. They pick up generally useful software tools later, in CS 35L. Hardware design techniques begin to be introduced in CS 51A, also early in the program, and are developed in both further classwork (CS 151B) and in labs (CS 152A and CS 152B, plus possibly other elective labs). The important techniques associated with probability and statistics are also developed in the required class in those areas. More focused software tools in topics like graphics, AI, data mining, and web development are introduced in various electives. Throughout the program, newly introduced tools and skills are exercises, first in fairly basic ways, eventually in more sophisticated situations. The capstone design class requires application of a range of such tools, techniques, and skills, giving students the opportunity to demonstrate that they are ready to use them in industrial settings or as part of their further educations.
3) Attach a flowchart or worksheet that illustrates the prerequisite structure of the program’s required courses.
4) Describe how your program meets the EAC Criteria requirements in terms of hours and depth of study for each subject area (Math & Basic Sciences, Engineering Topics, and General Education) specifically addressed by either the EAC general criteria or the program criteria.

The EAC general criteria require:

- one year of a combination of college level mathematics and basic sciences
- one and one-half years of engineering topics, consisting of engineering sciences and engineering design appropriate to the student’s field of study.
- a general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives.

Where a “year” is defined as ¼ of the credit hours required for graduation. In our CS&E program, 186 credit hours are required, so “one year” translates to 48 credit hours, and “one and one-half years” translates to 72 credit hours.

Our CS&E program requires a minimum of 51 credit hours of college level mathematics and basic science, including classes in calculus, probability and statistics, discrete mathematics, differential equations, and physics, including a lab component for physics.

Our CS&E program requires a minimum of 85 hours of classes covering engineering topics, including both substantial classwork in computer science and many classes in other branches of engineering. Various classes, including the capstone design class, require study of engineering design in the context of computer science and engineering.

The program also requires 46 hours of general education covering a wide range of areas that complement the technical content of the program.

The EAC program criteria relevant to our CS&E program are for “ELECTRICAL, COMPUTER, COMMUNICATIONS, TELECOMMUNICATION(S) AND SIMILARLY NAMED ENGINEERING PROGRAMS.” These criteria require:

- both breadth and depth across the range of engineering topics implied by the title of the program.
- probability and statistics, including applications appropriate to the program name; mathematics through differential and integral calculus; sciences (defined as biological, chemical, or physical science); and engineering topics (including computing science) necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components.
- The curriculum for programs containing the modifier “computer” in the title must include discrete mathematics.

As discussed above, the 85 credit hours on engineering topics in both computer science and other branches of engineering provide the necessary breadth and depth called for by this criterion.

Our CS&E program requires a range of math classes that cover probability and statistics, differential and integral calculus, physics, and electrical engineering and computer science
topics that will allow the kinds of analysis and design of systems including hardware and software components described in this second criterion.

Our CS&E program also requires classwork specifically in discrete mathematics, as required by the final criterion.

5) Describe how your program meets the CAC Criteria requirements in terms of hours and depth of study for each curricular area specifically addressed by either the CAC general criteria or the applicable program criteria.

The CAC curriculum requirements are one and one third year of computer science (or 37.5% of total hours) and one year of science and mathematics (or 25% of total hours), with some specificity about the content of each of those areas.

For the computer science component, there are several detailed requirements:

1. Coverage of the fundamentals of algorithms, data structures, software design, concepts of programming languages and computer organization and architecture.
2. An exposure to a variety of programming languages and systems. [CS]
3. Proficiency in at least one higher-level language.
4. Advanced course work that builds on the fundamental course work to provide depth.”

Our CS&E curriculum devotes a minimum of 47% of its total required hours to computer science and engineering classes, thus exceeding the CAC percentage requirement. In terms of the detailed requirements, students take required classes teaching the fundamentals of algorithms (CS 33 and CS 180), data structures (CS 33), software design (CS 31, 32, 33, 35L), concepts of programming languages (CS 31, 32, 33, and 131), and computer organization and architecture (CS 51A, 111, 151B, and 152A). CS 31, 32, and 33 cover the C programming language and assembly language, which CS 131 provides exposure to other programming languages. Systems, including Windows and Linux, are covered in CS 111. The CS 31/32/33 sequence ensures proficiency in C. 12 units (typically 3 courses) of CS electives and 4 units of Electrical and Computer Engineering electives build on these fundamental courses. Depending on student choice, these electives include topics like machine learning, AI, advanced architecture, advanced programming language topics, bioinformatics, graphics and vision, cryptography and computer security, and web development, among others.

For the math component, the requirement is:

“At least one half year that must include discrete mathematics. The additional mathematics might consist of courses in areas such as calculus, linear algebra, numerical methods, probability, statistics, number theory, geometry, or symbolic logic.”

For the science component, the requirement is:

“A science component that develops an understanding of the scientific method and provides students with an opportunity to experience this mode of inquiry in courses for science or engineering majors that provide some exposure to laboratory work.”
In terms of math and science, our students must take at least 28% of their required hours in math and science fitting the requirement’s definitions.

Our curriculum’s math requirements include courses in discrete structures, multiple quarters of calculus, differential and linear equations, and probability and statistics. Our curriculum’s science requirement is two quarters of physics, plus a physics lab, thus meeting the CAC science requirement.

6) Describe the major design experience that prepares students for engineering practice. Describe how this experience is based upon the knowledge and skills acquired in earlier coursework, and incorporates appropriate engineering standards and multiple design constraints.

Major design experience is provided to our students via the program’s capstone design class, CS 152B. This design class makes use of skills developed in earlier architecture classes, such as CS M51A and CS 151B. For example, CS M51A requires students to students build simple sequential systems using modules like registers and counters. CS 151B builds on that experience to require students to design a simple pipelined processor. CS 152B (depending on the particular project chosen for the quarter) may require them to build on this experience to design and implement a more complex pipelined processor based on FPGA technology. For all projects, CS 152B will require students to demonstrate their mastery of the skills taught in these earlier classes. The CS 152B projects also require designing to various realistic constraints and use of proper engineering techniques and standards.

7) If your program allows cooperative education to satisfy curricular requirements specifically addressed by either the general or program criteria, describe the academic component of this experience and how it is evaluated by the faculty.

We do not allow cooperative education to satisfy curricular requirements.

8) Describe the materials (course syllabi, textbooks, sample student work, etc.), that will be available for review during the visit to demonstrate achievement related to this criterion. (See the 2017-2018 APPM Section 1.E.5.b.(2) regarding display materials.)

Course syllabi are included in Appendix A. Samples of the textbooks used in required classes will be made available to the evaluators. Sample assignments, tests, and student work will be available via an online site accessible to evaluators during the visit.

B. Course Syllabi

Appendix A contains syllabi for each course used to satisfy the mathematics, science, and computer-science requirements listed earlier.
A. **Faculty Qualifications**

There are currently 34 ladder faculty and 2 full-time career lecturers in the department. The faculty provide more than adequate coverage for all areas of the undergraduate program.

Full-time faculty by area (roughly, as faculty can have multiple interests that change over time):

- Artificial Intelligence: Darwiche, Korf, Van den Broeck, Chang
- Computational Systems Biology: Distefano, Ernst, Eskin, Halperin
- Computer Networks: Gerla, Lu, Zhang, Varghese
- Computer Science Theory: Gafni, Ostrovsky, Sahai, Sherstov, Meka
- Computer Systems Architecture: Cong, Ercegovac, Potkonjak, Reinman, Sarrafzadeh, Tamir, Nowatzki
- Graphics and Vision: Soatto, Terzopolous, Zhu
- Data Science Computing: Cho, Zaniolo, Wang, Sun
- Software Systems: Eggert, Millstein, Palsberg, Smallberg, Kim

All but one of our ladder faculty hold Ph.D. degrees in computer science, electrical engineering, or related disciplines.

<table>
<thead>
<tr>
<th></th>
<th>Full Professor</th>
<th>Associate Professor</th>
<th>Assistant Professor</th>
<th>Lecturer</th>
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<td>5</td>
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<tr>
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<td>17</td>
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</table>

The “tenured other” category contains ladder faculty whose primary appointment is in another department. The “untenured other” category contains active emeritus faculty members and active adjunct faculty members.

Among the regular faculty and active emeritus faculty there are 2 Turing Award winners, 5 members of the National Academy of Engineering, 2 members of the National Academy of Sciences, 9 ACM Fellows, 2 AAAI fellows, 14 IEEE Fellows, and a winner of an American Motion Picture Academy of Arts and Sciences Academy Award.

B. **Faculty Workload**

Table 6-2 describes our faculty workload. Our general teaching requirement for ladder faculty is four classes per year, usually one undergraduate class, two graduate classes, and a CS 298 class, which is a graduate student research seminar. New faculty generally receive some relief, and faculty serving in particularly taxing administrative positions (like the chair and vice chairs) also receive some relief from teaching. Our two permanent lectures have a heavier teaching burden, since that is the nature of their position.
C. **Faculty Size**

Our current faculty is sufficient in number to meet our current needs for teaching, advising, and other critical responsibilities. We are actively expanding the department, so we anticipate that we will have equally sufficient numbers of faculty in the foreseeable future, despite likely retirements and perhaps some other faculty departures. While, like most departments, ours experiences some faculty attrition, for the past few years we have added more faculty than have left (as shown in Table 8.4, below), and our Dean has indicated that we will be able to add several more faculty, above and beyond any attrition, in the next few years. Our faculty tends to remain with us until retirement, in most cases, so we do not usually have issues with continuity.

With regard to advising, the Associate Dean of Academic & Student Affairs initially assigns undergraduate advisees to each regular faculty member, with each faculty member getting a roughly equal number of students to advise. Students can reassign themselves to a different advisor via the online CourseWeb system. Advising on programmatic and course requirements is handled by professional advisors in the dean’s office—thus considerably reducing the faculty advising load. Faculty advice tends to be of more general nature—for example, career/professional goals and personal advice based on experience. Time for advising is considered part of a faculty member’s regular workload, and no special release time is assigned. Faculty now set aside at least three hours per quarter for undergraduate student advising. Meetings are arranged either with individuals or in small groups. Students are required to have an appointment with their advisor at least once each year.

Advising also takes place often as a part of the course interaction and after-class discussion or during office hours, particularly when the student is excited about the particular course material. Further, the department initiated a freshman seminar course in 2006 in which faculty from different areas give broad introductory talks. These talks help to provide students with a perspective on the breadth of computer science, current issues and research directions, as well as to generate enthusiasm for their studies. Upper-division students also have the option of one elective taken as a directed research project course with a faculty.

Other interactions with students and faculty include an annual Town Hall meeting where students can ask questions or bring up issues they have with the program or the department. Generally this meeting is attended by students, faculty, and representatives of the Office of Academic and Student Affairs. The department also interacts with student organizations—most notably the ACM Student Chapter and the UPE Computer Science Honor Society. The department vice chair for undergraduate studies meets with officers of these organizations several times per year for general discussions. Representatives of these organizations also are members of the Undergraduate Program Advisory Board and help organize the annual Town Hall meeting. We recently invited the presidents of our ACM student chapter and UPE Honor Society to present information about their organizations’ activities at a faculty meeting.

The Computer Science department faculty supports both the Computer Science program and the Computer Science and Engineering program. Faculty are not formally divided
between the programs.

D. **Professional Development**

Faculty are expected to be active in professional societies, and promotions and merit increases are based partially on ongoing research and publication of research results in their areas of expertise. Most, if not all, faculty are members of professional societies such as the ACM and IEEE and publish extensively in conferences and journals in their respective areas of research. In addition, faculty earn sabbatical leave at a rate of 1/9 quarter of paid sabbatical for each quarter of teaching. (For example, this is one full academic year of sabbatical at 2/3 salary after 18 quarters, i.e., 6 years, of teaching.) Sabbatical leaves are used in various ways—such as an extended visit to an industry research lab, another university, or self study in a new research area. These sabbaticals offer an opportunity for exploring new areas and/or gaining new perspectives.

E. **Authority and Responsibility of Faculty**

All courses have one or more instructor-in-charge with a basic responsibility for the course. Year-to-year alterations and improvements in the content of a course are under the responsibility of the instructor-in-charge, working with any other faculty who are teaching the course in that year.

The department is organized for many purposes into “fields” which handle both annual scheduling and longer term issues related to courses, to ensure sufficient coverage of an entire body of material across a set of courses. Currently the fields are Artificial Intelligence, Computational Systems Biology, Computer Networks, Computer Science Theory, Computer Systems Architecture, Graphics and Vision, Data Science Computing, and Software Systems. Fields take on responsibilities such as initial scheduling of course offerings and staffing to meet student demand. The vice chair for undergraduate studies and the department chair make final decisions on the schedule and teaching assignments to ensure that we meet student demand, balance offerings over quarters, avoid time conflicts, etc. As previously described, fields are involved in the assessment process early in each year to (a) review the contribution of courses in their field to the “focus set” of student outcomes for the year, and (b) more generally consider the portion of the curriculum associated with their field. An Undergraduate Program Committee reviews the field reports and other recent assessment data (alumni survey results, senior exit surveys, etc.) to help prepare for the annual faculty meeting during which the status of the department is reviewed.

The department has an Academic Policy Committee (APC) which first reviews and decides for or against any significant course modification (e.g., catalog description changes and proposals to create or delete a course). Proposals that are approved by the APC are submitted to the School of Engineering’s Faculty Executive Committee (FEC) for a decision. The FEC has faculty representatives from all School of Engineering departments. (At the discretion of the APC, some proposals may also be brought to the entire faculty for a vote before going to the FEC.) Curriculum changes are first voted on by the entire faculty at a faculty meeting and, if approved, are referred to the FEC. The
FEC has final authority on most course revisions but curricula changes must be approved by the campus-wide Undergraduate Council.

All courses have one or more instructor-in-charge with a basic responsibility for the course. Year-to-year alterations and improvements in the content of a course are under the responsibility of the instructor-in-charge, working with any other faculty who are teaching the course in that year.

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<table>
<thead>
<tr>
<th>Faculty Name</th>
<th>Highest Degree Earned- Field and Year</th>
<th>Rank</th>
<th>Type of Academic Appointment</th>
<th>Type of Employment</th>
<th>Years of Experience</th>
<th>Level of Activity</th>
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<td>Afanasyev, Alexander</td>
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<td>Chang, Kai-Wei</td>
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<tr>
<td>Cong, Jason</td>
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1. Rank: Assistant Professor (A), Associate Professor (AST), Professor (P)
2. Type of Academic Appointment: T, TT, NTT
3. Type of Employment: FT, PT
4. Level of Activity: H, M, L

Years of Experience:
- Teaching
- This Institution
- Professional Registration/Certification
- Govt./Ind. Practice
- Consulting/summer work in industry
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<td>Ercegovac, Milos</td>
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<td>Ernst, Jason</td>
<td>Ph.D. Machine Learning, 2008</td>
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<td>Eskin, Eleazar</td>
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<td>Esrin, Deborah</td>
<td>Ph.D. Electrical Engineering &amp; Computer Science, 1985</td>
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<td>Jacobson, Van</td>
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<td>Kim, Miryung</td>
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<td>Majumdar Rupak</td>
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<td>Ramezani, Ramin</td>
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<td>Faculty Member (name)</td>
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<td>Varghese, George</td>
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**Table 6-2. Faculty Workload Summary**

*Computer Science and Engineering*

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<tr>
<th>Faculty Member (name)</th>
<th>Program Activity Distribution&lt;sup&gt;3&lt;/sup&gt;</th>
<th>% of Time Devoted to the Program&lt;sup&gt;5&lt;/sup&gt;</th>
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<td>Campbell, Michael</td>
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<td>Chang, Kai-Wei</td>
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<td>Cho, Junghoo</td>
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<td>Cong, Jason</td>
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<td>Darwiche, Adnan</td>
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<td>Dressler, Falko</td>
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<td>CS 219/W18</td>
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<td>Gafni, Eli</td>
<td>FT</td>
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<tr>
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<td>FT</td>
<td>CS 495/F17, Vice Chair Course Reduction, CS 261A/S18</td>
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<td>FT</td>
<td>CS CM121/221/F17, Chemistry/W18, Chemistry/S18</td>
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<td>Lu, Songwu</td>
<td>FT</td>
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<td>FT</td>
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<td>Millstein, Todd</td>
<td>FT</td>
<td>CS 97/F17, CS 231/W18, CS 239/S18</td>
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<td>Nowatzki, Tony</td>
<td>FT</td>
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<td>Ostrovsky, Rafail</td>
<td>FT</td>
<td>CS M282A/F17, CS 180/W18, CS M282B/S18</td>
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<td>Palsberg, Jens</td>
<td>FT</td>
<td>CS 132/F17, CS 232/W18, CS 239/S18</td>
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<td>Pasaniuc, Bogdan</td>
<td>PT</td>
<td>CS CM225/W18</td>
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<td>Pellegrini, Matteo</td>
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<td>Potkonjak, Miodrag</td>
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<tr>
<td>Ramezani, Ramin</td>
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<td>Reinman, Glenn</td>
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<td>Rosario, Ryan</td>
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<td>Van den Broeck, Guy</td>
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<td>Zaniolo, Carlo</td>
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<td>Zhang, Lixia</td>
<td>FT</td>
<td>Sabbatical/F17, CS 217A/W18, CS 217B/S18</td>
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</tbody>
</table>
CRITERION 7. FACILITIES

A. Offices, Classrooms and Laboratories

Faculty and staff offices are adequate, containing desk, chairs, filing cabinets and bookcases as supplied by the department. All offices have both wired and wireless Ethernet access. There is sufficient room for meeting with students and visitors during office hours. Teaching assistants often have individual office space, and common spaces are provided for teaching assistants to meet with students in the classes they handle during office hours.

UCLA has nearly 200 General Assignment Classrooms, located in 22 buildings across campus. Specific information about each room, including an image of the space, installed equipment, and links to useful training guides, can be found at: http://www.oid.ucla.edu/classrooms

The table below provides a brief overview of the general assignment classrooms available at UCLA. All general assignment rooms have Wi-Fi network connectivity and almost all have data projection and video playback capabilities. Most of the rooms also have voice amplification and an installed computer. Some feature audio podcasting capability and built-in BruinCast video capability.

<table>
<thead>
<tr>
<th>Classroom Size</th>
<th># of Rooms</th>
<th>Voice Amplification</th>
<th>Installed Computer</th>
<th>Streaming/ Podcasting</th>
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<td>12</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>20-39</td>
<td>84</td>
<td>40</td>
<td>42</td>
<td>2</td>
</tr>
<tr>
<td>40-59</td>
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<td>5</td>
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<td>60-99</td>
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<td>21</td>
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<td>150-199</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

1 Include information concerning facilities at all sites where program courses are delivered.
Many of the teaching facilities used by UCLA Samueli are located in Boelter Hall in the southern part of the UCLA campus. The UCLA Registrar allows UCLA Samueli first priority in scheduling their courses in 18 of the general assignment classrooms located in Boelter Hall.

The table below lists the 18 Boelter Hall classrooms for which UCLA Samueli has scheduling priority. All of the rooms feature Wi-Fi network connectivity, installed computer or laptop connectivity, data projectors, transparency projection, video playback, voice amplification and by request slide projection and/or BruinCast video capability. A few of the rooms feature audio podcasting capability, and/or a document camera.

<table>
<thead>
<tr>
<th></th>
<th>200-299</th>
<th>6</th>
<th>6</th>
<th>4</th>
<th>6</th>
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<tr>
<td>300+</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>7</td>
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<tr>
<td>Totals</td>
<td>192</td>
<td>133</td>
<td>122</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>69%</td>
<td>63.5%</td>
<td>33%</td>
<td></td>
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<tr>
<td>Room</td>
<td>Capacity</td>
<td>Data Project</td>
<td>Computer</td>
<td>Video Playback</td>
<td>Sound System</td>
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<tr>
<td>------</td>
<td>----------</td>
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<td>----------</td>
<td>----------------</td>
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<tr>
<td>3400</td>
<td>167</td>
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<td>Yes</td>
<td>DVD/VHS</td>
<td>Voice &amp; Media</td>
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<tr>
<td>5249</td>
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<td>2444</td>
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<td>DVD/VHS</td>
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<td>Voice &amp; Media</td>
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<td>Voice &amp; Media</td>
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<td>Voice &amp; Media</td>
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<td>5272</td>
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<td>5280</td>
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<td>Voice &amp; Media</td>
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<td>5422</td>
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<td>Voice &amp; Media</td>
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<td>5252</td>
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<td>Yes</td>
<td>DVD/VHS</td>
<td>Voice &amp; Media</td>
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<td>4283</td>
<td>29</td>
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<td>Yes</td>
<td>DVD/VHS</td>
<td>Voice &amp; Media</td>
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<td>4413</td>
<td>28</td>
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<td>Yes</td>
<td>DVD/VHS</td>
<td>Voice &amp; Media</td>
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<tr>
<td>5514</td>
<td>13</td>
<td>Yes</td>
<td>Yes</td>
<td>DVD/VHS</td>
<td>Voice &amp; Media</td>
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</table>
UCLA Samueli also controls two computer laboratories available for instructional teaching. UCLA Samueli departments may opt to use these additional rooms for classroom discussion sections in place of a general assignment classroom. These rooms are Boelter 3760 (28 seat capacity) and Boelter 4404 (65 seating capacity).

UCLA Samueli has the responsibility to use the 18 priority rooms where it has priority as efficiently as possible and to accommodate as many of its classes as possible within those rooms. However, when a class cannot be accommodated within those rooms, UCLA Samueli requests a general assignment classroom. Finding rooms for all UCLA classes, either in the UCLA Samueli-priority rooms or in a general assignment classroom has always been possible, although it does take effort and occasionally the class meeting times need to be changed to times when a room is available.

Because of our increase in undergraduate enrollment and resulting increase in class size, an increasing number of our courses require larger lecture rooms than are typically available in Boelter Hall. That building has only one lecture room capable of holding more than 100 students, and perhaps half a dozen to a dozen of our classes have larger enrollments than that per quarter. As a result, more of our classes are being offered in other buildings on campus. These general assignment rooms are scattered in various buildings across campus, and since UCLA Samueli does not have scheduling priority for them, we cannot predict far ahead which rooms will be assigned for our classes. However, like the rooms in Boelter Hall, all general assignment lecture halls being used for our classes are fully equipped with screens, network connectivity, data projection, voice amplification, installed computers, and other features to support classes. Thus, whether in Boelter Hall or elsewhere, our classroom facilities are currently adequate to support our teaching needs.

**Laboratory Facilities**

The UCLA Computer Science Department maintains three laboratories to support our undergraduate classes: Boelter Hall 3704 (for CS 117), Boelter Hall 3424 (for CS 152A) and Boelter Hall 3436 (for CS 152B). Appendix C provides a list of the equipment used in these laboratories. These rooms are devoted to supporting these labs and are not used for other purposes, including other classes.

**B. Computing Resources**

UCLA Samueli maintains an advanced computing facility and local area network to support educational, research and administrative activities. A total of 16 full-time equivalent (FTE) positions along with 30 lab consultants support the School’s computing needs. Computing in UCLA Samueli is managed by Nicodemus Wibowo, SEASnet Director, and is overseen by the Ronald and Valerie Sugar Dean of Engineering, Jayathi Y. Murthy.

A network of over 158 enterprise servers, provide a wide array of critical services. Eight Network Appliance NFS servers supply reliable storage for users’ personal data and email and offer nearly instant recovery of deleted files through regular snapshots.

More than 100 Unix/Linux servers, including 20 virtual machines, provide both administrative and instructional support to ensure smooth operation of approximately 700 Linux and Windows
workstations. The Unix servers provide back end services like DNS, authentication, virtualization, software licensing, web servers, interactive login, database, email, class applications and security monitoring.

Thirty Windows servers make up the backbone for all instructional computing labs and allow students to work remotely with computationally and resource intensive applications. There are 4 computer labs and 1 instructional computer lab with 200 Windows workstations.

A high speed network that links the entire infrastructure ensures a latency free operation for users from UCLA and around the world. It consists of dual fiber uplinks to a Cisco core router which feeds and routes 20 networks and over 150 switches. The network serves over 8,000 users across 4 buildings.

For backup and disaster recovery, large capacity LTO tapes are used to back up servers and selected user workstations regularly, and incremental backups are done to online disk storage. The LTO tapes are sent out to off-site storage monthly for disaster recovery.

The servers are protected by two high capacity UPS units along with seven racked UPS for short-term power outages, and campus emergency power keeps the critical equipment running during extended downtime.

Student and faculty have access to retail Microsoft software through the Microsoft Developer Network Academic Alliance (MSDNAA) program, MathType software, and Abaqus through an UCLA Samueli download service at no charge. Faculty and staff have access to Microsoft Office software at no charge through the UCLA Samueli download service and the Microsoft Consolidated Campus Agreement (MCCA). Adobe software is also available to tenured track faculty and staff. The Microsoft Imagine Premium, Autodesk, and Ansys programs offer additional software at no charge to all UCLA Samueli students.

The school’s manufacturing engineering program operates a group of workstations dedicated to CAD/CAM instruction, and the Computer Science Department operates a network of Windows, Linux, and Macintosh workstations. The school is connected via high-speed networks to the Internet, and computing resources at the national supercomputer centers are available.

Upon acceptance to the School of Engineering, students are eligible for a computer account that remains with them for the duration of their affiliation with Engineering. Students may also request an Engineering lifetime email account provided by Gmail. Engineering’s computing services are available 24/7 for engineering students and those students enrolled in engineering courses. Remote access is available to all servers and a virtualized Windows environment enables students to access local resources remotely via a computer with a wireless or wired network connection. Courses using process-intensive applications are given specific instructions and staff work with instructors and teaching assistants to ensure students have the resources needed to complete coursework.

School computer labs are available when most needed by the students:
<table>
<thead>
<tr>
<th>Day</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>10am - 11pm</td>
</tr>
<tr>
<td>Tuesday – Thursday</td>
<td>8am - 11pm</td>
</tr>
<tr>
<td>Friday</td>
<td>8am - 6pm</td>
</tr>
<tr>
<td>Saturday</td>
<td>9am - 9pm</td>
</tr>
<tr>
<td>Sunday</td>
<td>1pm - 11pm</td>
</tr>
</tbody>
</table>

*During 8th -10th week, one lab remains open until 12am
*Reduced hours for finals week, labs remain open until 9pm

Instructors may also request extended lab hours for their courses. Tier-1 level support is available at all times during lab hours.

SEASnet works closely with all UCLA Samueli faculty, lecturers and teaching assistants to ensure that adequate instructional resources are available to students. Over fifty Windows applications and hundreds of Linux/UNIX applications are available. Due to licensing requirements, some applications such as Matlab and COMSOL require an instructor’s authorization for student access. This process is nearly fully automated and students receive access to restricted software within 24 business hours. Students may also request additional applications. Student requests are weighed by the instructional or scholarly need. The Dean’s office is consulted on issues that require a change or modification to the existing support structure or funding requests outside of the organization’s budget limitations. SEASnet staff utilizes a helpdesk application to provide users with a central contact to streamline support. The helpdesk application is monitored during business hours from 8:00am - 4:30pm. Critical services are monitored 24/7 using a network monitoring application.

UCLA Samueli provides web-based support using CCLE (Moodle-based) for class websites. CCLE is a campus-wide learning management system that provides state-of-the-art teaching and learning experience, including interactive and active learning, such as Kaltura video tools, ZOOM web conferencing, Turnitin, Iclicker, online assignment system, chat, forum, feedback, questionnaire, database, interactive lessons, wikis, peer learning, PoodLL, HotPot, video annotation, and voice authoring. The campus also provides webcasts of selected undergraduate classes, online streaming video contents (DVDs, videotapes, laserdiscs and films), G Suites, and Box, and have contracts with Amazon Web Services and Google Apps for Education that are capable of providing cloud learning experience and resources for classes. Additionally, UCLA Samueli maintains a complex and well developed in-house application (MyEngineering) that provides specific tools and functionality for engineering students, faculty and staff; such as the undergraduate advising and mentorship tools, student organization tool, authorization gateway to Microsoft Imagine Premium, mass email tool capable of targeting various selected groups of students, and the ABET accreditation tool.

**Maintenance and upgrading of computing resources**

Hardware replacement is on a three-year cycle. Servers and client machines are replaced with three-year growth and software trends in mind so that there is no degradation in performance as software is upgraded and new software is installed.
To optimize service, applications are upgraded once a year during the inter-quarters or summer breaks when there is less activity in the labs. In the event that an instructor requires new or upgraded applications, the programming staff will work with the instructor during the academic year. Server and client operating system software are updated about a year after release to ensure stability and to provide a sufficient amount of time for staff to become familiar with the new version. Patching is done year-round. Licensed software is maintained so that students have access to the latest release.

C. Guidance

1. Guidance regarding laboratory safety

The School collaborates closely with UCLA Environmental Health and Safety (EH&S) to implement training that contributes to a safe learning and research environment and that ensures school-wide compliance to new campus policies related to laboratory safety and emergency preparedness. One critical component of the laboratory safety training program is to ensure that all laboratory users, including undergraduate students, high school interns, and short-term visitors, receive adequate training before they set foot in a laboratory. In addition to the EH&S guidelines, the School put in place a policy to not release keys to research laboratories until researchers have completed applicable laboratory safety training. Each department has appointed a laboratory safety liaison, who helps to enforce safety guidelines and who communicates all pertinent policy changes and safety practice updates to all department personnel.

EH&S offers numerous courses in the following areas:

- General Safety Training (Fire Extinguisher Training, Respirator Training, Safety & Compliance Training)
- Laboratory Safety Training (Chemical Inventory System, Laboratory Safety Fundamentals, Laboratory Safety for Principle Investigators and Laboratory Supervisors)
- Biosafety Training (B-virus Exposure, Biological Safety Cabinet, BSL2, BSL2+, BSL3, Bloodborne Pathogens, Medical Waste Management, NIH Guidelines, Shipping Biological Materials)
- Laser and Photobiological Safety Training (Laser Safety Fundamentals)
- Radiation Safety Training (New Radiation Worker Qualification, X-ray Diffraction Safety)
- Shop & Technical Area Safety Training (Fundamentals of Shop Safety, Hazard Communication, Heat Illness Prevention, Lookout/Tagout Training)

For undergraduate teaching labs, the requirement for Laboratory Safety Fundamentals training applies, and laboratory instructors provide additional training to students relevant to the specific equipment and materials utilized in the particular teaching laboratory. Undergraduate students are not permitted to enter a teaching laboratory in the absence of an instructor and are not allowed to work alone in the laboratories. The student machine shop, a part of the School machine shop, is located on the first floor of Boelter Hall. The space has been designed to comply with the current California Building Code and Fire Code. The student shop also follows the EH&S mandated guidelines for safety training and practice.
The School maintains an annually updated Emergency Response Plan that is followed by all personnel. Designated emergency coordinators for each department undergo training on heart-saver first aid training. Floor wardens also have been appointed who are trained to aid in emergency response procedures. The emergency team drills quarterly and meets annually.

2. Guidance regarding computing resources

Most engineering students (and Computer Science and Engineering majors particularly) begin university studies with a good foundational background in personal computing, whether it is with Windows, OSX, or Linux. The majority of the guidance needed by students in the School pertains to our specific computing environment and engineering applications. School of Engineering and Applied Science network (SEASnet) Helpdesk staff are trained in the use of all operating systems and can assist students with problems they may encounter in our computer laboratories or on their personal machines. An extensive website (https://www.seasnet.ucla.edu) is available to provide assistance to students with, for example, obtaining a SEASnet account, choosing a personal computer, locating and using the computer laboratories, and obtaining access to software. The School maintains 5 computer laboratories most of which are available on most nights until 11 PM. Walk-in support is available during both open laboratory hours and business hours. Each quarter, engineering students receive an email reminding them of the services and resources provided by the School, and engineering student groups offer free training in the use of technical software such as MATLAB. UCLA provides a VPN capability to all students that allows them to securely access campus computing resources when outside the boundaries of the campus. The campus recently converted to a two-factor authentication system to prevent student, staff, and faculty accounts from being compromised.

D. Maintenance and Upgrading of Facilities

1. Annual support for teaching laboratories

Each year, the School allocates instructional equipment and laboratory activity funds to each department. Table 7-3 details the allocation information for the past six years. The departments use these funds to upgrade and replace equipment, buy instructional supplies, and enhance the infrastructure as needed. This budget is also augmented by charitable donations from alumni, parents, etc.

Table 7-3. Instructional Equipment Allocations

<table>
<thead>
<tr>
<th>Department</th>
<th>FY 12-13</th>
<th>FY 13-14</th>
<th>FY 14-15</th>
<th>FY 15-16</th>
<th>FY 16-17</th>
<th>FY 17-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioengineering</td>
<td>$40,000</td>
<td>$40,000</td>
<td>$75,000</td>
<td>$12,000</td>
<td>$20,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>Chemical and Biomolecular</td>
<td>$19,000</td>
<td>$25,000</td>
<td>$20,000</td>
<td>$95,000</td>
<td>$30,000</td>
<td>$30,000</td>
</tr>
<tr>
<td>Civil and Environmental</td>
<td>$50,000</td>
<td>$50,000</td>
<td>$50,000</td>
<td>$35,000</td>
<td>$35,000</td>
<td>$35,000</td>
</tr>
<tr>
<td>Computer Science</td>
<td>$65,000</td>
<td>$65,000</td>
<td>$39,000</td>
<td>$10,000</td>
<td>$10,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>$55,000</td>
<td>$45,000</td>
<td>$85,000</td>
<td>$30,000</td>
<td>$30,000</td>
<td>$30,000</td>
</tr>
<tr>
<td>Materials Science</td>
<td>$30,000</td>
<td>$30,000</td>
<td>$30,000</td>
<td>$25,000</td>
<td>$25,000</td>
<td>$25,000</td>
</tr>
<tr>
<td>Mechanical &amp; Aerospace</td>
<td>$75,000</td>
<td>$65,000</td>
<td>$145,000</td>
<td>$100,000</td>
<td>$100,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>School</td>
<td>$334,000</td>
<td>$320,000</td>
<td>$444,000</td>
<td>$307,000</td>
<td>$250,000</td>
<td>$250,000</td>
</tr>
</tbody>
</table>
In addition to the computing resources provided at the UCLA Samueli level, the Computer Science department provides and manages its own computing resources for various research and instructional activities of the department. Serving many diverse areas across the computer science spectrum, the facility provides networking, disk storage and backup, general-purpose timesharing access to multi-user systems, email, and workstation support. The computing resources of the department are much greater than this central core; focused research groups have many machines that are not listed here, but are connected to the departmental LAN. The department's central computing facility is focused on supporting research, and is available to graduate students, faculty and staff, and to undergraduate students involved in research projects. The facility houses multiple Linux servers running with sharing of file systems provided via NFS. All users’ directories are stored on a RAID system. The departmental LAN is based on the Ethernet and TCP/IP. Aside from the central servers, hosts on the LAN include more than 900 workstations and personal computers.

The LAN is implemented with a gigabit backbone and 10/100/1000 auto-sensing switched connections to desktops. Additionally, the departmental network is connected to the UCLA campus backbone via two gigabit connections. There is also an 802.11N wireless network available throughout the department. The CSD network is closely linked to UCLA’s School of Engineering and Applied Science network (SEASnet), described above.

The department computing facility also manages various computing laboratories; among these is a graduate student workstation room and several undergraduate computer architecture laboratories (whose equipment is described in appendix C).

The department has a facility committee consisting of three faculty members and the manager of the facility staff. The committee meets regularly to assess the ongoing management of the facility as well as consideration of upgrades to current equipment or new initiatives. If school support is needed, a proposal is prepared with a specification, justification, and budget, which is then submitted to the dean.

**Adequacy of laboratory and computing support**

Each CS laboratory is associated with one or more courses, and the instructors in charge are responsible for the evaluation of their respective labs and proposals for refurbishing. The laboratories are assessed relative to the current state of the art. Laboratory equipment and design tools are kept current by updating them as appropriate, which is approximately every three years. The dean of UCLA Samueli requests an updated three-year plan every three years, and an annual budget each year.

The department has three full-time positions for facility staff who provide support to the laboratories.

**Student access**
The CSM 152A and CSM 152B laboratories are used for instruction approximately half of the time. The course TA is also present in the lab two to four hours per week at scheduled times, allowing students to have access. The 117 lab is somewhat less used, since it services only a single non-required class, but has a similar policy on student access.

**Modern engineering tools in the curriculum**

Students have access to and are instructed in the use of a wide variety of tools. In the EE lab courses students learn to use physical measurement tools such as DMMs, digital oscilloscopes, and signal generators. In logic design (CS M51A) some projects use the LogiSim tool for schematic capture and simulation of digital systems. MATLAB is used in a number of courses including EE102, EE103, and CS170A. A benefit of MATLAB is that many third-party toolboxes are available, permitting some exploration of advanced topics. CS170A also uses the Maple symbolic algebra environment for analyzing some mathematical models. All of these tools are available to students on SEASnet.

On the software side, students are exposed to a wide variety of tools. Examples include:

- **CS 31, 32**: Programming environments and debugger (currently either the Visual C++ or Xcode IDEs, and gcc using AddressSanitizer and UndefinedBehaviorSanitizer)
- **CS33**: Programming tools for C, x86 assembly, and parallel programming (CUDA and OpenMP)
- **CS35L**: Tools for scripting (sh, Python, Awk), building (GCC, libffi, make, tar), change management (diff, patch, Git), debugging (GDB, ldd, strace, Valgrind), integrated development (Emacs), documentation (man), graphics (Gimp), parallelism (pipes, POSIX threads), and security (GnuPG, OpenSSH).
- **CS130**: GitHub for source control, IDEs such as IntelliJ and Eclipse, and build tools like Maven
- **CS136**: Wireshark, Ettercap, and tcpdump
- **CS143**: VirtualBox, Apache + PHP, MySQL, GNU C++ compiler
- **CS144**: SON-based MongoDB, Node.JS JavaScript engine, and Docker container virtualization engine

2. Renovation and construction

Over the past several years, the School spearheaded multiple major renovation/construction projects to create much needed state-of-the-art space to support our current and projected growth in teaching and research activities. There has been a particularly rapid pace of construction and renovation of engineering related buildings, with support from federal funding agencies, the School, and the campus. The state-of-the-art Engineering VI building providing ~95,000 ASF of laboratory, office and instructional space at a cost of $130M, which was financed by a combination of NIST, private donor and campus funding, was completed. Nearby in Boelter Hall, the final phase of a multi-year, $1.2M project to complete a Student Creativity Center (SCC) to support undergraduate student groups and a summer Tech Camp was finished with the completion of an enlarged patio area for student projects, carports for student-built vehicles, canoe racks (in support of civil engineering activities) and 42 large lockers for student group storage.
The Engineering VI project was completed in two phases. The first entailed the construction of 35,000 ASF of laboratories that now are occupied by the research programs of professors from a number of different departments in the School. The second phase of 60,000 ASF currently houses the Computer Science Department on floors two through four. The first floor of phase 2 includes a state-of-the-art, 300-seat, seminar/lecture space that was used for the first time for several engineering classes during the 2017-18 academic year. Also on the first floor is a ~90-seat, reconfigurable experimental/active learning instructional space equipped with flat panel monitors, projection systems, and “smart” boards.

3. Construction and renovation plans for engineering

The School and the campus continue to invest heavily in UCLA Samueli infrastructure. After a one-year planning process entailing input from students as well as department faculty, construction is underway on a 9000 ASF shops/makerspace facility. This facility, located near to the SCC in Boelter Hall, will include wet laboratory areas with fume hoods, an instructional space with workbenches, a handheld tool zone, a full spectrum of 3D printing machines, CNC mills, welding stations, CAD stations, and a microelectronics workshop. The facility will be available for instruction, student group projects, creative student use, research applications and outreach.

During the summer of 2018, the renovation of all general assignment classrooms on the fifth floor of Boelter Hall is scheduled as well as the 167-seat lecture hall on the third floor. The renovations will include new furniture and AV systems. Two of the classrooms will be outfitted for active learning with reconfigurable seating and “smart” boards with the capability to project as well as to record information, and to transmit data wirelessly to students.

4. Maintenance and upgrading of computing resources

As a rule, software is upgraded once a year during the inter-quarters or summer breaks when there is less activity in the laboratories. In the event that an instructor needs new software, or an upgraded version, programming staff will work with the instructor during the academic year. Server and client operating system software and Microsoft Office software are updated about a year after release to ensure stability and to provide a sufficient amount of time for staff to become familiar with the new version. Patching is done year-round. Licensed software is maintained so that students have access to the latest release.

Hardware replacement is on a three-year cycle. Servers and client machines are replaced with three-year growth and software trends in mind so that there is no degradation in performance as software is upgraded and new software is installed.

A few years ago, the School shifted from its own, internally developed, learning management system for classes (CourseWeb) to a University-wide platform, CCLE (Common Collaborative and Learning Environment). The crossover went very smoothly due to the active participation of SEASnet staff with the campus in the implementation of CCLE. Internally developed ABET documentation functions remain on CourseWeb as does our successful system for the
scheduling, recording and tracking of undergraduate student advising.

E. Library Services
Science and Engineering Library (SEL)’s Boelter Collection is located on the 8th floor of Boelter Hall, the original engineering building. SEL provides reference, course reserves, circulation, and instructional services, as well as rich print and online technical collections to the Engineering School’s students and faculty. Other services include public computers, printers, copiers, and four-hour laptop check out. SEL/Boelter houses:

- a Research Commons designed for group work and collaboration with large tables, white boards, and 14 public workstations, and a large wall-mounted monitor for laptop hookups;
- a Learning Commons provides a flexible space for collaborative research and active learning with reconfigurable furniture, whiteboards, and an overhead projector;
- a reading room, designed for quiet study;
- a group study room;
- a room for 3D printing (operated by the 3D Print Club).

During the academic year, SEL/Boelter is open from 8:00am to 11:00pm, Monday – Thursday, 8:00am-6:00pm Friday, 9:00-5:00 Saturday, and 1:00pm-10:00pm Sunday. In-person reference varies by quarter, but librarians are generally available for consultations or drop-in appointments Monday-Friday, and digital reference is provided via email and a library cooperative 24/7 chat service. Boelter Hall is open to the public during all hours that the library is open.

SEL has three librarians who share responsibility for reference, collection development, and instruction in engineering and the physical sciences. They are professionally active and keep abreast of developments in emerging technologies, library science, scholarly communication and open access, research data management, engineering research trends, and teaching pedagogy both locally and nationally. Each librarian is the primary liaison to multiple departments.

Physical collections available within the library include circulating collections, reference, reserves, a popular science collection, microfiche technical reports, and current print periodicals. There are three levels of stacks, which house the books, reports, bound periodicals and conference proceedings. Older materials including journal archives, monographs, and dissertations and theses are stored in the Southern Regional Library Facility (SRLF), a remote storage facility that is located on the UCLA campus. Materials can be paged from SRLF and delivered to the library for use, usually within 24 hours. All the items in SEL (with the exception of the reserve book collection) are on open shelves open to the public.

The vast majority of SEL’s current technical collection is accessible online via IP authentication from on and off campus. The preponderance of the journal output of all major scientific commercial and society publishers is available online to UCLA’s students, faculty and staff. Among others, they provide access to:
ACM Digital Library
Acoustical Society of America Publications
AIAA ARC (Aerospace Research Central) Library
American Institute of Physics publications
Alloy Phase Diagram Center
American Ceramic Society publications
American Chemical Society Legacy Archives and Web Editions
American Institute of Aeronautics and Astronautics publications
ASCE Library
ASME Digital Library and Transactions Journals
ASTM Digital Library (standards, journals, and books)
American Nuclear Society
American Physical Society publications
American Vacuum Society technical literature
ASM Alloy Phase Diagram Center, Handbooks Online, and Materials Information
Begell House Journals
Bentham Journals
BioMedCentral
Cambridge University Press Journals (selected)
Cambridge Structural Database
China Online Journals – Science & Technology
Computing Reviews
CRC Journals
Crystallography Journals Online
Electrochemical Society Digital Library
Elsevier’s Science Direct (most journals)
Emerald Journals (selected)
IEEE/IET Electronic Library
IOP current and historic journals
ISI Science and Technology Proceedings
JSTOR Arts and Sciences Collections I-XV
Materials Research Society Publications
Morgan and Claypool Synthesis Collections I-VII
NASA Astrophysics Data Systems Journals
National Technical Reports Library (NTRL/NTIS)
Royal Aeronautical Society journals
Royal Society of Chemistry journals (includes archives)
SAE Mobilus
Sage journals
Science of Synthesis
Scientific American Archive Online
SIAM journals
SPIE Digital Library
Springer Protocols
Springer Nature journals (selected)
Taylor and Francis journals (selected)
They also provide large, current electronic book collections from Cambridge University Press, CRC, Springer-Verlag, Elsevier, and Wiley. For Springer, they have access to over 105,000 ebooks published since 2005. For Wiley, they have access to all ebooks on the Wiley Online Library published since 2011. They have access to all ebooks published by Elsevier since 2013. They have access to all Cambridge University Press ebooks from 2015 to present. They have access to all 2017 CRC ebooks and thousands of engineering books published prior to that. Many of these large collections have some textbooks that can be used as primary and supplementary course materials. In addition, they have subscriptions to the Kovel engineering collection, McGraw-Hill’s pre 2009 AccessEngineering collection, Safari Technical Books, IEEE-Wiley books, IET ebooks, ACM ebooks, SIAM special publications, and Thieme monographs online. They also have made investments in electronic reference works such as Access Science, Kirk-Othmer Encyclopedia of Chemical Technology, the Merck Index, CHEMnetBASE, Wiley Encyclopedia of Electrical Engineering, Comprehensive Biotechnology, Polymer Science: A Comprehensive Reference, Organic Reactions, Comprehensive Water Quality and Purification, Wiley Encyclopedia of Composites, Comprehensive Nanoscience and Technology, Encyclopedia of Membrane Science and Technology, among others. The library also purchases selected one-off ebooks directly through publishers or ebook aggregators to supplement the large collections.

The processes by which faculty may request the library to order books or subscriptions

Faculty may request the purchase of books or subscriptions through a variety of mechanisms:

1) They may request the book directly from the librarian liaison to their department;
2) They may fill out a library-wide purchase request form online which is forwarded to the appropriate selector;
3) They may request that any book be placed on course reserves – if the library does not own a requested book, that book is purchased automatically;
4) They may request books through the library’s Patron Driven Acquisitions system. Through the system, records for books in selected engineering areas are added to the library catalog when publishers release information about these books. A note in the catalog indicates that the book is not currently owned by the library, but that faculty and students may request its immediate purchase. Requests are filled automatically and typically arrive within a four-week period. Users are alerted when their books arrive, and the books are placed on hold.

SEL librarians are responsible for managing the collections budget in their areas. Though small, the library’s budget for monographic acquisitions allows for the purchase of any requested item. Most of SEL’s serial subscriptions are obtained consortially in cooperation with other University of California campuses and the California Digital Library, but librarians work with faculty to help ensure that they get subscriptions to new serials of interest to faculty and maintain subscriptions to those of continuing interest. Librarians keep abreast of the research interests in the engineering departments and consult with faculty to identify new programs and collection levels which are appropriate.
The library’s systems for locating and obtaining electronic information

SEL has subscriptions to all major engineering databases, including Compendex, Inspec, Advanced Technologies and Aerospace Database, Earthquake Engineering Abstracts, NTRL, Web of Science, and databases that serve related disciplines, including Agricola, GeoRef, Proquest Natural Science Collection of databases, SciFinder, Reaxys, Avery Index to Architectural Periodicals, EBSCOhost databases, Transportation Research Record, and Water Resources Abstracts. Engineering students and faculty also have access to key business databases, such as Business Source Premier, Nexis Uni, and Factiva, and ProQuest Digital Dissertations with contains all dissertations produced in the UC system since 1996. Using an SFX link resolver, full-text versions of the books, chapters, conference papers, and journal articles can be linked to directly from any of the above databases as well as Google Scholar. In addition, the UCLA Library is a member institution for arXiv.org providing financial support for the sustainability of the popular preprint service.

All electronic books and journals are searchable from the Library Catalog, the UC-wide shared catalog, Melvyl, and ArticlesPlus, which is a one-stop federated search engine powered by ProQuest’s Summon product. Users can also set up Google Scholar to enable full-text access to journal articles via the SFX link resolver (UC-eLinks).

SEL makes extensive use of resource guides, LibGuides, to help students locate electronic resources (http://guides.library.ucla.edu). LibGuides have been prepared for each engineering discipline to highlight the key databases, societies, and journals in the field. In addition, LibGuides have been prepared for the engineering core courses, which help students identify resources that are appropriate for their specific research projects. These LibGuides are refreshed each quarter, and accessed by students about 6,000 times each term.

The library offers in-person, email, telephone and chat-based reference to help students locate the resources they need, as well as in-person consultations and in-class instruction.

Other library services relevant to the needs of the program.

Information and research skills instruction is provided by SEL librarians in each of the required writing engineering classes and several capstone classes. These classes often provide hands-on practice in searching catalogs and databases for relevant resources. They explain the importance of scientific journal literature and how to evaluate information for credibility and appropriateness. They are beginning to offer remote learning options through interactive videos and modules embedded in the course management system for engineering classes.

In addition, SEL librarians make an effort to be part of the curriculum for teaching assistant training and other classes at the graduate level. In these classes, librarians focus on the information skill gaps of undergraduates and provide hands-on training in the use of discipline focused databases to retrieve information. They also explain issues surrounding their roles as producers of information such as copyright issues, open access, predatory publishing, research data management, and maximizing visibility of their work. Instruction for both undergraduates
and graduates has a large impact; for example, SEL librarians taught approximately 72 sessions for over two thousand students in 2017, the majority of these for SEAS students.

Information about new resources, services, and events, as well as articles about important news and trends from the engineering fields is presented to students through SEL’s website (http://www.library.ucla.edu/sel), Facebook page, Twitter feed, and departmental listservs. Recent SEL news entries focused on the SEL Graduate Student Resource Fair, the STEM Collaborative Learning Center pilot, new library online modules, and research data visualization workshops.

The library also provides services and workshops to help researchers manage their research data and comply with the UC Open Access Policy and federal public access requirements to make grant funded research publications and data available. Some of the tools the library provides to help meet these requirements are the Data Management Planning Tool (DMPTool), EZID (for persistent identifiers), DataDen (local data repository), and the Open Science Framework. Librarians also provide in-person and email consultations with researchers to meet specific needs.

**F. Overall Comments on Facilities**

As described in the preceding sections, our department has all the needed facilities to support high quality education including the needed offices, classrooms, laboratories, computing resources, and extensive library resources. We are especially proud of our laboratory safety training program and our recent construction and renovation activity.

The UCLA Computer Science department has a program in both Computer Science and Computer Science and Engineering. All facilities described above that are specific to the department are shared by the two programs.
CRITERION 8. INSTITUTIONAL SUPPORT

A. Leadership

UCLA Samueli has changed deans during the period since the last review. While both the former and present dean had their own priorities, both UCLA Samueli deans have supported the Computer Science and Engineering program by allocating funds, as needed, for department laboratories, teaching assistants, and temporary lecturers. Both showed strong interest in the undergraduate programs of the various departments.

The Associate Dean for Academic and Student Affairs handles the admissions to the program and also provides other school-wide services, such as the SEASnet computing environment and student advising.

Within the department the vice chair for undergraduate studies oversees much of the administrative work that is essential to the program. This includes working with faculty to schedule courses, set enrollment capacities, and allocate teaching assistant and reader resources. The vice chair also chairs an Undergraduate Program Committee that regularly discusses the state of the program based on the assessment data described earlier. This committee discusses and formulates summary information and recommendations that will be presented at faculty meetings.

The department has defined eight fields (Artificial Intelligence, Computational Systems Biology, Computer Networks, Computer Science Theory, Computer Systems Architecture, Graphics and Vision, Data Science Computing, and Software Systems) as an organizational device for activities such as course scheduling. Each field has a chair responsible for communicating and summarizing information from members of their field. As an example, each field prepares a field assessment in the Fall quarter of each year. These are then digested by the Undergraduate Program Committee as a basis for a status report and recommendations to the entire faculty.

B. Program Budget and Financial Support

Resources are discussed in relation to the undergraduate program, as opposed to other aspects of the department. The “atmosphere” is quite good in terms of support from the UCLA Samueli administration. The administration has a high degree of concern for our undergraduate programs.

In terms of support for instruction, we annually submit a teaching schedule in the Spring quarter for the following academic year. This includes a projection of the needed offerings of courses. Course offerings are typically taught in the same quarters each year; the main variables are the specific assignment of instructors and the number of sections of a particular course. Support here consists of funds for temporary lecturers and teaching assistants.
Besides the ladder faculty and staff salaries that are paid from a central pool, the Computer Science Department is given resources from UCLA Samueli for operation, temporary faculty (lecturers, etc.), graduate teaching assistants, graduate student researchers, readers (graders), and equipment for instructional laboratories on an annual basis. The amount allocated in each category to the various departments depends on the size of the faculty, number of faculty on sabbatical or leave of absence, number of undergraduate and graduate students, and required laboratory and design courses in a given program. Each year, departments are asked to provide a budget request for the following year’s temporary teaching and Teaching Assistant (TA) needs. These are funded through unfilled faculty positions. The school currently has a total of 218.71 faculty FTE, of which 169 are filled. The remaining FTE are used to fund lecturers and TAs (see Table 8-1 below). As UCLA Samueli resources are not sufficient to cover the need, the School submits a request to the campus for supplemental funding. This is requested on a year to year basis. The campus has provided UCLA Samueli with this additional funding to help meet our teaching needs (Table 8-2), which is reflected in the total allocation numbers in Table 8-1.

### Table 8-1: Lecturer and TA Allocations to Departments

<table>
<thead>
<tr>
<th>Department</th>
<th>FY 12-13</th>
<th>FY 13-14</th>
<th>FY 14-15</th>
<th>FY 15-16</th>
<th>FY 16-17</th>
<th>FY 17-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecturer</td>
<td>$1,961,968</td>
<td>$1,998,137</td>
<td>$1,919,609</td>
<td>$1,841,427</td>
<td>$2,344,385</td>
<td>$2,094,979</td>
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<tr>
<td>TA</td>
<td>$1,903,669</td>
<td>$1,806,381</td>
<td>$2,335,599</td>
<td>$2,664,395</td>
<td>$3,605,348</td>
<td>$3,671,745</td>
</tr>
<tr>
<td>BE Lecturer</td>
<td>$67,198</td>
<td>$98,927</td>
<td>$38,800</td>
<td>$19,492</td>
<td>$37,364</td>
<td>$42,857</td>
</tr>
<tr>
<td>BE TAs</td>
<td>$159,336</td>
<td>$181,601</td>
<td>$188,726</td>
<td>$205,866</td>
<td>$227,770</td>
<td>$243,350</td>
</tr>
<tr>
<td>CBE Lecturer</td>
<td>$99,085</td>
<td>$96,978</td>
<td>$116,100</td>
<td>$117,395</td>
<td>$155,660</td>
<td>$180,600</td>
</tr>
<tr>
<td>CBE TAs</td>
<td>$153,408</td>
<td>$176,550</td>
<td>$111,950</td>
<td>$147,475</td>
<td>$198,996</td>
<td>$231,807</td>
</tr>
<tr>
<td>CEE Lecturer</td>
<td>$321,386</td>
<td>$376,991</td>
<td>$422,481</td>
<td>$299,025</td>
<td>$427,409</td>
<td>$385,831</td>
</tr>
<tr>
<td>CEE TAs</td>
<td>$138,215</td>
<td>$179,711</td>
<td>$237,396</td>
<td>$187,146</td>
<td>$235,897</td>
<td>$256,556</td>
</tr>
<tr>
<td>CS Lecturer</td>
<td>$100,414</td>
<td>$144,418</td>
<td>$199,350</td>
<td>$225,044</td>
<td>$124,704</td>
<td>$163,801</td>
</tr>
<tr>
<td>CS TAs</td>
<td>$319,137</td>
<td>$326,933</td>
<td>$813,074</td>
<td>$1,083,106</td>
<td>$1,474,578</td>
<td>$1,444,180</td>
</tr>
<tr>
<td>ECE Lecturer</td>
<td>$455,847</td>
<td>$488,719</td>
<td>$384,920</td>
<td>$434,016</td>
<td>$585,009</td>
<td>$464,900</td>
</tr>
<tr>
<td></td>
<td>FY 12-13</td>
<td>FY 13-14</td>
<td>FY 14-15</td>
<td>FY 15-16</td>
<td>FY 16-17</td>
<td>FY 17-18</td>
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<td>----------</td>
</tr>
<tr>
<td>ECE TAs</td>
<td>$243,336</td>
<td>$167,605</td>
<td>$238,687</td>
<td>$194,343</td>
<td>$176,877</td>
<td>$156,515</td>
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<tr>
<td>MAE Lecturer</td>
<td>$557,418</td>
<td>$464,809</td>
<td>$426,762</td>
<td>$409,775</td>
<td>$569,596</td>
<td>$440,750</td>
</tr>
<tr>
<td>MAE TAs</td>
<td>$446,674</td>
<td>$421,331</td>
<td>$405,216</td>
<td>$471,061</td>
<td>$664,487</td>
<td>$837,795</td>
</tr>
<tr>
<td>MSE Lecturer</td>
<td>$145,050</td>
<td>$127,620</td>
<td>$132,900</td>
<td>$138,211</td>
<td>$227,920</td>
<td>$175,040</td>
</tr>
<tr>
<td>MSE TAs</td>
<td>$87,370</td>
<td>$85,315</td>
<td>$68,772</td>
<td>$80,179</td>
<td>$104,382</td>
<td>$110,490</td>
</tr>
<tr>
<td>SW Lecturer</td>
<td>$215,570</td>
<td>$199,660</td>
<td>$198,296</td>
<td>$198,469</td>
<td>$216,724</td>
<td>$241,191</td>
</tr>
<tr>
<td>SW TAs</td>
<td>$356,193</td>
<td>$267,334</td>
<td>$271,784</td>
<td>$295,219</td>
<td>$522,361</td>
<td>$391,051</td>
</tr>
</tbody>
</table>

Table 8-2: Campus-Provided Supplemental Teaching Allocation (Samueli-wide)

The department allocates these funds for teaching assistants and readers (graders) based on formulae related to enrollments and type of course, e.g., lecture or lab. Teaching assistants must be graduate students, and readers may be either graduate or undergraduate students who have previously taken the course or its equivalent.

The campus offers a teaching assistant training course, and all TAs must pass a test of spoken English. Our department provides a seminar course designed to prepare graduate students for their TA position, taught by the Vice Chair for Undergraduate Programs. All TAs are required to take the course, but sometimes scheduling conflicts cannot be avoided. Other departments also offer training courses for TAs, and in some cases we accept training from those classes, instead of our own.

The Office of Instructional Development provides a wealth of resources for faculty interested in improving their teaching effectiveness using instructional technology. They also provide grants for course development. For example, the department’s instructors for CS 111 received a grant to help update that class in 2016. In addition, the school has sponsored assistant professors to attend the National Effective Teaching Institute (NETI, a three-day workshop sponsored by the American Society for Engineering Education.)
In addition to support for lecturers and teaching assistants, each year the School of Engineering allocates instructional equipment and lab activity funds to each department. Table 8-3 below details the allocation information for the Computer Science department for the past six years. The departments use these funds to upgrade and replace equipment, buy instructional supplies, and enhance the infrastructure as needed. In addition to this annual allocation, the School has paid for renovations to modernize the teaching facilities and improve the safety conditions of our existing teaching labs. In some cases (such as the updating of CS 111, Operating System Principles), the department has received grants from the university to pay for new server machines and other resources related to the changes made in the class.

<table>
<thead>
<tr>
<th>Table 8-3. Funding for instructional maintenance and upgrading</th>
</tr>
</thead>
<tbody>
<tr>
<td>----------</td>
</tr>
<tr>
<td><strong>Funds</strong></td>
</tr>
</tbody>
</table>

While the total support for lecturers, teaching assistants, readers, and improvements to educational infrastructure varies from year to year, in general in recent years it is more than twice what we received for these purposes in 2012-2013, primarily because of a significant increase in undergraduate enrollment in our department. We have found the amounts provided to be sufficient to provide strong instructional support to our faculty and undergraduate students.

Support for computing is of two flavors: the general SEASnet computing facilities and the Computer Science Department laboratories. SEASnet is generally felt to be adequate, if not optimal, in all dimensions. The non-optimal aspects sometimes result in additional work by faculty in preparing class projects. However, students do not see these issues, and they are apparently quite content with SEASnet. The Computer Science Department laboratories are sufficiently supported to provide up-to-date equipment for the classes they support, as discussed earlier. The current equipment in these labs is detailed in Appendix C.

The university provides web-based facilities to help run classes using a Moodle-based site called CCLE. Class materials can be posted here, students contacted via email, assignments turned in, quizzes taken, grades posted, etc. CCLE offers a range of tools for instructors to run their classes more effectively.

Classrooms have whiteboards and built-in media facilities such as data projectors and in-classroom computers for hosting and displaying presentations. In summary, the resource situation is good, and there is adequate and steady support from the administration.

**C. Staffing**

The Computer Science Department has 18 full- or part-time staff members. Most have dedicated functions, such as the management services officer (1), accounting (1), purchasing (1), academic
personnel (1), payroll (1), graduate student affairs (2), undergraduate student affairs (1),
computing facilities (3), assistant to the chair (1), administrative assistants to department (2) and
administrative assistants to PIs (3) The administrative support staff for the undergraduate
program includes one full-time person in the department as well as two full-time counselors in
the associate dean’s office. In addition, the associate dean’s office handles a number of
administrative issues such as admissions. We feel that staffing for the undergraduate program is
sufficient.

There are two departmental administrative assistants who are available to the faculty to support
class-related work. This number is adequate since most of the faculty generate their own course
material. Each of these staff members has a desktop computer and access to the School and
departmental computing facility.

The department works hard to retain staff by offering staff training through the campus human
resource office. We look for opportunities to provide staff with reclassifications, promotions, and
equity increases as new needs develop in the department.

**D. Faculty Hiring and Retention**

The Dean of UCLA Samueli allocates tenure track positions to the department. Sometimes these
are promised positions extending over several years. For example, this year the department was
told that we have 10 tenure track positions over the next 3-5 years. The department has been
expanding, due to increased enrollments in computer science and engineering, and this expansion
has been accompanied by an increase in our tenure track positions. Further, several recent
retirements and a few departures by faculty members have opened positions.

To fill such vacant positions, a recruiting committee is appointed by the chair, and this committee advertises open positions, encourages all faculty to participate in identifying good
candidates, and determines which candidates will be invited for a recruiting visit. Our recent
deans have encouraged a focus on inclusivity and diversity in our faculty hiring decisions, so
such issues have a serious impact on which candidates we choose to interview.

A faculty candidate will be hosted by the faculty member who was an advocate for the visit. In
addition to giving a research presentation and talking to several current faculty members, the
visiting faculty candidate will typically meet with students. After a visit, all faculty are invited to
provide comments on the candidate. Several faculty meetings are generally held during the
recruiting season where presentations are made for candidates; this is followed by a vote on each
candidate by all faculty. The vote may prioritize the candidates. The chair then takes the
department results to the dean for a final School decision. In 2018, we interviewed 20 faculty
candidates.

Faculty salaries, teaching loads, sabbatical rules, and benefits are competitive with other leading
research universities. Scholarly activity is strongly supported and is a principle criterion for
promotion. The department atmosphere is quite collegial, and historically few faculty leave prior
to retirement. The department chair is proactive in identifying faculty that are performing
strongly, encouraging them to apply for accelerated promotions, and of course supporting those accelerations. The UCLA Samueli administration is also amenable to such actions when warranted.

The total number of faculty and the number of faculty resignations, retirements, and new hires for each of the last five years is given in Table 8-4 below. The department is aggressively recruiting now to bring the head count up to the target of 45.

Table 8-4. UCLA Computer Science Department Faculty Status

<table>
<thead>
<tr>
<th>Year</th>
<th>Faculty</th>
<th>Resignations</th>
<th>Retirements</th>
<th>New Hires</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-12</td>
<td>29</td>
<td></td>
<td>1 (Sherstov)</td>
<td></td>
</tr>
<tr>
<td>2012-13</td>
<td>29</td>
<td>1 (Majumdar)</td>
<td>Cardenas</td>
<td>2 (Wang &amp; Condie)</td>
</tr>
<tr>
<td>2013-14</td>
<td>28</td>
<td>1 (Estrin)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2014-15</td>
<td>30</td>
<td>1 (Vaughn)</td>
<td>Meka, Kim, Talwalkar</td>
<td></td>
</tr>
<tr>
<td>2015-16</td>
<td>33</td>
<td></td>
<td>Sha, van den broeck, Sankararaman</td>
<td></td>
</tr>
<tr>
<td>2016-17</td>
<td>34</td>
<td>Sha, Makarchev¹</td>
<td>Dyer, Parker</td>
<td>Varghese, Halperin, Nowatzki, Sun, Makarchev</td>
</tr>
<tr>
<td>2017-18</td>
<td>33</td>
<td>(Condie, Talwalkar)</td>
<td></td>
<td>Chang</td>
</tr>
</tbody>
</table>

E. Support of Faculty Professional Development

Sabbatical leave is earned at the rate of 1/3 quarter of paid sabbatical per 3 quarters of teaching. It can be taken in various ways; e.g., after 4 years of teaching a faculty may ask to take 2 quarters of sabbatical at 2/3 salary or after 9 years, 3 quarters of sabbatical at full salary. Sabbatical leaves must be approved by the dean (and they generally are). Leaves are generally used to expand knowledge into new areas or to carry out a scholarly project such as book writing.

Most, if not all, of our faculty are members of the ACM and/or IEEE and publish extensively in conferences and journals in their respective areas of research. Faculty also frequently serve on conference committees and editorial boards. While some funds are available from the university for such activities, for the most part faculty have research funds that support their professional activities.

¹ While Dr. Makarchev accepted a position in our department, he never actually worked here.
CAC Program Criteria

The CAC program criteria for degrees in Computer Science is the closest match for CAC programs to our program in Computer Science and Engineering. These criteria cover three major areas:

1. Student outcomes
2. Curriculum
3. Faculty

Each of these is covered in detail in other areas of this report. Section 3 provides details on the student outcomes from our Computer Science and Engineering program. Section 5 describes the curriculum required for our students, with syllabi for all classes in Appendix A. Section 6 discusses our faculty’s qualifications, with CVs provided for all faculty members in Appendix B.

For convenience, we summarize the information from these other sections as relevant to the CAC program criteria here.

Student Outcomes

In terms of student outcomes, the CAC program criteria highlight:

- An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices. [CS]
- An ability to apply design and development principles in the construction of software systems of varying complexity. [CS]

Our required coursework addresses these outcomes in multiple ways. Students are introduced to the necessity to trade off different desirable properties in computer systems early in the program, in classes such as CS 31 (Introduction to Computer Science I) and CS 111 (Operating Systems Principles). This necessity to balance various desirable goals recurs throughout our program, in classes such as CS 118 (Computer Network Fundamentals), CS 144 (Web Applications), CS 131 (Programming Languages), CS 136 (Introduction to Computer Security), and many other courses. Theoretical limitations on such tradeoffs are covered in classes like CS 180 (Introduction to Algorithms and Complexity) and CS 181 (Introduction to Formal Languages and Automaton Theory). In many cases, properly analyzing these tradeoffs require use of mathematics covered in our required math preparatory classes, such as Mathematics 61 (Introduction to Discrete Structures, covering topics like sets, graphs, and equivalence relations) and the set of probability and statistics classes that our students take. Our Computer Science classes, particularly the upper division classes, generally require students to perform labs, projects, or extensive homework assignments making use of this knowledge to demonstrate their modeling and design abilities.
We test our students’ abilities to apply design and development principles first on simple systems covered in upper division classes (such as projects in CS 111 and CS 118), and finally in the capstone design class (CS 152B). This class requires design and implementation of more extensive and complex systems, building on the principles provided in earlier classes.

Curriculum

CAC’s curriculum requirements focus on two elements:
1. One and one third years of computer science, covering particular topics in algorithms and software, exposure to a variety of software systems and languages, proficiency in at least one language, and advanced course work building on the basics of the program.
2. A year of science and math, including discrete mathematics and a science component that includes lab work.

Our students master a programming language (currently C++) in our introductory programming sequence (CS 31, 32, and 33). CS 33 exposes them to assembly and machine language, and CS 131 provides a comparative survey of many other programming languages. Fundamentals of algorithms are provided in CS 180, data structures are covered in CS 31, 32, and 33, software design is covered in those classes and CS 35L, and computer organization and architecture are taught in CS 51A, M151B, and M152A. All of these are required courses taken by all students in the Computer Science program.

Our students are required to take 20 units of upper division computer science electives. We offer a wide range of such electives, which all build on knowledge gained in the lower division required courses and several of the upper division required courses. These electives include course in databases (CS 143), computer security (CS 136), artificial intelligence (CS 161), data mining (CS 145), modeling computer systems (CS 112), computer graphics (CS 174A), computational biology (M 184), and many others.

We require over 2 years of mathematics for our students, including discrete mathematics, probability and statistics, calculus, and other advanced mathematics classes.

We require a full year (three quarters) of physics from all majors, including a physics lab.

Faculty

CAC’s faculty requirement is that some full time faculty members have a Ph.D. in computer science. All but one of our full time faculty members hold Ph.D.s, as shown in their CVs in appendix B. Some of them hold Ph.D.s in related fields (such as electrical engineering or applied mathematics), but most of them obtained their doctorates in computer science. A few examples include Prof. Cho, Prof. Ercogovac, Prof. Eskin, Prof. Korf, Prof. Millstein, and Prof. Ostrovsky.
EAC Program Criteria

The EAC program criteria for programs that include “computer” in their name are the criteria applicable to our Computer Science and Engineering program. These criteria focus on curriculum. They require:

- “both breadth and depth across the range of engineering topics implied by the title of the program.”
- Classwork in probability and statistics
- Advanced math through differential and integral calculus
- Science classes, one acceptable category being physical sciences
- Suitable coverage of engineering “necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components.”
- For computer-oriented programs (as ours is), discrete mathematics

Section 5 describes the curriculum required for our students, with syllabi for all classes in Appendix A. To summarize, our Computer Science and Engineering program requires substantial classwork in Computer Science, Electrical Engineering, and another technical field. These classes include several dealing with both hardware and software design of computer systems. We require a class in probability and statistics, as well as classwork in discrete mathematics. We require all students to take advanced math courses, including differential and integral calculus. Our students must take a full year of physics, plus a physics lab.
1. Course Number/ Course Name:

COM SCI 1
Freshman Computer Science Seminar

2. Credits: 1.0

Contact Hours: Seminar, one hour; discussion, one hour.

3. Instructor(s) or Course Coordinator(s):

Jason Cong

4. Textbook(s): None

4a. Other Supplemental Materials:

None

5. Specific Course Information

5a. Course Description: Introduction to department resources and principal topics and key ideas in computer science and computer engineering. Assignments given to bolster independent study and writing skills.

5b. Prerequisite(s)/ Co-requisite(s):

None

5c. Degree Requirement: Computer Science degree - REQUIRED (do not assess)
    Computer Science and Engineering degree - REQUIRED (do not assess)
6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

a) Introducing the computer science department

b) Providing an overview of modern computer science and engineering, with highlights of several principal topics/subject areas in the field

c) Exposing the students to some latest development in computer science and engineering through lectures and reading assignments

d) Simulating students' interests in computer science and engineering

6b. Student Outcomes: H I J
1. Course Number/ Course Name:

COM SCI 31
Introduction to Computer Science I

2. Credits: 4.0

Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Jens Palsberg David Smallberg

4. Textbook(s):


4a. Other Supplemental Materials:

None

5 Specific Course Information


5b. Prerequisite(s)/ Co-requisite(s):
None

5c. Degree Requirement: Aerospace Engineering degree - REQUIRED (do not assess)
Bioengineering degree - REQUIRED (do not assess)
Civil and Environmental Engineering degree - REQUIRED (do not assess)
Computer Science degree - REQUIRED (do not assess) Computer Science and Engineering degree - REQUIRED (do not assess)

Electrical Engineering degree - REQUIRED (do not assess)

Materials Science and Engineering degree - REQUIRED (do not assess)

Mechanical Engineering degree - REQUIRED (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

a) Exhibit ability to write and debug modest programs that meet specifications, using a high level language (currently C++)
b) Understand basic data types and data structures (numeric and character types, strings, arrays, structures, pointers)
c) Understand control structures (conditionals, iteration, functions)
d) Understand data abstraction using classes (public vs. private)
e) Use a software development environment for editing, compiling, and debugging programs
f) Communicate program design through both external documentation and comments in code

6b. Student Outcomes: A B C E G K

7. Course Topics:

a) Types and variables
b) Conditional control flow
c) Iterative control flow
d) Functions
e) Arrays
f) Strings
g) Pointers
h) Structs and Classes
i) Constructors
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI 32
Introduction to Computer Science II

2. Credits: 4.0

Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Jens Palsberg David Smallberg

4. Textbook(s):

Carrano, “Data Abstraction and Problem Solving With C++,” Pearson Education 2017

4a. Other Supplemental Materials:

None

5. Specific Course Information


5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisite: course 31.

5c. Degree Requirement: Computer Science degree - REQUIRED (assess) Computer Science and Engineering degree - REQUIRED (assess)

6. Specific Goals for Course
6a. Course Outcomes/Outcomes of Instruction:

a) Exhibit ability to write and debug complex programs using data structures and
   object-oriented programming techniques

b) Understand how to decompose large problems to design and structure solutions

c) Understand object-oriented concepts (inheritance, polymorphism) and
   generic programming (templates)

d) Understand the structure and performance characteristics of data containers (stacks,
   queues, lists, trees, hash tables)

e) Understand the concept of algorithmic complexity (big-O)

f) Use a software development environment for editing, compiling, and debugging
   programs

   g) Communicate program design through both external documentation and comments in
      code

6b. Student Outcomes: A B C E K

7. Course Topics:

a) Data Abstraction

b) Resource Management

c) Linked Lists

d) Stacks and Queues

e) Inheritance and Polymorphism

f) Recursion

g) Templates and the STL

h) Algorithmic Efficiency

i) Sorting

j) Trees

k) Hash tables

l) Priority queues

m) Heaps

n) Graphs
1. Course Number/ Course Name:

COM SCI 33
Introduction to Computer Organization

2. Credits: 5.0

Contact Hours: Lecture, four hours; discussion, two hours; outside study, nine hours.

3. Instructor(s) or Course Coordinator(s):

Jens Palsberg Glenn Reinman

4. Textbook(s):


4a. Other Supplemental Materials:

None

5. Specific Course Information

5a. Course Description: Introductory course on computer architecture, assembly language, and operating systems fundamentals. Number systems, machine language, and assembly language. Procedure calls, stacks, interrupts, and traps. Assemblers, linkers, and loaders. Operating systems concepts: processes and process management, input/output (I/O) programming, memory management, file systems.

5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisite: course 32.

5c. Degree Requirement:

Computer Science degree - REQUIRED (do not assess)
Computer Science and Engineering degree - REQUIRED (do not assess)
6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

a) Understand the principles of computer architecture

b) Relate high-level data types to their representation in a computer

c) Gain deep knowledge in a particular instruction set architecture (ISA)
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

   COM SCI 35L
   Software Construction Laboratory

2. Credits:  3.0

   Contact Hours:  Laboratory, four hours; outside study, five hours.

3. Instructor(s) or Course Coordinator(s):

   Paul Eggert  Jens Palsberg

4. Textbook(s):  None

4a. Other Supplemental Materials:

   None

5 Specific Course Information

5a. Course Description:  Fundamentals of commonly used software tools and environments, particularly open-source tools to be used in upper-division computer science courses.

5b. Prerequisite(s)/ Co-requisite(s):

   Requisite:  course 31.

5c. Degree Requirement:

   Computer Science degree - REQUIRED (assess)
   Computer Science and Engineering degree - REQUIRED (assess)

6. Specific Goals for Course
6a. Course Outcomes/Outcomes of Instruction:

a) Summarize the distinguishing characteristics and tradeoffs of the major software construction paradigms.

b) Understand the fundamental relationships among files, editors, compilers, linkers, debuggers, software build tools, and software virtual machines.

c) Understand the basic construction techniques behind command line interfaces, graphical user interfaces, and browsers.

d) Understand the basics of change management, including patches, revision control, and conflict resolution.

e) Understand the basics of how software can go wrong, and how to detect
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI M51A
Logic Design of Digital Systems

2. Credits: 4.0

Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Milos Ercegovac Miodrag Potkonjak

4. Textbook(s):

Ercegovac, “CRS Introduction to Digital Systems,” UCLA Course Reader Solutions

4a. Other Supplemental Materials:

None

5 Specific Course Information


5b. Prerequisite(s)/ Co-requisite(s):

None

5c. Degree Requirement: Computer Science degree - REQUIRED (do not assess)
Computer Science and Engineering degree - REQUIRED (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/ Outcomes of Instruction:

a) Ability to specify requirements, convert them to a digital system specification, and implement and analyze a digital design
b) Understanding the logical functions of building blocks for digital systems and obtaining proficiency in their use (e.g. gates, ALUs, decoders, multiplexors, Flip flops, counters, registers, etc.)
c) Ability to determine delays, and satisfy loading requirements (fan-in fan-out) based on an understanding of circuit properties

d) Ability to specify, implement, and minimize combinational logic and to determine the logic functions of existing designs

e) Ability to specify, implement, and minimize state machines and to determine equivalent state machines

f) Ability to implement and analyze sequential systems using D, JK, SR and any other types of flip-flops

g) Ability to design using combinational and sequential modules

h) Ability to specify requirements, convert them to high and binary level specification, and implement and analyze a hierarchical modular digital design

i) Ability to design data paths and controllers to design processors and application specific digital system

j) Understanding of iterative logic and especially logic for addition, subtraction and complement arithmetic.

k) Ability to use sequential modules (registers, shift registers, and counters) to implement sequential systems

l) Demonstration of understanding and competence by completing small logic design problems.

6b. Student Outcomes: A C D E F G I J K

7. Course Topics:

a) Digital systems: combinational and sequential.

b) Specification and implementation of combinational systems.


g) Programmable logic arrays (PLAs and PALs).


m) Programmable sequential arrays (PSAs), read-only memories (ROMs), and field-programmable gate arrays (FPGAs).

Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI 111
Operating Systems Principles

2. Credits: 5.0

Contact Hours: Lecture, four hours; laboratory, two hours; outside study, nine hours.

3. Instructor(s) or Course Coordinator(s):

Paul Eggert

4. Textbook(s):

“Operating Systems: Three Easy Pieces,” Remzi and Andrea Arpaci-Dusseau

4a. Other Supplemental Materials:

None

Specific Course Information


5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisites: courses 32, 33, 35L.

5c. Degree Requirement:

Computer Science degree - REQUIRED (assess)
Computer Science and Engineering degree - REQUIRED (assess)

6. Specific Goals for Course
6a. Course Outcomes/Outcomes of Instruction:

a) Understand the features provided by modern operating systems, including processes, memory, file systems, hardware, and networking.
b) Understand performance consequences of different operating system interfaces.
c) Understand operating system interactions with computer hardware, including interrupts, traps, user versus kernel mode, and device interaction.
d) Understand synchronization problems and solutions, including context switching, interrupts, mutual exclusion, synchronization, and deadlock.
e) Understand multi-threaded and multi-process computation models, and the impact of multi-processor architectures on synchronization.
f) Understand operating system memory architectures, including virtual memory, paging and segmentation, caching and the memory hierarchy, and swapping.
g) Understand file system designs, including directory structures, naming, storage allocation. Analysis of file system designs' performance, robustness, and efficiency.
h) Understand operating system/network interactions, including RPC, distributed file systems, and denial of service.
i) Understand operating system isolation, protection and security, including virtual memory isolation and models of access control.
j) Demonstrate ability to use and extend operating system interfaces, through small software design projects that use system calls and add kernel functionality.

6b. Student Outcomes
A B C D E F G H I J K

7. Course Topics:

a) abstractions and bootstrapping
b) modularity and virtualization
c) operating system organization
d) API and ABI design and Use
e) scripting
f) processes and threads
g) Orthogonality
h) concurrency and race conditions
i) Signals
j) Scheduling
k) synchronization primitives
l) Deadlock
m) file system performance
n) file system design and implementation
o) file system robustness
p) device management
q) memory management
r) distributed systems basics
s) authentication, authorization, and confidentiality
t) security protocols
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI 112
Modeling Uncertainty in Information Systems

2. Credits: 4.0

Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Mario Gerla

4. Textbook(s):

Sanadidi, “CRS Performance Modeling Fundamentals,” UCLA Course Reader Solutions
Sanadidi, “E-CRS Performance Modeling Fundamentals,” UCLA Course Reader Solutions

4a. Other Supplemental Materials:
None

5 Specific Course Information

5a. Course Description: Designed for juniors/seniors. Probability and stochastic process models as applied in computer science. Basic methodological tools include random variables, conditional probability, expectation and higher moments, Bayes theorem, Markov chains. Applications include probabilistic algorithms, evidential reasoning, analysis of algorithms and data structures, reliability, communication protocol and queueing models.

5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisites: course 111 and one course from Civil Engineering 110, Electrical Engineering 131A, Mathematics 170A, or Statistics 100A.

5c. Degree Requirement: Computer Science degree - SELECTED_ELECTIVE (do not assess) Computer Science and Engineering degree - ELECTIVE (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/ Outcomes of Instruction:
a) Understand the role of probability and randomness in engineering problems and algorithm design.

b) Understand and apply the axioms of probability and the concepts of a sample space and events.

c) Understand and apply the concepts of conditional probability, mutually independent events and Bayes Theorem.

d) Understand and apply the concepts of discrete and continuous random variables, examples and source of types of random variables that frequently arise in engineering problems.

e) Understand and apply the notions of expectation, variance, correlation of random variables.

f) Understand the basic notions of random processes and Markov chains.

g) Understand the basic ideas behind Bayesian inference, including the notions of prior and posterior distributions and the MAP rule.

h) Understand the basic ideas behind classical statistical inference, including maximum likelihood estimation.

6b. Student Outcomes: A K

7. Course Topics:
   a) Sample spaces and events
   b) Probability laws
   c) Conditional probability
   d) The total probability theorem and Bayes’ rule
   e) Independence
   f) The counting principle, permutations, and combinations
   g) Discrete random variables
   h) Expectation and variance
   i) Expectation and variance
   j) Conditional expectation and the total expectation theorem
   k) Correlation and covariance
   l) Information and entropy and related applications
   m) Continuous random variables
   n) The Law of Large Numbers
   o) Maximum likelihood estimation
   p) Maximum likelihood estimation
   q) Naive Bayes classifiers
   r) Discrete time Markov chains
   s) Long term behavior of Markov chains
   t) Absorption probabilities in Markov chains
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:
   COM SCI M117
   Computer Networks: Physical Layer

2. Credits: 4.0
   Contact Hours: None

3. Instructor(s) or Course Coordinator(s):
   Mario Gerla

4. Textbook(s):

4a. Other Supplemental Materials:
   None

5. Specific Course Information
5a. Course Description:

5b. Prerequisite(s)/ Co-requisite(s):
   None

5c. Degree Requirement:
   Computer Science degree - ELECTIVE (do not assess)
   Computer Science and Engineering degree - ELECTIVE (do not assess)

6. Specific Goals for Course
6a. Course Outcomes/ Outcomes of Instruction:
   a) Understand the properties of communication channels
   b) Understand signal modulation, demodulation, multiplexing and demultiplexing processes
   c) Understand MAC Protocols for reliable and noisy channels.
   d) Understand Wireless LAN and PAN design and operations.
e) Understand structures of Computer Communication systems.

f) Final comprehensive project requiring the student to re-design and re-think one of the experiments he/she performed.

6b. Student Outcomes: No student outcomes selected

7. Course Topics:
   a) principles of modern data communications
   b) principles of modern networking
   c) network protocol stack
   d) physical layer
   e) media access layer
   f) mobile communications projects
   g) lab experiments
   h) wireless MAC
   i) wireless TCP
   j) ad hoc networks
   k) modulation: AM, FM, PM
   l) Wireless LANs
   m) Zig-Bee
   n) Cellular communications
   o) Blue Tooth
   p) Body Sensor Networks
   q) medical sensor applications
   r) Fourier Transforms
   s) multiplexing
   t) data encoding/decoding
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:
   COM SCI 118
   Computer Network Fundamentals

2. Credits: 4.0
   Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):
   Mario Gerla Lixia Zhang

4. Textbook(s):

4a. Other Supplemental Materials:
   None

5. Specific Course Information

5a. Course Description: Designed for juniors/seniors. Introduction to design and performance evaluation of computer networks, including such topics as what protocols are, layered network architecture, Internet protocol architecture, network applications, transport protocols, routing algorithms and protocols, internetworking, congestion control, and link layer protocols including Ethernet and wireless channels.

5b. Prerequisite(s)/ Co-requisite(s):
   Enforced requisite: course 111.

5c. Degree Requirement: Computer Science degree - REQUIRED (assess)
6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

a) Understand principal conceptual models of computer networks, packet switching, network protocols, and the value of a layered approach.

b) Understand the basic components in network applications, popular application protocols such as HTTP, SMTP, and DNS, Client-Server paradigm, application programming interface, and socket programming.

c) Understand the basic functionality of transport protocols, error detection and recovery, flow and congestion control, and get a complete grasp of the Transmission Control Protocol (TCP).

d) Understand the basic concept of inter-networking, and get a complete grasp of the Internet Protocol (IP)

e) Understand link-layer protocol functionalities such as framing and media access control, be familiar with commonly used layer-2 protocols including Ethernet and IEEE 802.11

f) Demonstrate the overall understanding through term projects including Unix network programming and simple network applications

6b. Student Outcomes: A C E H I J K

7. Course Topics:

a) Computer networks
b) Packet switching
c) Network protocols
d) Layered protocol stack
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI CM121
Introduction to Bioinformatics

2. Credits: 4.0

Contact Hours: Lecture, four hours; discussion, two hours.

3. Instructor(s) or Course Coordinator(s):

Eleazar Eskin

4. Textbook(s):

Jones, “Intro Bioinformations Algorithms” MIT PRESS2004

4a. Other Supplemental Materials:

None

5. Specific Course Information

5a. Course Description: Prior knowledge of biology not required. Designed for engineering students as well as students from biological sciences and medical school. Introduction to bioinformatics and methodologies, with emphasis on concepts and inventing new computational and statistical techniques to analyze biological data. Focus on sequence analysis and alignment algorithms. Concurrently scheduled with course CM221.

5b. Prerequisite(s)/ Co-requisite(s):

Requisites: course 32 or Program in Computing 10C with grade of C- or better, and one course from Biostatistics 100A, Civil Engineering 110, Electrical Engineering 131A, Mathematics 170A, or Statistics 100A.

5c. Degree Requirement:

Computer Science degree - ELECTIVE (do not assess)
6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

No course outcomes found

6b. Student Outcomes: No student outcomes selected

7. Course

a) Bayesian inference

b) Probabilistic modeling

c) Genetic Variation

d) Introduction to Hidden Markov Models

e) Forward-Backward algorithms

f) Baum-Welch training

g) Gene prediction

h) Pairwise sequence alignment

i) Global and local alignment

j) Overlap and repeat alignment algorithms

k) Detection of RNA structure

o) Posterior probability
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:
   COM SCI CM122
   Algorithms in Bioinformatics

2. Credits: 4.0
   Contact Hours: Lecture, four hours; discussion, two hours.

3. Instructor(s) or Course Coordinator(s):
   Eleazar Eskin

4. Textbook(s):
   
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4a. Other Supplemental Materials:

   None

5 Specific Course Information

5a. Course Description: Course CM121 is not requisite to CM122. Designed for engineering students as well as students from biological sciences and medical school. Development and application of computational approaches to biological questions, with focus on formulating interdisciplinary problems as computational problems and then solving these
problems using algorithmic techniques. Computational techniques include those from statistics and computer science. Concurrently scheduled with course CM222.

5b. Prerequisite(s)/ Co-requisite(s):

Requisites: course 32 or Program in Computing 10C with grade of C- or better, and one course from Biostatistics 100A, Civil Engineering 110, Electrical Engineering 131A, Mathematics 170A, or Statistics 100A.

5c. Degree
Requirement: Computer Science degree - ELECTIVE (do not assess)
Computer Science and Engineering degree - ELECTIVE (do not assess)

6. Specific Goals for Course

6a Course Outcomes/ Outcomes

No course outcomes

6b Student Outcomes:

No student outcomes

7. Course

a) Introduction to Bioinformatics
b) Exhaustive Search
c) Greedy Algorithms
d) Dynamic Programming Algorithms
e) Divide-and-Conquer Algorithms
f) Graph Algorithms
g) Combinatorial Pattern Matching
h) Hidden Markov Models
i) Clustering Algorithms
j) Inferring Trees
m) Final Project
1. **Course Number/ Course Name:**

COM SCI CM124
Computational Genetics

2. **Credits:** 4.0

Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. **Instructor(s) or Course Coordinator(s):**

Eleazar Eskin

4. **Textbook(s):** None

4a. **Other Supplemental Materials:**

None

5. **Specific Course Information**

5a. **Course Description:** Designed for engineering students as well as students from biological sciences and medical school. Introduction to computational analysis of genetic variation and computational interdisciplinary research in genetics. Topics include introduction to genetics, identification of genes involved in disease, inferring human population history, technologies for obtaining genetic information, and genetic sequencing. Focus on formulating interdisciplinary problems as computational problems and then solving those problems using computational techniques from statistics and computer science. Concurrently scheduled with course CM224.

5b. **Prerequisite(s)/ Co-requisite(s):**
Requisites: course 32 or Program in Computing 10C with grade of C- or better, Mathematics 33A, and one course from Civil Engineering 110, Electrical and Computer Engineering 131A, Mathematics 170A, or Statistics 100A.

5c. Degree Requirement:

Computer Science degree - ELECTIVE (do not assess)
Computer Science and Engineering degree - ELECTIVE (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

No course outcomes found

6b. Student outcomes:

No student outcomes found

7. Course Topics:

a) Introduction to Computational Genetics

b) Disease Genetics

c) Association Studies
d) Association Studies

e) Multiple Testing Correction

f) Meta-Analysis
g) Sequencing Technology

h) Read Mapping

i) Sequence Assembly

j) Structural Variation

k) Population Structure

l) Reading Research Papers

m) Computational Problem Formulation

n) Final project presentation
1. **Course Number/ Course Name:**

COM SCI 130
Software Engineering

2. **Credits:** 4.0

Contact Hours: Lecture, four hours; laboratory, two hours; outside study, six hours.

3. **Instructor(s) or Course Coordinator(s):**

Paul Eggert Miryung Kim

4. **Textbook(s):**

Freeman, “Head First Design Patterns,” O’Reilly and Associates, Inc. 2004

4a. **Other Supplemental Materials:**

None

5. **Specific Course Information**

5a. **Course Description:** Structured programming, program specification, program proving, modularity, abstract data types, composite design, software tools, software control systems, program testing, team programming.

5b. **Prerequisite(s)/ Co-requisite(s):**

Requisites: courses 111, 131. Recommended requisite: Engineering 183EW or 185EW.
5c. Degree Requirement:
Computer Science degree - ELECTIVE (assess)
Computer Science and Engineering degree - ELECTIVE (assess)

6. Specific Goals for Course

6a. Course Outcomes/ Outcomes of Instruction:

a) A project-based understanding of the software development life cycle

b) A project-based understanding of specifying system requirements and communicating requirements among team members

c) Understanding software design principles, design patterns, and trade-offs; component design, communication and interaction patterns, abstract data types, and software development support tools

d) Understanding and demonstration of test effectiveness, how to write

6b. Student Outcomes: A B C D E F G J K

7. Course Topics:

a). software process models
b) requirements engineering
c) system modeling and analysis
d) architectural and component-level design
e) refactoring and reuse
f) user interfaces
g) naming
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI 131
Programming Languages

2. Credits: 4.0

Contact Hours: Lecture, four hours; laboratory, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Paul Eggert Todd Millstein

4. Textbook(s):


4a. Other Supplemental Materials:

None

5 Specific Course Information

5a. Course Description: Basic concepts in design and use of programming languages, including abstraction, modularity, control mechanisms, types, declarations, syntax, and semantics. Study of several different language paradigms, including functional, object-oriented, and logic programming.

5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisites: courses 33, 35L.

5c. Degree Requirement: Computer Science degree - REQUIRED (do not assess)
Computer Science and Engineering degree - REQUIRED (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/ Outcomes of Instruction:

a) Summarize the history, distinguishing characteristics, and tradeoffs of the major programming languages and their paradigms.
b) Understand how software reuse and programming in the large are supported by programming abstraction mechanisms, including parameter-passing techniques, parameterized types, and modules.

c) Explain the uses and properties of types, abstract data types, static and dynamic type-checking, declarations, binding, visibility, and scope.

d) Understand object-oriented programming issues, including encapsulation, information hiding, inheritance, polymorphism, and basic patterns such as iterators.

e) Understand functional programming issues, including recursive functions, recursively-defined data structures, divide-and-conquer, and functions as data.

f) Understand logic programming issues, including unification, pattern matching, backtracking, and resolution.

g) Understand fundamental pragmatic issues in programming language implementation, including safety, efficiency, and simplicity, particularly with respect to storage management.

h) Design, implement, test, and debug simple programs in each of the major paradigms.

6b. Student Outcomes: A B C D E G H I J K

7. Course Topics:
a) syntax, grammars, and parsing
b) interpretation and translation
c) virtual machines
d) storage management
e) names and binding
f) abstraction mechanisms
g) declarations, types, and polymorphism
h) functional programming
i) object-oriented programming
j) logic programming
k) Control
l) faults and exceptions
m) Concurrency
n) Scripting
o) language design tradeoffs
p) formal semantics
q) history of programming languages
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI 132
Compiler Construction

2. Credits: 4.0

Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Paul Eggert Jens Palsberg

4. Textbook(s):


4a. Other Supplemental Materials:

None

5 Specific Course Information

5a. Course Description: Compiler structure; lexical and syntactic analysis; semantic analysis and code generation; theory of parsing.

5b. Prerequisite(s)/ Co-requisite(s):

Requisite: course 131.
5c. Degree
Requirement: Computer Science degree - REQUIRED (do not assess)
Computer Science and Engineering degree - REQUIRED (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:
   a) Understanding of lexical and syntactic analysis
   b) Understanding of semantic analysis
   c) Understanding of code generation
   d) Ability to design and implement a compiler that translates a high-level programming
      language to machine code

6b. Student Outcomes: A B C E K

7. Course Topics:
   a) lexical analysis
   b) Predictive parsing
   c) LR parsing
   d) abstract syntax
   e) compiler construction tools, e.g., JavaCC
   f) semantic analysis
   g) translation and simplification
   h) instruction selection
   i) liveness analysis
   j) register allocation
   k) activation records and memory management
   l) type systems
   m) cache-related optimizations
1. Course Number/ Course Name:

COM SCI 133
Parallel and Distributed Computing

2. Credits: 4.0

Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Jason Cong Glenn Reinman

4. Textbook(s):

Grama, “Intro to Parallel Programming (2nd),” Addison-Welsey/CSC 2003

4a. Other Supplemental Materials:

None

5 Specific Course Information

5a. Course Description: Distributed memory and shared memory parallel architectures; asynchronous parallel languages: MPI, Maisie; primitives for parallel computation: specification of parallelism, interprocess communication and synchronization; design of parallel programs for scientific computation and distributed systems.

5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisites: courses 111 (may be taken concurrently), 131.
5c. Degree
Requirement: Computer Science degree - ELECTIVE (do not assess)
Computer Science and Engineering degree - ELECTIVE (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

a) Shared/distributed-memory models for parallel programs
b) Familiarity with general methodologies for parallel programming
c) Familiarity with concurrent programming using OpenMP
d) Familiarity with distributed programming using message passing APIs
e) Basic training for performance analysis enhancement in parallel programming
f) Synchronized access to shared resources in parallel programs
g) Exposure to heterogeneous computing

6b. Student Outcomes: A B C E K

7. Course Topics:
a) Shared memory architectures
b) Distributed memory architectures
c) Threads and processes
d) Recognizing potential parallelism
e) Confronting race conditions
f) Domain decomposition
g) Task decomposition
h) Pipeline decomposition
i) CUDA
j) OpenMP
k) POSIX
l) MP1
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI 136
Introduction to Computer Security

2. Credits: 4.0

Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Jens Palsberg

4. Textbook(s):


4a. Other Supplemental Materials:

None

5 Specific Course Information

5a. Course Description: Introduction to basic concepts of information security necessary for students to understand risks and mitigations associated with protection of systems and data. Topics include security models and architectures, security threats and risk analysis, access control and authentication/authorization, cryptography, network security, secure application design, and ethics and law.

5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisite: course 118.

5c. Degree Requirement: Computer Science degree - ELECTIVE (do not assess)
Computer Science and Engineering degree - ELECTIVE (do not assess)

6. Specific Goals for Course
6a. Course Outcomes/Outcomes of Instruction:

a) Understand the unique characteristics of the problems of computer security as compared to other fields of computer science. Understand the different security goals, their purposes, and the threats against them in single computers, networks, and distributed systems.
b) Understand the basic mechanisms used to secure various elements of an operating system.
c) Understand access control mechanisms and the role of trust in computer security.
d) Understand the basics of cryptography and how to use different forms of cryptography to achieve various security goals.
e) Understand the special security problems of networks, including the Internet, wireless networks, and the World Wide Web. Understand various common network security mechanisms, including firewalls, VPNs, and honeynets.
f) Understand the basic methods available to perform authentication in both single machine and network settings, including their strengths and weaknesses, and the situations in which each can be useful.
g) Understand the basic concepts behind intrusion detection systems, the various styles of intrusion detection systems, and the challenges in making such systems work well.
h) Understand the common pitfalls in writing secure code. Understand how to perform secure system design and how to evaluate the security of systems.
i) Understand the various kinds of malicious software (viruses, worms, Trojan Horses, botnets, logic bombs, etc.), their purpose, and methods of defending against them.
j) Demonstrate the ability to use core security tools, including firewalls, forensics, and network defense tools, through practical lab exercises. Demonstrate understanding of common attack mechanisms (like buffer overflows) by exercising them in lab settings.

6b. Student Outcomes: No student outcomes selected

7. Course Topics:

a) Security design principles, policies, and tools
b) Access control and security models
c) Network security
d) Web security and privacy
e) Applied cryptography
f) Secure software design and programming.
g) Operating system security
h) Malware
i) Security analysis and forensics
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI 143
Database Systems

2. Credits: 4.0

Contact Hours: Lecture, four hours; laboratory, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Alfonso Cardenas Carlo Zaniolo

4. Textbook(s):


4a. Other Supplemental Materials:

None

5. Specific Course Information


5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisite: course 111.

5c. Degree Requirement: Computer Science degree - ELECTIVE (do not assess)
Computer Science and Engineering degree - ELECTIVE (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

a) Ability to design and implement information systems, and understanding of their enabling technology

b) Understand principles and methods for the analysis and design of information systems: logical and physical database design

c) Understand mathematical models for database relations and query languages

d) Understanding of database system architecture, algorithms for secondary storage, indexing, and scalability in data engineering

d) Understanding the engineering and social challenges encountered in designing secure, reliable, scalable, and maintainable databases for the information age

e) Understand transaction atomicity, Concurrency control and Recovery

f) Understand principles of data distribution, organization and web-based access

g) Understand high-level query languages and usability issues

h) Understand techniques for query optimization and performance estimation

6b. Student Outcomes: A B C D E F G K

7. Course topics:

a) Information systems and database systems in enterprises

b) File organization and secondary storage structures.

c) Relational model and relational database systems.

d) Network, hierarchical, and object models.

e) Query languages

f) Database design principles

g) Transactions, concurrency, and recovery

h) Integrity, Security, and authentication
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI 144
Web Applications

2. Credits: 4.0

Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Junghoo Cho Carlo Zaniolo

4. Textbook(s): None

4a. Other Supplemental Materials:

None

5 Specific Course Information

5a. Course Description: Important concepts and theory for building effective and safe Web applications and first-hand experience with basic tools. Topics include basic Web architecture and protocol, XML and XML query language, mapping between XML and relational models, information retrieval model and theory, security and user model, Web services and distributed transactions.

5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisite: course 143.

5c. Degree Requirement: Computer Science degree - ELECTIVE (do not assess)
Computer Science and Engineering degree - ELECTIVE (do not assess)
6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

a) Understand the basic Web application architecture

b) Learn the core standards used by Web applications, including HTTP, HTML, CSS and Unicode.

c) Learn JavaScript programming both in client and server contexts

d) Learn event-based asynchronous programming

e) Learn about asymmetric cryptography and its application for public-key infrastructure (PKI)

f) Learn common vulnerabilities of Web applications

g) Learn the core issues in scaling a Web application

h) Learn how to use modern tools for Web development

6b. Student Outcomes: A C E H J K

7. Course Topics:

a) Basic Web standards (HTTP, HTML, CSS)

b) Web site architecture

c) JavaScript programming

d) Asynchronous programming

 e) Model-View-Controller approach

f) Web security

g) Common Web vulnerability

h) Scaling Web sites

i) Cluster-based computing
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI M151B
Computer Systems Architecture

2. Credits: 4.0

Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Glenn Reinman Yuval Tamir

4. Textbook(s):


4a. Other Supplemental Materials:

None

5. Specific Course Information

5a. Course Description: Computer system organization and design, implementation of CPU datapath and control, instruction set design, memory hierarchy (caches, main memory, virtual memory) organization and management, input/output subsystems (bus structures, interrupts, DMA), performance evaluation, pipelined processors.

5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisites: courses 33, and M51A or Electrical and Computer Engineering M16. Recommended: courses 111, and M152A or Electrical and Computer Engineering M116L.

5c. Degree Requirement: Computer Science degree - REQUIRED (do not assess) Computer Science and Engineering degree - REQUIRED (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/ Outcomes of Instruction:

a) Understanding of the finite-state-machine model of a computer and virtual machines
b) Understanding of the difference between ISA and organization
c) Ability to design a datapath of a simple processor
d) Ability to design a control unit of a simple processor
e) Ability to modify an existing processor implementation to implement modifications to the ISA
f) Understanding of computer system performance measures
g) Ability to analyze the impact of instruction mix and CPU organization of program performance
h) Understanding of the key considerations and alternatives for ISA design
i) Knowledge of the ISA features needed to support protection and an understanding of their implementation
j) Understanding of the mechanisms used to support input/output and associated design tradeoffs
k) Understanding of the technologies used to implement register files and memories
l) Understanding of the idea of memory hierarchy
m) Understanding of alternative cache memory organizations
n) Understanding of the idea of virtual memory and associated implementation tradeoffs
o) Ability to analyze the impact of various levels of the memory hierarchy on program performance
p) Understanding of the concept of pipelining
q) Ability to design a simple pipelined processor

6b. Student Outcomes: A B C E I J
7. a) Trends in Computer Architecture
   b) Instruction Set Architecture
   c) Basic Logic Design
   d) Adder Design
   e) Multiplier Design
   f) Single Cycle Datapath
   g) Basic Pipelining
   h) Data Hazards
   i) Control Hazards
   j) Superpipelining
   k) Superscalar Architecture
   l) Static Scheduling (VLIW)
   m) Dynamic Scheduling
   n) Caches
   o) Virtual Memory and TLBs
   p) I/O
   q) Multiprocessors and Multithreading
   r) Cache Coherence
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI 151C Design of Digital Systems

2. Credits: 4.0
Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):
Milos Ercegovac

4. Textbook(s):
EBK Coursesmart Intro Digital Systems (Ercegovac), Coursesmart LLC

4a. Other Supplemental Materials:
None

5 Specific Course Information

5b. Prerequisite(s)/ Co-requisite(s):
Requisites: courses M151B, M152A.

5c. Degree Requirement: Computer Science degree - ELECTIVE (do not assess)
Computer Science and Engineering degree - ELECTIVE (do not assess)

6. Specific Goals for Course
6a. Course Outcomes/ Outcomes of Instruction:

a) Ability to specify, analyze, design and implement digital systems. Understand behavioral, structural and physical models; levels of implementation and VLSI design alternatives: gate arrays, standard cells, and custom design. Learn about CAD tools and hardware description languages.
b) Ability to design combinational and sequential systems using regular networks such as iterative, array, tree, and lookahead networks. Understand design with decoders, encoders, multiplexers, counters, and RAMs.
c) Ability to design with programmable modules: Programmable logic arrays (PLAs), programmable sequential arrays (PSAs), read-only memories (ROMs), and field-programmable gate arrays (FPGAs).
d) Ability to analyze and design arithmetic algorithms and modules for fast addition, multiplication, and division.
e) Understand pipelining and its main aspects: partitioning and staging, latch design, and timing and control.
f) Understand asynchronous systems and system timing: synchronous, asynchronous, and combined approaches; clock distribution; synchronization and metastability.
g) Ability to analyze and develop register-transfer level (RTL) systems. Understand organization, design and implementation of RTL systems.
h) Understand data and control subsystems. Understand data subsystem parts: storage modules, functional modules, and datapaths. Same for control subsystem: hardwired and microprogrammed approaches.
i) Ability to specify and implement microcomputers. Understand microcomputer organization and architecture: memory subsystem, I/O subsystem, processor. Ability to implement a simple microcomputer system.
j) Demonstrate understanding of covered topics by completing a group project which involves specification, design, and implementation at the HDL level (VHDL) of a digital system. Performance (cycle time) and cost (size and interconnect) are analyzed and evaluated. Design review by peers performed.

6b. Student Outcomes: A C D E G I J K

7. Course Topics: 
b) Register-transfer level (RTL) systems. Computational models and execution graphs: sequential, group-sequential, concurrent. Data and control subsystem organizations. Specification and implementation of RTL systems. Analysis and design of RTL systems.
e) Arithmetic operations and modules. Case studies: Algorithms and implementations for fast addition, multiplication, and division.
g) System timing. Synchronous, asynchronous, and combined approaches. Clock distribution. Synchronization problems: clock skew, arbitration, and metastability. Self-timed systems.
1. Course Number/ Course Name:

COM SCI M152A
Introductory Digital Design Laboratory

2. Credits: 2.0

Contact Hours: Laboratory, four hours; outside study, two hours.

3. Instructor(s) or Course Coordinator(s):

Miodrag Potkonjak

4. Textbook(s): None

4a. Other Supplemental Materials:

None

5 Specific Course Information

5a. Course Description: Hands-on design, implementation, and debugging of digital logic circuits, use of computer-aided design tools for schematic capture and simulation, implementation of complex circuits using programmed array logic, design projects.

5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisite: course M51A or Electrical and Computer Engineering M16.

5c. Degree Requirement:

Computer Science degree - REQUIRED (assess)
Computer Science and Engineering degree - REQUIRED (assess)
6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

a) Ability to design, implement and debug digital logic circuits

b) Understanding of circuit delay, noise, and timing characteristics by direct measurements and simulation results

c) Ability to implement programmable logic (FPGAs)

d) Ability to use computer aided design tools for digital design - verilog, simulation, and implementation on programmable logic chips (PLD or FPGA)

e) Demonstration of competence by completing group design projects

f) Demonstrate communications ability by preparing written reports documenting the requirements, approach taken, justification for the selected approach, and detailed implementation of the design projects

6b. Student Outcomes: A B C D E G

7. Course Topics:

a) Discrete electronic components, breadboards, oscilloscopes, voltmeters, datasheets, and instruction manuals

b) Hands on design of various systems using analog and digital components and testing such systems

c) Floating-point representation, designing encoders and clock dividers

d) Implementing more complex designs with schematic editors and VHDL language

e) FPGA programming

f) State diagrams in Xilinx ISE
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI 152B
Digital Design Project Laboratory

2. Credits: 4.0

Contact Hours: Laboratory, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Majid Sarrafzadeh

4. Textbook(s): None

4a. Other Supplemental Materials:

None

5 Specific Course Information

5a. Course Description: Limited to seniors. Design and implementation of complex digital subsystems using field-programmable gate arrays (e.g., processors, special-purpose processors, device controllers, and input/output interfaces). Students work in teams to develop and implement designs and to document and give oral presentations of their work.

5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisite: course M151B or Electrical Engineering M116C. Recommended: Engineering 183EW or 185EW.

5c. Degree
Requirement: Computer Science degree - REQUIRED (assess)
Computer Science and Engineering degree - REQUIRED (assess)

6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

a) To provide students with a major design experience, building on previous studies and to provide experience working as a team to develop communications skills through written and oral reports on their work

b) Ability to design and implement characterize and test complex digital systems using Field-Programmable Gate Arrays (e.g., processors, special purpose device controllers, etc.)

c) Ability to use computer aided design tools for digital design - schematic capture, VHDL, simulation, implementation.

6b. Student Outcomes: A B C D E G K

7. Course Topics:

a) Introduction to programming in VHDL
b) ISE Tutorial
c) EDK Tutorial
d) Introduction to FPGA Architectures
e) Design and implementation of a digital system using FPGAs
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI 161
Fundamentals of Artificial Intelligence

2. Credits: 4.0

Contact Hours: Lecture, four hours; laboratory, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Adnan Darwiche Richard Korf

4. Textbook(s):


4a. Other Supplemental Materials:

None

5 Specific Course Information

5a. Course Description: Introduction to fundamental problem solving and knowledge representation paradigms of artificial intelligence. Introduction to Lisp with regular programming assignments. State-space and problem reduction methods, brute-force and heuristic search, planning techniques, two-player games. Knowledge structures including predicate logic, production systems, semantic nets and primitives, frames, scripts. Special topics in natural language processing, expert systems, vision, and parallel architectures.

5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisite: course 180.

5c. Degree
Requirement: Computer Science degree - REQUIRED (do not assess)
Computer Science and Engineering degree - ELECTIVE (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/ Outcomes of Instruction:

a) Understand the idea of a machine being intelligent
b) Be able to design, code, and debug computer programs in LISP

c) Understand the model of problem solving as search in a problem space

d) Understand the behavior of brute-force search algorithms, including breadth-first, depth-first, and depth-first iterative-deepening search.

e) Understand the behavior of heuristic search algorithms, including A*.

f) Know the completeness, solution quality, time complexities, and space complexities of these search algorithms.

g) Understand the behavior of minimax search with alpha-beta pruning for two-player games, and its time and space complexity.

h) Understand the behavior of backtracking and local search algorithms for constraint-satisfaction problems.

i) Understand propositional and first-order logic (predicate calculus) as a model of valid reasoning.

j) Be able to translate statements in English into first-order logic.

k) Be able to apply resolution refutation to prove a theorem in first-order logic.

l) Understand rule-based reasoning (forward and backward chaining).

m) Be able to apply probability theory and Bayes theorem to reasoning under uncertainty.

6b. Student Outcomes: No student outcomes selected

7. Course Topics:

a) LISP Programming

b) Problem types, problem spaces, search trees and graphs, AND/OR trees

c) Brute-force search, breadth-first, depth-first, depth-first iterative-deepening.

d) Backward chaining, bidirectional, best-first, and uniform-cost search.

e) A* algorithm, admissibility, time and space complexity of A*.


g) Two-player games, minimax search, alpha-beta pruning

h) Constraint-satisfaction problems, backtracking and heuristic repair

i) Propositional and predicate calculus, clause form, unification, resolution.

j) Soundness, completeness, decidability, Goedel's results

k) Probabilistic reasoning, Bayes theorem, Bayes nets

l) Production systems, expert systems.

m) Natural language processing, grammars, syntax and semantics

n) Structured representations, semantic nets, frames, scripts.

o) Perception, speech, vision, line labeling of polyhedral scenes
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI 170A
Mathematical Modeling and Methods for Computer Science

2. Credits: 4.0

Contact Hours: Lecture, four hours; laboratory, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Douglas Parker

4. Textbook(s):

Parker, “CRS Exploring the Matrix – Adventures in Modeling With MATLAB,” UCLA Course Reader Solutions

4a. Other Supplemental Materials:

None

5 Specific Course Information

5a. Course Description: Introduction to methods for modeling and simulation using interactive computing environments. Extensive coverage of methods for numeric and symbolic computation, matrix algebra, statistics, floating point, optimization, and spectral analysis. Emphasis on applications in simulation of physical systems.

5b. Prerequiste(s)/ Co-requisite(s):

Enforced requisites: course 180, Mathematics 33B.

5c. Degree Requirement: Computer Science degree - REQUIRED (do not assess)
Computer Science and Engineering degree - ELECTIVE (do not assess)
6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

a) Ability to use exploratory environments like Maple and Matlab.

b) Understanding of statistics developed through hands-on exploratory data analysis, visualization, and empirical development of hypotheses.

c) Understanding of basic issues regarding uncertainty and error floating-point arithmetic, numerical accuracy, and stability.

d) Familiarity with linear models, including matrix computations, least squares, regression, pseudoinverses, SVD, PCA, LSI.

e) Understanding of spectral methods, including the Fourier and Wavelet transforms, and their application in signal processing.

f) Ability to use modern optimization tools, and apply them in fitting models to data (supervised and unsupervised learning).

g) Appreciation for basic properties of iterative computations, chaos, and complex systems.

h) Ability to work in groups in solving mathematical problems.

6b. Student Outcomes A B C D E H I J K

7. Course Topics:

a) Matrix Algebra, and Types of Matrices

b) Eigenstructure, Matrix Decompositions, and the SVD

c) Least Squares and Pseudoinverses

d) Covariance, Correlation, and PCA

e) Floating-Point Arithmetic, Error, Accuracy, and Stability

f) Linear Models, Matrix Transformations, and the FFT

g) Models of Randomness, the Central Limit Theorem, and Exploratory Data Analysis

h) Nonlinear Models, Newton’s Method, and Optimization
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI M171L
Data Communication Systems Laboratory

2. Credits: 2.0-4.0

Contact Hours: Laboratory, four to eight hours; outside study, two to four hours.

3. Instructor(s) or Course Coordinator(s):

Mario Gerla

4. Textbook(s):


4a. Other Supplemental Materials:

None

5 Specific Course Information

5a. Course Description: Limited to seniors. Not open to students with credit for course M117. Interpretation of analog-signaling aspects of digital systems and data communications through experience in using contemporary test instruments to generate and display signals in relevant laboratory setups. Use of oscilloscopes, pulse and function generators, baseband spectrum analyzers, desktop computers, terminals, modems, PCs, and workstations in experiments on pulse transmission impairments, waveforms and their spectra, modem and terminal characteristics, and interfaces.

5b. Prerequisite(s)/ Co-requisite(s):

Recommended preparation: course M152A.

5c. Degree
Requirement: Computer Science degree - ELECTIVE (do not assess)
Computer Science and Engineering degree - ELECTIVE (do not assess)
Electrical Engineering degree - ELECTIVE (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

a) Understand the properties of transmission lines: Attenuation, Bandwidth, Reflection, Distortion, and Phase delay.
b) Understand signal modulation, demodulation, multiplexing and demultiplexing processes
c) Understand radio signal propagation and properties of wireless communication systems.
d) Understand signal Fourier transforms and fast Fourier transforms. Use advanced digital oscilloscopes, spectrum analyzers measure signal characteristics.
e) Design a laboratory experiment that demonstrates the properties of communication system components.
f) Understand the properties of LED and Laser diodes, the properties of p-i-n and Avalanche photo detectors.
g) Laboratory reports requiring the analysis of laboratory data vs. theoretical calculations.
h) Final comprehensive project requiring the student to re-design and re-think one of the 8 experiments he/she performed,

6b. Student Outcomes: A B C G J K

7. Course Topics:

a) Understand the properties of transmission lines: Attenuation, Bandwidth, Reflection, Distortion, and Phase delay.
b) Understand signal modulation, demodulation, multiplexing and demultiplexing processes
c) Understand radio signal propagation and properties of wireless communication systems.
d) Understand signal Fourier transforms and fast Fourier transforms. Use advanced digital oscilloscopes, spectrum analyzers measure signal characteristics.
e) Design a laboratory experiment that demonstrates the properties of communication system components.
f) Understand the properties of LED and Laser diodes, the properties of p-i-n and Avalanche photo detectors.
g) Laboratory reports requiring the analysis of laboratory data vs. theoretical calculations.
h) Final comprehensive project requiring the student to re-design and re-think one of the 8 experiments he/she performed,
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI 174A
Introduction to Computer Graphics

2. Credits: 4.0

Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Stefano Soatto Demetri Terzopoulos

4. Textbook(s):


4a. Other Supplemental Materials:

None

5. Specific Course Information

5a. Course Description: Basic principles behind modern two- and three-dimensional computer graphics systems, including complete set of steps that modern graphics pipelines use to create realistic images in real time. How to position and manipulate objects in scene using geometric and camera transformations. How to create final image using perspective and orthographic transformations. Basics of modeling primitives such as polygonal models and implicit and parametric surfaces. Basic ideas behind color spaces, illumination models, shading, and texture mapping.

5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisite: course 32.

5c. Degree Requirement:

Computer Science degree - ELECTIVE (do not assess)
Computer Science and Engineering degree - ELECTIVE (do not assess)
6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

a) Understanding of how mathematical models are used to represent and visualize real world phenomena and processes.

b) Understanding of how to algorithmically represent complex processes using efficient data structures and algorithms.

c) Understanding of the importance of interdisciplinary education. The course aims to show how techniques from the areas of mathematical modeling, engineering, physics, visualization and art co-operate to create state-of-the-art graphics for scientific visualization as well as entertainment.

d) Understanding of graphics hardware and pipelining architectures.

e) Understanding of how important creativity and imagination are for problem solving.

f) Understanding of the practical applications of engineering and computer science in scientific visualization, arts and entertainment.

6b. Student Outcomes: A B C D E G H I K

7. Course Topics:

a) Transformations: Euclidean, affine, similarity, projective

b) Homogeneous coordinates

c) Digital images: sampling theorem, aliasing, discontinuities

d) Scan conversion, polygon filling, drawing lines

e) Basic computational geometry

f) Geometric image formation: projections and relation to projective transformations

g) Viewing in 3D: Stereopsis

h) Accomodation

i) Visibility, elimination of hidden surfaces

j) Shading, basic illumination models

k) Color

l) Reflectance, materials

m) Curves and curved surfaces

n) Textures and texture mapping

o) Illumination shading, reflectance
1. Course Number/ Course Name:

COM SCI 174B
Introduction to Computer Graphics: Three-Dimensional Photography and Rendering

2. Credits: 4.0

Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Stefano Soatto Demetri Terzopoulos

4. Textbook(s):


4a. Other Supplemental Materials:

None

5 Specific Course Information

5a. Course Description: Basic principles behind modern two- and three-dimensional computer graphics systems, including complete set of steps that modern graphics pipelines use to create realistic images in real time. How to position and manipulate objects in scene using geometric and camera transformations. How to create final image using perspective and orthographic transformations. Basics of modeling primitives such as polygonal models and implicit and parametric surfaces. Basic ideas behind color spaces, illumination models, shading, and texture mapping.

5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisite: course 32.

5c. Degree Requirement:
Computer Science degree - ELECTIVE (do not assess)
Computer Science and Engineering degree - ELECTIVE (do not assess)
6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

a) Understanding of how mathematical models are used to represent and visualize real world phenomena and processes.

b) Understanding of how to algorithmically represent complex processes using efficient data structures and algorithms.

c) Understanding of the importance of interdisciplinary education. The course aims to show how techniques from the areas of mathematical modeling, engineering, physics, visualization and art co-operate to create state-of-the-art graphics for scientific visualization as well as entertainment.

d) Understanding of graphics hardware and pipelining architectures.

e) Understanding of how important creativity and imagination are for problem solving.

f) Understanding of the practical applications of engineering and computer science in scientific visualization, arts and entertainment.

6b. Student Outcomes: A B C D E G H I K

7. Course Topics:

a) Transformations: Euclidean, affine, similarity, projective

b) Homogeneous coordinates

c) Digital images: sampling theorem, aliasing, discontinuities

d) Scan conversion, polygon filling, drawing lines

e) Basic computational geometry

f) Geometric image formation: projections and relation to projective transformations

g) Viewing in 3D: Stereopsis

h) Accomodation

i) Visibility, elimination of hidden surfaces

j) Shading, basic illumination models

k) Color

l) Reflectance, materials

m) Curves and curved surfaces

n) Textures and texture mapping

o) Illumination shading, reflectance
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI C174C
Computer Animation

2. Credits: 4.0
Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Demetri Terzopoulos

4. Textbook(s):


4a. Other Supplemental Materials:

None

5 Specific Course Information

5a. Course Description: Designed for juniors/seniors. Introduction to computer animation, including basic principles of character modeling, forward and inverse kinematics, forward and inverse dynamics, motion capture animation techniques, physics-based animation of particles and systems, and motor control. Concurrently scheduled with course C274C.

5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisite: course 174A.

5c. Degree Requirement: Computer Science degree - ELECTIVE (do not assess)
Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

a) Understanding how mathematical techniques are used to animate virtual objects in computer graphics.

b) Understanding the basics of kinematic and dynamic (physics-based) motion representation and synthesis for virtual objects.

c) Understanding the importance of interdisciplinary education in computer animation for entertainment and scientific purposes, including mathematical modeling, physics, engineering, and art.

d) Understanding the practical applications of computer science and engineering in science and entertainment.

6b. Student Outcomes: A C E

7. Course Topics:

a) Introduction to computer animation

b) Animation principles

c) Forward and inverse kinematics

d) Forward and inverse dynamics

e) Physics-based animation of particles and systems

f) Basic principles of character modeling

g) Motion capture animation techniques

h) Motor control
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI 180
Introduction to Algorithms and Complexity

2. Credits: 4.0

Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):

Eliezer Gafni

4. Textbook(s):


4a. Other Supplemental Materials:

None

5 Specific Course Information

5a. Course Description: Designed for junior/senior Computer Science majors. Introduction to design and analysis of algorithms. Design techniques: divide-and-conquer, greedy method, dynamic programming; selection of prototypical algorithms; choice of data structures and representations; complexity measures: time, space, upper, lower bounds, asymptotic complexity; NP-completeness.

5b. Prerequisite(s)/Co-requisite(s):

Enforced requisites: course 32, Mathematics 61.

5c. Degree Requirement: Computer Science degree - REQUIRED (assess)
Computer Science and Engineering degree - REQUIRED (assess)

6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

a) Understanding what is a computer algorithm
b) Understanding the notion of a cost of an algorithm on a Ram model

c) Understanding date structures and their role in algorithmic design

d) Understanding and exposure to specific techniques: Greedy, divide and conquer, Dynamic programming.

e) Familiarity with efficient solutions to generic problems: Sorting, Searching, Graphs

f) Understanding Abstractions and Proofs and their role in Computer Science

g) Acquire the ability to outline a top down design of an algorithm, using abstraction of modules

h) Understanding the notion of solution reduction, and lower bound argumentation

i) Demonstrate understanding of concepts and the ability to do creative algorithmic designs by completion of several homework sets.

6b. Student Outcomes: A C D E G I K

7. Course Topics:

   a) The notion of algorithm, induction/recursion.

   b) Complexity notion, and RAM model

   c) Graphs: Presentation and traversal

   d) Greedy Algorithms

   e) Divide and Conquer algorithms

   f) Dynamic Programming

   g) Sorting and pattern matching

   h) Network Flows

   i) NP-completeness Reductions.
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:
   COM SCI 181
   Introduction to Formal Languages and Automata Theory

2. Credits: 4.0
   Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s):
   Rafail Ostrovsky Amit Sahai

4. Textbook(s):

4a. Other Supplemental Materials:
   None

5. Specific Course Information


5b. Prerequisite(s)/ Co-requisite(s):
   Enforced requisite: course 180.

5c. Degree Requirement: Computer Science degree - REQUIRED (do not assess)
   Computer Science and Engineering degree - REQUIRED (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/ Outcomes of Instruction:
   a) Understanding of finite state systems, their specifications and properties and building them to meet a task
b) Understanding of regular expressions and their connection to finite state machines

c) Understanding of context-free languages

d) Basic understanding of Turing machines and undecidable problems

6b. Student Outcomes: A C

7. Course Topics:
a) Recursively Enumerable Languages
b) Recursion Theorem
c) Reductions between Languages
d) Countable and Uncountable Sets
e) Diagonalization
f) Undecidability
g) Deterministic Finite Automata (DFA)
h) Non-Deterministic Finite Automata (NFA)
i) Equivalence between DFA and NFA
j) Regular Languages
k) Regular Expressions
l) Equivalence between Regular Languages and Regular Expressions
m) Pigeonhole Principle
n) Pumping Lemma for Regular Languages
o) Context-Free Grammars (CFG)
p) Pushdown Automata (PDA)
q) Equivalence between CFG and PDA
r) Pumping Lemma for Context-Free Languages
s) Turing Machines (TM)
t) Decidable Languages
1. **Course Number/ Course Name:**

   COM SCI 183
   Introduction to Cryptography

2. **Credits:**  4.0

   Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. **Instructor(s) or Course Coordinator(s):**

   Rafail Ostrovsky

4. **Textbook(s):**


4a. **Other Supplemental Materials:**

   None

5. **Specific Course Information**

5a. **Course Description:** Introduction to cryptography, computer security, and basic concepts and techniques. Topics include notions of hardness, one-way functions, hard-core bits, pseudorandom generators, pseudorandom functions and pseudorandom permutations, semantic security, public-key and private-key encryption, key-agreement, homomorphic encryption, private information retrieval and voting protocols, message authentication, digital signatures, interactive proofs, zero-knowledge proofs, collision-resistant hash functions, commitment protocols, and two-party secure computation with static security.

5b. **Prerequisite(s)/ Co-requisite(s):**

   Preparation: knowledge of basic probability theory. Enforced requisite: course 180.

5c. **Degree Requirement:**

   Computer Science degree - ELECTIVE (do not assess)
   Computer Science and Engineering degree - ELECTIVE (do not assess)
6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

No course outcomes found

6b. Student Outcomes: No student outcomes selected

7. Course Topics:
   a) notions of hardness,
   b) one-way functions,
   c) hard-core bits,
   d) pseudo-random generators,
   e) pseudorandom functions
   f) pseudorandom permutations,
   g) semantic security,
   h) public-key and private-key encryption,
   i) key-agreement,
   j) homomorphic encryption,
   k) private information retrieval
   l) voting protocols,
   m) message authentication,
   n) digital signatures,
   o) interactive proofs,
   p) zero-knowledge proofs,
   q) collision-resistant hash functions,
   r) commitment protocols, and
   s) two-party secure computation
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI M184
Introduction to Computational and Systems Biology

2. Credits: 2.0

Contact Hours: Lecture, two hours; outside study, four hours.

3. Instructor(s) or Course Coordinator(s):

Joseph DiStefano III

4. Textbook(s): None

4a. Other Supplemental Materials:

None

5. Specific Course Information

5a. Course Description: Presentations by individual UCLA researchers discussing their active computational and systems biology research.

5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisites: one course from 31, Civil Engineering M20, Mechanical and Aerospace Engineering M20, or Program in Computing 10A, and Mathematics 3B or 31B. Presentations by individual UCLA researchers discussing their active computational and systems biology research.

5c. Degree Requirement:

Computer Science degree - ELECTIVE (do not assess)
Computer Science and Engineering degree - ELECTIVE (do not assess)
6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:
   a) To introduce students to biomedical computing and computational biology
   b) To introduce computational modeling concepts applied to modern biology and medicine.
   c) To survey current topics in biocomputing, biomodeling and computational biology

6b. Student Outcomes: A

7. Course Topics:
   a) Systems Biology Modeling
   b) Challenges in Computational Genetics
   c) Dynamics and Control of Animal Locomotion
   d) Dynamic Systems Biology Modeling & Simulation
   e) Computational & Systems Biology Approaches to Post-Transcriptional Gene Regulation
   f) Stochastic Simulation: Application to Cancer Biology Modeling
   g) Computational and systems biology as a scientific discipline
   h) Biomodeling and computer simulation concepts, with examples in biology and medicine
   i) Bioinformatics methodologies
   j) Molecular, cellular and organ system biology, biochemistry and physiology models
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

COM SCI CM187
Research Communication in Computational and Systems Biology

2. Credits: 4.0

Contact Hours: Lecture, four hours; outside study, eight hours.

3. Instructor(s) or Course Coordinator(s):

Joseph DiStefano III

4. Textbook(s): None

4a. Other Supplemental Materials:

None

5 Specific Course Information

5a. Course Description: Closely directed, interactive, and real research experience in active quantitative systems biology research laboratory. Direction on how to focus on topics of current interest in scientific community, appropriate to student interests and capabilities. Critiques of oral presentations and written progress reports explain how to proceed with search for research results. Major emphasis on effective research reporting, both oral and written. Concurrently scheduled with course CM287.

5b. Prerequisite(s)/ Co-requisite(s):

Requisite: course CM186.

5c. Degree Requirement: Computer Science degree - ELECTIVE (do not assess)
Computer Science and Engineering degree - ELECTIVE (do not assess)
6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

a) Learn how to apply basic math modeling concepts to real biomedical research problems, in a real research lab environment.

b) Learn how to give concise oral presentations on science and engineering topics, with few slides.

c) Learn how to write scientific papers for peer review.

d) Learn how to defend your work

6b. Student Outcomes: A B D E G J K

7. Course Topics:

a) Systems Biology Modeling

b) Challenges in Computational Genetics

c) Dynamics and Control of Animal Locomotion

d) Dynamic Systems Biology Modeling & Simulation

e) Computational & Systems Biology Approaches to Post-Transcriptional Gene Regulation

f) Stochastic Simulation: Application to Cancer Biology Modeling

 g) Computational and systems biology as a scientific discipline

 h) Biomodeling and computer simulation concepts, with examples in biology and medicine

i) Bioinformatics methodologies

 j) Molecular, cellular and organ system biology, biochemistry and physiology models
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/Course Name: EC ENGR 2
   Physics for Electrical Engineers

2. Credits: 4.0
   Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s): Bahram Jalali Benjamin Williams

4. Textbook(s):

<table>
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<th>Author/Title</th>
<th>Publisher/Year</th>
<th>Req</th>
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<td>NEAMEN</td>
<td>MCGRAW HILL CO.</td>
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<td>SEMICONDUCTOR PHYSICS &amp; DEVICES</td>
<td>2012</td>
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4a. Other Supplemental Materials: None

5 Specific Course Information

5a. Course Description: Introduction to concepts of modern physics necessary to understand solid-state devices, including elementary quantum theory, Fermi energies, and concepts of electrons in solids. Discussion of electrical properties of semiconductors leading to operation of junction devices.

5b. Prerequisite(s)/Co-requisite(s): Requisite: Physics 1C.

5c. Degree Requirement:
   - Computer Science degree - REQUIRED (do not assess)
   - Computer Science and Engineering degree - REQUIRED (do not assess)
   - Electrical Engineering degree - REQUIRED (assess)
   - Materials Science and Engineering degree - ELECTIVE (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:
   a) Understand concepts of Quantum mechanics and electrons in solids.
   b) Know about atomic bonding and energy bands.
   c) Know about holes and effective mass.
d) Understand Fermi statistics and conduction.
e) Understand direct and indirect bandgap semiconductors (Si and GaAs)
f) Learn about extrinsic semiconductors.
g) Learn about drift and diffusion.
h) Learn about recombination and generation.
i) Compute potential and electric fields in PN junctions.
j) Learn about I-V characteristics of PN junctions.
k) Several homework assignments delving on core concepts and reinforcing analytical skills learned in class.
l) Opportunities to interact weekly with the instructor and the teaching assistant(s) during regular office hours and discussion sections in order to further the students' learning experience and the students' interest in the material.

6b. Student Outcomes: No student outcomes selected


b) Know about atomic bonding and energy bands.

c) Know about holes and effective mass.

d) Understand Fermi statistics and conduction.

e) Understand direct and indirect bandgap semiconductors (Si and GaAs)

f) Learn about extrinsic semiconductors.

g) Learn about drift and diffusion.

h) Learn about recombination and generation.

i) Compute potential and electric fields in PN junctions.

j) Learn about I-V characteristics of PN junctions.

k) Several homework assignments delving on core concepts and reinforcing analytical skills learned in class.

l) Opportunities to interact weekly with the instructor and the teaching assistant(s) during regular office hours and discussion sections in order to further the students' learning experience and the students' interest in the material.
1. **Course Number/ Course Name:**
   EC ENGR 10
   Circuit Theory I

2. **Credits:** 4.0

3. **Instructor(s) or Course Coordinator(s):**
   Puneet Gupta, Behzad Razavi

4. **Textbook(s):**

4a. **Other Supplemental Materials:**
   None

5. **Specific Course Information**

5a. **Course Description:**
   Introduction to linear circuit analysis. Resistive circuits, capacitors, inductors and ideal transformers, Kirchhoff laws, node and loop analysis, first-order circuits, second-order circuits, Thevenin and Norton theorem, sinusoidal steady state.

5b. **Prerequisite(s)/ Co-requisite(s):**
   Requisites: course 3 (or Computer Science 1 or Materials Science 10), Mathematics 33A, Physics 1B. Corequisites: course 11L (enforced), Mathematics 33B.

5c. **Degree**
   Computer Science and Engineering degree - REQUIRED (do not assess)
   Electrical Engineering degree - REQUIRED (do not assess) Materials Science and Engineering degree - REQUIRED (do not assess)

6. **Specific Goals for Course**
6a. **Course Outcomes/ Outcomes of Instruction:**
   a) Analyze circuit systems using direct application of Kirchoff's Current and Voltage Laws along with Ohm's Law.
   b) Interpret analytical circuit results to properly assign power, current, and voltage values to circuit graphical representations.
c) Apply node-voltage analysis techniques to analyze circuit behavior.
d) Apply mesh-current analysis techniques to analyze circuit behavior.
e) Explain the characteristics of capacitor, inductor, and transformer circuit elements.
f) Compute initial conditions for current and voltage in first order R-L and R-C capacitor and inductor circuits.
g) Compute time response of current and voltage in first order R-L and R-C capacitor and inductor circuits.
h) Compute initial conditions for current and voltage in second order RLC circuits.
i) Compute time response of current and voltage in second order RLC circuits.
j) Introduction to sinusoidal steady state.
k) Design and analysis of RLC circuits using phasor techniques.
l) Several homework assignments that review core concepts and reinforce analytical skills learned in class.
m) Several homework assignments that review core concepts and reinforce analytical skills learned in class.

6b. Student Outcomes: A C E I K M N

7. Course Topics:
   a) Analyze circuit systems using direct application of Kirchoff’s Current and Voltage Laws along with Ohm’s Law.
b) Interpret analytical circuit results to properly assign power, current, and voltage values to circuit graphical representations.
c) Apply node-voltage analysis techniques to analyze circuit behavior.
d) Apply mesh-current analysis techniques to analyze circuit behavior.
e) Construct parallel, series, delta, and Y, resistor equivalent circuits.
f) Explain the role of negative feedback in establishing amplifier response.
g) Explain the characteristics of ideal and non-ideal operational amplifiers.
h) Analyze the characteristics of ideal and non-ideal operational amplifier circuits using node-voltage methods.
i) Explain the characteristics of capacitor and inductor circuit elements.
j) Compute initial conditions for current and voltage in first order R-L and R-C capacitor and inductor circuits.
k) Compute time response of current and voltage in first order R-L and R-C capacitor and inductor circuits.
l) Compute initial conditions for current and voltage in second order RLC circuits.
m) Compute time response of current and voltage in second order RLC circuits.
n) Use PSpice tools to create and analyze circuit models.
o) Use PSpice tools to design and analyze resistive circuit systems.
p) Use PSpice tools to design and analyze operational amplifier circuit systems.
q) Several homework assignments delving on core concepts and reinforcing analytical skills learned in class.
r) Opportunities to interact weekly with the instructor and the teaching assistant(s) during regular office hours and discussion sections in order to further the students’ learning experience and the students’ interest in the material.
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<tbody>
<tr>
<td><strong>1. Course Number/ Course Name:</strong></td>
<td>EC ENGR 11L Circuits Laboratory I</td>
</tr>
<tr>
<td><strong>2. Credits:</strong></td>
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</tr>
<tr>
<td><strong>Contact Hours:</strong></td>
<td>Lecture, one hour; laboratory, one hour; outside study, one hour.</td>
</tr>
<tr>
<td><strong>3. Instructor(s) or Course Coordinator(s):</strong></td>
<td>Puneet Gupta Sudhakar Pamarti</td>
</tr>
<tr>
<td><strong>4. Textbook(s):</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>4a. Other Supplemental Materials:</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>5. Specific Course Information</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5a. Course Description:</strong></td>
<td>Experiments with basic circuits containing resistors, capacitors, inductors, and transformers. Ohm’s law voltage and current division, Thevenin and Norton equivalent circuits, superposition, transient and steady state analysis.</td>
</tr>
<tr>
<td><strong>5b. Prerequisite(s)/ Co-requisite(s):</strong></td>
<td>Enforced corequisite: course 10.</td>
</tr>
<tr>
<td><strong>5c. Degree Requirement:</strong></td>
<td>• Electrical Engineering degree - REQUIRED (assess)</td>
</tr>
<tr>
<td><strong>6. Specific Goals for Course</strong></td>
<td></td>
</tr>
<tr>
<td><strong>6a. Course Outcomes/ Outcomes of Instruction:</strong></td>
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</tr>
<tr>
<td><strong>6b. Student Outcomes:</strong></td>
<td>No student outcomes selected</td>
</tr>
<tr>
<td><strong>7. Course Topics:</strong></td>
<td>No course topics found</td>
</tr>
</tbody>
</table>
c) Experiments in electrostatics.

d) Experiments with direct currents (DC).

e) Experiments with alternating currents (AC).

f) Experiments on magnetic fields.

g) The speed of sound and light.

h) Experiments in geometric optics.

i) Diffraction and interference.

6b. **Student Outcomes:** No student outcomes selected

7. **Course Topics:**

   a) Data acquisition system.

   b) Statistics and error propagation.

   c) Experiments in electrostatics.

   d) Experiments with direct currents (DC).

   e) Experiments with alternating currents (AC).

   f) Experiments on magnetic fields.

   g) The speed of sound and light.

   h) Experiments in geometric optics.

   i) Diffraction and interference.
Course Syllabus [Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/Course Name:
   EC ENGR 102
   Systems and Signals

2. Credits: 4.0
   Contact Hours: Lecture, four hours; discussion, one hour; outside study, seven hours.

3. Instructor(s) or Course Coordinator(s):
   Christina Fragouli

4. Textbook(s):
   Author/Title: CHAPARRO
   SIGNALS & SYSTEMS USING MATLAB
   Publisher/Year: ELSEVIER HEALTH SCIENCES
   2014

4a. Other Supplemental Materials: None

5. Specific Course Information


5b. Prerequisite(s)/Co-requisite(s): Requisite: Mathematics 33A. Corequisite: Mathematics 33B.

5c. Degree Requirement
   Computer Science and Engineering degree - REQUIRED
   Electrical Engineering degree - REQUIRED

6. Specific Goals for Course
6a. Course Outcomes/Outcomes of Instruction
   a) Understand the concept of a signal and a system, plot continuous-time signals, evaluate the periodicity of a signal.
   b) Identify properties of continuous-time systems such as linearity, time-invariance, and causality.
   c) Solve constant-coefficient differential equations.
   d) Calculate with the Dirac delta function.
   e) Compute convolution of continuous-time functions.
   f) Understand the concept of the impulse response function of a linear system, and its use to describe the input/output relationship.
g) Compute the Laplace transform of a continuous function, identify its domain of convergence, and be familiar with its basic properties, including the initial and final value theorems.

h) Find the inverse Laplace transform by partial fractions.

i) Use Laplace transform to solve constant-coefficient differential equations with initial conditions.

j) Use the Laplace transform to evaluate the transfer function of linear time-invariant systems.

k) Understand Parseval's relation in Fourier series, and its interpretation in terms of decomposing the signal's energy between its harmonics.

l) Evaluate the response of a linear time-invariant system to periodic inputs.

m) Evaluate the Fourier transform of a continuous function, and be familiar with its basic properties. Relate it to the Laplace transform.

n) Evaluate and plot the frequency responses (magnitude and phase) of linear time-invariant systems, and apply it to filtering of input signals.

o) Understand conditions under which a band-limited function can be recovered from its samples.

p) Several homework assignments delving on core concepts and reinforcing analytical skills learned in class. Opportunity to conduct a matlab-based design project requiring some independent reading, programming, simulations and technical writing.

q) Interact weekly with the instructor and the teaching assistant(s) during regular office hours and discussion sections in order to further students' learning experience and interest in the material.

6b. Student outcomes: No student outcomes selected

7. Course Topics
   a) Understand the concept of a signal and a system, plot continuous-time signals, evaluate the periodicity of a signal.
   b) Identify properties of continuous-time systems such as linearity, time-invariance, and causality.
   c) Solve constant-coefficient differential equations.
   d) Calculate with the Dirac delta function.
   e) Compute convolution of continuous-time functions.
   f) Understand the concept of the impulse response function of a linear system, and its use to describe the input/output relationship.
   g) Compute the Laplace transform of a continuous function, identify its domain of convergence, and be familiar with its basic properties, including the initial and final value theorems.
   h) Find the inverse Laplace transform by partial fractions.
   i) Use Laplace transform to solve constant-coefficient differential equations with initial conditions.
   j) Use the Laplace transform to evaluate the transfer function of linear time-invariant systems.
   k) Compute the Fourier series representation of a periodic function, in both exponential and sine-cosine forms.
   l) Understand Parseval’s relation in Fourier series, and its interpretation in terms of decomposing the signal’s energy between its harmonics.
   m) Evaluate the response of a linear time-invariant system to periodic inputs.
   n) Evaluate the Fourier transform of a continuous function, and be familiar with its basic properties. Relate it to the Laplace transform.
   o) Evaluate and plot the frequency responses (magnitude and phase) of linear time-invariant systems, and apply it to filtering of input signals.
   p) Understand conditions when a band-limited function can be recovered from its samples.
   q) Several homework assignments delving on core concepts and reinforcing analytical skills learned in class. Opportunity to conduct a matlab-based design project requiring some independent reading, programming, simulations and technical writing.
1. Course Number/ Course Name: EC ENGR 110
   Circuit Theory II

2. Credits: 4.0
   Contact Hours: Lecture, three hours; discussion, one hour; outside study, eight hours.

3. Instructor(s) or Course Coordinator(s): Babak Daneshrad
   Alan Willson

4. Textbook(s):
   Author>Title: VAN VALKENBURG
   NETWORK ANALYSIS (UC REPRINT)
   Publisher-Year: UC LIBRARY BINDERY
   1974

4a. Other Supplemental Materials: None

5. Specific Course Information

5a. Course Description: Sinusoidal excitation and phasors, AC steady state analysis, AC
   steady state power, network functions, poles and zeros, frequency
   response, mutual inductance, ideal transformer, application of
   Laplace transforms to circuit analysis.

5b. Prerequisite(s)/ Co-requisite(s): Enforced requisites: courses 10, M16 (or Computer Science M51A),
   102. Corequisite: course 111L (enforced only for Computer Science
   and Engineering and Electrical Engineering majors).

5c. Degree Requirement: Computer Science and Engineering degree - REQUIRED(do not
   assess)
   Electrical Engineering degree - REQUIRED(do not assess)
   Materials Science and Engineering degree - ELECTIVE(do not
   assess)

6. Specific Goals for Course

6a. Course Outcomes/ Outcomes of Instruction:
   a) Analysis of RLC circuits using integro-differential equations.
   b) Introduction to sinusoidal steady state.
   c) Analysis of RLC circuits under sinusoidal steady state
analysis using complex phasor notation.
f) Ability to evaluate the Laplace and inverse Laplace transforms.
g) Solving and analyzing RLC circuits under both transient and steady state conditions using Laplace transform techniques.
h) Classify RLC circuits as low pass, high-pass, band-pass, or notch filters.
i) Identify the center frequency, damping factor, peaking, etc. for RLC filters.
j) Frequency response determination using Bode plots.
k) Design of first order circuits with given frequency responses.
l) Two port model for circuit and circuit elements.
m) Understand the concept of mutual inductance and how it affects circuit performance and its use in transformers.
n) Explain the purpose of a simulator such as SPICE.
o) Understanding of 2-port parameters and ability to calculate them for linear networks.
p) Several homework assignments delving on core concepts and reinforcing analytical skills learned in class.
q) Opportunities to interact weekly with the instructor and the teaching assistant(s) during regular office hours and discussion sections in order to further the students' learning experience and the students' interest in the material.

6b. Student Outcomes: No student outcomes selected

7. Course Topics:

a) Analysis of RLC circuits using integro-differential equations.
b) Introduction to sinusoidal steady state.
c) Analysis of RLC circuits under sinusoidal steady state conditions.
d) Design and analysis of RLC circuits using phasor techniques.
e) Complex power and its relationship to real and reactive power analysis using complex phasor notation.
f) Ability to evaluate the Laplace and inverse Laplace transforms.
g) Solving and analyzing RLC circuits under both transient and steady state conditions using Laplace transform techniques.
h) Classify RLC circuits as low pass, high-pass, band-pass, or notch filters.
i) Identify the center frequency, damping factor, peaking, etc. for RLC filters.
j) Frequency response determination using Bode plots.
k) Design of first order circuits with given frequency responses.
l) Two port model for circuit and circuit elements.
m) Understand the concept of mutual inductance and how it affects circuit performance and its use in transformers.
n) Explain the purpose of a simulator such as SPICE.
o) Understanding of 2-port parameters and ability to calculate them for linear networks.
p) Several homework assignments delving on core concepts and reinforcing analytical skills learned in class.
q) Opportunities to interact weekly with the instructor and the teaching assistant(s) during regular office hours and discussion sections in order to further the students' learning experience and
# Course Syllabus

**[Fall 2012-Spring 2018 ABET Review Cycle]**

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<tbody>
<tr>
<td>1.</td>
<td>Course Number/ Course Name:</td>
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<td>Credits:</td>
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<td></td>
<td>Contact Hours:</td>
<td>Lecture, one hour; laboratory, one hour; outside study, one hour.</td>
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<tr>
<td>3.</td>
<td>Instructor(s) or Course Coordinator(s):</td>
<td>Puneet Gupta Sudhakar Pamarti</td>
</tr>
<tr>
<td>4.</td>
<td>Textbook(s):</td>
<td>None</td>
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<td>4a.</td>
<td>Other Supplemental Materials:</td>
<td>None</td>
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<td>5.</td>
<td>Specific Course Information</td>
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<tr>
<td>5a.</td>
<td>Course Description:</td>
<td>Experiments with electrical circuits containing resistors, capacitors, inductors, transformers, and op-amps. Steady state power analysis, frequency response principles, op-amp-based circuit synthesis, and two-port network principles.</td>
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<td>5b.</td>
<td>Prerequisite(s)/ Co-requisite(s):</td>
<td>Enforced requisites: courses 10, 11L. Enforced corequisite: course 110.</td>
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<td>5c.</td>
<td>Degree Requirement:</td>
<td>• Electrical Engineering degree - REQUIRED (assess)</td>
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<td>6.</td>
<td>Specific Goals for Course</td>
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<td>6a.</td>
<td>Course Outcomes/ Outcomes of Instruction:</td>
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<tr>
<td>6b.</td>
<td>Student Outcomes:</td>
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</tr>
<tr>
<td>7.</td>
<td>Course Topics:</td>
<td>No course topics found</td>
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c) Experiments in electrostatics.

d) Experiments with direct currents (DC).

e) Experiments with alternating currents (AC).

f) Experiments on magnetic fields.

g) The speed of sound and light.

h) Experiments in geometric optics.

i) Diffraction and interference.

6b. Student Outcomes: No student outcomes selected

7. Course Topics:

a) Data acquisition system.

b) Statistics and error propagation.

c) Experiments in electrostatics.

d) Experiments with direct currents (DC).

e) Experiments with alternating currents (AC).

f) Experiments on magnetic fields.

g) The speed of sound and light.

h) Experiments in geometric optics.

i) Diffraction and interference.
1. **Course Number/Course Name:**
   - EC ENGR 113
   - Digital Signal Processing

2. **Credits:**
   - 4.0

   **Contact Hours:**
   - Lecture, four hours; discussion, one hour; outside study, seven hours.

3. **Instructor(s) or Course Coordinator(s):**
   - Mihaela Van Der Schaar

4. **Textbook(s):**
   - **Author/Title:** SAYED
     - CRS DISCRETE-TIME PROCESSING AND FILTERING
   - **Publisher/Year:** UCLA COURSE READER SOLUTIONS

4a. **Other Supplemental Materials:**
   - None

5. **Specific Course Information**

5a. **Course Description:**

5b. **Prerequisite(s)/Co-requisite(s):**
   - Enforced requisite: course 102.

5c. **Degree Requirement:**
   - Computer Science and Engineering degree – ELECTIVE
   - Electrical Engineering degree - REQUIRED (do not assess)
   - Master of Science in Engineering degree - REQUIRED

6. **Specific Goals for Course**

6a. **Course Outcomes/Outcomes of Instruction:**
   - a) Plot discrete-time signals, evaluate their energy and power, check for periodicity, and evaluate the period of a signal.
   - b) Identity properties of discrete-time systems such as time-invariance, stability, causality, and linearity.
   - c) Draw block diagrams of discrete-time systems.
   - d) Solve constant-coefficient difference equations and identify their modes.
   - e) Determine the zero-input and zero-state responses of systems described by constant-coefficient difference equations, and use the superposition principle to determine the complete response of such systems.
   - f) Compute the linear and circular convolutions of discrete-time sequences.
   - g) Evaluate the discrete-time Fourier transform (DTFT) of a
i) Evaluate the discrete Fourier transform (DFT) of a sequence, relate it to the DTFT, and use the DFT to compute the linear convolution of two sequences.

j) Compute the z-transform of a sequence, identify its region of convergence, and compute the inverse z-transform by partial fractions.

k) Use the z-transform to evaluate the transfer function of linear time-invariant systems and to identify the corresponding zeros and poles.

l) Use the z-transform to determine difference equations from transfer function descriptions.

m) Use the z-transform to solve constant-coefficient difference equations with initial conditions.

n) Use Nyquist sampling theorem to choose adequate sampling rates and to understand aliasing.

o) Opportunity to conduct matlab-based project(s) requiring some independent reading, programming, simulations, and technical writing.

p) Explain how Digital Signal Processing concepts are used in some selected applications in lecture and through the computer project.

q) Several homework assignments delving on core concepts and reinforcing analytical skills learned in class.

r) Opportunities to interact weekly with the instructor and the teaching assistant(s) during regular office hours and discussion sections in order to further the students' learning experience and the students' interest in the material.

6b. Student Outcomes:  
No student outcomes selected

7. Course Topics:

a) Introduction
b) DSP History and Applications
c) Concept of discrete signals
d) Sampling
e) Sampling theorem
f) Aliasing
g) Linear, time-invariant digital systems
h) Causality, stability
i) Impulse response
j) Convolution and correlation
k) Z-transforms
l) Forward and inverse z-transforms
m) Region of convergence, stability
n) Properties
o) One-sided z-transforms
p) Fourier series and transforms
q) Discrete Fourier Transform (DFT)
r) Fast Fourier Transform (FFT)
s) Introduction to digital filtering
t) FIR filter design; Filter design using poles and zeros in the z-plane
1. Course Number/ 
   Course Name: EC ENGR 115A
   Analog Electronic Circuits I

2. Credits: 4.0
   Contact Hours: Lecture, four hours; discussion, one hour; outside study, seven hours.

3. Instructor(s) or 
   Course Coordinator(s): Babak Daneshrad

4. Textbook(s):
   Author/Title: RAZAVI
   FUNDAMENTALS MICROELECTRONICS
   (SPIRAL)
   Publisher/Year: JOHN WILEY AND SONS/CSC #021
   2013
   Author/Title: RAZAVI
   FUNDAMENTALS OF
   MICROELECTRONICS
   Publisher/Year: JOHN WILEY AND SONS/CSC #021
   2013

4a. Other Supplemental Materials: None

5. Specific Course Information

5a. Course Description: Review of physics and operation of diodes and bipolar and MOS

5b. Prerequisite(s)/ 
    Co-requisite(s): Enforced requisite: course 110.

5c. Degree Requirement: Computer Science and Engineering degree - REQUIRED(do not assess)
   Electrical Engineering degree - REQUIRED(assess)

6. Specific Goals for Course

6a. Course Outcomes/ 
    Outcomes of Instruction:
    a) Design inverting or non-inverting amplifier structures with operational amplifiers.
    b) Include the input impedance, output impedance and finite gain in the analysis of an operational amplifier circuit.
    c) Draw the I-V characteristics of a PN junction diode.
    d) Indicate the breakdown, reverse biased, and forward biased regions of operation of a diode.
    e) Determine the different regions of operation for a bipolar junction transistor.
6b. **Student Outcomes:**

A B C I K

7. **Course Topics:**

a) Design inverting or non-inverting amplifier structures with operational amplifiers.

b) Include the input impedance, output impedance and finite gain in the analysis of an operational amplifier circuit.

c) Draw the I-V characteristics of a PN junction diode.

d) Indicate the breakdown, reverse biased, and forward biased regions of operation of a diode.

e) Determine the different regions of operation for a bipolar junction transistor.

f) Draw the small-signal model for an npn and pnp transistor.

g) Determine the small-signal parameters (i.e., \( r_p \), \( g_m \) and \( r_o \)) of a small-signal model.

h) Design the DC biasing for a common-emitter amplifier.

i) Analyze the small-signal properties (input and output impedance, and gain) of a common-base amplifier.

j) Determine the different regions of operation for a field-effect transistor (MOSFET).

k) Analyze the DC voltages of a basic common-source amplifier.

l) Draw and analyze the small-signal model of a common-drain amplifier.

m) Explain the purpose of a simulator such as SPICE.

n) Explain an example of how amplifiers and transistors are used in an application.

o) Several homework assignments delving on core concepts and reinforcing analytical skills learned in class.

p) Opportunities to interact weekly with the instructor and the teaching assistant(s) during regular office hours and during discussion sections in order to further the students' learning experience and the students' interest in the material.
1. Course Number/ Course Name: EC ENGR 115C
   Digital Electronic Circuits

2. Credits: 4.0
   Contact Hours: Lecture, four hours; discussion, one hour; outside study, seven hours.

3. Instructor(s) or Course Coordinator(s): Danijela Cabric, Chih-Kong Yang

4. Textbook(s):
   Author/Title: RABAЕY
   DIGITAL INTEGRATED CIRCUITS (2ND)
   Publisher/Year: PEARSON EDUCATION 2003

4a. Other Supplemental Materials: None

5. Specific Course Information

5a. Course Description: (Formerly numbered Electrical Engineering 115C.) Lecture, four
    hours; discussion, one hour; outside study, seven hours. Enforced
    requisites: course 115A, Computer Science M51A. Recommended:
    course 115B. Transistor-level digital circuit analysis and design.
    Modern logic families (static CMOS, pass-transistor, dynamic logic),
    integrated circuit (IC) layout, digital circuits (logic gates,
    flipflops/latches, counters, etc.), computer-aided simulation of digital
    circuits. Letter grading.

5b. Prerequisite(s)/ Co-requisite(s): Enforced requisites: EC ENGR 115A, CS M51A.

5c. Degree Requirement: Computer Science and Engineering degree – ELECTIVE
    Electrical Engineering degree - REQUIRED(assess)

6. Specific Goals for Course

6a. Course Outcomes/ Outcomes of Instruction:
   a) Understand the current equations and parasitic effects of MOS
      transistors.
   b) Apply current equations of MOS transistors.
   c) Understand the static operation of a CMOS inverter.
   d) Calculate resistances and capacitances of MOS transistors.
   e) Delay analysis of a CMOS inverter.
   f) Power analysis of a CMOS inverter.
   g) Physical layout of logic gates.
   h) Design and sizing (W/L) of simple logic gates.
   i) Delay analysis of a chain of logic gates.
   j) Calculate the delay of wires.
n) Analyze timing constraints of logic paths.
o) Several homework assignments delving on core concepts and reinforcing analytical skills learned in class.
p) A design project, mimic of industrial environment, with design phase, implementation phase, verification phase and professional reporting phase.
q) Opportunities to interact weekly with the instructor and the teaching assistant(s) during regular office hours and discussion sections in order to further the students' learning experience and the students' interest in the material.

6b. Student Outcomes: A C E I K

7. Course Topics:

a) Understand the current equations and parasitic effects of MOS transistors.
b) Being able to apply and calculate current equations and parasitic effects of MOS transistors.
c) Understand the static operation of a CMOS inverter.
d) Analysis of the dynamic behavior of a CMOS inverter (delay).
e) Design of a CMOS inverter (layout, delay calculations, verification).
f) Analysis of simple logic gates (NAND, NOR, EXOR) in standard CMOS technology.
g) Design (W/L) and delay calculation of simple logic gates.
h) Analysis of dynamic logic circuit styles.
i) Design and analysis of different register structures (static, dynamic, etc.) including set-up and hold times.
j) Alternative adder structures and their speed/complexity tradeoffs.
k) Several homework assignments delving on core concepts and reinforcing analytical skills learned in class.
l) A design project, mimic of industrial environment, with design phase, implementation phase, verification phase and professional reporting phase.
m) Opportunities to interact weekly with the instructor and the teaching assistant(s) during regular office hours and discussion sections in order to further the students' learning experience and the students' interest in the material.
Course Syllabus  
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name: EC ENGR M16C  
   Computer Systems Architecture

2. Credits: 4.0
   Contact Hours: Lecture, four hours; discussion, two hours; outside study, six hours.

3. Instructor(s) or Course Coordinator(s): Puneet Gupta

4. Textbook(s):

<table>
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<th>Author/Title</th>
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<tr>
<td>PATTERSON</td>
<td>ACADEMIC PRESS</td>
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<tr>
<td>COMPUTER ORG &amp; DESIGN (5TH)</td>
<td>2014</td>
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4a. Other Supplemental Materials: None

5. Specific Course Information

5a. Course Description: Computer system organization and design, implementation of CPU datapath and control, instruction set design, memory hierarchy (caches, main memory, virtual memory) organization and management, input/output subsystems (bus structures, interrupts, DMA), performance evaluation, pipelined processors.

5b. Prerequisite(s)/ Co-requisite(s): Enforced requisites: course M16 or Computer Science M51A, Computer Science 33. Recommended: course M116L or Computer Science M152A, Computer Science 111.

5c. Degree Requirement:  
   - Computer Science degree - ELECTIVE (do not assess)  
   - Computer Science and Engineering degree - ELECTIVE (do not assess)  
   - Electrical Engineering degree - ELECTIVE (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/ Outcomes of Instruction:  
   a) Compare the performance of computer systems using MIPS and MFLOPS ratings.

   b) Identify the components of an instruction set, such as opcode, operands, and format.
c) Translate fractional numbers into IEEE scientific format.

d) Translate numbers in IEEE scientific format into their fractional form.

e) Implement 32-bit multiplication using iterative methods.

f) Construct a simple 32-bit datapath composed of two function units and a register file.

g) Use pipelining to improve the performance of a simple 32-bit instruction set.

h) Compare the design of direct-mapped and associative caches.

i) Explain the function of the translation lookaside buffer in a memory management unit.

j) Explain the sequence of operations in handling interrupts from a variety of simple peripherals.

k) Several homework assignments delving on core concepts and reinforcing analytical skills learned in class.

l) Opportunities to interact weekly with the instructor and the teaching assistant(s) during regular office hours and discussion sections in order to further the students' learning experience and the students' interest in the material.

6b.  **Student Outcomes:**  No student outcomes selected

7. **Course Topics:**  No course topics found
# Course Syllabus

**[Fall 2012-Spring 2018 ABET Review Cycle]**

1. **Course Number/ Course Name:**  
   EC ENGR M116L  
   Introductory Digital Design Laboratory

2. **Credits:**  
   2.0

   **Contact Hours:**  
   Laboratory, four hours; outside study, two hours.

3. **Instructor(s) or Course Coordinator(s):**  
   Lei He

4. **Textbook(s):**  
   None

4a. **Other Supplemental Materials:**  
   None

5. **Specific Course Information**

5a. **Course Description:**  
   Hands-on design, implementation, and debugging of digital logic circuits, use of computer-aided design tools for schematic capture and simulation, implementation of complex circuits using programmed array logic, design projects.

5b. **Prerequisite(s)/ Co-requisite(s):**  
   Enforced requisite: course M16 or Computer Science M51A.

5c. **Degree Requirement:**
   - Computer Science degree - ELECTIVE (do not assess)
   - Computer Science and Engineering degree - ELECTIVE (do not assess)
   - Electrical Engineering degree - ELECTIVE (do not assess)

6. **Specific Goals for Course**

6a. **Course Outcomes/ Outcomes of Instruction:**
   a) To implement the concepts learned in the Digital Logic Design course with CAD tools.

   b) To have the ability to synthesize, implement, test and debug digital logic circuits using an FPGA design tool such as Xilinx ISE 7.

   c) To know an FPGA design tool, and also to know how to write technical reports.

   d) To be familiar with breadboards, wiring, and 7400 Logic Chips.
e) To design a sequential system.

f) To design an arithmetic unit.

g) To design a combinational system.

h) To design a control unit and data paths.

i) To design a finite state machine.

j) Six Lab Projects delving on core concepts and reinforcing analytical skills learned in the digital logic course.

k) Lab assignments exposing students to computer aided digital circuits design and asking them to carry out simple and complex illustrative design projects.

l) Opportunities to interact weekly with the instructor and the teaching assistant(s) during regular office hours and during the lab in order to further the students' learning experience and the students' interest in the material.

6b. Student Outcomes: No student outcomes selected

7. Course Topics: No course topics found
1. Course Number/ Course Name: EC ENGR 132A
   Introduction to Communication Systems

2. Credits: 4.0
   Contact Hours: Lecture, four hours; discussion, one hour; outside study, seven hours.

3. Instructor(s) or Course Coordinator(s): Suhas Diggavi
   John Villasenor

4. Textbook(s):
   Author/Title: PROAKIS
   COMMUNICATIONS SYSTEMS ENGINEERING
   Publisher/Year: PEARSON EDUCATION
   2002

4a. Other Supplemental Materials: None

5. Specific Course Information

5a. Course Description: Review of basic probability, basics of hypothesis testing, sufficient
   statistics and waveform communication, signal-design tradeoffs for digital communications, basics of error control coding, intersymbol interference channels and orthogonal frequency division multiplexing (OFDM), basics of wireless communications.

5b. Prerequisite(s)/ Co-requisite(s): Enforced requisites: courses 102, 113, 131A.

5c. Degree Requirement: Computer Science and Engineering degree - ELECTIVE(do not assess)
   Electrical Engineering degree - REQUIRED(assess)

6. Specific Goals for Course

6a. Course Outcomes/ Outcomes of Instruction:
b) How to compute the autocorrelation of a random process
d) How to determine the power spectral density of a WSS process
e) How to do basic hypothesis testing for optimal error probability
f) How to represent waveforms in signal space and finding basis of
the vector space
g) How to analyze a digital modulation system with noise in signal
space and computing union bounds for error
h) How to trade-off energy, error probability and rate for digital
modulation
i) How to use error correction to increase reliability of
communication
j) How to design transmission for inter-symbol interference
channels and use of OFDM
k) The basics of wireless channels and transmission
l) How to up-convert and down-convert signals
m) How to do overall design of a communication system from
encoding, transmission to reception
n) Opportunity to use MATLAB and understand communication
system performance

6b. Student Outcomes: No student outcomes selected

7. Course Topics:
a) Review of basic probability
b) Hypothesis testing and error probability
c) Signal-design trade-offs for digital communication
d) Basics of error control coding
e) Inter-symbol interference channels and OFDM
f) Basics of wireless communications
1. **Course Number/ Course Name:**
   EC ENGR 141
   Principles of Feedback Control

2. **Credits:**
   4.0

   **Contact Hours:**
   Lecture, four hours; discussion, one hour; outside study, seven hours.

3. **Instructor(s) or Course Coordinator(s):**
   Paulo Tabuada

4. **Textbook(s):**
   **Author/Title:** FRANKLIN
   FEEDBACK CONTROL OF DYNAMIC SYSTEMS
   **Publisher/Year:** PEARSON EDUCATION
   2015

4a. **Other Supplemental Materials:** None

5. **Specific Course Information**

5a. **Course Description:**

5b. **Prerequisite(s)/ Co-requisite(s):**
   Enforced requisite: course 102.

5c. **Degree Requirement:**
   Computer Science and Engineering degree – ELECTIVE
   Electrical Engineering degree - REQUIRED(assess)

6. **Specific Goals for Course**

6a. **Course Outcomes/ Outcomes of Instruction:**
   a) Identify the basic elements and structures of feedback control systems.
   b) Derive transfer function representations for input-output systems.
   c) Correlate the pole-zero configuration of transfer functions and their time-domain response to known test inputs.
   d) Apply Routh-Hurwitz criterion to determine the domain of stability of linear time-invariant systems in the parameter space.
   e) Apply Final-value Theorem to determine the steady-state response of stable control systems.
   f) Construct and recognize the properties of root-locus for feedback control systems with a single variable parameter.
   g) Specify design region in the s-plane in terms of settling-time, rise-time and overshoot to step-response.
terms of gain and phase margins, and design compensators to achieve the desired performance.

k) Design sampled data systems using discrete equivalents; Understand the effects of sample rate selection.

l) Several homework assignments delving on basic concepts and reinforcing analytical skills learned in class.

m) At least two computer assignments exposing students to computer-aided design of practical feedback control systems. Conduct matlab-based projects requiring some independent reading, programming, simulations and technical writing.

n) Opportunities to interact weekly with the instructor and the teaching assistant(s) during regular office hours and discussion sections in order to further the students' learning experience and the students' interest in the material.

6b. Student Outcomes: No student outcomes selected

7. Course Topics:

a) Introduction; basic elements of a control system; open and closed-loop control systems; concept of feedback.

b) Basic elements of a control system; open and closed-loop control systems; concept of feedback.; Mathematical Modelling of Physical Systems

c) Mathematical Modelling of Physical Systems; Physical systems and models in form of differential equations; linearized models.

d) Physical systems and their models in the form of differential equations; linearized models.; Input-output Description: time-domain description; impulse response; transfer function representation; signal-flow graphs.

e) Input-output Description: Time-domain description; impulse response; transfer function representation; signal-flow graphs.; Stability and Time-Domain Analysis of Control Systems

f) Stability and Time-Domain Analysis of Control Systems; Poles and zeros of transfer functions and their corresponding time-domain response to known inputs.

g) Poles and zeros of transfer functions and their corresponding time-domain response to known inputs.; Routh-Hurwitz criterion for stability

h) Routh-Hurwitz criterion for stability.; Steady-state response of stable systems; static error coefficients.

i) Steady-state response of stable systems; static error coefficients.; Feedback Control System Design

j) Feedback Control System Design

k) Root-locus Method

l) Frequency-domain method: Bode plot, polar plot, Nyquist stability criterion; gain and phase margins; closed-loop system performance based on frequency response.

m) Feedback Control System Synthesis

n) Synthesizable transfer functions

o) Compensation Methods: Root-locus and frequency-domain approaches.

p) Synthesis in terms of closed-loop pole-zero configurations.

q) Introduction to Optimal Design, Sensitivity and Robustness of
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/Course Name:
   ENGCOMP 3
   English Composition, Rhetoric, and Language

2. Credits:
   5.0
   Contact Hours:
   Lecture, three hours.

3. Instructor(s) or Course Coordinator(s):
   None

4. Textbook(s):

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<td>PKT WADSWORTH HNDBK (6TH)</td>
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4a. Other Supplemental Materials:
   None

5. Specific Course Information

5a. Course Description:
   Rhetorical techniques and skillful argument. Analysis of varieties of academic prose and writing of minimum of 20 pages of revised text. Completion of course with grade of C or better satisfies Writing I requirement.

5b. Prerequisite(s)/Co-requisite(s):
   Enforced requisite: satisfaction of Entry-Level Writing requirement or course 2 or 2I (C or better).

5c. Degree Requirement:
   - Aerospace Engineering degree - REQUIRED (do not assess)
   - Chemical and Biomolecular Engineering degree - REQUIRED (do not assess)
   - Civil and Environmental Engineering degree - REQUIRED (do not assess)
   - Computer Science degree - REQUIRED (do not assess)
   - Computer Science and Engineering degree - REQUIRED (do not assess)
   - Mechanical Engineering degree - REQUIRED (do not assess)
6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:
   a) Ability to analyze a variety of styles of academic prose.
   b) Ability to write clearly and skillfully, and to make convincing written arguments.

6b. Student Outcomes: G

7. Course Topics:
   a) Ability to analyze a variety of styles of academic prose.
   b) Ability to write clearly and skillfully, and to make convincing written arguments.
1. Course Number/ Course Name:

ENGR 183EW
Engineering and Society

2. Credits: 4.0

Contact Hours: Lecture, four hours; discussion, three hours; outside study, five hours.

3. Instructor(s) or Course Coordinator(s):

None

4. Textbook(s):


4a. Other Supplemental Materials: None

5. Specific Course Information

5a. Course Description: Not open for credit to students with credit for course 185EW. Limited to sophomore/junior/senior engineering students. Professional and ethical considerations in practice of engineering. Impact of technology on society and on development of moral and ethical values. Contemporary environmental, biological, legal, and other issues created by new technologies. Emphasis on research and writing within engineering environments. Writing and revision of about 20 pages total, including two individual technical essays and one team-written research report. Readings address technical issues and writing form. Satisfies engineering writing requirement.

5b. Prerequisite(s)/ Co-requisite(s):
Enforced requisite: English Composition 3 or 3H or English as a Second Language 36.

5c. Degree Requirement:
- Aerospace Engineering degree - REQUIRED (assess)
- Bioengineering degree - SELECTED ELECTIVE (assess)
- Chemical and Biomolecular Engineering degree - REQUIRED (assess) Civil and Environmental Engineering degree - REQUIRED (assess) Computer Science degree - REQUIRED (assess)
- Computer Science and Engineering degree - REQUIRED (assess) Electrical Engineering degree - REQUIRED (assess)
- Engineering degree - REQUIRED (do not assess)
- Materials Science and Engineering degree - REQUIRED (assess) Mechanical Engineering degree - REQUIRED (assess)
6. Specific Goals for Course
6a. Course Outcomes/Outcomes of Instruction:
   a) Teamwork - Students gain knowledge in the importance and prevalence of teamwork in real engineering environments by lecture and discussion, and gain actual experience.
   b) Global Issues of Society and Technology - Students gain perspective and understanding regarding the history of human population growth, the technological factors that have contributed to it, and the problems that accompany it. Projections into the future are reviewed, including the issues of food, water, energy, natural resources, and the potential problems associated with increasing world affluence. The emergence of a global ethical framework is presented and discussed. The role of technology in creating, understanding, and ameliorating these global problems are reviewed.
   c) Contemporary Issues of Society and Technology - Students learn how technology changed society in the early and late 20th Century, including society’s evolving ideas about the benefits and problems of technology. Students learn what the new technologies of the 21st Century, which include bioengineering, nanoscale structures, simulation, information processing and dissemination, social networks, and robotic weaponry, can promise regarding new benefits, and potential new societal and ethical problems.
   d) Ethics - Students learn the basic elements of the historical development of ethical practices and theories and are familiarized with five major and useful ethical philosophies. They gain an understanding of how ethical practice has been influenced by extensions of the moral community, by increased scientific understanding and technological capabilities, and by the emergence of global environmental and biocentric ethical concepts.
   e) Case Studies – Students are introduced to engineering case studies that involved serious questions of ethics and competence in technical and management processes, and that resulted in successes as well as failures. Students learn that engineering practice has substantial consequences with regard to public safety and well being.
   f) Communication – Students gain improved writing and communication skills through a series of writing assignments, including a library research and abstracting assignment, a team research report on a current social issue that is technology based, and an oral presentation of the team research results.
   g) Historical Review of Society and Technology. Students gain knowledge of pre-20th Century science and technology as sources of major inventions, as templates for modern society, and as stimuli for societal reactions both positive and negative. Emphasis is placed on the industrial revolution and the rise of science based technology, as well as on the ways in which power in society has flowed to the scientific/technological culture and its practitioners, which has necessitated more ethical responsibility, a topic that is treated throughout the course.
6b. Student Outcomes: No student outcomes selected

7. Course Topics:
   a) Teamwork.
   b) Global Issues of Society and Technology.
   c) Contemporary Issues of Society and Technology.
   d) Ethics.
   e) Case Studies.
   f) Communication.
   g) Historical Review of Society and Technology.
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]
1. Course Number/ Course Name:
ENGR 185EW
Art of Engineering Endeavors

2. Credits: 4.0
Contact Hours: Lecture, four hours; discussion, three hours; outside study, five hours.

3. Instructor(s) or Course Coordinator(s):
None

4. Textbook(s):

4a. Other Supplemental Materials:
None

5. Specific Course Information
5a. Course Description: Not open for credit to students with credit for course 183EW.
Designed for junior/senior engineering students. Nontechnical skills and experiences necessary
for engineering career success. Importance of group dynamics in engineering practice.
Teamwork and effective group skills in engineering environments. Organization and control of
multidisciplinary complex engineering projects. Forms of leadership and qualities and
characteristics of effective leaders. How engineering, computer sciences, and technology relate
to major ethical and social issues. Societal demands on practice of engineering. Emphasis on
research and writing in engineering environments. Satisfies engineering writing requirement.

5b. Prerequisite(s)/ Co-requisite(s):
Enforced requisite: English Composition 3 or 3H or English as a Second Language 36.

5c. Degree Requirement:
Aerospace Engineering degree - REQUIRED (assess)
Bioengineering degree - SELECTED ELECTIVE (assess)
Chemical and Biomolecular Engineering degree - REQUIRED (assess)
Civil and Environmental Engineering degree - REQUIRED (assess)
Computer Science degree - REQUIRED (assess)
Computer Science and Engineering degree - REQUIRED (assess)
Electrical Engineering degree - REQUIRED (assess)
Engineering degree - REQUIRED (do not assess)
Materials Science and Engineering degree - REQUIRED (assess)
Mechanical Engineering degree - REQUIRED (assess)

6. Specific Goals for Course
6a. Course Outcomes/ Outcomes of Instruction:

a) Teamwork. Experiential exercise in teamwork followed by lecture and discussion.
b) Project Management. Students acquire basic knowledge of the methodologies by which
complex, multidisciplinary undertakings are rendered tractable. They learn the rudiments of how
a project is organized, planned and managed. Case studies show how real projects implement these techniques.

c) Team Project. Students experience an engineering team effort, and apply knowledge gained in the above categories, by providing a conceptual design, and planning a development program for an innovative product, taking into account engineering, economic, market and social factors.

d) Global Social Issues - Students gain perspective and understanding regarding the history of human population growth, the technological factors that have contributed to it, and the problems that accompany it. Projections into the future, governing variables, and the issues of food, water, energy, natural resources, and biodiversity are reviewed. The roles of technology in creating, understanding, and ameliorating problems are reviewed.

e) Ethics - Students learn the basic elements of the historical development of philosophy and ethical theories; how these have been influence by increased scientific understanding and technological capabilities; concepts and extensions of the moral community; and the emergence of environmental and biocentric ethical concepts.

f) Case Studies provide students with examples of engineering triumphs and failures that involved questions of ethics and competence in engineering processes. That engineering practice has consequences with regard to health and safety is demonstrated.

g) Communication - Writing assignments, including a library research and abstracting assignment, a paper on a current social issue that is technology based, and the team project reports, as well as oral presentations of social issues and the team project presentations provide for improved communication skills.

6b. Student Outcomes: No Student outcome selected

7. Course Topics:

a) Teamwork. Experiential exercise in teamwork followed by lecture and discussion.

b) Project Management. Students acquire basic knowledge of the methodologies by which complex, multidisciplinary undertakings are rendered tractable. They learn the rudiments of how a project is organized, planned and managed. Case studies show how real projects implement these techniques.

c) Team Project. Students experience an engineering team effort, and apply knowledge gained in the above categories, by providing a conceptual design, and planning a development program for an innovative product, taking into account engineering, economic, market and social factors.

d) Global Social Issues - Students gain perspective and understanding regarding the history of human population growth, the technological factors that have contributed to it, and the problems that accompany it. Projections into the future, governing variables, and the issues of food, water, energy, natural resources, and biodiversity are reviewed. The roles of technology in creating, understanding, and ameliorating problems are reviewed.

e) Ethics - Students learn the basic elements of the historical development of philosophy and ethical theories; how these have been influence by increased scientific understanding and technological capabilities; concepts and extensions of the moral community; and the emergence of environmental and biocentric ethical concepts.

f) Case Studies provide students with examples of engineering triumphs and failures that involved questions of ethics and competence in engineering processes. That
# Course Syllabus

**Course Name:** Integration and Infinite Series

## Course Information

1. **Course Number/Course Name:** MATH 31B
2. **Credits:** 4.0
   - **Contact Hours:** Lecture, three hours; discussion, one hour.
3. **Instructor(s) or Course Coordinator(s):** Thomas Liggett
4. **Textbook(s):**
   - **Author/Title:** ROGAWSKI SINGLE VARIABLE CALCULUS (LOOSE-LEAF)
   - **Publisher/Year:** MACMILLAN PUBLISHING 2015
   - **Required:**

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<th>Author/Title</th>
<th>Publisher/Year</th>
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<td>ROGAWSKI SINGLE VARIABLE CALCULUS</td>
<td>MACMILLAN</td>
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<tr>
<td>(LOOSE-LEAF)</td>
<td>PUBLISHING 2015</td>
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5. **Specific Course Information**

   5a. **Course Description:** Not open for credit to students with credit for course 3B. Transcendental functions; methods and applications of integration; sequences and series.

   5b. **Prerequisite(s)/Co-requisite(s):** Requisite: course 31A with grade of C- or better.

   5c. **Degree Requirement:**
      - Aerospace Engineering degree - REQUIRED (do not assess)
      - Bioengineering degree - REQUIRED (do not assess)
      - Chemical and Biomolecular Engineering degree - REQUIRED (do not assess)
      - Civil and Environmental Engineering degree - REQUIRED (do not assess)
      - Computer Science degree - REQUIRED (do not assess)
      - Computer Science and Engineering degree - REQUIRED (do not assess)
      - Materials Science and Engineering degree - REQUIRED (do not assess)
      - Mechanical Engineering degree - REQUIRED (do not assess)

6. **Specific Goals for Course**
6a. Course Outcomes/Outcomes of Instruction:
   a) Definite integration. Fundamental theorem of calculus.
   b) Area between curves.
   c) Volume by cross sections.
   d) Exponential functions. Inverse functions. Logarithms and their derivatives.
   e) Inverse trigs. Hyperbolic functions.
   f) Integration by parts.
   g) Integrals of trigonometric functions.
   h) Trig substitution.
   i) Partial fractions.
   j) Improper integrals.
   k) Arc length and area of a surface of revolution.
   l) Sequences and convergence.
   m) Series and integral test.
   n) Comparison test and alternating series.
   o) Absolute convergence, ratio, and root tests.
   p) Power series.
   q) l'Hospital's rule and Taylor's theorem.
   r) Taylor series.

6b. Student Outcomes: A

7. Course Topics:
   a) Area between curves. Volumes by cross sections. Arc length. Area of a surface of revolution
   b) Exponential functions. Logarithms. Inverse trigs. Hyperbolic functions
   c) Integration by parts. Partial fractions. Integrals of trig. Functions.
   d) Trig. substitution
   e) Sequences and convergence. Series and convergence tests
   f) Power series and Taylor series
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name: MATH 32A
   Calculus of Several Variables

2. Credits: 4.0
   Contact Hours: Lecture, three hours; discussion, one hour.

3. Instructor(s) or Course Coordinator(s): Thomas Liggett

4. Textbook(s):

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4a. Other Supplemental Materials: None

5 Specific Course Information

5a. Course Description: Introduction to differential calculus of several variables, vector field theory.

5b. Prerequisite(s)/ Co-requisite(s): Enforced requisite: course 31A with grade of C- or better.

5c. Degree Requirement:
   - Aerospace Engineering degree - REQUIRED (do not assess)
   - Bioengineering degree - REQUIRED (do not assess)
   - Chemical and Biomolecular Engineering degree - REQUIRED (do not assess)
   - Civil and Environmental Engineering degree - REQUIRED (do not assess)
   - Computer Science degree - REQUIRED (do not assess)
   - Computer Science and Engineering degree - REQUIRED (do not assess)
   - Materials Science and Engineering degree - REQUIRED (do not assess)
   - Mechanical Engineering degree - REQUIRED (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/ a) Three dimensional coordinate system. Vectors. Dot product and cross
Outcomes of Instruction:

b) Equations of lines and planes.
c) Curves defined by parametric equations.
d) Vector functions. Derivatives and integrals of vector functions.
e) Arc-length and curvature.
f) Motion in space (Kepler's laws).
g) Functions of several variables.
h) Cylinders and quadric surfaces.
i) Limits and continuity.
j) Partial derivatives.
k) Tangent planes and linear approximation.
l) Chain rule.
m) Directional derivative and the gradient vector.
n) Maximum and minimum values.
o) Lagrange multipliers.

6b. Student Outcomes: A

7. Course Topics:
a) Three dimensional coordinate system. Vectors, dot products, and cross products.


c) Functions of several variables. Continuity. Partial derivatives.

d) Tangent planes and linear approximation.

e) Chain rule. Directional derivative. Gradient vector.
f) Maxima and minima.

g) Lagrange multipliers.
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name: MATH 32B
   Calculus of Several Variables

2. Credits: 4.0
   Contact Hours: Lecture, three hours; discussion, one hour.

3. Instructor(s) or Course Coordinator(s): Thomas Liggett

4. Textbook(s):

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4a. Other Supplemental Materials: None

5. Specific Course Information

5a. Course Description: Introduction to integral calculus of several variables, line and surface integrals.

5b. Prerequisite(s)/ Co-requisite(s): Enforced requisites: courses 31B and 32A, with grades of C- or better.

5c. Degree Requirement:
   - Aerospace Engineering degree - REQUIRED (do not assess)
   - Bioengineering degree - REQUIRED (do not assess)
   - Chemical and Biomolecular Engineering degree - REQUIRED (do not assess)
   - Civil and Environmental Engineering degree - REQUIRED (do not assess)
   - Computer Science degree - REQUIRED (do not assess)
   - Computer Science and Engineering degree - REQUIRED (do not assess)
   - Materials Science and Engineering degree - REQUIRED (do not assess)
   - Mechanical Engineering degree - REQUIRED (do not assess)

6. Specific Goals for Course
6a. Course Outcomes/Outcomes of Instruction:

a) The double integral over a rectangle and over more general regions.
b) Changing the order of integration.
c) The triple integral.
d) Cylindrical and spherical coordinates.
e) The change of variables theorem.
f) Path integrals. Line integrals.
g) Parametrized surfaces.
h) Area of a surface.
i) Integrals of scalar functions over surfaces.
j) Surface integrals of vector functions.
k) Green’s theorem.
l) Stoke’s theorem.
m) Conservative fields.
n) Gauss’ theorem.

6b. Student Outcomes:

A

7. Course Topics:

a) The double integral over a rectangle and over more general regions
b) Triple integrals
c) Cylindrical and spherical coordinates
d) Cylindrical and spherical coordinates.
e) Path and line integrals
f) Area of a surface. Integrals of scalar functions over surfaces.
g) Surface integrals of vector functions
h) Green’s theorem. Stoke’s theorem. Gauss’ theorem
Course Syllabus
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ Course Name:

MATH 33A
Linear Algebra and Applications

2. Credits: 4.0

Contact Hours: Lecture, three hours; discussion, one hour.

3. Instructor(s) or Course Coordinator(s):

Thomas Liggett

4. Textbook(s):


4a. Other Supplemental Materials:

None

5 Specific Course Information

5a. Course Description: Introduction to linear algebra: systems of linear equations, matrix algebra, linear independence, subspaces, bases and dimension, orthogonality, least-squares methods, determinants, eigenvalues and eigenvectors, matrix diagonalization, and symmetric matrices.

5b. Prerequisite(s)/ Co-requisite(s):

Enforced requisite: course 3B or 31B or 32A with grade of C- or better.

5c. Degree Requirement: Aerospace Engineering degree - REQUIRED (do not assess)
Bioengineering degree - REQUIRED (do not assess)
Chemical and Biomolecular Engineering degree - REQUIRED (do not assess)
Civil and Environmental Engineering degree - REQUIRED (do not assess)
Computer Science degree - REQUIRED (do not assess) Computer Science and Engineering degree - REQUIRED (do not assess)
Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:
   c) Column and row spaces of a matrix. Null space of a matrix.
   d) Linear subspaces. Dimension of a subspace. Basis vectors.
   e) Linearly independent vectors.
   h) Scalar product. Orthogonal vectors. Orthonormal basis.
   i) Cauchy-Schwarz inequality. Triangle inequality.
   j) QR factorization of a matrix.
   k) Orthogonal projections.
   l) Properties of orthogonal matrices.
   n) Eigenvalues and eigenvectors of matrices.
   o) Fundamental theorem of algebra.
   p) Similar matrices.
   q) Symmetric matrices. Eigenvalues of symmetric matrices.

6b. Student Outcomes: A

7. Course Topics:
   a) Systems of linear equations
   b) Matrix algebra and matrix inversion. Ranks of matrices
   c) Subspaces, bases and dimension. Range and nullspaces of matrices
   d) Determinants and properties
   e) Orthogonal basis and orthogonal matrices. QR factorization. Least-squares
   f) Eigenvectors and eigenvalues
   g) Symmetric and positive-definite matrices
# Course Syllabus

**[Fall 2012-Spring 2018 ABET Review Cycle]**

<table>
<thead>
<tr>
<th>1. Course Number/Course Name:</th>
<th>MATH 33B Differential Equations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Credits:</td>
<td>4.0</td>
</tr>
<tr>
<td>Contact Hours:</td>
<td>Lecture, three hours; discussion, one hour.</td>
</tr>
<tr>
<td>3. Instructor(s) or Course Coordinator(s):</td>
<td>Thomas Liggett</td>
</tr>
<tr>
<td>4. Textbook(s):</td>
<td><strong>Author/Title</strong></td>
</tr>
<tr>
<td></td>
<td>POLKING</td>
</tr>
<tr>
<td></td>
<td>DIFFERENTIAL EQUATIONS</td>
</tr>
<tr>
<td>4a. Other Supplemental Materials:</td>
<td>None</td>
</tr>
<tr>
<td>5. Specific Course Information</td>
<td></td>
</tr>
<tr>
<td>5a. Course Description:</td>
<td>Highly recommended: course 33A. First-order, linear differential equations; second-order, linear differential equations with constant coefficients; power series solutions; linear systems.</td>
</tr>
<tr>
<td>5b. Prerequisite(s)/Co-requisite(s):</td>
<td>Enforced requisite: course 31B with grade of C- or better.</td>
</tr>
<tr>
<td>5c. Degree Requirement:</td>
<td>- Aerospace Engineering degree - REQUIRED (do not assess)</td>
</tr>
<tr>
<td></td>
<td>- Bioengineering degree - REQUIRED (do not assess)</td>
</tr>
<tr>
<td></td>
<td>- Chemical and Biomolecular Engineering degree - REQUIRED (do not assess)</td>
</tr>
<tr>
<td></td>
<td>- Civil and Environmental Engineering degree - REQUIRED (do not assess)</td>
</tr>
<tr>
<td></td>
<td>- Computer Science degree - REQUIRED (do not assess)</td>
</tr>
<tr>
<td></td>
<td>- Computer Science and Engineering degree - REQUIRED (do not assess)</td>
</tr>
<tr>
<td></td>
<td>- Materials Science and Engineering degree - REQUIRED (do not assess)</td>
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<tr>
<td></td>
<td>- Mechanical Engineering degree - REQUIRED (do not assess)</td>
</tr>
<tr>
<td>6. Specific Goals for Course</td>
<td></td>
</tr>
</tbody>
</table>

6a. Course Outcomes/Outcomes of Instruction:

a) Linear differential equations with variable coefficients.
b) Separable differential equations.
c) Modeling with first-order differential equations.
d) Second-order differential equations.
e) Fundamental solutions of differential equations.
f) Linear independence, Wronskian.
g) Solving differential equations with complex and repeated roots.
h) The method of undermined coefficients.
i) The method of variation of parameters.
j) Solutions of differential equations with free and forced vibrations.
k) Sums of infinite series; convergence tests.
l) Power series.
m) Linear systems of differential equations.
n) Homogeneous constant-coefficient differential equations.
o) Eigenvalues and eigenvectors. Solutions with distinct eigenvalues and with complex eigenvalues.
p) Fundamental matrix.
q) Solving Inhomogeneous systems of differential equations.

6b. Student Outcomes:

A

7. Course Topics:

a) Separable differential equations
b) First- and second-order linear constant-coefficient differential equations
c) Methods of solutions: undermined coefficients, variation of parameters
d) Solving differential equations with free or forced vibrations
e) Linear systems of differential equations. Homogeneous and inhomogeneous equations
## Course Syllabus
### [Fall 2012-Spring 2018 ABET Review Cycle]

<p>| | |</p>
<table>
<thead>
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</tr>
</thead>
</table>
| **1. Course Number/ Course Name:** | MATH 61  
Introduction to Discrete Structures |
| **2. Credits:** | 4.0 |
| **Contact Hours:** | Lecture, three hours; discussion, one hour. |
| **3. Instructor(s) or Course Coordinator(s):** | Thomas Liggett |
| **4. Textbook(s):** | None |
| **4a. Other Supplemental Materials:** | None |
| **5. Specific Course Information** |   |
| **5a. Course Description:** | Not open for credit to students with credit for course 180 or 184. Discrete structures commonly used in computer science and mathematics, including sets and relations, permutations and combinations, graphs and trees, induction. |
| **5b. Prerequisite(s)/ Co-requisite(s):** | Requisites: courses 31A, 31B. |
| **5c. Degree Requirement:** |   |
|   | - Computer Science degree - REQUIRED (do not assess)  
- Computer Science and Engineering degree - REQUIRED (do not assess) |
| **6. Specific Goals for Course** |   |
| **6a. Course Outcomes/ Outcomes of Instruction:** | a) Mathematical induction.  
b) Sets, functions.  
c) Sequences and strings.  
d) Relations, equivalence relations, matrices of relations.  
e) Basic counting principles, permutations and combinations, generalized permutations and combinations, binomial coefficients. |
6b. Student Outcomes: A

7. Course Topics:

   a) Mathematical induction.

   b) Sets, functions.

   c) Sequences and strings.

   d) Relations, equivalence relations, matrices of relations.

   e) Basic counting principles, permutations and combinations, generalized permutations and combinations, binomial coefficients.

   f) Pigeonhole principle.

   g) Recurrence relations, solving recurrence relations.

   h) Graphs, paths and cycles, shortest-path algorithm, representations of graphs, isomorphisms of graphs, planar graphs.

   i) Trees, minimal spanning trees, binary trees, decision trees, sorting, isomorphic trees.
# Course Syllabus

## [Fall 2012-Spring 2018 ABET Review Cycle]

| 1. Course Number/ Course Name: | PHYSICS 1A  
Physics for Scientists and Engineers: Mechanics |
| 2. Credits: | 5.0 |
| 3. Instructor(s) or Course Coordinator(s): | Joseph Rudnick |
| 4. Textbook(s): |  
| | Author/Title | Publisher/Year | Req |
| | HOLTZBRINCK | MACMILLAN |  |
| | I - CLICKER 2 (NEW COPIES INCLD REEF MOBILE ACCESS) | PUBLISHING 2015 |  |
| | YOUNG | ADDISON |  |
| | UNIVERSITY PHYSICS W/MOD PHYS + W/ACCESS CARD | 2016 |  |
| 4a. Other Supplemental Materials: | None |
| 5. Specific Course Information |
| 5a. Course Description: | Motion, Newton laws, work, energy, linear and angular momentum, rotation, equilibrium, gravitation. |
| 5b. Prerequisite(s)/Co-requisite(s): | Recommended preparation: high school physics, one year of high school calculus or Mathematics 31A and 31B. Enforced requisites: Mathematics 31A, 31B. Enforced corequisite: Mathematics 32A. Recommended corequisite: Mathematics 32B. |
| 5c. Degree Requirement: |  
- Aerospace Engineering degree - REQUIRED (do not assess)  
- Bioengineering degree - REQUIRED (do not assess)  
- Chemical and Biomolecular Engineering degree - REQUIRED (do not assess)  
- Civil and Environmental Engineering degree - REQUIRED (do not assess)  
- Computer Science degree - REQUIRED (do not assess)  
- Computer Science and Engineering degree - REQUIRED (do not assess) |
- Materials Science and Engineering degree - REQUIRED (do not assess)
- Mechanical Engineering degree - REQUIRED (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:
   a) Knowledge of Kinematics, Vectors, Motion in 1 dimension
   b) Knowledge of Motion in two and three dimensions, Newtonian Dynamics
   c) Knowledge of Gravitation, Particle Dynamics
   d) Knowledge of Work and Energy
   e) Knowledge of Conservation of Energy
   f) Knowledge of Linear Momentum, Conservation of Momentum
   g) Knowledge of Collisions, Center of Mass
   h) Knowledge of Rotational Kinematics and Dynamics
   i) Knowledge of Angular Momentum

6b. Student Outcomes: A

7. Course Topics:
   a) Kinematics, Vectors, Motion in 1 dimension
   b) Motion in two and three dimensions, Newtonian Dynamics
   c) Gravitation, Particle Dynamics
   d) Work and Energy
   e) Conservation of Energy
   f) Linear Momentum, Conservation of Momentum
   g) Collisions, Center of Mass
   h) Rotational Kinematics and Dynamics
   i) Statics
   j) Angular Momentum
Course Syllabus  
[Fall 2012-Spring 2018 ABET Review Cycle]

1. Course Number/ 
   Course Name: PHYSICS 1B  
   Physics for Scientists and Engineers: Oscillations, Waves, Electric and  
   Magnetic Fields

2. Credits: 5.0  
   Contact Hours: Lecture/demonstration, four hours; discussion, one hour.

3. Instructor(s) or 
   Course Coordinator(s): Joseph Rudnick

4. Textbook(s):  
<table>
<thead>
<tr>
<th>Author/Title</th>
<th>Publisher/Year Req</th>
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</thead>
<tbody>
<tr>
<td>YOUNG</td>
<td>ADDISON</td>
</tr>
<tr>
<td>UNIVERSITY PHYSICS W/MOD PHYS + W/ ACCESS CARD</td>
<td>2016</td>
</tr>
</tbody>
</table>

4a. Other Supplemental Materials: None

5 Specific Course Information

5a. Course Description: Damped and driven oscillators, mechanical and acoustic waves. 
   Electrostatics: electric field and potential, capacitors, and dielectrics. 
   Currents and DC circuits. Magnetic field.

5b. Prerequisite(s)/  
   Co-requisite(s): Enforced requisites: course 1A, Mathematics 31B, 32A. Enforced corequisite: Mathematics 32B. 
   Recommended corequisite: Mathematics 33A.

5c. Degree Requirement:  
   - Aerospace Engineering degree - REQUIRED (do not assess)
   - Bioengineering degree - REQUIRED (do not assess)
   - Chemical and Biomolecular Engineering degree - REQUIRED (do not assess)
   - Civil and Environmental Engineering degree - REQUIRED (do not assess)
   - Computer Science degree - REQUIRED (do not assess)
   - Computer Science and Engineering degree - REQUIRED (do not assess)
   - Materials Science and Engineering degree - REQUIRED (do not assess)
   - Mechanical Engineering degree - REQUIRED (do not assess)
6. Specific Goals for Course

6a. Course Outcomes/Outcomes of Instruction:

   a) Knowledge of sampled and damped harmonic oscillators.

   b) Knowledge of traveling waves; standing waves in strings; sound waves

   c) Knowledge of Coulomb’s law; electric field; Gauss’ law.

   d) Knowledge of potential energy; capacitors, dielectrics, currents and resistance.

   e) Knowledge of DC circuits, RC circuits.

   f) Knowledge of magnetic fields and the effect of magnetic forces on moving charges.

   g) Knowledge of Bio-Savart law, Ampere’s law, and of induced electromagnetic fields.

6b. Student Outcomes: A

7. Course Topics:

   a) Sampled and damped harmonic oscillator

   b) Traveling waves; standing waves in strings; sound waves

   c) Coulomb's law; electric field; Gauss' law

   d) Potential energy; capacitors, dielectrics, currents and resistance

   e) DC circuits, RC circuits.

   f) Magnetic fields and the effect of magnetic forces on moving charges

   g) Bio-Savart law, Ampere's law, and of induced electro-magnetic fields.
# Course Syllabus

[Fall 2012-Spring 2018 ABET Review Cycle]

<table>
<thead>
<tr>
<th>1. Course Number/ Course Name:</th>
<th>PHYSICS 1C Physics for Scientists and Engineers: Electrodynamics, Optics, and Special Relativity</th>
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<tbody>
<tr>
<td>2. Credits:</td>
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<tr>
<td>Contact Hours:</td>
<td>Lecture/demonstration, four hours; discussion, one hour.</td>
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<tr>
<td>3. Instructor(s) or Course Coordinator(s):</td>
<td>None</td>
</tr>
</tbody>
</table>
| 4. Textbook(s):               | **Author/Title**  
<p>|                               | YOUNG MASTERING PHYSICS W/PEARSON ETEXT EDUCATION (YOUNG UNIV PHYSICS 14TH) 2016                |
|                               | YOUNG UNIVERSITY PHYSICS W/MOD PHYS + W/ ACCESS CARD 2016                                        |
| 4a. Other Supplemental Materials: | None                                                                               |
| 5. Specific Course Information|                                                                                                 |
| 5b. Prerequisite(s)/ Co-requisite(s): | Enforced requisites: courses 1A, 1B, Mathematics 32A, 32B. Enforced corequisite: Mathematics 33A. Recommended corequisite: Mathematics 33B. |
| 5c. Degree Requirement:       | • Aerospace Engineering degree - REQUIRED (do not assess)                                      |
|                               | • Bioengineering degree - REQUIRED (do not assess)                                              |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>6. Specific Goals for Course</td>
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</tr>
<tr>
<td>6a. Course Outcomes/</td>
<td>No course outcomes found</td>
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<td>Outcomes of Instruction:</td>
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<tr>
<td>6b. Student Outcomes:</td>
<td>No student outcomes selected</td>
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<td>7. Course Topics:</td>
<td>No course topics found</td>
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</table>

- Electrical Engineering degree - REQUIRED (do not assess)
- Materials Science and Engineering degree - REQUIRED (do not assess)
- Mechanical Engineering degree - REQUIRED (do not assess)
**Course Syllabus**  
*[Fall 2012-Spring 2018 ABET Review Cycle]*

<p>| | |</p>
<table>
<thead>
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</table>
| 1. | **Course Number/ Course Name:** PHYSICS 4AL  
Physics Laboratory for Scientists and Engineers: Mechanics |
| 2. | **Credits:** 2.0  
**Contact Hours:** Laboratory, three hours. |
| 3. | **Instructor(s) or Course Coordinator(s):** William Slater |
| 4. | **Textbook(s):**  
| | **Author/Title** | **Publisher/Year Req** |
| | TEXTBOOK NOTE | DUMMY |
| | PLEASE SEE COURSE NOTES ABOVE (LISTED UNDER INSTRUCTOR'S NAME) | VENDOR |
| 4a. | **Other Supplemental Materials:** None |
| 5. | **Specific Course Information** |
| 5a. | **Course Description:** Experiments on measuring gravity, accelerated motion, kinetic and potential energy, impulse and momentum, damped and driven oscillators, resonance and vibrating strings. Computer data acquisition and analysis. Introduction to error analysis, including distributions and least-squares fitting procedures. |
| 5b. | **Prerequisite(s)/ Co-requisite(s):** Enforced requisite: course 1A or 1AH. Enforced corequisite: course 1B or 1BH. |
| 5c. | **Degree Requirement:**  
- Aerospace Engineering degree - REQUIRED (do not assess)  
- Bioengineering degree - REQUIRED (do not assess)  
- Chemical and Biomolecular Engineering degree - REQUIRED (do not assess)  
- Civil and Environmental Engineering degree - REQUIRED (do not assess)  
- Computer Science degree - REQUIRED (do not assess)  
- Computer Science and Engineering degree - REQUIRED (do not assess)  
- Mechanical Engineering degree - REQUIRED (do not assess) |
| 6. | **Specific Goals for Course** |
6a. Course Outcomes/Outcomes of Instruction:
   a) Uniform Acceleration
   b) Acceleration due to gravity
   c) Kinetic+potential energy of mass/spring
   d) Momentum transfer and impulse
   e) Harmonic motion
   f) Vibrating string

6b. Student Outcomes: A B G K

7. Course Topics:
   a) Uniform Acceleration
   b) Measure g
   c) Kinetic+potential energy of mass/spring motion on air track
   d) Momentum transfer and impulse
   e) Harmonic motion: simple mass hanging on spring
   f) Harmonic motion of a pendulum with damped retarding force proportion to
   g) Vibrating string, pulse drive, sinusoid drive
1. Course Number/ Course Name: PHYSICS 4BL
   Physics Laboratory for Scientists and Engineers: Electricity and Magnetism

2. Credits: 2.0
   Contact Hours: Laboratory, three hours.

3. Instructor(s) or Course Coordinator(s): Reiner Stenzel

4. Textbook(s):

<table>
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<th>Author/Title</th>
<th>Publisher/Year Req</th>
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<tr>
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<tr>
<td>PLEASE SEE COURSE NOTES ABOVE (LISTED UNDER INSTRUCTOR'S NAME)</td>
<td>VENDOR</td>
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</table>

4a. Other Supplemental Materials: None

5. Specific Course Information


5b. Prerequisite(s)/ Co-requisite(s): Enforced requisites: courses 1A or 1AH, 1B or 1BH. Enforced corequisite: course 1C or 1CH.

5c. Degree Requirement:
   - Aerospace Engineering degree - REQUIRED (do not assess)
   - Civil and Environmental Engineering degree - REQUIRED (do not assess)
   - Computer Science degree - REQUIRED (do not assess)
   - Computer Science and Engineering degree - REQUIRED (do not assess)
   - Mechanical Engineering degree - REQUIRED (do not assess)

6. Specific Goals for Course

6a. Course Outcomes/ Outcomes of Instruction:
   a) Data acquisition system.
   b) Statistics and error propagation.
Experiments in electrostatics.

d) Experiments with direct currents (DC).

e) Experiments with alternating currents (AC).

f) Experiments on magnetic fields.

g) The speed of sound and light.

h) Experiments in geometric optics.

i) Diffraction and interference.

6b. Student Outcomes: A B G K

7. Course Topics:

a) Data acquisition system.

b) Statistics and error propagation.

c) Experiments in electrostatics.

d) Experiments with direct currents (DC).

e) Experiments with alternating currents (AC).

f) Experiments on magnetic fields.

g) The speed of sound and light.

h) Experiments in geometric optics.

i) Diffraction and interference.
1. Name
ALEXANDER AFANASYEV, Adjunct Assistant Professor, Computer Science

2. Education

<table>
<thead>
<tr>
<th>Year</th>
<th>Degree</th>
<th>Institution</th>
<th>Field</th>
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<tr>
<td>2005</td>
<td>B.S.</td>
<td>Bauman Moscow State Technical</td>
<td>Computer Engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>University, Russia</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>M.S.</td>
<td>Bauman Moscow State Technical</td>
<td>Computer Engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>University, Russia</td>
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<tr>
<td>2012</td>
<td>M.S.</td>
<td>University of California, Los</td>
<td>Computer Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Angeles</td>
<td></td>
</tr>
<tr>
<td>12/13/2013</td>
<td>Ph.D.</td>
<td>University of California, Los</td>
<td>Computer Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Angeles</td>
<td></td>
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3. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
No Data

4. Academic & Non-Academic Experience (b) Employment History

<table>
<thead>
<tr>
<th>Year</th>
<th>Position Description</th>
<th>Institution/Company</th>
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<tbody>
<tr>
<td>2015</td>
<td>Adjunct Assistant Professor</td>
<td>Computer Science Department at University of California, Los Angeles</td>
</tr>
<tr>
<td>2013 - 2015</td>
<td>Postdoctoral Scholar</td>
<td>Computer Science Department at University of California, Los Angeles</td>
</tr>
<tr>
<td>Jun 2012 - Sep 2012</td>
<td>Research Intern</td>
<td>Palo Alto Research Center, Xerox Company</td>
</tr>
<tr>
<td>2008 - 2013</td>
<td>Graduate Student Researcher</td>
<td>Computer Science Department at University of California, Los Angeles</td>
</tr>
<tr>
<td>2006 - 2008</td>
<td>System Architect</td>
<td>JSC &quot;Technological Systems&quot;, Moscow, Russia</td>
</tr>
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5. Academic & Non-Academic Experience (c) Consulting Activities
N/A

6. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations

<table>
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<tr>
<th>Year</th>
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<tbody>
<tr>
<td>2017</td>
<td>Co-Chair, INFOCOM Workshop on Name-Oriented Mobility: Architecture, Algorithms and Applications (NOM'2017)</td>
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<tr>
<td>2017</td>
<td>Co-Chair, Poster/Demo track of ACM Information-Centric Networking Conference (ICN'2017)</td>
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<tr>
<td>2017</td>
<td>Publicity and Web Co-Chair, ACM SIGCOMM 2017 Organizing Committee</td>
<td></td>
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<tr>
<td>2016</td>
<td>Co-chair, 2nd NDN Hackathon</td>
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<tr>
<td>2016</td>
<td>Co-chair, 3rd NDN Hackathon</td>
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7. Honors and Awards

<table>
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<tr>
<th>Year</th>
<th>Award Description</th>
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<tbody>
<tr>
<td>2015</td>
<td>UCLA Chancellor’s Award for Postdoctoral Research, UCLA</td>
</tr>
<tr>
<td>2013</td>
<td>Exemplary Reviewer, IEEE Communication Letters</td>
</tr>
<tr>
<td>2012</td>
<td>Best Tutorial Paper Award, IEEE Communications Society</td>
</tr>
<tr>
<td>2011</td>
<td>Exemplary Reviewer, IEEE Communication Letters</td>
</tr>
<tr>
<td>2006</td>
<td>Medal of the Open Contest for the Best Student Scientific Project in Natural Sciences, Engineering and Humanities in Russian Federation Universities, Moscow, Russia</td>
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8. Service Activities (a) Committee Services
N/A

Service Activities (b) Community Services
N/A
Service Activities (c) Other Professional Activities
N/A

9. Publications

Papers Published in Professional & Scholarly Journals

Papers Published in Proceedings or Records of Conf/Symposia

10: Professional Development Activities
N/A
1. Name
JOSEPH GREGORY BILLOCK, Lecturer, Computer Science

2. Education
   1994    B.S.    Walla Walla University
   1995    M.S.    Walla Walla University
   2001    Ph.D.  California Institute of Technology

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
   No Data

Academic & Non-Academic Experience (b) Employment History
   2012 - 2016    Lecturer    California Institute of Technology
   2005 - ongoing  Staff Software Engineer  Google
   2001 - 2005    Chief Software Architect  iSpheres

Academic & Non-Academic Experience (c) Consulting Activities
   N/A

5. Certifications or Professional Registrations
   N/A

6. Current Membership In Professional Organizations
   N/A

7. Honors and Awards
   N/A

8. Service Activities (a) Committee Services
   N/A

Service Activities (b) Community Services
   N/A

Service Activities (c) Other Professional Activities
   N/A

9. Publications

10: Professional Development Activities
   N/A
1. Name
MICHAEL CAMPBELL, Lecturer, Computer Science

2. Education
06/13/1980 BS University of California, Riverside Mathematics
03/13/1982 MS UCLA Computer Science Theory
12/24/1986 PhD UCLA Computer Science Theory

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
No Data

Academic & Non-Academic Experience (b) Employment History
12/07/1992 - ongoing Principal Engineering Specialist The Aerospace Corp.
04/07/1988 - MTS Senior Math Hughes Research Laboratories (Now HRL Labs), Malibu CA
12/04/1992 - MTS Math Hughes Aircraft Co. (Now part of Raytheon)
04/07/1988 -

Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
Apr 1988 - Apr 2014 Member Sigma Xi: Scientific Research Society, Chapter President 1990-1992 Hughes Laboratories Chapter
Sprg 1982 - Fall Member ACM
2002
Wntr 1982 - ongoing Member IEEE Computer Society

7. Honors and Awards
2005 Alumni of Distinction, UC Riverside Bourns College of Engineering

8. Service Activities (a) Committee Services
N/A

Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
N/A

9. Publications

10. Professional Development Activities
N/A
1. Name
KAI-WEI CHANG, Assistant Professor, Computer Science

2. Education
2007  BS  National Taiwan University  Computer science
2009  MS  National Taiwan University  Computer Science
2015  PhD  University of Illinois at Urbana Champaign  Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
No Data

Academic & Non-Academic Experience (b) Employment History
06/01/2017  Assistant Professor  UCLA
08/06/2016 - 06/30/2017  Assistant Professor  University of Virginia
06/30/2017
07/20/2015 - 07/10/2016  Postdoctoral Researcher  Microsoft Research
07/10/2016

Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations

7. Honors and Awards
2017  Best Long Paper Award, EMNLP 2017
2011  C.L and Jane W. S. Liu Award, UIUC
2011  Yahoo! Key Scientific Challenges Program Award, Yahoo!
2010  Best Research Paper Award, KDD 2010

8. Service Activities (a) Committee Services
N/A

Service Activities (b) Community Services


Service Activities (c) Other Professional Activities
Oct 2017  Invited Talk, UCSB
Oct 2017  Invited Talk, USC
Oct 2017  Invited Talk, USC- ISI
Aug 2017  Invited Talk, University of Utah
Jun 2017  Invited talk, National Taiwan University, Appier
Dec 2016 Invited talk, NIPS workshop on learning high dimensions with structure

9. Publications

Papers Published in Professional & Scholarly Journals

Papers Published in Proceedings or Records of Conf/Symposia
Tolga Bolukbasi, Kai-Wei Chang, James Y Zou, Venkatesh Saligrama, Adam T Kalai, Man is to computer programmer as woman is to homemaker? debiasing word embeddings NIPS, 4348-4357 (2016)
Jieyu Zhao, Tianlu Wang, Mark Yatskar, Vicente Ordonez, Kai-Wei Chang, Men also like shopping: Reducing gender bias amplification using corpus-level constraints EMNLP, (2017)

10: Professional Development Activities
N/A
1. Name
JUNGHOO CHO, Associate Professor, Computer Science

2. Education
1996  B.S.  Seoul National University, Seoul, Korea  Physics, Summa Cum Laude
1997  M.S.  Stanford University, Stanford, CA  Computer Science
Jan 2002  Ph.D.  Stanford University, Stanford, CA  Computer Science

3. Academic & Non-Academic Experience
3.1. UCLA HSSEAS Appointment History
Jul 2001  Appointment to Assistant Professor
Jul 2007  Promotion to Associate Professor

3.2. Employment History
Jul 2001 - present  Assistant Professor  University of California at Los Angeles, Los Angeles, CA
Jun 2000 - Sep 2000  Summer Intern  IBM Almaden Research Center
Sep 1996 - Jun 2001  Research Assistant  Stanford University
Sep 1994 - Feb 1996  Research Assistant  Seoul National University

3.3. Consulting Activities
Jun 2000 - Sep 2000  Consultant in the Software development group, GIGABEAT, INC., Palo Alto, CA

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
2002 - present  Member, IEEE
1999 - present  Member, ACM
1999 - present  Member, SIGMOD

7. Honors and Awards
2013  Finalist Runner-Up for the Best Paper Award, 2013 SIGIR Conference
Jul 2011  Dr Stevenson Award for Best Faculty-in-Residence, Office of Residential Life
09/23/2010  10 Year Best Paper Award, International Conference on Very Large Data Bases
Mar 1995  General Electric Scholarship, General Electric (GE)

8. Service Activities
8.1. Committee Services
2015 - 2016  Department  Vice Chair, Graduate Program
2014 - 2015  Department  Member, WQE Committee
2014 - present  Department  Member, Adhoc Committee
2013 - 2016  Department  Member, MS Admission Committee
Fall 2012 - ongoing  Department  Field Chair, Field Chair of Information and Data Management

8.2. Community Services
N/A

8.3. Other Professional Activities
2015 - 2016  Program Committee, Twenty-Second ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD 2016)
2015 - 2016  Tutorial Track Committee, 2016 ACM International Conference on Management of Data (SIGMOD 2016)
2014 - 2015 Program Committee, Twenty-First ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD 2015)

9. Publications

Papers Published in Professional & Scholarly Journals
Le, Tuan M.V., Cao, Tru H., Hoang, Son M., Cho, Junghoo, Ontology-based proximity search iiWas2011, 5-7 (Dec 2011)
Heo, J., Cho, J., Whang, K., Subspace top-k query processing using the hybrid-layer index with a tight bound Data & Knowledge Engineering, 83:1-19 (Jan 2013)

Papers Published in Proceedings or Records of Conf/Symposia

10: Professional Development Activities
N/A
1. Name
TYSON CONDIE, Assistant Professor, Computer Science

2. Education
May 2001  B.A.  Berkeley  Computer Science
May 2004  M. S.  Stanford  Computer Science
May 2011  PhD  Berkeley  Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
No Data

Academic & Non-Academic Experience (b) Employment History
05/07/2012 - 12/31/2013  Principal Scientist  Microsoft
2012 - 2010  Research Scientist  Yahoo! Research
2007 - 2008  Research Intern  Yahoo! Research
2004 - 2006  Research Intern  Intel Research
2001 - 2002  Server Technology Engineer  Oracle Corporation
1998 - 2001  Database Administrator  Sybase Inc.
1992 - 1996  Communications Operator  United States Marine Corps

Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
N/A

7. Honors and Awards
2015  The Okawa Foundation Award
2015  Endowed Chair Award, Symantec
2015  Intel Early Faculty Career Award, Intel
2014  Faculty Award, IBM
2014  University of California Early Career Award, NSF Career Award

8. Service Activities (a) Committee Services
2015 - 2016  Department  Graduate Admissions Committee
Mar 2014  Department  Organizer of PhD students Visit Day, Organizer of prospective PhD Students Visit Day

Service Activities (b) Community Services
2016  Program Committee Chair, ACM SIGMOD 2016 (Industrial Track)
2016  Program Committee, ACM SIGMOD, Reviewed research paper submissions for SIGMOD 2016.
2015  Program Committee, ACM SIGMOD, Reviewed research paper submissions for SIGMOD 2015
2015 - 2016  Program Committee Chair, USENIX HotCloud, I was the PC Chair for USENIX HotCloud 2016. The premiere workshop on Cloud Computing.
2014 - 2015 VLDB Proceedings Editor, VLDB Proceedings 2015, I was in charge of monthly proceedings publications for a year.
2013 Program Committee, ACM SIGMOD, Reviewed research paper submissions for SIGMOD 2013
2013 SoCC Poster Chair, ACM

Service Activities (c) Other Professional Activities
2013 - 2013 Poster Session Chair, Organized and chaired the poster session for SOCC conference, handling around 80 submissions

9. Publications

Papers Published in Professional & Scholarly Journals


Papers Published in Proceedings or Records of Conf/Symposia

Bu, Y., Borkar, V., Jia, J., Carey, M.J., and Condie, T., Pregelix: Big(ger) Graph Analytics on A Dataflow Engine PVldb 2015, Volker Marcel and Chen Li, 8(2):1-12 (10/01/2014)

10: Professional Development Activities
N/A
1. Name
JINGSHENG CONG, Professor, Computer Science

2. Education
Jun 1985 B.S. Peking University, Beijing, China
May 1987 M.S. University of Illinois, Urbana, Illinois
Oct 1990 Ph.D. University of Illinois, Urbana, Illinois

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 1990 Appointment to Assistant Professor
Jul 1994 Promotion to Associate Professor
Jul 1998 Promotion to Professor

years of service: 28

Academic & Non-Academic Experience (b) Employment History
2014 - present Distinguished Chancellor's Professor University of California, Los Angeles
2008 - 2014 Chancellor's Professor University of California, Los Angeles
1998 - 2008 Professor University of California, Los Angeles

Academic & Non-Academic Experience (c) Consulting Activities
2017 - present Member of Board of Directors, Semiconductor Manufacturing International Corporation
2016 - present Member of Board of Directors, Inspirit, Inc.
2016 - present Member of Technical Advisory Board, Lenovo Group, Limited
2014 - present Co-founder and Chief Scientific Advisor, Falcon Computing Solutions, Inc

6. Current Membership In Professional Organizations
2012 - 2012 Member, A.R. Newton Technical Impact Award selection committee
2012 - present Founding Member, IEEE Spectrum China Editorial Advisory Committee
2008 - present Fellow, ACM
2000 - present Fellow, IEEE

7. Honors and Awards
Oct 2017 Best Paper Award, the International Symposium on Memory Systems (MEMSYS), for the paper "AIM: Accelerating Computational Genomics through Scalable and Noninvasive Accelerator-Interposed Memory"
Oct 2017 Outstanding Oversea Contribution Award, China Computer Federation (CCF)
Feb 2017 Member of the National Academy of Engineering, among the highest honors that can be accorded to an American engineer, “for pioneering contributions to application-specific programmable logic via innovations in field programmable gate array (FPGA) synthesis”
2017 FPGA and Reconfigurable Computing Hall of Fame Program inducted the paper "Flow Map: An Optimal Technology Mapping Algorithm for Delay Optimization in Look-Up Table Based FPGA Designs" into the inaugural class of the Hall of Fame.

8. Service Activities (a) Committee Services
2014 University Wide Member, Review Committee for appointment renewal, Vice Provost-Information Technology, 2014
2012 - 2013 Department Member, CS Department Faculty Recruiting Committee
2012 - 2014 University Wide Member, Special Programs Task Force, a campus-level committee appointed by Provost and EVC Scott Waugh

Service Activities (c) Other Professional Activities
2017 Chair, ICCAD 10-year Retrospective Most Influential Paper Selection Committee
2017 External Program Committee (EPC) Member, for the IEEE/ACM International Symposium on Microarchitecture (MICRO)
9. Publications

Books, Chapters in Books and Editorships


Papers Published in Professional & Scholarly Journals


Papers Published in Proceedings or Records of Conf/Symposia


10: Professional Development Activities

N/A
1. Name
ADNAN Y. DARWICHE, Professor, Computer Science

2. Education
1987 B.S. Kuwait University
1989 M.S. Stanford University
1993 Ph.D. Stanford University

3. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 1999 Appointment to Assistant Professor
Jul 2001 Promotion to Associate Professor
Jul 2005 Promotion to Professor

years of service: 19

Academic & Non-Academic Experience (b) Employment History
1998 - 1999 Senior Scientist Rockwell Science Center, CA
1996 - 1998 Assistant Professor American University of Beirut
1993 - 1996 Department Manager Rockwell Science Center, CA

Academic & Non-Academic Experience (c) Consulting Activities
2008 - 2008 Consultant, Symantec
2001 - 2004 Consultant, HRL Labs
1996 - 1998 Consultant, Rockwell Science Center, CA

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
2001 - present Member, ACM: Association for Computing Machinery
2001 - present Member, IEEE: Institute of Electronics and Electrical Engineers
1994 - present Member, American Association for Artificial Intelligence (AAAI)
1992 - present Member, Association for Uncertainty in Artificial Intelligence (AUAI)

7. Honors and Awards
2014 Best paper award for "On Compiling CNF into Decision-DNNF" International Conference on Principles and Practice of Constraint Programming (CP)
2014 Inference competition: 1st place in 1 category; 2nd place in 5 categories, Conference on Uncertainty in AI (UAI)
2010 Inference competition: 1st place in 2 categories; 2nd place in 4 categories., Conference on Uncertainty in AI (UAI)
2007 Gold Medal (first place) in SAT-2007 Competition: Industrial Benchmarks Category, Tenth International Conference on Theory and Appliance

8. Service Activities (a) Committee Services
2014 - 2015 Department Member, Faculty Recruiting Committee
2013 - 2014 Department Chair, Faculty Recruiting Committee
2012 - 2012 Department Member, Faculty recruiting committee
2011 - present Department Field Chair, AI Field
Jan 2009 - Sep 2010 Department Chair, Computer Science Department

Service Activities (b) Community Services
N/A
Service Activities (c) Other Professional Activities

2016  Workshop Chair, AAAI-16 Workshop on "Beyond NP."


2014  Invited Talk, Kyoto University, Japan: "Same-Decision Probability: Theory and Applications."

2012 - present Member of Advisory Board, Journal of Artificial Intelligence Research (JAIR)

9. Publications

Books, Chapters in Books and Editorships
Darwiche, A., Modeling and Reasoning with Bayesian Networks 1-548 (2009)

Papers Published in Professional & Scholarly Journals
Choi, A., Darwiche, A., Relax, Compensate and then Recover In New Frontiers in Artificial Intelligence, 6797:167-180 (2011)
Pipatsrisawat, K., Darwiche, A., On the Power of Clause-Learning SAT Solvers as Resolution Engines Artificial Intelligence, 175(2):512-525 (Feb 2011)

Papers Published in Proceedings or Records of Conf/Symposia

10: Professional Development Activities
N/A
1. Name
JOSEPH J. DISTEFANO, Professor Above Scale, Computer Science

2. Education
Jun 1961 B.E.E. City College of New York, New York Electrical Engineering
Jan 1964 M.S. University of California, Los Angeles Engineering
Sep 1966 Ph.D. University of California, Los Angeles Control Engineering and Biocybernetics

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 1966 Appointment to Assistant Professor
Jul 1972 Promotion to Associate Professor
Jul 1976 Promotion to Professor
years of service: 52

Academic & Non-Academic Experience (b) Employment History
Jul 2004 - ongoing Distinguished Professor UCLA, Computer Science and Medicine Depts
Jul 1976 - ongoing Professor UCLA
Jul 1966 - Jun 1968 Assistant Professor UCLA, System Science Department

Academic & Non-Academic Experience (c) Consulting Activities
2002 - 2005 Consultant, Abbott Laboratories
1995 - 1996 Consultant, ALZA Corporation, Palo Alto, California
1986 - 1989 simulation consultant, University of Southern California, Biomedical Simulation Resource, Department of Biomedical Engineering
1977 - 1983 Co-Chair, System Science Group, Biomedical Engineering Center, Univ. of Southern Calif.
1969 - 1972 Advanced Technology Consultants Corporation, Wallingford, CN (Associate)

5. Certifications or Professional Registrations
1978 Professional Engineer in Control Systems State of California License No. CS4465
1961 Professional Engineer-in-Training State of New York

6. Current Membership In Professional Organizations
1995 - present Member, European Thyroid Association
1989 - present Member, The UCLA Chapter of the Society of Sigma XI
1987 - present Member, IFAC TC BIOMED Working Group: Computer-Aided Decision Support For Medical Diagnosis and Therapy
1986 - 1989 Member, Board of Directors, Biomedical Engineering Society
1985 - 1986 Chairman, Finance and Audit Committee, American Thyroid Association

7. Honors and Awards
2005 Elected to Fellow of the Biomedical Engineering Society, Biomedical Engineering Society
2004 Lockheed-Martin Award for Excellence in Teaching, Henri Samueli School of Engr & Appld Science
2003 UCLA Distinguished Teaching Award, Academic Senate
2003 UCLA Harvey Eby Award for the Art of Teaching, Academic Senate
1989 Elected to Sigma Xi, Sigma Xi
8. Service Activities (a) Committee Services

<table>
<thead>
<tr>
<th>Year</th>
<th>Type</th>
<th>Details</th>
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<tbody>
<tr>
<td>2015</td>
<td>University Wide</td>
<td>Chair, MS pgm -- Computational &amp; Systems Biology, New MS option on Bioinformatics Grad IDP</td>
</tr>
<tr>
<td>2013 - 2015</td>
<td>Department</td>
<td>Member By-Law 55 Committee</td>
</tr>
<tr>
<td>2011 - 2013</td>
<td>Department</td>
<td>MS Admission Committee</td>
</tr>
<tr>
<td>2009 - 2013</td>
<td>University Wide</td>
<td>Co-Chair, Biosystem Science and Engineering subfield, Biomedical Engineering Graduate IDP</td>
</tr>
<tr>
<td>2008 - 2014</td>
<td>Department</td>
<td>Chair, Computational Systems Biology Graduate Pgm, Computer Science Grad pgms</td>
</tr>
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</table>

Service Activities (b) Community Services

<table>
<thead>
<tr>
<th>Year</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010 - 2013</td>
<td>Vice President, Scholarships &amp; Student Support, UCLA Friends of Jazz, Support group for the UCLA Jazz Program (Dept of Ethnomusicology)</td>
</tr>
</tbody>
</table>

Service Activities (c) Other Professional Activities

<table>
<thead>
<tr>
<th>Year</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/03/2015</td>
<td>Invited Seminar-Combined Endocrine Conf, Department of Medicine, UCLA, THYROSIM: A Facile App for Education &amp; Research on Thyroid Hormone Regulation Dynamics in Health &amp; Disease: Assessing Potential Health Risks of OTC Thyroid â€œSupportâ€? Supplements â€“ Caveat Emptor</td>
</tr>
<tr>
<td>2012 - ongoing</td>
<td>Lab collaboration with Dr. Reed Larsen at Harvard Med School, Quantitative studies on paradoxical thyroid hormone production and distribution dynamics in hyperthyroidism and thyroid storm</td>
</tr>
</tbody>
</table>

9. Publications

Books, Chapters in Books and Editorships


JJ DiStefano III, Dynamic Systems Biology Modeling and Simulation (updated ed) 1-889 (Jan 2015)

Papers Published in Professional & Scholarly Journals


R Ben-Shachar, M Eisenberg, S A Huang, J J DiStefano III, Simulation of Post-Thyroidectomy Treatment Alternatives for Triiodothyronine or Thyroxine Replacement in Pediatric Thyroid Cancer Patients Thyroid, 22(6):1-9 (2012)


Papers Published in Proceedings or Records of Conf/Symposia


10: Professional Development Activities

N/A
1. Name
MICHAEL G. DYER, Professor, Computer Science

2. Education
May 1978  M.S.  University of Kansas  (1974-1978)

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Nov 1982  Appointment to Assistant Professor
Jul 1986  Promotion to Associate Professor
Jul 1991  Promotion to Professor
Jul 1992  Promotion to Professor

years of service: 36

Academic & Non-Academic Experience (b) Employment History
Jan 1982 - May 1982  Acting Instructor  Yale University  1982
1982  Acting Instructor  Yale University
Sep 1979 - Dec 1979  Teaching Assistant  Yale University  1982
Jan 1979 - Apr 1982  Research Assistant  Yale University

Academic & Non-Academic Experience (c) Consulting Activities
Nov 1988  Consultant to Committee of Bar Examiners of State Bar of CA
Jun 1988  Consultant Seminar to TTI-Citicorp, Santa Monica, CA  1985
1985  Consultant to Lockheed Software Technology Center
1985 - 1987  Consultant Seminar to JPL, Pasadena, California  1984
1984  Consultant to Hughes Corp., (AI Center)

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
2008 - 2012  Program Committee Member, 10th, 11th & 12th Intern. conferences on Simulation of Adaptive Behavior (conf. is biennial)
1989 - present  Member, UCLA Cognitive Science Research Program
1988 - 1990  Member, International Neural Network Society
1985 - 1991  Member, American Association for Artificial Intelligence
1984 - present  Associate Member, in BBS: The Behavioral and Brain Sciences

7. Honors and Awards
1998  Editorial Board Member of Journal of Cognitive Systems Research (Electronic)
1995  Guest Editor, Connectionist Networks for High-Level Reasoning, special issue of Applied Intelligence
1993  Editorial Board Member of Artificial Life Journal
1989  Journal Editorial Board Member, Applied Intelligence

8. Service Activities (a) Committee Services
2012 - 2013  Department  Member, PhD Admissions Committee
2011 - 2013  Department  Member, MS Admissions Committee
2009 - 2009  Department  Member, Admissions Committee
2009 - 2010  Department  Chair, AI Field Committee
2009 - 2010 Department Member, Academic Policy Committee (APC)

Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
N/A

9. Publications

Papers Published in Professional & Scholarly Journals

10: Professional Development Activities
N/A
1. Name
PAUL R. EGGERT, Computer Science

2. Education
1975 B.A. Rice University Mathematical Sciences and Electrical Engineering
1977 M.S. University of California, Los Angeles Computer Science
1980 Ph.D. University of California, Los Angeles Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Nov 2002 Appointment to
Jul 2008 Promotion to
years of service: 16

Academic & Non-Academic Experience (b) Employment History
2012 - ongoing Senior Lecturer SOE University of California, Los Angeles
2009 - 2012 Lecturer SOE University of California, Los Angeles
2003 - 2009 Lecturer PSOE University of California, Los Angeles
1998 - 1999 Visiting Lecturer University of California, Los Angeles
1990 - 2002 Chief Technology Officer Twin Sun
1986 - 1989 Senior Advisor to Management Unisys Corp.
1983 - 1986 Chief Scientist Silogic Inc.

Academic & Non-Academic Experience (c) Consulting Activities

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
1980 - present Member, IEEE Computer Society
1975 - present Member, Association for Computing Machinery

7. Honors and Awards
2012 Lockheed Martin Excellence in Teaching Award, UCLA Henry Samueli School of Engineering and Applied Science
1990 Winner of "Most Transmittable" Prize, International Obfuscated C Code Contest
1982 Teaching Award, UC Santa Barbara, School of Engineering

8. Service Activities (a) Committee Services
2017 - ongoing Department Vice Chair, Corporate Relations and Affiliates Vice Chair, Computer Science Department
2013 - ongoing Department Member, Undergraduate Committee
2012 - ongoing Other Supervisor, Dept. Computing Facility, I plan and review the operation of the Computer Science Department Computing Facility; see http://www.cs.ucla.edu/dcf/.
2011 - 2012 Department Chair, Facility Committee

Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
N/A
9. Publications

Papers Published in Professional & Scholarly Journals


Highly accessed as of 2014-04-02


10: Professional Development Activities

N/A
1. Name
MILOS D. ERCEGOVAC, Professor, Computer Science

2. Education
1965    B.S.    Univ. of Belgrade, Belgrade, Yugoslavia Electrical and Electronic Engineering
1972    M.S.    Univ. of Illinois, Urbana, IL Computer Science
07/09/1975    Ph.D.    Univ. of Illinois, Urbana, IL Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 1975    Appointment to Assistant Professor
Jul 1984    Promotion to Professor
years of service: 43

Academic & Non-Academic Experience (b) Employment History
Jul 2010 - present    Distinguished Professor    Univ. of California, Los Angeles
Jul 1983 - Jun 2010    Professor    Univ. of California, Los Angeles
Jul 1979 - Jun 1983    Associate Professor    Univ. of California, Los Angeles
Jul 1975 - Jun 1979    Assistant Professor    Univ. of California, Los Angeles

Academic & Non-Academic Experience (c) Consulting Activities
1990 - 2004    Morgan & Kaufman Publishers
1984 - 1988    GMD Institute (German government)
Jan 1981 - present    Addison Wesley

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
07/01/2016 - 06/30/2017    Chair of the Steering Committee Board, IEEE Symposium on Computer Arithmetic
07/01/2016 - 06/30/2017    Session Chair, Asilomar Conference on Signals, Systems and Computers
Sep 2011    General Co-chair, 2011 International Conference on Application-Specific Architectures, Systems and Processors (ASAP2011)
2007 - 2015    Technical Program Committee member, International Conference on Application-Specific Architectures, Systems and Processors (ASAP)
1997 - present    Member of the Steering Committee, IEEE Symposium on Computer Arithmetic

7. Honors and Awards
06/23/2015    President's Medal, Ecole Normale Supérieure de Lyon, France
01/01/2014    Life Fellow, IEEE
10/24/2013    Distinguished Alumni Educator Award, University of Illinois Urbana-Champaign, Computer Science Department
11/06/2009    Lockheed Martin Excellence in Teaching Award, Henry Samueli School of Engineering and Applied Science
2006    Research Grant, The Okawa Foundation

8. Service Activities (a) Committee Services
Jul 2017 - present    Department    Field Chair, Computer System Architecture Field
2015 - 2016    University Wide    Member, School-wide diversity committee
Oct 2014 - Oct 2017    Other    Director of Diversity, HSSEAS Director of Diversity/Equity and Inclusion
2012 - 2013    Department    Member, CS Representative on the HSSEAS Faculty Executive Committee
2010 - present    Department    Member, Planning Committee
Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
N/A

9. Publications

Papers Published in Professional & Scholarly Journals

Dormiani, P., Ercegovac, M.D., Muller, J.-M., Low Precision Table Based Complex Reciprocal Approximation. 43rd Asilomar Conference on Signals, Systems and Computers, 1-5 (2009)
D. Wang and M.D Ercegovac, A Radix-16 Combined Complex Division/Square Root Unit with Operand Prescaling. IEEE Transactions on Computers, 61(9):1243-1255 (Sep 2012)
M. Ozbilen and M. D. Ercegovac, Design and evaluation of schemes for computing sum of squares in fixed point. Turkish Journal of Electrical Engineering & Computer Sciences, 500-512 (Apr 2013)
Wang, D., Muller, J-M., Brisebarre, N., Ercegovac, M.D., (M,p,k) -Friendly Points: A Table-Based Method to Evaluate Trigonometric Function. IEEE Transactions on Circuits and Systems II: Express Briefs, 61(9):711-715 (Sep 2014)

Papers Published in Proceedings or Records of Conf/Symposia


10: Professional Development Activities
N/A
1. Name
ELEAZAR ESKIN, Professor, Computer Science

2. Education
   May 1997  B.A.   University of Chicago   Economics (with Honors)
   May 1997  B.S.   University of Chicago   Mathematics
   May 1997  B.S.   University of Chicago   Computer Science (with Honors)
   May 2000  M.S.   Columbia University    Computer Science
   Oct 2002  Ph.D.  Columbia University    Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
   Jul 2006  Appointment to Assistant Professor
   Jul 2009  Promotion to Associate Professor
   Jul 2014  Promotion to Professor
   years of service: 12

   Academic & Non-Academic Experience (b) Employment History
   Jul 2014 - present  Professor
       University of California, Los Angeles; Department of Computer Science and Department of Human Genetics

   Jul 2009 - Jul 2014  Associate Professor
       University of California, Los Angeles; Department of Computer Science and Department of Human Genetics

   Nov 2006 - Jun 2009  Assistant Professor
       University of California, Los Angeles; Department of Computer Science and Department of Human Genetics

   Academic & Non-Academic Experience (c) Consulting Activities
   N/A

5. Certifications or Professional Registrations
   N/A

6. Current Membership In Professional Organizations
   Jan 2008  Member, Genetics Society of America
   2006     Member, American Society of Human Genetics
   2006     Member, International Society of Computational Biology

7. Honors and Awards
   2014  The Rosalinde and Arthur Gilbert Foundation - BSF Multiplier Research Grants Program and the Foundation, Gilbert Foundation
   Feb 2009  Alfred P. Sloan Foundation Research Fellowship
   10/08/2008  Okawa Research Grant, Okawa Foundation
   Jan 2005  William J. von Liebig Center for Entrepreneurism and Technology Advancement Award, University of California, San Diego
   May 2002  Paul Charles Michaelman Memorial Departmental Service Award, Columbia University Computer Science Department

8. Service Activities (a) Committee Services
   2017 - 2018  Department  Member, Space Committee
   2016 - 2018  Department  Member, Academic Policy Committee
   2016 - 2018  Department  Member, Hiring Committee
   2013 - present  Other  Director, Bioinformatics Undergraduate Minor
Service Activities (c) Other Professional Activities

2015 - 2016  Organizing Committee Chair, Recomb 2016 Conference in Santa Monica
2013        Program Committee, The Thirteenth Workshop on Algorithms in Bioinformatics (WABI-2013)
2013        Program Committee, The Twenty First Annual International Conference on Intelligent Systems in Molecular Biology (ISMB-2013)
2012        Program Committee Chair, Second Annual RECOMB Satellite Meeting on Sequencing (RECOMB-seq)
2012        Program Committee, Population Quantitative Genetics Conference

9. Publications

Books, Chapters in Books and Editorships
Han, B., Eskin, E., Multiple Testing in Genetic Epidemiology Encyclopedia of Life Sciences, DOI: 10.1002/9780470: (2010)

Papers Published in Professional & Scholarly Journals
Dat Duong, Lisa Gai, Sagi Snir, Eun Yong Kang, Buhm Han, Eleazar Eskin and JaeHoon Sul, Applying meta-analysis to Genotype-Tissue Expression data from multipletissues to identify eQTLs and increase the number of eGenes Bioinformatics, 33(14):67-74 (2017)
Cue Hyunkyu Lee, Eleazar Eskin, Buhm Han, Increasing power of meta-analysis of genomewide association studies for detecting heterogeneous effects Bioinformatics, 33(14):379-388 (2017)
Alexander Artyomenko, Nicholas Wu, Serghei Mangul, Eleazar Eskin, Ren Sun and Alex Zelikovsky, Long single-molecule reads can resolve the complexity of the influenza virus composed of rare, closely related mutant variants Journal of Computational Biology, 24(6):558-570 (2017)

Papers Published in Proceedings or Records of Conf/Symposia
Wen-Yun Yang, Farhad Hormozdiari, Eleazar Eskin, Bogdan Pasaniuc, A Spatial-Aware Haplotype Copying Model with Applications to Genotype Imputation InProceedings of the Eighteenth Annual Conference on Research in Computational Biology (RECOMB-2014), (Apr 2014)
Dan He, Zhanyong Wang, Laxmi Parida and Eleazar Eskin, IPED2: InheritancePath based Pedigree Reconstruction Algorithm for Complicated Pedigrees In Proceedings of the 5th ACM Conference on Bioinformatics, Computational Biology, and Health Informatics, (Sep 2014)
Jong Wha J. Joo, Eun Yong Kang, Elin Org, Nick Furlotte, Brian Parks, Aldons J. Lusis, Eleazar Eskin, Efficient and accurate multiple-phenotype regression methodfor high dimensional data considering population structure In Proceedings of the Nineteenth Annual Conference on Research in Computational Biology (RECOMB- 2015), (Apr 2015)

10: Professional Development Activities
N/A
1. Name
   JAMES FARRELL, Lecturer, Computer Science

2. Education
   1997   B.A.   Reed College
   2006   M.S.   California State University

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
   No Data

   Academic & Non-Academic Experience (b) Employment History
   2013 - present   Lecturer   California Institute of Technology
   2012 - present   Senior Software Engineer   Google
   2010 - present   Lead Software Engineer   Live Nation
   2010 - 2012     Software Engineer   Google
   2008 - 2010     Lead Software Engineer   Ticketmaster
   2007 - 2008     Senior Software Engineer   Ticketmaster

   Academic & Non-Academic Experience (c) Consulting Activities
   N/A

5. Certifications or Professional Registrations
   N/A

6. Current Membership In Professional Organizations
   N/A

7. Honors and Awards
   N/A

8. Service Activities (a) Committee Services
   N/A

   Service Activities (b) Community Services
   N/A

   Service Activities (c) Other Professional Activities
   N/A

9. Publications
   N/A

10: Professional Development Activities
   N/A
1. Name
TREVOR FOUCHER, Lecturer, Computer Science

2. Education
1998 B.S. UC Berkeley

3., 4. Academic & Non-Academic Experience
(a) UCLA HSSEAS Appointment History
No Data

(b) Employment History
2014 - present Lecturer California Institute of Technology
2006 - present Staff Software Engineer Google
2002 - 2006 Software Engineer Lead Microsoft
2001 - 2002 Software Engineer GNP Computers, Inc.
1999 - 2001 Software Engineer Microsoft

(c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
N/A

7. Honors and Awards
1996 Kraft Scholarship, UC Berkeley
1995 Chancellors Scholarship, UC Berkeley

8. Service Activities
(a) Committee Services
N/A

(b) Community Services
N/A

(c) Other Professional Activities
N/A

9. Publications
Books, Chapters in Books and Editorships

10. Professional Development Activities
N/A
1. Name
SCOTT FRIEDMAN, Lecturer, Computer Science

2. Education
1988 A.A. Oakton Community College
1993 B.ARCH University of Illinois
1994 M.ARC University of California, Los Angeles
1999 M.S. University of California, Los Angeles
2004 Ph.D. University of California, Los Angeles

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
No Data

Academic & Non-Academic Experience (b) Employment History
2009 Chief Technologist for Research Computing Office of Information Technology, University of California, Los Angeles
2009 - 2010 Manager Manager High Performance Computing Systems, Institute for Digital Research and Education, University of California, Los Angeles
2007 Senior Research Scientist Institute for Digital Research and Education, University of California, Los Angeles
2005 - 2007 Research Scientist High Performance Computing and Visualization, Academic Technology Services, University of California, Los Angeles
1995 Lecturer University of California, Los Angeles
1995 - 2005 Senior Staff Researcher Computer Science Department Urban Simulation Laboratory, University of California, Los Angeles
1994 - 1995 Lecturer University of California, Los Angeles
1993 - 1994 Research Associate Department of Architecture University of California, Los Angeles

Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
1995 Member, Association for Computing Machinery (ACM)
1995 Member, Institute of Electrical and Electronics Engineers (IEEE)

7. Honors and Awards
2009 Innovations in Networking Award for High-Performance Research Applications, CENIC
2007 Bandwidth Challenge: Special Award for "making it Look easy"
2001 Research and Technology Award, American Institute of Architects
1999 Award for Innovative use of Technology, American Planning Association
1995 Sixth Annual Inter-Service/Industry Training Systems and Education Award, I/ITSEC

8. Service Activities (a) Committee Services
N/A
Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
N/A

9. Publications

10: Professional Development Activities
N/A
1. Name
ELIEZER M. GAFNI, Professor, Computer Science

2. Education
1972  B.S.C.  Technion, Israel  Electrical Engineering, Cum Laude
1979  M.S.C.  University of Illinois, Urbana-Champaign, Illinois  Electrical Engineering
1982  Ph.D.  Massachusetts Institute of Technology, Cambridge, Massachusetts

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 1982  Appointment to Assistant Professor
Jul 1986  Promotion to Associate Professor
Jul 1998  Promotion to Professor
Jul 2003  Promotion to Professor
years of service: 36

Academic & Non-Academic Experience (b) Employment History
Jan 1979 - Aug 1982  Research Assistant  M.I.T.
Aug 1977 - Jan 1979  Research Assistant  University of Illinois

Academic & Non-Academic Experience (c) Consulting Activities
Jul 1993 - Aug 1993  AT&T
Nov 1987 - Nov 1988  U.S. Army
1988

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
1990 - present  Member, ACM
Apr 1988  Program Committee, IEEE Computer Networking Symposium

7. Honors and Awards
2010  PODC; Special session for 60th Birthday celebration of Danny Dolev and Eli Gafni
1985  NSF Presidential Young Investigator Award
1984  IBM Faculty Development Award
1982  Arco Junior Faculty Award

8. Service Activities (a) Committee Services
2015 - 2016  Department  Member, Ad-hoc committee
2015 - 2016  Department  Member, Awards
2012 - 2014  Department  Member, Academic Policy
2011 - 2013  Department  Member, MS Admission

9. Publications
Papers Published in Professional & Scholarly Journals


**Papers Published in Proceedings or Records of Conf/Symposia**


Afek, Y., Gafni, E., Asynchrony from Synchrony ICDCN, 225-239 (2013)


Gafni, E., Herlihy, M., Sporadic Solutions to Zero-One Exclusion Tasks ICALP (1) 2014, 1-10 (Jul 2014)

Fraigniaud, P., Gafni, E., Rajsbaum, S., Roy, M., Automatically Adjusting Concurrency to the Level of Synchrony DISC 2014, 1-15 (Sep 2014)

Bouzid, Z., Gafni, E., Kuznetsov, P., Strong Equivalence Relations for Iterated Models OPODIS 2014, 139-154 (Dec 2014)


He, Y., Gopalakrishnan, K., Gafni, E., Group mutual exclusion in linear time and space ICDCN 2016: 22:1-22:10, 1-10 (Jan 2016)

Castaeda, A., Fraigniaud, P., Gafni, E., Rajsbaum, S., Roy, M., Brief Announcement: Asynchronous Coordination with Constraints and Preferences PODC 2016, 299-301 (Jul 2016)


Saraph, V., Herlihy, M., Gafni, E., Asynchronous Computability Theorems for t-Resilient Systems DISC 2016,, 428-441 (Sep 2016)

10: Professional Development Activities

N/A
1. Name
MARIO GERLA, Professor Above Scale, Computer Science

2. Education
Dec 1966 Grad Deg Politecnico di Milano Graduate Degree in Engr. (Dottorato)
Sep 1970 M.S. Univ. of California Los Angeles Engineering
Jan 1973 Ph.D. Univ. of California Los Angeles Engineering

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 1978 Appointment to Assistant Professor
Jul 1979 Promotion to Associate Professor
Jul 1985 Promotion to Professor
years of service: 40

Academic & Non-Academic Experience (b) Employment History
Jul 1977 - Jun 1978 Acting Assistant Professor Univ. of Calif., Los Angeles
Jun 1976 - Jul 1977 Computer Systems Designer Univ. of Calif., Los Angeles

Academic & Non-Academic Experience (c) Consulting Activities
2014 Consultant, Lockheed Martin, IAI, BOEING, Utopia Compression
2014 Consultant, RAE, Scientific Advisory Board
2009 consultant, IAI Inc, Washington DC, Consultant in network performance evaluation of tactical systems

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
2004 IEEE WONS - Advisory Board Member, WONS (Wireless OnLine Network Systems) Annual Conference
2002 - present IFIP MedHocNet Technical Advisory Board
2001 - present ACM Mobihoc Technical Advisory Board
1976 - 1980 IEEE Circuits and Systems Society-Large-Scale Systems Committee Chairman, Subcommittee on Queueing Networks
1974 - present Member, IEEE

7. Honors and Awards
Feb 2018 2018 IEEE INFOCOM Achivement Award, IEEE
Sep 2015 ACM Sigmobile Life Achievement Award, ACM Sigmobile
Dec 2011 AHSN Best Performer Award, IEEE Ad Hoc and Sensor Network (AHSN)
Nov 2011 Lifetime Excellent Performer Award, MILCOM (Military Communications Conference)
Jun 2010 WWIC 2010 - Keynote on Routing in the Vehicular Grid, Chair

8. Service Activities (a) Committee Services
2014 Department Liason, Department Affiliate Northrop Grumman Corporation
2014 Department Member, By-Law 55 Committee
2014 University Wide Member, Information Technology Planning Board (ITPB)
Fall 2013 Department Chair, WQE exam

Service Activities (b) Community Services
2009 Member of the Board, Green Comm Challenge, Green Comm Challenge is a consortium aimed at funding research in Green Comms Technologies
Service Activities (c) Other Professional Activities
Dec 2017 - Jun 2018 General Chair, MobiHoc 2018
Mar 2016 Chair, INRIA Programs evaluation Committee
2016 - present Advisory Board, IMDEA (Madrid)
Mar 2015 General Chair, International Conference on Computing, Networking and Communications 2015

9. Publications

Books, Chapters in Books and Editorships
Pazos CM, Gerla M, for the Internet Data Traffic Management of Multimedia Networks and Services, 177 (01/09/2016)

Papers Published in Professional & Scholarly Journals
Gomes RL, Bittencourt L, Madeira E, Cerqueira E, Gerla M, Management of virtual network resources for multimedia applications Multimedia Systems, 23(4):405-419 (07/01/2017)

Papers Published in Proceedings or Records of Conf/Symposia
Han S, Ban D, Park W, Gerla M, Localization of Sybil Nodes with Electro-Acoustic Positioning in VANETs GLOBECOM, Singapore, Dec 4-8, 2017, 1-6 (12/04/2017)
Lobato W, Rosario D, Gerla M, Villas LA, Platoon-Based Driving Protocol Based on Game Theory for Multimedia Transmission over VANET GLOBECOM, Singapore, Dec 4-8, 2017, 1-6 (12/04/2017)

10: Professional Development Activities
N/A
1. Name  
HALPERIN, ERAN, Professor, Computer Science

2. Education  
<table>
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<th>Year</th>
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<th>Institution</th>
<th>Major</th>
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<tr>
<td>1993</td>
<td>B.Sc.</td>
<td>Tel-Aviv University</td>
<td>MMathematics and computer Science</td>
</tr>
<tr>
<td>1996</td>
<td>M.Sc.</td>
<td>Tel-Aviv University</td>
<td>Computer Sciences</td>
</tr>
<tr>
<td>2001</td>
<td>Ph.D.</td>
<td>Tel-Aviv University</td>
<td>Computer Sciences</td>
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3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History  
No Data

Academic & Non-Academic Experience (b) Employment History  
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<th>Year</th>
<th>Position</th>
<th>Institution</th>
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<tbody>
<tr>
<td>2016 - present</td>
<td>Professor</td>
<td>Blavatnik School of Computer Science, Tel-Aviv University</td>
</tr>
<tr>
<td>May 2012 - present</td>
<td>Computational Advisory Board</td>
<td>DNA Nexus</td>
</tr>
<tr>
<td>Jul 2011 - Dec 2016</td>
<td>Scientific Advisory Board</td>
<td>Genia Technologies</td>
</tr>
<tr>
<td>2011 - 2016</td>
<td>Associate Professor</td>
<td>Blavatnik School of Computer Science, Tel-Aviv University</td>
</tr>
<tr>
<td>Jul 2007 - Dec 2008</td>
<td>Director of Bioinformatics</td>
<td>Navigenics, Inc. (genetic testing)</td>
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5. Certifications or Professional Registrations  
N/A

6. Current Membership In Professional Organizations  
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<th>Year</th>
<th>Position</th>
<th>Institution</th>
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<tbody>
<tr>
<td>2016</td>
<td>Organizing committee</td>
<td>UCLA Computational Geonomics Summer Institute (CGSI)</td>
</tr>
<tr>
<td>2016</td>
<td>Program committee, RECOMB-Genetics</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>steering committee, RECOMB-SEQ</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>Program committee, RECOMB</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>steering committee, RECOMB-SEQ</td>
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7. Honors and Awards  
<table>
<thead>
<tr>
<th>Year</th>
<th>Award Description</th>
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<tr>
<td>2014</td>
<td>Juludan Research Fund Prize, Juludan Research fund</td>
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<tr>
<td>2012</td>
<td>one of the &quot;40 Promising Israelis younger than 40&quot;, The Marker Magazine (Israeli Business Magazine)</td>
</tr>
<tr>
<td>2010</td>
<td>The Krill prize for excellence in scientific research, Krill</td>
</tr>
<tr>
<td>2010</td>
<td>The Raymond and Beverly Sackler, Career Development Chair</td>
</tr>
<tr>
<td>2001</td>
<td>The Rothschild fellowship (for post-doc), Rothschild</td>
</tr>
<tr>
<td>2000</td>
<td>The Checkpoint prize (for Ph.D.), Tel-Aviv University</td>
</tr>
<tr>
<td>2000</td>
<td>The Intel prize (for Ph.D.), Tel-Aviv University</td>
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8. Service Activities (a) Committee Services  
<table>
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<tr>
<th>Year</th>
<th>Department</th>
<th>Description</th>
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<tbody>
<tr>
<td>Sep 2017 - ongoing</td>
<td>Department</td>
<td>By-law committee, computer science, Reviewing promotion cases</td>
</tr>
<tr>
<td>2017 - 2017</td>
<td>Department</td>
<td>ad-hoc committee</td>
</tr>
<tr>
<td>2017 - ongoing</td>
<td>University Wide</td>
<td>Associate Director, Institute of Precision Health, In charge of the informatics infrastructure for the IPH, connecting the research to UCLA's hospital</td>
</tr>
<tr>
<td>2017 - ongoing</td>
<td>University Wide</td>
<td>Member, Clinical Neurogenomics Research Center (CNRC) Working Group, Advising regarding which genomics projects could be pursued in CNRC.</td>
</tr>
</tbody>
</table>
2016 - ongoing  University Wide  co-director, Computational Genomic Summer Institute, UCLA, Co-directing CGSI, a summer institute that brings to UCLA about a hundred genomics researchers from all over the world for interaction and increasing the visibility of UCLA

Service Activities (c) Other Professional Activities

2016  invited speaker, invited speaker at the annual meeting of the Israeli statistical association
2016  invited speaker, invited speaker at the waterman symposium, Los Angeles
2015  invited speaker, invited speaker at the "studying human evolution from ancient DNA" workshop, Hebrew University
2015  invited speaker, invited speaker at the AAAS annual meeting
2015  invited speaker, invited speaker at the biennial conference of the cancer biology research center (CBRC) meeting

9. Publications

Papers Published in Professional & Scholarly Journals

Rahmani, E., Schweiger, R., Shenhav, L., Eskin, E., Halperin, E., A Bayesian framework for estimating cell type composition from DNA methylation without the need for methylation reference RECOMB, 112417 (01/01/2017)
Jensen, H., et al, Rheumatoid arthritis and coronary artery disease: genetic analyses do not support a casual relation The Journal of Rheumatology, 44(1):4-10 (01/01/2017)
Rhead, Brooke, et al., Rheumatoid Arthritis nage T cells share hypermethylation sites with synoviocytes Arthritis and Rheumatology, 69(3):550-559 (Feb 2017)

10: Professional Development Activities
N/A
1. Name
   JOSHUA HYMAN, Lecturer, Computer Science

2. Education
   2005   B.S.   UCLA
   2008   M.S.   UCLA
   2009   Ph.D.  UCLA

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
   No Data

Academic & Non-Academic Experience (b) Employment History
   2004 - present   Senior Staff Software Engineer   Google

Academic & Non-Academic Experience (c) Consulting Activities
   N/A

5. Certifications or Professional Registrations
   N/A

6. Current Membership In Professional Organizations
   N/A

7. Honors and Awards
   6th place in ACM Regional Programming Competition
   American Mensa Member
   Eta Kappa Nu Computer Science and Electrical Engineering Honors Society
   Top 10 score in Brainbench Certifications for C, C++, and Python
   UCLA School of Engineering Deans list

8. Service Activities (a) Committee Services
   N/A

Service Activities (b) Community Services
   N/A

Service Activities (c) Other Professional Activities
   N/A

9. Publications

10: Professional Development Activities
   N/A
1. Name
   MARK KAMPE, Lecturer, Computer Science

2. Education
   1974   B.S.                           Computer Science (cum laude)
   1982   M.S.                           Computer Science (magna cum laude)

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
   No Data

3. Academic & Non-Academic Experience (b) Employment History
<table>
<thead>
<tr>
<th>Period</th>
<th>Position</th>
<th>Company</th>
</tr>
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<tbody>
<tr>
<td>Aug 2013 - Aug 2017</td>
<td>Distinguished Engineer</td>
<td>Huawei</td>
</tr>
<tr>
<td>Nov 2011 - Jun 2013</td>
<td>VP Engineering</td>
<td>Inktank</td>
</tr>
<tr>
<td>Aug 2010 - Oct 2011</td>
<td>Consultant</td>
<td>Hitachi</td>
</tr>
<tr>
<td>Jan 2007</td>
<td>Lecturer</td>
<td>Pomona College</td>
</tr>
<tr>
<td>Jun 2006 - Aug 2010</td>
<td>Technical Director</td>
<td>Parascale</td>
</tr>
<tr>
<td>2000 - present</td>
<td>Lecturer</td>
<td>UCLA</td>
</tr>
<tr>
<td>1991 - 2002</td>
<td>Architect, Engineering Manager, Staff to several directors and VPs</td>
<td>Sun Microsystems</td>
</tr>
<tr>
<td>1989 - 1991</td>
<td>Architect, lead Engineer for the Norton Utilities for Unix</td>
<td>Segue Software</td>
</tr>
<tr>
<td>1984 - 1989</td>
<td>Architect, Development Manager</td>
<td>Locus Computing Corporation</td>
</tr>
<tr>
<td>1977 - 1984</td>
<td>Developer, Architect, and Development Manager</td>
<td>Interactive Systems Corporation</td>
</tr>
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</table>

3. Academic & Non-Academic Experience (c) Consulting Activities
   N/A

5. Certifications or Professional Registrations
   N/A

6. Current Membership In Professional Organizations
   N/A

7. Honors and Awards
   N/A

8. Service Activities (a) Committee Services
   N/A

Service Activities (b) Community Services
   N/A

Service Activities (c) Other Professional Activities
   N/A

9. Publications

10: Professional Development Activities
   N/A
1. Name
MIRYUNG KIM, Associate Professor, Computer Science

2. Education
<table>
<thead>
<tr>
<th>Date</th>
<th>Degree</th>
<th>Institution</th>
<th>Field</th>
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<tr>
<td>Feb 2001</td>
<td>B.S.</td>
<td>Korea Advanced Institute of Science and Computer Science Technology</td>
<td>Computer Science and Engineering</td>
</tr>
<tr>
<td>Aug 2003</td>
<td>M.S.</td>
<td>University of Washington</td>
<td>Computer Science and Engineering</td>
</tr>
<tr>
<td>Dec 2008</td>
<td>PhD</td>
<td>University of Washington</td>
<td>Computer Science and Engineering</td>
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3. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
No Data

3. Academic & Non-Academic Experience (b) Employment History

<table>
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<tr>
<th>Date</th>
<th>Position</th>
<th>Institution</th>
<th>Role Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep 2014</td>
<td>Associate Professor</td>
<td>University of California, Los Angeles</td>
<td></td>
</tr>
<tr>
<td>Sum 2014</td>
<td>Visiting Researcher</td>
<td>Microsoft Research</td>
<td>Investigating the Role of Data Scientists in a Software Company</td>
</tr>
<tr>
<td>Sum 2011</td>
<td>Visiting Researcher</td>
<td>Microsoft Research</td>
<td></td>
</tr>
<tr>
<td>Jan 2009 - Aug 2014</td>
<td>Assistant Professor</td>
<td>University of Texas at Austin</td>
<td></td>
</tr>
<tr>
<td>Oct 2008 - Dec 2008</td>
<td>Visiting Researcher</td>
<td>Korea Advanced Institute of Science and Technology</td>
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</table>

3. Academic & Non-Academic Experience (c) Consulting Activities

<table>
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<th>Year</th>
<th>Activity Description</th>
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<tbody>
<tr>
<td>2016 - 2016</td>
<td>Consultant, Databricks, Investigating Errors in Big Data Systems</td>
</tr>
<tr>
<td>2016 - 2016</td>
<td>Consultant, Microsoft Research, Investigating the Role of Data Scientists in a Software Company</td>
</tr>
<tr>
<td>2015</td>
<td>Consultant, Databricks, Investigating Errors in Big Data Systems</td>
</tr>
<tr>
<td>2015</td>
<td>Consultant, Microsoft Research, Investigating the Role of Data Scientists in a Software Company</td>
</tr>
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5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations

<table>
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<tr>
<th>Year</th>
<th>Membership Description</th>
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<tr>
<td>2019</td>
<td>Program Co-Chair, The 35th IEEE International Conference on Software Maintenance and Evolution (ICSME 2019)</td>
</tr>
<tr>
<td>2016 - 2018</td>
<td>Steering Committee Member, International Conference on Mining Software Repositories</td>
</tr>
<tr>
<td></td>
<td>Program Board Member, 38th ACM/IEEE International Conference on Software Engineering (ICSE 2016)</td>
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<td>Program Board Member, 39th ACM/IEEE International Conference on Software Engineering (ICSE 2017)</td>
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7. Honors and Awards

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<th>Award Description</th>
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<tr>
<td>2017</td>
<td>Faculty/Staff of the Year Award for Faculty-In-Residence at UCLA Residential Life, UCLA Chapter of the National Residence Hall Honorary</td>
</tr>
<tr>
<td>2017</td>
<td>Senior Member, Association for Computing Machinery</td>
</tr>
<tr>
<td>2015</td>
<td>Okawa Research Grant Award, Okawa Foundation</td>
</tr>
<tr>
<td>2014</td>
<td>Google Research Award, Google</td>
</tr>
<tr>
<td>2013</td>
<td>Invited Speaker at the UVa CS Top Gun Series, University of Virginia</td>
</tr>
<tr>
<td>2013</td>
<td>Paper Selected for Expedited Journal Publication, ASE</td>
</tr>
<tr>
<td>2012</td>
<td>Paper Selected for Expedited Journal Publication, MSR</td>
</tr>
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<td>2011</td>
<td>NSF CAREER Award, National Science Foundation</td>
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8. Service Activities (a) Committee Services

<table>
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<tr>
<th>Year</th>
<th>Position</th>
<th>Institutional Role Description</th>
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<tr>
<td>2016 - present</td>
<td>Department Chair</td>
<td>CS Diversity Committee</td>
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<tr>
<td>2016 - present</td>
<td>University Wide</td>
<td>Faculty in Residence, UCLA Office of Residential Life</td>
</tr>
</tbody>
</table>
2015 University Wide Member, Diversity Committee in Henry Samueli School of Engineering and Applied Science (UCLA)
2015 - present Department Faculty Sponsor of ACM-W (UCLA)
2014 - 2015 Department CS201 Coordinator

Service Activities (c) Other Professional Activities

<table>
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<tr>
<th>Date</th>
<th>Event Description</th>
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<tbody>
<tr>
<td>Sep 2017</td>
<td>Panelist, National Science Foundation</td>
</tr>
<tr>
<td>Jul 2017</td>
<td>Outreach, I designed outreach activities that teach Computer Science to 4 to 6 year old children using hands-on activities without using computers. Its story was featured in PC Magazine and DailyBruin.</td>
</tr>
<tr>
<td>Jun 2017</td>
<td>Invited Talk, &quot;Interactive and Automated Debugging for Big Data Analytics,&quot; LMU Munich, Germany</td>
</tr>
<tr>
<td>Jun 2017</td>
<td>Invited Talk, &quot;Interactive and Automated Debugging for Big Data Analytics,&quot; University of College London</td>
</tr>
<tr>
<td>Apr 2017</td>
<td>Panelist, National Science Foundation</td>
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9. Publications

Books, Chapters in Books and Editorships

Kim, M., Five Steps for Success: How to Deploy Data Science in Your Organizations Perspectives on Data Science for Software Engineering, Menzies, T., Williams, L., Zimmermann, T, 245-248 (Jul 2016)

Papers Published in Professional & Scholarly Journals


10: Professional Development Activities

N/A
1. Name
RICHARD E. KORF, Professor, Computer Science

2. Education
<table>
<thead>
<tr>
<th>Date</th>
<th>Degree</th>
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<th>Field</th>
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<tr>
<td>Jun 1977</td>
<td>B.S.</td>
<td>Massachusetts Institute of Technology</td>
<td>Electrical Engineering and Computer Science</td>
</tr>
<tr>
<td>Aug 1980</td>
<td>M.S.</td>
<td>Carnegie-Mellon University</td>
<td>Computer Science</td>
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<tr>
<td>May 1983</td>
<td>Ph.D.</td>
<td>Carnegie-Mellon University</td>
<td>Computer Science</td>
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3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
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<tr>
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<tr>
<td>Jul 1985</td>
<td>Appointment to Assistant Professor</td>
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<tr>
<td>Jul 1988</td>
<td>Promotion to Associate Professor</td>
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<tr>
<td>Jul 1995</td>
<td>Promotion to Professor</td>
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</table>

years of service: 33

Academic & Non-Academic Experience (b) Employment History
<table>
<thead>
<tr>
<th>Date</th>
<th>Position</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>07/01/1995</td>
<td>Professor</td>
<td>UCLA</td>
</tr>
<tr>
<td>07/01/1988 - 06/30/1995</td>
<td>Associate Professor</td>
<td>UCLA</td>
</tr>
<tr>
<td>06/30/1995</td>
<td></td>
<td></td>
</tr>
<tr>
<td>07/01/1985 - 06/30/1988</td>
<td>Assistant Professor</td>
<td>UCLA</td>
</tr>
<tr>
<td>Jul 1983 - May 1985</td>
<td>Assistant Professor</td>
<td>Columbia University</td>
</tr>
</tbody>
</table>

Academic & Non-Academic Experience (c) Consulting Activities
<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug 1990</td>
<td>Consultant, NTT Corporation</td>
</tr>
<tr>
<td>Jul 1988</td>
<td>Consultant, FMC Corporation</td>
</tr>
<tr>
<td>Mar 1987</td>
<td>Consultant, Technology Transfer Institute</td>
</tr>
<tr>
<td>Aug 1986</td>
<td>Consultant, American Association for Artificial Intelligence</td>
</tr>
</tbody>
</table>

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
<table>
<thead>
<tr>
<th>Date</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul 1995 - Jul 1998</td>
<td>Councilor, American Association for Artificial Intelligence</td>
</tr>
<tr>
<td>Jan 1983 - present</td>
<td>Member, American Association for Artificial Intelligence (AAAI)</td>
</tr>
<tr>
<td>May 1977 - present</td>
<td>Member, ETA Kappa Nu</td>
</tr>
</tbody>
</table>

7. Honors and Awards
<table>
<thead>
<tr>
<th>Date</th>
<th>Award</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul 2018</td>
<td>Invited Speaker, Symposium on Combinatorial Search (SoCS-2018)</td>
</tr>
<tr>
<td>Jun 2018</td>
<td>Invited Speaker, International Conference on Automated Planning and Scheduling</td>
</tr>
<tr>
<td>Jul 2016</td>
<td>Classic Paper Award, Artificial Intelligence Journal</td>
</tr>
<tr>
<td>Jul 2008</td>
<td>Outstanding Senior Program Committee Member, Assoc. for the Advancement of Artificial Intel.</td>
</tr>
<tr>
<td>Jul 2007</td>
<td>Honorable Mention, Best-Paper Award, IJCAI-JAIR</td>
</tr>
<tr>
<td>Jul 2006</td>
<td>Honorable Mention, AAAI Classic Paper Award, American Association for Artificial Intelligence</td>
</tr>
<tr>
<td>2005</td>
<td>Excellence in Teaching Award, Lockheed Martin</td>
</tr>
<tr>
<td>Jul 2000</td>
<td>Invited Speaker, National Conference on Artificial Intelligence, AAAI-2000, American Association for Artificial Intelligence</td>
</tr>
</tbody>
</table>

8. Service Activities (a) Committee Services
<table>
<thead>
<tr>
<th>Date</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>Department Member, Space Committee</td>
</tr>
<tr>
<td>Jul 2015 - present</td>
<td>Department Vice Chair, Undergraduate Programs</td>
</tr>
<tr>
<td>Apr 2015 - Jun 2015</td>
<td>Department Chair, Written Qualifying Exam (WQE)</td>
</tr>
</tbody>
</table>
May 2014 - Dec 2014 University Wide Member, HSSEAS Dean Search Committee
2014
2014 - 2015 Department Member, Ph.D. Funding Committee
Sep 2013 - Aug 2016 Academic Senate Member, Grievance Advisory Committee
2013 - 2014 Department Member, By-Law 55 Committee
Jul 2011 - Jun 2012 University Wide Member, Graduate Division Sponsorship Group
Sep 2009 - Sep 2012 Academic Senate Member, Legislative Assembly
Jan 2009 - 06/30/2012 Department Vice Chair, Graduate Programs
Sep 2008 - Sep 2011 Academic Senate Member, Committee on Charges

Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
2015 Program Committee Member, Association for the Advancement of Artificial Intelligence (AAAI)
2015 Program Committee Member, International Joint Conference on Artificial Intelligence (IJCAI)
2015 Program Committee Member, International Symposium on Combinatorial Search (SoCS)
2014 Program Committee Member, Association for the Advancement of Artificial Intelligence (AAAI)
2014 Program Committee Member, International Symposium on AI and Mathematics (ISAIM)
2014 Program Committee Member, International Symposium on Combinatorial Search (SoCS)
2013 Program Committee Member, Association for the Advancement of Artificial Intelligence (AAAI)
2013 Program Committee Member, International Symposium on Combinatorial Search (SoCS)
2012 Program Committee Member, Association for the Advancement of Artificial Intelligence (AAAI)
2012 Program Committee Member, International Conference on Automated Planning and Scheduling (ICAPS)
2012 Program Committee Member, International Symposium on AI and Mathematics
2012 Program Committee Member, International Symposium on Combinatorial Search (SoCS)
2011 Member, Award Panel, Computing Research Association Undergraduate Research Awards
2011 Program Committee Member, Association for the Advancement of Artificial Intelligence (AAAI)
2011 Program Committee Member, International Conference on Automated Planning and Scheduling (ICAPS)
2011 Program Committee Member, International Joint Conference on Artificial Intelligence (IJCAI)
2011 Program Committee Member, International Symposium on Combinatorial Search (SoCS)
2010 Program Committee Member, Association for the Advancement of Artificial Intelligence (AAAI)
2010 Program Committee Member, International Conference on Automated Planning and Scheduling (ICAPS)
2010  Program Committee Member, International Symposium on Combinatorial Search (SoCS)
2010  Program Committee Member, International Symposium on Artificial Intelligence and Mathematics
2009  Program Committee Member, International Conference on Automated Planning and Scheduling (ICAPS)
2009  Program Committee Member, International Joint Conference on Artificial Intelligence (IJCAI)
2009  Program Committee Member, International Symposium on Combinatorial Search (SoCS)
2009  Program Committee Member, Symposium on Abstraction, Reformulation, and Approximation (SARA)

9. Publications

Books, Chapters in Books and Editorships

Papers Published in Professional & Scholarly Journals

Papers Published in Proceedings or Records of Conf/Symposia
R.E. Korf, Minimizing disk I/O in two-bit breadth-first search Proceedings of the Association for the Advancement of Artificial Intelligence, (Jul 2008)
Breyer T., and R.E. Korf, 1.6 bit pattern databases Symposium on Combinatorial Search (SOCS-09), (Jul 2009)
Dow, A., and R.E. Korf, Duplicate avoidance in depth-first search with applications to treewidth Proceedings of the International Joint Conference on Artificial Intelligence (IJCAI-09), 480-485 (Jul 2009)
Korf, R.E., Multi-way number partitioning Proceedings of the International Joint Conference on Artificial Intelligence (IJCAI-09), 538-543 (Jul 2009)
Huang, E., and R.E. Korf, New improvements in optimal rectangle packing Proceedings of the International Joint Conference on Artificial Intelligence (IJCAI-09), 511-516 (Jul 2009)
Breyer, T.M., and R.E. Korf, 1.6-Bit pattern databases Proceedings of the Association for the Advancement of Artificial Intelligence (AAAI-10), 39-44 (Jul 2010)
Breyer, T.M., and R.E. Korf, Independent additive heuristics reduce search multiplicatively Proceedings of the Association for the Advancement of Artificial Intelligence (AAAI-10), 33-38 (Jul 2010)
R.E. Korf, Objective functions for multi-way number partitioning Proceedings of the Symposium on Combinatorial Search (SOCS-10), 71-72 (Jul 2010)
Huang, E., and R.E. Korf, Optimal rectangle packing on non-square benchmarks Proceedings of the Association for the Advancement of Artificial Intelligence (AAAI-10), 83-88 (Jul 2010)

Standley, T., and R.E. Korf, Complete approximation algorithms for optimal pathfinding problems Proceedings of the International Joint Conference on Artificial Intelligence (IJCAI-11), 668-673 (Jul 2011)


Korf, R. E., Research Challenges in Combinatorial Search Proceedings of the Association for the Advancement of Artificial Intelligence, Toronto, Canada, 2129-2133 (Jul 2012)

Barker, J., and R.E. Korf, Solving Dots and Boxes Proceedings of the Association for the Advancement of Artificial Intelligence (AAAI-12), Toronto, Canada., 414-419 (Jul 2012)

Barker, J., and R.E. Korf, Solving Peg Solitaire with bidirectional BFIDA* Proceedings of the Association for the Advancement of Artificial Intelligence (AAAI-12), Toronto, Canada, 419-426 (Jul 2012)

Korf, R.E., and E.L. Schreiber, Optimally scheduling small numbers of identical parallel machines Proceedings of the 23rd International Conference on Automated Planning and Scheduling (ICAPS-2013), 144-152 (Jun 2013)


Korf, R.E., E.L. Schreiber, and M.D. Moffitt, Optimal sequential multi-way number partitioning International Symposium on Artificial Intelligence and Mathematics (ISAIM-2014), 1-7 (Jan 2014)


Korf, R.E., How do you know that your search algorithm and code are correct? Proceedings of the 7th International Symposium on Combinatorial Search (S0CS-2014), 200-201 (Aug 2014)

J. Barker and R.E. Korf, Limitations of front-to-end bidirectional search Proceedings of the Association for the Advancement of Artificial Intelligence (AAAI), 1086-1092 (Jan 2015)

Korf, R.E., Comparing search algorithms using sorting and hashing on disk and in memory International Joint Conference on Artificial Intelligence (IJCAI-2016), 610-616 (Jul 2016)

10: Professional Development Activities

N/A
1. Name
SONGWU LU, Professor, Computer Science

2. Education
<table>
<thead>
<tr>
<th>Date</th>
<th>Degree</th>
<th>Institution</th>
<th>Field</th>
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<tbody>
<tr>
<td>Jul 1990</td>
<td>B.S.</td>
<td>University of Science and Technology of</td>
<td>Electrical Engineering and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>China</td>
<td>Mechanical Engineering</td>
</tr>
<tr>
<td>10/15/1996</td>
<td>M.S.</td>
<td>University of Illinois at Urbana-Champaign</td>
<td>Electrical and Engineering</td>
</tr>
<tr>
<td>05/14/2000</td>
<td>Ph.D.</td>
<td>University of Illinois at Urbana-Champaign</td>
<td>Electrical Engineering</td>
</tr>
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</table>

3. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
- Aug 1999  Appointment to Assistant Professor
- Jul 2005  Promotion to Associate Professor
- Jul 2010  Promotion to Professor

years of service: 19

3. Academic & Non-Academic Experience (b) Employment History
<table>
<thead>
<tr>
<th>Date</th>
<th>Position</th>
<th>Institution</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul 2005</td>
<td>Associate Professor</td>
<td>University of California at Los Angeles</td>
<td>UCLA</td>
</tr>
<tr>
<td>Jul 1999 - Jun 2005</td>
<td>Assistant Professor</td>
<td>University of Illinois Urbana-Champaign</td>
<td></td>
</tr>
<tr>
<td>Jan 1996 - May 1999</td>
<td>PhD Student</td>
<td>University of Illinois Urbana-Champaign</td>
<td></td>
</tr>
<tr>
<td>Sep 1990 - Jul 1993</td>
<td>Research Engineer</td>
<td>Shenzhen Industrial Research Institute, Shenzhen, China</td>
<td></td>
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3. Academic & Non-Academic Experience (c) Consulting Activities
<table>
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<tr>
<th>Date</th>
<th>Activity Description</th>
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<tbody>
<tr>
<td>Jun 2017 -</td>
<td>Technology Consultant, U9 Technology Inc., Beijing, China, served as a technology</td>
</tr>
<tr>
<td>07/19/2017</td>
<td>consultant for a month over the summer</td>
</tr>
<tr>
<td>Oct 2015 -</td>
<td>Hiring Consultant, Peking University, served as consultant for new hires each year</td>
</tr>
<tr>
<td>Jul 2017</td>
<td>Hiring Consultant, Peking University, served as consultant for new hires for one</td>
</tr>
<tr>
<td>Aug 2015 -</td>
<td>month</td>
</tr>
<tr>
<td>Sep 2013 -</td>
<td>Course Instructor for MS Online Program, UCLA SEAS, taught CS211 for MSOL</td>
</tr>
<tr>
<td>Jan 2014</td>
<td>Hiring Consultant, Peking University, served as consultant for PKU new hires for 6</td>
</tr>
<tr>
<td>Aug 2013 -</td>
<td>weeks</td>
</tr>
<tr>
<td>Sep 2013 -</td>
<td>Hiring Consultant, Peking University, served as consultant for PKU new hires for 1.5</td>
</tr>
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<td></td>
<td>months</td>
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5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
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<tr>
<th>Year</th>
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<th>Organization</th>
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<tbody>
<tr>
<td>2006</td>
<td>Senior Member, IEEE</td>
<td></td>
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<tr>
<td>1999 - present</td>
<td>Member, ACM</td>
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<td>1995 - 2005</td>
<td>Member, IEEE</td>
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7. Honors and Awards
<table>
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<tr>
<th>Year</th>
<th>Award Description</th>
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<tbody>
<tr>
<td>2017</td>
<td>Best community paper award, ACM MobiCom'17</td>
</tr>
<tr>
<td>01/01/2016</td>
<td>IEEE Fellow, IEEE</td>
</tr>
<tr>
<td>2016</td>
<td>Best Community Paper Award, ACM MobiCom</td>
</tr>
<tr>
<td>2011</td>
<td>Best paper awards, IEEE ISCC2011</td>
</tr>
<tr>
<td>2006</td>
<td>Appreciation Services, ACM</td>
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8. Service Activities (a) Committee Services
<table>
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<tr>
<th>Date</th>
<th>Other</th>
<th>Committee member, department bylaw committee</th>
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<tbody>
<tr>
<td>Fall 2017 - present</td>
<td>Other</td>
<td>Committee member, department bylaw committee</td>
</tr>
</tbody>
</table>
Fall 2016 - Sum1 Other Departmental Banking Committee 2017
Fall 2016 - Sum1 Other Departmental WQE Committee, Chaired WQE for Spring 2017 2017
Fall 2016 - ongoing Other Field Chair, Networking Field Chair
Fall 2015 - Sprg Department Member of PhD Funding Committee 2016

Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
Dec 2017 - Feb 2018 Panelist for NSF SaTC program, Review panelist for NSF SaTC medium program 06/29/2017 - Session Co-Chair for "Augmented and Virtual Reality", 8th RJI symposium by 06/30/2017 UCLA and PKU
Dec 2016 Invited Talk, Tsinghua University
Nov 2016 Invited Talk, Shanghai Jiaotong University
Mar 2016 - Apr 2016 NSF Panelist for SaTC Program, Panelist on NSF Review Panel for SaTC Program

9. Publications

Papers Published in Professional & Scholarly Journals

Papers Published in Proceedings or Records of Conf/Symposia
Muhammad Taqi Raza, Songwu Lu., Enabling low latency and high reliability for IMS-NFV 13th International Conference on Network and Service Management (CNSM), 1-9 (Nov 2017)

10: Professional Development Activities
N/A
1. Name
    SERGHEI MANGUL, Lecturer, Computer Science

2. Education
    2007    B.S.    Moldova State University
    2012    Ph.D.    Georgia State University

3. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
    No Data

4. Academic & Non-Academic Experience (b) Employment History
    2018 - 2018    Lecturer    University of California, Los Angeles
    2013 - present    Postdoctoral Fellow    University of California, Los Angeles

5. Certifications or Professional Registrations
    N/A

6. Current Membership In Professional Organizations
    N/A

7. Honors and Awards
    N/A

8. Service Activities (a) Committee Services
    N/A

9. Publications
    N/A

10. Professional Development Activities
    N/A
1. Name
   No Data

2. Education
   May 2005  B.S.  Indian Institute of Technology Madras,  Bachelor of Technology
               Chennai India
   Aug 2011  Ph.D. University of Texas at Austin  Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
   No Data

Academic & Non-Academic Experience (b) Employment History
   Sep 2013 - Sep 2014 Researcher  Microsoft Research, Silicon Valley
   Aug 2012  Consulting Researcher  Microsoft Research, Silicon Valley
   Sep 2011 - Aug 2013 Postdoctoral member  Institute for Advanced Study,
                                           Princeton and DIMACS, Rutgers
   May 2011 - Jul 2011 Intern  Microsoft Research, Silicon Valley
   Jun 2010 - Sep 2010 Intern  Microsoft Research, Silicon Valley

Academic & Non-Academic Experience (c) Consulting Activities
   2015  Research Consultant, Microsoft, Research in Complexity

5. Certifications or Professional Registrations
   N/A

6. Current Membership In Professional Organizations
   Feb 2016  Panelist, National Science Foundation
   2016  Program Committee Member, 43rd International Colloquium on Automata,
         Languages and Programming (ICALP)
   2016  Program Committee Member, 57th IEEE Annual Symposium on Foundations of
         Computer Science (FOCS)
   2015  Program Committee Member, Random
   2014  Program Committee Member, 55th Symposium on Foundations of Computer
         Science (FOCS)

7. Honors and Awards
   Oct 2015  Plenary speaker at International Workshop on RANDOM, APPROX-RANDOM
   2011  Bert Kay Best Dissertation award, University of Texas at Austin
   2005  Deans Excellence award, University of Texas at Austin.
   2005  MCD Fellowship, University of Texas at Austin.

8. Service Activities (a) Committee Services
   01/09/2017 -  Department  Organizer, Graduate student visit day
   03/15/2017
   09/01/2016 -  Department  WQE Chair, Manage department's WQE submissions for Fall
   12/31/2016
   01/01/2016 -  Department  Organizer, Graduate student visit day
   03/15/2016
   2015 - 2016  Department  MS Admission Committee
   2015 - present  University Wide  Organizer, LATS: LA Theory Seminar

Service Activities (b) Community Services
   N/A
Service Activities (c) Other Professional Activities

Mar 2017  Workshop Organizer, Workshop on "Proving and Using Pseudorandomness" at Simons Institute at University of California, Berkeley

Jan 2017  Invited participant, Invited long-term participant at a semester-long program on "Foundations of Machine Learning" being held at the Simons Institute at University of California, Berkeley.

Jan 2017  Invited participant, Invited long-term participant at a semester-long program on "Pseudorandomness" being held at the Simons Institute at University of California, Berkeley.

Sep 2016  Invited participant, Workshop on Computational Complexity, Banff International Research Station

Jul 2016  Invited Talk, Harvard Theory Group

9. Publications

Papers Published in Professional & Scholarly Journals

Prahldh Harsha, Adam Klivans, Raghu Mela, Bounding the Sensitivity of Polynomial Threshold Functions Theory of Computing, 10: (2014)


Papers Published in Proceedings or Records of Conf/Symposia


Parikshit Gopalan, Daniel Kane, Raghu Meka, Pseudorandomness via the discrete Fourier transform 56th IEEE Symposium on Foundations of Computer Science(FOCS), (2015)


Approximating Rectangles by Juntas and Weakly-Exponential Lower Bounds for LP Relaxations of CSPs, Pravesh Kothari, Raghu Meka, Prasad Raghavendra 49th ACM Symposium on Theory of Computing (STOC), (2017)

10: Professional Development Activities

N/A
1. Name
TODD D. MILLSTEIN, Associate Professor, Computer Science

2. Education
May 1996  A.B.  Brown University  Computer Science
Mar 1998  M.S.  University of Washington  Computer Science
Dec 2003  Ph.D.  University of Washington  Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Nov 2003  Appointment to Assistant Professor
Jul 2009  Promotion to Associate Professor

4. Academic & Non-Academic Experience (b) Employment History
Jul 2015 - present  Professor  University of California, Los Angeles
Jul 2012 - Sep 2012  Visiting Researcher  Microsoft Research Redmond
Jul 2010 - Jan 2011  Academic Visitor  University of Oxford
Jul 2009 - Jun 2015  Associate Professor  University of California, Los Angeles
Nov 2003 - Jun 2009  Assistant Professor  University of California, Los Angeles

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
N/A

7. Honors and Awards
2017  Our LoopInvGen tool for loop invariant inference was the winner of the Invariant Synthesis track., The 4th Syntax Guided Synthesis Competition (SyGuS-Comp 2017)
Aug 2016  Best Paper Award, SIGCOMM 2016, ACM SIGCOMM
Jul 2016  Microsoft Research Outstanding Collaborator, Microsoft Research
Jul 2016  Okawa Foundation Research Grant recipient, The Okawa Foundation
Jan 2016  Northrop Grumman Excellence in Teaching Award, UCLA Engineering

8. Service Activities (a) Committee Services
2017 - 2018  Department  Committee Chair, Bylaw 55 Committee
2017 - 2018  Department  Committee Member, Faculty Recruiting Committee
2017 - 2018  Department  Committee Member, Undergraduate Program Committee

Service Activities (c) Other Professional Activities
Mar 2017 - present  Advisory Board member, NSF-sponsored Debugging Failure project, a collaborative research project between the Graduate Schools of Education at UCLA and UC Berkeley and the non-profit 9 Dots
Aug 2016  Invited Speaker, "Invariant Inference for Program Specification and Verification" presented at Sandia National Labs
Sep 2016  Invited Speaker, "Invariant Inference for Program Specification and Verification" presented at the USC Computer Engineering Seminar Series
2016  Program Committee Member, ACM Conference on Programming Language Design and Implementation (PLDI 2016)

9. Publications
Books, Chapters in Books and Editorships

**Papers Published in Professional & Scholarly Journals**


Marino, D., Singh, A., Millstein, T., Musuvathi, M., Narayanasamy, S., DRFx: An Understandable, High Performance, and Flexible Memory Model for Concurrent Languages ACM Transactions on Programming Languages and Systems (TOPLAS), (2016)


**Papers Published in Proceedings or Records of Conf/Symposia**

Felgentreff, T., Millstein, T., Borning, A., Hirschfeld, R., Checks and Balances - Constraint Solving without Surprises in Object-Constra... Programming Languages Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA 2015), 767-782 (Oct 2015)


Padhi, S., Sharma,R., Millstein, T., Data-Driven Precondition Inference with Learned Features ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI 2016), 42-56 (Jun 2016)


Steven Holtzen, Todd Millstein, and Guy Van den Broeck, Probabilistic Program Abstractions Conference on Uncertainty in Artificial Intelligence (UAI 2017), (2017)

**10: Professional Development Activities**

N/A
1. Name
ANDREW MUTZ, Lecturer, Computer Science

2. Education
2001 B.S. University of California, Santa Barbara
2008 Ph.D. University of California, Santa Barbara

3., 4. Academic & Non-Academic Experience
(a) UCLA HSSEAS Appointment History
No Data

(b) Employment History
2009 - present Chief Technology Officer, Property Management Appfolio, Inc.

(c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
N/A

7. Honors and Awards
California MICRO Grant Recipient
National Merit Finalist
UC Regents Scholar

8. Service Activities
(a) Committee Services
N/A

(b) Community Services
N/A

(c) Other Professional Activities
N/A

9. Publications
Papers Published in Proceedings or Records of Conf/Symposia

10. Professional Development Activities
N/A
1. Name
CAREY NACHENBERG, Adjunct Assistant Professor, Computer Science

2. Education
Jun 1995 Bachelors UCLA Computer Science and Engineering
Jun 1995 Masters UCLA Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
No Data

Academic & Non-Academic Experience (b) Employment History
07/11/2016 - ongoing Principal Engineer Google[x]
Jan 2001 - ongoing Lecturer/Adjunct Assistant Professor UCLA
Jul 1995 - Jul 2016 Fellow, Vice President Symantec Corp.

Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
N/A

7. Honors and Awards
2010 Awarded the Wall Street Journal's 2010 Technology Innovation Award for Computer Security
2008 UCLA School of Engineering and Applied Science Community Service Award
2007 Named on Computer World's "40 under 40" list

8. Service Activities (a) Committee Services
N/A

Service Activities (b) Community Services
Jan 2009 Volunteer professor, UCLA, I volunteer my time as a UCLA professor. I am not paid for this work.
Apr 2008 - ongoing Speaker, UCLA School of Engineering, Speaker for UCLA Engineering Open House - give a talk from an Alumnus's perspective on why these prospective students should attend UCLA

Service Activities (c) Other Professional Activities
10/27/2015 Speaker, UC Berkeley Center for Long Term CyberSecurity - Gave a talk on cyber-security - https://www.youtube.com/watch?v=bR6mprNvuCI
08/10/2015 Speaker, Google Los Angeles - Gave a talk on the Stuxnet virus - https://www.youtube.com/watch?v=jQtPqlh5CpE
04/01/2015 Speaker, Stanford Computer Systems Colloquium - Gave a talk on Deep Learning - https://www.youtube.com/watch?v=hlPhtUuUCdU
9. Publications

*Books, Chapters in Books and Editorships*


10: Professional Development Activities

N/A
1. Name
ANTHONY J. NOWATZKI, Assistant Professor, Computer Science

2. Education

<table>
<thead>
<tr>
<th>Year</th>
<th>Degree</th>
<th>Institution</th>
<th>Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>B.S.</td>
<td>University of Minnesota-Twin Cities</td>
<td>Computer Science &amp; Computer Engineering</td>
</tr>
<tr>
<td>May 2011</td>
<td>M.S.</td>
<td>University of Wisconsin -- Madison</td>
<td>Computer Sciences</td>
</tr>
<tr>
<td>Dec 2016</td>
<td>Ph.D.</td>
<td>University of Wisconsin -- Madison</td>
<td>Computer Sciences</td>
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3., 4. Academic & Non-Academic Experience

3. (a) UCLA HSSEAS Appointment History
No Data

4. (b) Employment History

**Academic & Non-Academic Experience**

<table>
<thead>
<tr>
<th>Period</th>
<th>Role</th>
<th>Institution</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum1 2011 - Sum1 2012</td>
<td>Intern</td>
<td>Qualcomm, Qualcomm Research Silicon Valley</td>
<td></td>
</tr>
<tr>
<td>Jun 2010 - present</td>
<td>Research Assistant</td>
<td>University of Wisconsin, Vertical Research Group</td>
<td></td>
</tr>
<tr>
<td>Fall 2009 - Sprg 2011</td>
<td>Teaching Assistant</td>
<td>University of Wisconsin, Department of Computer Sciences</td>
<td></td>
</tr>
<tr>
<td>2005 - 2009</td>
<td>Application Programmer</td>
<td>University of Minnesota, Digital Technology Center</td>
<td></td>
</tr>
</tbody>
</table>

5. Certifications or Professional Registrations
N/A

6. Current Membership in Professional Organizations
2017 Micro 2017 Program Committee Member

7. Honors and Awards

<table>
<thead>
<tr>
<th>Year</th>
<th>Honor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun 2017</td>
<td>Top Picks in Computer Architecture: Domain Specialization is Generally Unnecessary for Accelerators, IEEE Micro</td>
</tr>
<tr>
<td>2016</td>
<td>Top Picks in Computer Architecture: A Heterogeneous Von Neumann/Explicit Dataflow Processor., IEEE Micro</td>
</tr>
<tr>
<td>2014</td>
<td>Google PhD Fellowship in Computer Architecture</td>
</tr>
<tr>
<td>2013</td>
<td>Distinguished Paper Award, PLDI</td>
</tr>
<tr>
<td>2013</td>
<td>Publication Nomination for a CACM Research Highlights, SIGPLAN</td>
</tr>
<tr>
<td>2009</td>
<td>University of Wisconsin Alumni Scholar</td>
</tr>
<tr>
<td>2007</td>
<td>Roger M. Norby Engineering Scholarship</td>
</tr>
<tr>
<td>2006</td>
<td>John Tate Scholarship</td>
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</tbody>
</table>

8. Service Activities

8. (a) Committee Services
N/A

8. (c) Other Professional Activities

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/22/2017</td>
<td>Invited Keynote Talk at AGP 2017, General Purpose Acceleration and the Challenges for Irregular Workloads</td>
</tr>
<tr>
<td>Dec 2015</td>
<td>Invited Talk, Transparency Specialized Cores. Intel, Santa Clara</td>
</tr>
<tr>
<td>Sep 2012</td>
<td>Invited Talk, Automatic Data-Parallel acceleration using CGRAs. Qualcomm MMR&amp;D, San Diego</td>
</tr>
<tr>
<td>Aug 2012</td>
<td>Poster:, &quot;Prototyping the DySER Specialization Architecture with OpenSPARC&quot; Hot Chips</td>
</tr>
</tbody>
</table>
9. Publications

Books, Chapters in Books and Editorships

Papers Published in Professional & Scholarly Journals
Nowatzki, T., Menon, J., Ho, C., Sankaralingam, K., Architectural Simulators Considered Harmful 4-12 (2015)
Nowatzki, T., Govindaraju, V., Sankaralingam, K., A Graph-based Program Representation for Analyzing Hardware Specialization Approaches 94-98 (09/04/2015)
Nowatzki, T., Gangadhar, V., Sankaralingam, K., Wright, G., Domain Specialization is Generally Unnecessary for Accelerators IEEE Micro, 1-8 (Jun 2017)
Gupta, G., Nowatzki, T., Gangadhar, V., Sankaralingam, K., Kickstarting Semiconductor Innovation with Open Source Hardware IEEE Computer, 50-59 (Jun 2017)

Papers Published in Proceedings or Records of Conf/Symposia
Nowatzki, T., Gangadhar, V., Sankaralingam, K., Wright, G., Pushing the Limits of Accelerator Efficiency While Retaining General-Purpose Programmability HPCA, 27-39 (2016)
Nowatzki, T., Gangadhar, N., Ardalani, N., Sankaralingam, K., Stream-Dataflow Acceleration ISCA, 1-14 (Jun 2017)

10: Professional Development Activities
N/A
1. Name
RAFAIL OSTROVSKY, Professor, Computer Science

2. Education
Mathematics
1987 M.S. Computer Science; Boston University, Boston, Massachusetts
Computer Science
1992 Ph.D. Computer Science; Massachusetts Institute of Technology, Cambridge, Massachusetts
Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 2003 Appointment to Professor
years of service: 15

Academic & Non-Academic Experience (b) Employment History
2008 - present Serving in the Board of Directors
Appointments Stealth Software Technologies, Inc
2006 - present Professor of Mathematics (by Courtesy)
Department of Mathematics University of California, Los Angeles
2003 - present Director, Center for Information and Computation Security (See http://web.cs.ucla.edu/security/)
School Of Engineering
2003 - present Professor
Computer Science Department University of California, Los Angeles
1999 - present Senior Research Scientist
Telcordia Technologies RM MCC IC-357 B Morristown, N.J.

Academic & Non-Academic Experience (c) Consulting Activities
2013 - 2014 Panelist, NSF, Panel Service
2013 - 2015 Consultant, HRL Labs LLC, Consultant
2008 - ongoing Board Member & Consultant, Stealth Software Technologies, Inc, consulting
2004 - ongoing Panelist, NSF, CYBERTRUST

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
2019 Program committee member, Eurocrypt 2019, Darmstadt, Germany.
Apr 2018 - present Member of the Theory of Computing Committee, Ad hoc committee to combat harassment and discrimination in the Theory of Computing community
2018 - present Steering Committee member, IEEE FOCS Conference
Apr 2017 - 05/04/2017 Program committee member, Eurocrypt, Paris
2017 Academic Senate, Divisional Representative

7. Honors and Awards
2017 IEEE Computer Society Technical Achievement Award, IEEE Computer Society
2017 IEEE Fellow, IEEE
8. Service Activities (a) Committee Services

2017 Other General Chair, FOCS
2017 - 2018 University Wide UC Academic Senate, Divisional Representative
2017 - present Other External Advisory Board, Johns Hopkins University Computer Science Department
Mar 2016 Other General Chair, FOCS
2016 - 2017 Department Member By-Law 55 Committee

9. Publications

Books, Chapters in Books and Editorships

Papers Published in Professional & Scholarly Journals
Felber, D., Ostrovsky, R., A Randomized Online Quantile Summary in O((1/\&\#949;) log(1/\&\#949;)) Words Theory of Computing 13(1):, 1-17 (2017)

Papers Published in Proceedings or Records of Conf/Symposia
Lu, S., Ostrovsky, R.,, Black-Box Parallel Garbled RAM 66-92 (2017)
Chongchitmate, W., Ostrovsky,R., Circuit-Private Multi-key FHE 241-270 (2017)

10: Professional Development Activities
N/A
1. Name
JENS PALSBERG, Professor, Computer Science

2. Education
1988 M.S. University of Aarhus, Denmark Computer Science & Math
1992 Ph.D. University of Aarhus, Denmark Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 2003 Appointment to Professor

years of service: 15

Academic & Non-Academic Experience (b) Employment History
Sep 2010 - present Chair of Computer Science UCLA
Apr 2010 - Sep 2010 Visiting Professor University of Aarhus, Denmark
Jul 2005 - Sep 2007 Graduate Vice Chair, Computer Science UCLA
Jul 2003 - May 2006 Adjunct Professor of Computer Science Purdue University
Jul 2003 - present Professor of Computer Science UCLA

Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
2016 Member, Program Committee, CC’16, International Conference on Compiler Construction (Barcelona)
2016 Member, Program Committee, OOPSLA’16, (Amsterdam)
2015 Chair, external review committee, University of Texas, Dallas, Computer Science Department
2015 Member, Program Committee, X10’15, ACM SIGPLAN X10 Workshop (Portland, Oregon)
2015 Member, U.S. National Science Foundation Review Panel, In the Computer and Information Science and Engineering directorate: Software and Hardware Foundations

7. Honors and Awards
2012 Distinguished Service Award, ACM SIGPLAN
2006 Distinguished Speaker, ACM
2005 Faculty Award, IBM
2003 Okawa Foundation Research Award, Okawa Foundation
2001 One of the Ten Best Teachers of Undergraduates in the School of Science, Purdue University, for 2001, as selected by junior and senior science students, Purdue University

8. Service Activities (a) Committee Services
2012 - 2015 University Wide Member, Advisory Committee for the UCLA Academic Recruit program
Sep 2010 - Jun 2015 Department Department Chair
2009 - 2010 Department Member, By-Law 55 Committee
2008 - 2009 Department Member, Faculty Search Committee, Computer Science Department, UCLA
2008 - 2010 Department Chair, Awards Committee, Computer Science Department, UCLA
Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
Oct 2015  Lecturer, Invited talk, Carnegie Mellon University
Oct 2015  Lecturer, Invited talk, Harvey Mudd College
Aug 2015  Lecturer, Invited talk, University of Aarhus, Denmark
Nov 2014  Lecturer, Invited talk, National Taiwan University
Nov 2013  Lecturer, Invited talk, Georgia Institute of Technology

9. Publications

Books, Chapters in Books and Editorships
Havelund, K., Majumdar, K., Palsberg, J. (Eds.), Model Checking Software 15th International SPIN Workshop, 342 pp. (Aug 2008)
Palsberg, J. (Ed.), Semantics and Algebraic Specification, Essays Dedicated to Peter D. Mosses on the Occasion of His 60th Birthday (Sep 2009)
Jens Palsberg, Overloading is NP-complete Logic and Program Semantics, Essays Dedicated to Dexter Kozen on the Occasion of His 60th Birthday, Robert L. Constable and Alexandra Silva, 204-218 (2012)

Papers Published in Professional & Scholarly Journals

Papers Published in Proceedings or Records of Conf/Symposia
Freiberg, O., Palsberg, J., Eslamimehr, M., Retargetable communication for distributed programs Proceedings of QoSA’16, ACM SIGSOFT Conference on Quality of Software Architectures, Venice, Italy, 21-30 (Apr 2016)

10: Professional Development Activities
N/A
1. Name
BOGDAN PASANIUC, Assistant Professor, Pathology and Laboratory Medicine

2. Education
2003 B.S. University of Iasi, Iasi, Romania
2008 Ph.D. University of Connecticut

3. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
No Data

Academic & Non-Academic Experience (b) Employment History
2010 - 2012 Postdoctoral Fellow Harvard and MIT
2008 - 2010 Postdoctoral Fellow International Computer Science Institute

Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
N/A

7. Honors and Awards
2012 Stellar Abstract Award, 6th Annual Program in Quantitative Genetics Conference, Harvard School of Public Health, Boston, 2012
2012 Charles J. Epstein Trainee Semifinalist, American Society of Human Genetics, San Francisco
2008 Best Poster Award, 4th Int. Symposium on Bioinformatics Research and Applications, Atlanta

8. Service Activities (a) Committee Services
N/A

Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
N/A

9. Publications

10. Professional Development Activities
N/A
1. Name
PELLEGRINI, MATTEO, Professor, Department of Molecular, Cell and Developmental Biology

2. Education
1989  B.A.  Columbia University
1995  Ph.D.  Stanford University

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
2005  Appointment to Assistant Professor
2010  Associate Professor
2014  Promotion to Professor

Academic & Non-Academic Experience (b) Employment History
2004-2005  Research Fellow  Merck
1999-2004  President  Protein Pathways

Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
N/A

7. Honors and Awards
2007  Sloan Research Fellowship
1999  Paul Boyer Postdoctoral Award
1996  Sloan Foundation Postdoctoral Fellowship in Computational Biology

8. Service Activities (a) Committee Services
N/A

Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
N/A

9. Publications

10: Professional Development Activities
N/A
1. Name
MIODRAG POTKONJAK, Professor, Computer Science

2. Education
Dec 1982 B.S. University of Belgrade
Dec 1987 M.S. University of Belgrade
Dec 1991 Ph.D. University of California, Berkeley

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 1995 Appointment to Assistant Professor
Jul 1998 Promotion to Associate Professor
Jul 2000 Promotion to Professor
years of service: 23

Academic & Non-Academic Experience (b) Employment History
Jul 1995 - Assistant Professor
06/30/1998 University of California at Los Angeles, Los Angeles, CA
Aug 1987 - Oct 1991 Research Assistant University of California, Berkeley
Jan 1986 - Aug 1987 Research Fellow Serbian Academy of Sciences and Arts, Belgrade, Yugoslavia
Sep 1985 - Jun 1987 Instructor University of Belgrade, Yugoslavia

Academic & Non-Academic Experience (c) Consulting Activities
Sep 2009 Consultant, Perkins Coie
Apr 2009 Consultant, Su IP Consulting
Aug 2008 - present Consultant, Intellectual Ventures, Consultant - Inventor

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
1999 - present Member, CANDE
1999 - present Member, IEEE Computer Test Technology Council

7. Honors and Awards
Sep 2013 Best paper award at 23rd International Workshop on Power and Timing Modeling, Optimization and Simulation (PATMOS), PATMOS Conference
Jun 2013 DAC Most Papers in Fourth Decade. For publishing the most papers in the fourth decade of DAC's history, ACM/IEEE Design Automation Conference Executive Committee
Jun 2013 DAC Prolific Author Award. DAC 50 Club: Has published 50 or more papers at the Design Automation Conference, ACM/IEEE Design Automation Conference Executive Committee
Jun 2013 DAC Prolific Author in a Single Year. It is awarded to authors that have at least 6 papers in single year, ACM/IEEE Design Automation Conference Executive Committee

8. Service Activities (a) Committee Services
Sep 2013 - present University Wide Member, Privilege & Tenure Committee
Feb 2011 - present University Wide Reviewer, COR Faculty Grants
2011 - present Department Chair, Academic Policy Committee
Sep 2010 - present Department Member, Bylaw 55

Service Activities (c) Other Professional Activities
2016 - 2016 Program Committee Member, DAC 2016 - Design Automation Conference
2016 - 2016  Program Committee Member, ICASSP 2016 - IEEE International Conference on Acoustics, Speech and Signal Processing
2016 - 2016  Program Committee Member, MOBILITY 2016 - International Conference on Mobile Services, Resources, and Users
2016 - 2016  Program Committee Member, SENSORCOMM 2016 - International Conference on Sensor Technologies and Applications

9. Publications

Books, Chapters in Books and Editorships

Papers Published in Professional & Scholarly Journals

Papers Published in Proceedings or Records of Conf/Symposia
J. Guo, M. Potkonjak, Pruning Filters and Classes: Towards On-Device Customization of Convolutional Neural Networks International Workshop on Embedded and Mobile Deep Learning (Deep Learning for Mobile Systems and Applications) (EMDL@MobiSys), 13-17 (Jun 2017)
J. Guo, M. Potkonjak, Pruning ConvNets Online for Efficient Specialist Models IEEE Conference on Computer Vision and Pattern Recognition Workshops (CVPR Workshops), 430-437 (Jul 2017)

10: Professional Development Activities
N/A
1. Name
Ramin Ramezani, Adjunct Assistant Professor, Computer Science

2. Education
N/A

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
No Data

Academic & Non-Academic Experience (b) Employment History
- Jan 2017 - ongoing Co-Founder Invista Health Inc
- Jun 2015 - ongoing Adjunct Assistant Professor Department of Computer Science, UCLA

Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
N/A

7. Honors and Awards
N/A

8. Service Activities (a) Committee Services
N/A

Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
N/A

9. Publications
Books, Chapters in Books and Editorships
- Ramezani, R., An artificial intelligence framework for investigative reasoning Imperial College London Spiral, 1-376 (2014)

Papers Published in Professional & Scholarly Journals

Papers Published in Proceedings or Records of Conf/Symposia

Angelov, P., Ramezani, R. and Zhou, X., Autonomous novelty detection and object tracking in video streams using evolving clustering and takagi-sugeno type neuro-fuzzy system 2008 IEEE International Joint Conference on Neural Networks (IEEE World Congress on Computational Intelligence) (pp. 1456-1463). IEEE., 1456-1463 (06/01/2008)


Pease, A., Colton, S., Ramezani, R., Charnley, J. and Reed, K, A discussion on serendipity in creative systems Proceedings of the fourth international conference on computational creativity, 64-71 (2013)


10: Professional Development Activities

N/A
1. Name
PETER REIHER, Adjunct Professor, Computer Science

2. Education
1979 B.S. University of Notre Dame, Indiana Electrical Engineering
1983 M.S. University of California at Los Angeles, Computer Science Los Angeles, CA
1987 Ph.D. University of California at Los Angeles, Computer Science Los Angeles, California

3., 4. Academic & Non-Academic Experience
(a) UCLA HSSEAS Appointment History
No Data

(b) Employment History
Mar 1992 - present Principal Design Engineer UCLA
Nov 1987 - Mar 1992 Member of the Technical Staff Jet Propulsion Laboratory
Sep 1986 - Jan 1987 Visiting Professor, Computer Science Department Fudan University, Shanghai, China
1984 - 1986 Research Assistant UCLA
1982 - 1984 Systems Administrator UCLA, Mathematics Department

(c) Consulting Activities
Dec 2015 - Apr 2013 Expert witness consulting, Mobileiron Inc., Legal consulting
May 2015 - ongoing Expert witness consulting, Parallel Inc., Legal consulting
Jul 2012 - Dec 2012 Consultant, Inktank, Consulting on security for high scale storage systems.
2006 - 2006 Consultant, Fish and Richardson P.C., Legal consulting in case of Data Encryption Corporation vs. Microsoft Corporation.

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
2002 - present Member, IEEE
1994 - present Member, USENIX Association
1984 - present Member, ACM

7. Honors and Awards
N/A

8. Service Activities
(a) Committee Services
Sep 2015 - ongoing Department Department ABET supervisor, Handling ABET accreditation issues for Computer Science Department.
2013 Department Supervisor of Spring quarter WQE exam, Supervising administration of written qualifying exam for Ph.D. students in spring quarter, 2013.

(b) Community Services
Sep 2017 - Jul 2018 Treasurer, ACM Mobihoc, Treasurer for Mobihoc conference
Oct 2015 Local Arrangements chair for SIGCOMM 2017, ACM, Handling local arrangements for computer networking conference to be held at UCLA.
Service Activities (c) Other Professional Activities

9. Publications

Books, Chapters in Books and Editorships

Papers Published in Professional & Scholarly Journals
A. Afanasyev, N. Tilley, P. Reiher, L. Kleinrock, Host-to-Host Congestion Control for TCP IEEE Communications Surveys and Tutorials, 12(3): (Fall 2010)

Papers Published in Proceedings or Records of Conf/Symposia
M. Garip, M. Gerla, and P. Reiher, GHOST: Concealing Vehicular Botnet Communication in the VANET Control Channel IWCMC, (Sep 2016)

10: Professional Development Activities
N/A
1. Name
GLENN D. REINMAN, Associate Professor, Computer Science

2. Education
Jun 1996 B.S. Massachusetts Institute of Technology Computer Science & Engineering
Mar 1999 M.S. University of California San Diego, La Jolla, CA Computer Science
Jun 2001 Ph.D University of California San Diego, La Jolla, CA Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 2001 Appointment to Assistant Professor
Jul 2008 Promotion to Associate Professor
years of service: 17

Academic & Non-Academic Experience (b) Employment History
07/01/2001 - present Assistant Professor University of California at Los Angeles, Los Angeles, CA
1999 Summer Internship COMPAQ - Western Research Lab
1998 Summer Internship Intel Corporation - Microprocessor Research Lab
1997 - Jun 2001 Research Assistant University of California San Diego
1995 Summer Internship System One Corporation - Distributed Development

Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
2006 Finance Chair, International Symposium on Computer Architecture
2003 Program Committee Member, International Symposium on Microarchitecture (MICRO)
2003 Tutorials Chair, International Symposium on Microarchitecture (MICRO)
2003 Workshops Chair, International Symposium on Microarchitecture (MICRO)
2000 - present Member, IEEE

7. Honors and Awards
Feb 2008 Best Paper Award, International Symposium on High-Performance Computer Architecture
2005 Named Professor of the Year, ESUC
2004 Award for Excellence in Teaching, Northrop Grumman
2004 Faculty Career Development Award, UCLA
Jan 2002 NSF Career Grant

8. Service Activities (a) Committee Services
Jul 2016 - present Department Graduate Vice Chair
Sep 2015 - Dec 2015 Department WQE Committee Chair
2014 - 2016 Department Ad-Hoc Committee Service, Have served on six ad-hoc committees for faculty advancement between 2014 and 2016.
Sep 2013 - Jun 2015 Department PhD Admission Committee
2012 Other IDRE GPU Program, Headed up GPU advancement effort through IDRE.
Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
2014 Program Committee Member, PACT
2013 Program Committee Member, HPCA
2013 Program Committee Member, HiPEAC
2012 External Program Committee Member, MICRO
2011 - 2012 Program Committee Member, PACT

9. Publications

Books, Chapters in Books and Editorships

Papers Published in Professional & Scholarly Journals
Grigorian, B., Reinman, G., Accelerating Divergent Applications on SIMD Architectures Using Neural Networks ACM Transactions on Architecture and Code Optimization (TACO), 1-23 (Mar 2015)

Papers Published in Proceedings or Records of Conf/Symposia
Cong, J., Gill, M., Hao, Y., Reinman, G., Yuan, B., On-chip Interconnection Network for Accelerator-Rich Architectures Design Automation Conference (DAC), 1-6 (Jun 2015)
Choi, YK., Cong, J., Fang, Z., Hao, Y., Reinman, G., Wei, P., A Quantitative Analysis on Microarchitectures of Modern CPU-FPGA Acceleration Platforms Design Automation Conference (DAC), 1-6 (Jun 2016)

2. Yuchen Hao, Zhenman Fang, Jason Cong, and Glenn Reinman., Supporting Address Translation for Accelerator-Centric Architectures International Symposium on High Performance Computer Architecture (HPCA), 1-10 (Feb 2017)

10: Professional Development Activities
N/A
1. Name
RYAN ROSARIO, Lecturer, Computer Science

2. Education
2006  B.S.  University of California, Los Angeles
2008  M.S.  University of California, Los Angeles
2010  M.S.  University of California, Los Angeles
06/16/2017  Ph.D.  University of California, Los Angeles  Machine Learning and Natural Language Processing

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
No Data

Academic & Non-Academic Experience (b) Employment History
2017 - ongoing  Applied Scientist  Amazon
2013 - 2015  Quantitative Engineer (Machine Learning Engineer)  Facebook, Inc.
2011 - 2013  Chief Data Scientist/Research Engineer  GumGum, Inc
2010 - 2011  Data Scientist  Rubicon Project

Academic & Non-Academic Experience (c) Consulting Activities
2010 - 2013  Co-Organizer, Los Angeles R Users' Group
2010 - 2013  Technical Editor, Packt Publishing
2010 - present  Principal, Bytemining Labs, Data Science and Machine Learning consulting firm.

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
N/A

7. Honors and Awards
N/A

8. Service Activities (a) Committee Services
N/A

Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
N/A

9. Publications
Papers Published in Professional & Scholarly Journals

Papers Published in Proceedings or Records of Conf/Symposia

10: Professional Development Activities
N/A
1. Name
AMIT SAHAI, Professor, Computer Science

2. Education
1996 B. A. University of California, Berkeley Mathematics with Computer Science
1998 M. S. Massachusetts Institute of Technology, Cambridge, MA Computer Science
Sep 2000 Ph. D. Massachusetts Institute of Technology, Cambridge, MA Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 2004 Appointment to Associate Professor

4. Academic & Non-Academic Experience (b) Employment History
2010 - ongoing Professor University of California, Los Angeles
Aug 2004 - 2010 Associate Professor University of California, Los Angeles
Sep 2000 - Aug 2004 Assistant Professor (tenure track) Princeton University

4. Academic & Non-Academic Experience (c) Consulting Activities
2002 - ongoing (Various), (Various), Technical consulting services
2002 - ongoing Panelist, NSF, Panelist on multiple NSF panels

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
N/A

7. Honors and Awards
2018 Distinguished Lecture, Carnegie Mellon University (CMU) Cylab
2017 Invited Plenary Speaker, Southern California Theory Day
2017 Invited participant, Homomorphic Encryption Standardization Task Force, Microsoft Research
2017 Keynote Speaker, Bay Area Crypto Day
2017 Paper selected for Special Issue, IEEE FOCS

8. Service Activities (a) Committee Services
2017 - 2018 Department Member, Faculty Recruiting Committee
2017 - 2018 University Wide Member, Dissertation Year Fellowship Review Committee
2017 - 2018 University Wide Member, Privately Endowed Fellowships Review Committee
2016 - 2017 Department Member, Faculty Recruiting Committee
2015 - ongoing University Wide Member, University of California Cyber-Risk Advisory Board

Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
2017 Program Committee Member, STOC 2017
2017 Program Committee Member, TCC 2017
2016 Co-organizer, DIMACS Workshop on Cryptography and its Interactions: Learning Theory, Coding Theory, and Data Structures
2016 Co-organizer, DIMACS/CEF Bay Area Crypto Obfuscation Workshop, 2016
2015 - 2018 Organizing Committee Member, DIMACS/Simons Foundation Special Focus on Cryptography
9. Publications

**Books, Chapters in Books and Editorships**

- Amit Sahai, Brent Waters, and Steve Lu, Attribute-Based Encryption Identity-Based Cryptography, MarcJoye and Gregory Neven, 156-168 (2008)
- Secure Multi-Party Computation Prabhakaran,M.M.,Sahai, A., 201-221 (Jan 2013)
- Amit Sahai, Theory of Cryptography-10th Theory of Cryptography Conference, TCC 2013 Tokyo, Japan.Lecture Notes in Computer Science Amit Sahai, 7785: (03/03/2013)

**Papers Published in Professional & Scholarly Journals**


**Papers Published in Proceedings or Records of Conf/Symposia**

- Khurana, D., Sahai, A., How to Achieve Non-Malleability in One or Two Rounds FOCS, 564-575 (2017)
- Ananth, P., Jain, A., Sahai, A., Robust Transforming Combiners from Indistinguishability Obfuscation to Functional Encryption EUROCRYPT, 1:91-121 (2017)

10: Professional Development Activities

N/A
1. Name
MOHAMMAD Y. SANADIDI, Adjunct Professor, Computer Science

2. Education
<table>
<thead>
<tr>
<th>Year</th>
<th>Degree</th>
<th>Institution</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun 1971</td>
<td>B.S.</td>
<td>Alexandria University, Egypt</td>
<td>Computing Engineering</td>
</tr>
<tr>
<td>Aug 1975</td>
<td>M.S.</td>
<td>Pennsylvania State University, University Park, Pennsylvania</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Mar 1982</td>
<td>Ph.D.</td>
<td>University of California at Los Angeles, Los Angeles, CA</td>
<td>Computer Science</td>
</tr>
</tbody>
</table>

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
   Jul 2004 Appointment to Adjunct Professor
   years of service: 14

3., 4. Academic & Non-Academic Experience (b) Employment History
   Dec 1983 - Sep 1991 Computer Scientist, Principal MTS
   Citicorp, Transaction Technology, Incompany, Santa Monica, C

   Jun 1981 - Dec 1983 Assistant Professor, Computer Science Department
   University of Maryland, College Park, Maryland

   Sep 1975 Visiting Lecturer
   University of California at Los Angeles

   Sep 1973 - Aug 1975 Teaching Assistant/Research Assistant, Computer Science Department
   Penn State University, Pennsylvania

   Jun 1971 - Jun 1973 Teaching Assistant, College of Engineering
   Alexandria University, Alexandria, Egypt

3., 4. Academic & Non-Academic Experience (c) Consulting Activities
   N/A

5. Certifications or Professional Registrations
   N/A

6. Current Membership In Professional Organizations
   N/A

7. Honors and Awards
   1976 Elected for membership in Upsilon Pi Upsilon, Honor Society in the Computing Sciences

8. Service Activities (a) Committee Services
   N/A

Service Activities (b) Community Services
   N/A

Service Activities (c) Other Professional Activities
   N/A

9. Publications
   Papers Published in Proceedings or Records of Conf/Symposia


10: Professional Development Activities

N/A
1. Name
SRIRAM SANKARARAMAN, Assistant Professor, Computer Science

2. Education
Jun 2004  B.Tech  Indian Institute of Technology, Madras  Computer Science and Engineering
05/15/2010  Ph.D.  University of California at Berkeley  Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 2015  Appointment to Assistant Professor

years of service: 3

Academic & Non-Academic Experience (b) Employment History
11/01/2015  Assistant Professor  University of California at Los Angeles
01/01/2014 -  Fellow  Simons Institute for the Theory of Computing, Berkeley
05/31/2014 09/01/2010 -  Post-doctoral fellow  Department of Genetics, Harvard Medical School

Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
N/A

7. Honors and Awards
2017  Alfred P. Sloan Research Fellow
2017  Okawa Foundation Research Grant
2017  UCLA Hellman fellow
2015  One of ten, Finalist, Second Leena Peltonen Prize for Excellence in Human Genetics Research, 2015
2015  Awarded by the American Society of Human Genetics (ASHG), 2015, Semifinalist for Trainee Research Award

8. Service Activities (a) Committee Services
10/30/2017  Other  QCBio website committeee
04/17/2017 -  Other  NSF/CISE Computational Biology panel
04/18/2017  Jan 2017  Department  Chair of publicity committee
2017  Department  Faculty hiring committee
2017  Other  International Conference on Learning Representations 2017 PC member

Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
N/A
9. Publications

Papers Published in Professional & Scholarly Journals

Lipson, M., Loh, P. R., Sankararaman, S., Patterson, N., Berger, B., Reich, D., Calibrating the human mutation rate via ancestral recombination density in diploid genomes PLoS Genetics, 11: (2015)


Moorjani, P., Sankararaman, S., Fu, Q., Przeworski, M., Patterson, N., Reich, D., A genetic method for dating ancient genomes provides a direct estimate of human generation interval in the last 45,000 years Proceedings of the National Academy of Sciences, (2016)

Sankararaman, S., Mallick, S., Patterson, N., Reich, D., The combined landscape of denisovan and neanderthal ancestry in present-day humans Current Biology, 26(9):1241-1247 (2016) Developed statistical methods to infer one of the first maps of Denisovan and Neanderthal ancestries and used this map to understand the impact of archaic ancestries on human evolution.

Mallick et al., The Simons Genome Diversity Project: 300 genomes from 142 diverse populations Nature, 538:201-206 (Oct 2016)

Farhad Hormozdiari, Martijn van de Bunt, Ayellet V Segre, Xiao Li, Jong Wha J Joo, Michael Bilow, Jae Hoon Sul, Sriram Sankararaman, Bogdan Pasaniuc, Eleazar Eskin, Colocalization of GWAS and eQTL signals detects target genes American Journal of Human Genetics, 99(6):1245-1260 (Dec 2016)

B Jegou, S Sankararaman, AD Rolland, D Reich, F Chalmel, Meioti Genes Are Enriched in Regions of Reduced Archaic Ancestry Molecular Biology and Evolution, (Apr 2017)


Papers Published in Proceedings or Records of Conf/Symposia


10: Professional Development Activities

N/A
1. Name
MAJID SARRAFZADEH, Professor, Computer Science

2. Education
1982 B.S. University of Illinois at Urbana-Champaign
1984 M.S. University of Illinois at Urbana-Champaign
Jan 1987 Ph.D. University of Illinois at Urbana-Champaign

3. Academic & Non-Academic Experience
(a) UCLA HSSEAS Appointment History
Nov 2000 Appointment to Professor
years of service: 18

(b) Employment History
11/01/2000 - present Professor and Director of Embedded and Reconfigurable Computing (ER) Lab University of California at Los Angeles
Jul 1997 - Jun 1998 Architecture and Design (During Sabbatical) Motorola
1997 - 2000 Consulting and One of Three Original Architects Monterey Design Systems, California
1997 - 10/31/2000 Professor Northwestern University

(c) Consulting Activities
2014 - 2015 Consultant, MediSens Wireless
1997 - 2000 Consultant, Monterey Design Systems

4. Academic & Non-Academic Experience
(c) Consulting Activities

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
1997 - present Fellow, IEEE
1987 - present Member, ACM
1987 - present Senior Member, SIAM

7. Honors and Awards
2005 Okawa Foundation Award
1995 ACM-SIGDA Scholarship Award
1994 ACM-SIGDA Scholarship Award
1993 Best Paper Award in DAC-93 for "The Buffer Distribution Problem"
1991 Distinguished Paper in ICCAD-91 for "The Crossing Distribution Problem"

8. Service Activities (a) Committee Services
Oct 2017 Academic Senate Member, COR-Faculty Grants Program Committee
2017 - present Academic Senate Senate Committee Member, Committee on Undergraduate Admissions and Relations with Schools
2015 - present Department Chair, Hiring
2015 - present University Wide Co-Director, UCLA BRITE center
2015 - present University Wide Co-founder and Co-director, Center for SMART Health

Service Activities (b) Community Services
N/A
Service Activities (c) Other Professional Activities
12/12/2016 - Program Committee Member, The First Workshop on Data Mining for Internet of Things (DMiOT 2016), Barcelona, Spain

9. Publications

Books, Chapters in Books and Editorships

Papers Published in Professional & Scholarly Journals
Kalantarian, H., Sideris, C., Sarrafzadeh, M., A Hierarchical Classification and Segmentation Scheme for Processing Sensor Data IEEE Journal of Biomedical and Health Informatics, 10.1109/JBHI.2016.2526679, 21(3):672-681 (May 2017)

Papers Published in Proceedings or Records of Conf/Symposia

10: Professional Development Activities
N/A
1. Name
FABIAN SCALZO, Assistant Professor in Residence, Computer Science

2. Education
2000 B.S. Haute Ecole Rennequin Sualem, Belgium
2002 M.S. University of Liege, Belgium Computer Science
2004 M.S. University of Liege, Belgium Applied Science
2008 Ph.D. University of Liege, Belgium

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
No Data

Academic & Non-Academic Experience (b) Employment History
2015 - present Assistant Professor in Residence Dept. of Neurology and Dept. of Computer Science, University of California, Los Angeles
2013 - 2015 Visiting Assistant Professor Dept. of Neurology and Dept. of Computer Science, University of California, Los Angeles
2010 - 2012 Assistant Researcher Dept. of Neurosurgery and Neurology, University of California, Los Angeles

Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
N/A

7. Honors and Awards
2017 Best Paper Award, ICPR
2017 Best Poster Award, UC Bioengineering Symposium
2017 Best Poster Award-USC Grodins BME Symposium
2016 SAR Morton A. Bosniak Research Award
2016 SIIM Innovation Challenge (Finalist)
2016 SVIN Pilot Grant Award
2016 Spitzer DGSOM Seed Grant Program Award
2013 UCLA Anderson School of Management Knapp Venture Competition (2nd Place)
2013 UCLA Institute for Technology Advancement (ITA) Competition
2012 Best Poster Award, Annual UCLA Conference in Neurology
2012 UCLA Business of Science Center (BSC) Venture Team Competition
2010 Best Poster Award, ICP 2010 Conference
2010 International Young Scientist Award, National Science Foundation China

8. Service Activities (a) Committee Services
N/A

Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
N/A
9. Publications

10: Professional Development Activities
N/A
1. Name
ALEXANDER SHERSTOV, Assistant Professor, Computer Science

2. Education
May 2003   B.S.   Hope College   Computer Science
Aug 2009   Ph.D.   University of Texas at Austin   Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 2011   Appointment to Assistant Professor

years of service: 7

Academic & Non-Academic Experience (b) Employment History
Jul 2016 - ongoing   Associate Professor   UCLA
Jul 2011 - Jun 2016   Assistant Professor   UCLA
Aug 2009 - Jun 2011   Postdoctoral Researcher   Microsoft

Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
N/A

7. Honors and Awards
Wntr 2018   Was chosen by the Department to give an invited talk on the art of teaching, as part of the HSSEAS FT^2 Workshop on Teaching, HSSEAS and CS Department
05/08/2017   My undergraduate class CS 181 was ranked in the top 3 campus-wide in a Daily Bruin article. Online version available at http://stack.dailybruin.com/2017/05/08/bruinwalk-class-ratings/, Daily Bruin
02/10/2017   I was nominated by the Computer Science Department for the Campus-Wide Distinguished Teaching Award., Computer Science Department
Nov 2015   I delivered an invited plenary talk at the 2015 Southern California Theory Day (USC)., Southern California Theory Day

8. Service Activities (a) Committee Services
Fall 2017   Department   Written Qualifying Exam (WQE), Reviewed submissions to the Fall 2017 Written Qualifying Examination (WQE).
Fall 2017 - Sprg 2018   Department   Masters admissions committee, Served on the Masters admissions committee.
Dec 2017 - Mar 2018 Department   Ph.D. recruitment, Reviewed Ph.D. applications in the area of computer science theory (CST) and actively worked to recruit the top applicants on an individual basis.
Nov 2017   University Wide   Doctoral committee member for JAD HACHEM, Reviewed his Ph.D. thesis and attended his Ph.D. defense.
Sum1 2017 - Wntr 2018   Department   Ad hoc committee service (x2), Served on 2 ad hoc committees for faculty promotion

Service Activities (b) Community Services
N/A
Service Activities (c) Other Professional Activities

10/14/2017 Invited speaker, Gave an invited talk at the FOCS 2017 Workshop on Communication Complexity, titled “Lifting Approximate Degree to Communication Complexity”

Jun 2017 Grant refereeing, Served as a proposal reviewer for the Israel Science Foundation (ISF).

05/21/2017 Invited speaker, I gave an invited talk at the 2017 Banff Workshop on Communication Complexity and Applications (Banff, Canada, 2017), titled "Compressing Interactive Communication under Product Distributions"

Fall 2016 - Sprg 2017 Program committee member of STOC 2017, Served on the program committee of the 49th ACM Symposium on Theory of Computing (STOC 2017).

Sprg 2016 - Sum1 2016 Program committee member of RANDOM 2016, Served on the program committee of the 20th International Workshop on Randomization and Computation (RANDOM 2016).

9. Publications

Papers Published in Professional & Scholarly Journals

Papers Published in Proceedings or Records of Conf/Symposia

10: Professional Development Activities
N/A
1. Name
DAVID A. SMALLBERG, Computer Science

2. Education
1975 B.S. California Institute of Technology
1978 M.S. University of California at Los Angeles, Computer Science
Los Angeles, CA

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 2001 Appointment to
Jul 2013 Promotion to
years of service: 17

Academic & Non-Academic Experience (b) Employment History
Jul 2001 - present Senior Lecturer SOE UCLA
Jan 1997 - Jun 1997 Lecturer UCLA
1984 - present President David A. Smallberg Consulting & Training
1980 - 1983 Research Associate University of Southern California

Academic & Non-Academic Experience (c) Consulting Activities
Sep 2016 - present Lockheed Martin
Aug 2016 - present Stryker MAKO
Nov 2015 Safran Morpho
Mar 2015 QLogic
Nov 2014 - 2016 Teradici
Oct 2014 Bosch
Sep 2014 Juniper Networks
Sep 2014 - present Sandia National Laboratories
Dec 2013 BMW Car IT
Jun 2013 Intel
Mar 2012 - 2015 Autodesk
Mar 2010 Cisco Systems
2010 - 2012 Research in Motion
May 2009 Expert, Merhab Robinson & Jackson (law firm)
May 2009 - May 2011 Morgan Stanley
2011
Mar 2009 Expert, Poindexter & Doutrei (law firm)
Feb 2008 - Mar 2008 Expert, Kirkland & Ellis (law firm)
Feb 2007 GE Healthcare
Jan 2007 - Feb 2007 Intuit
Dec 2003 Lawrence Livermore National Laboratories
Aug 2003 Reuters
Jul 2003 - 2013 Hewlett-Packard
Jan 2003 - Aug 2011 Citadel Investment Group
2003 - 2009 EMC
1997 - present ESRI

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
1975 - present Member, Association for Computing Machinery
7. Honors and Awards

Oct 2008  Lockheed Martin Excellence in Teaching Award, HSSEAS
May 2005  Professor of the Year, Engineering Society of the Univ. of California
2003  Nominee, Brian Copenhaver Award for Innovation in Teaching with Technology, UCLA Office of Educational Technology
May 2001  Certificate of Recognition, Qualcomm Learning Center
1992  Excellence Award, Xerox
1986  Distinguished Teaching Assistant Award, UCLA Academic Senate

8. Service Activities (a) Committee Services

<table>
<thead>
<tr>
<th>Date Range</th>
<th>Activity Description</th>
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<tbody>
<tr>
<td>Sep 2017 - present</td>
<td>CS Dept. Rep., HSSEAS Dean's Diversity Committee</td>
</tr>
<tr>
<td>Feb 2017 - present</td>
<td>CS Dept. Rep., HSSEAS Community College Committee</td>
</tr>
<tr>
<td>Feb 2016 - Feb 2017</td>
<td>Member, Joint CS and EE committee on new Computer Engineering major</td>
</tr>
<tr>
<td>Sep 2015 - Nov 2015</td>
<td>UCLA CS Rep., UC Transfer Admissions Pathways Project</td>
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<td>Jul 2012 - Jun 2015</td>
<td>Vice Chair, Vice Chair for Undergraduate Programs</td>
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<td>Jul 2012 - Jun 2015</td>
<td>CS Dept. Rep., HSSEAS ABET accreditation committee</td>
</tr>
<tr>
<td>Nov 2010 - Dec 2010</td>
<td>UCLA CS Rep., UC Transfer Streamlining Task Force</td>
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Service Activities (b) Community Services

<table>
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<tr>
<th>Date Range</th>
<th>Activity Description</th>
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<tr>
<td>Mar 2014</td>
<td>Advisor, Granada Hills Charter High School, Advised on development of grade 9-12 computer science pathway</td>
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<td>Sep 2013 - present</td>
<td>Set up Computer Laboratory, AP Readiness, Center X, UCLA GSEIS, Set up lab environment for AP CS Readiness courses</td>
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</tbody>
</table>

Service Activities (c) Other Professional Activities

N/A

9. Publications

10. Professional Development Activities

N/A
1. Name
STEFANO SOATTO, Professor, Computer Science

2. Education
Jul 1992  Laurea  Universita degli studi di Padova, Padova, Italy  Ingegneria Elettronica
Jun 1993  M.S.  California Institute of Technology, Pasadena, CA  Electrical Engineering
Jun 1996  Ph.D.  California Institute of Technology, Pasadena, CA  Control and Dynamical Systems

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 2000  Appointment to Assistant Professor
Jul 2002  Promotion to Associate Professor
Jul 2005  Promotion to Professor

years of service: 18

Academic & Non-Academic Experience (b) Employment History
Nov 2006 - ongoing  Visiting Research Associate in Computation and Neural Systems  California Institute of Technology
07/01/2005  Professor of Computer Science  UCLA
07/01/2002 - 06/30/2005  Associate Professor, Computer Science  University of California, Los Angeles
Department
2002 - Oct 2006  Visiting Research Associate in Control and Dynamical Systems  California Institute of Technology
Aug 2000 - 08/31/2001  Associate Professor, Department of Electrical Engineering  Washington University, St. Louis, MO [on leave]

Academic & Non-Academic Experience (c) Consulting Activities
2010 - 2017  Consultant, Qualcomm
Apr 2006 - Aug 2006  Consultant, Sonaray, INC
Jan 2006 - Nov 2006  Member of the Scientific Advisory Board and Peer Review Panel, NASA New Millennium Program
Oct 2005 - May 2006  Consultant, Robotics Research, LLC
Oct 2005 - Jul 2006  Consultant, Aerovironment, INC

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
2013 - ongoing  Fellow, The IEEE
1996 - 2012  Senior Member, IEEE

7. Honors and Awards
2016  Keynote speaker, International Conference on 3D Vision (3DV 2016), Stanford, CA
2016  Keynote speaker, National Geospatial Intelligence Agency, Washington, DC
Jun 2015  Best Conference Paper Award, International Conference on Robotics and Automation (ICRA)
2015  Keynote Speaker, University of Minnesota, Distinguished Seminar Series
2014  Keynote Speaker, IEEE Workshop on Long-Term Detection and Tracking

8. Service Activities (a) Committee Services
2017  Other  Member, Big Data VGR Initiative
2017  Other  member, Alumni Reunion Panel
2016  Department  member, Space Committee
Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
2015 - 2016 Area Chair, Intl. Conf. on Comp. Vis. and Patt. Recog. (CVPR 2016)
2015 - 2016 Program Chair, SIAM Conference on Imaging Science
2015 - 2017 Program Chair, International Conference on Computer Visio (ICCV 2017)

9. Publications

Books, Chapters in Books and Editorships
Chiuso, A., Picci, G., Soatto, S., Wide-sense estimation on the special orthogonal group Communication in Information and Systems, 8(3):185-200 (2009)
S. Soatto, "Steps Towards a Theory of Visual Information: Active Perception, Signal-to-Symbol Conversion and the Interplay Between Sensing and Control" 1-151 (Sep 2010)
S. Soatto, Actionable Information in Vision Machine Learning for Computer Vision, R. Cipolla et al. (Eds), (2011)
J. Dong and S. Soatto, Visual Correspondence, the Lambert-Ambient Shape Space and the Systematic Design of Feature Descriptors Machine Learning for Computer Vision, R. Cipolla et al. (Eds), (2012)

Papers Published in Professional & Scholarly Journals

Papers Published in Proceedings or Records of Conf/Symposia
A. Achille, S. Soatto, On the emergence of invariance and disentangling in deep representations International Conference on Machine Learning, Workshop on Principal Approaches to Deep Learning (ICML PADL 2017), (08/10/2017)

10: Professional Development Activities
N/A
1. Name
HOWARD STAHL, Lecturer, Computer Science

2. Education
06/01/1988  B.S.  UC San Diego  Computer Science
06/01/1992  M.S.  Cornell University  Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
No Data

Academic & Non-Academic Experience (b) Employment History
01/01/2010 -  Chief Information Officer  Los Angeles International University - a fully online college located in the San Fernando Valley
12/31/2015
03/01/2004 -  Professor  ITT Technical Institute, Sylmar CA
12/31/2005
08/01/2001  Professor  Santa Monica College

Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
01/01/2001  Member, Association for Computing Machinery - ACM

7. Honors and Awards
06/01/2015  Outstanding Faculty Award, Santa Monica College - International Student Center

8. Service Activities (a) Committee Services
N/A

Service Activities (b) Community Services
01/01/2015  Vice-President, California Community College Independents, A group which advocates for faculty and students in the community college system at the state level

Service Activities (c) Other Professional Activities
08/01/2017  Department Chair, CSIS, Santa Monica College, Serving as Department Chair for the Computer Science Information Systems Department at Santa Monica College

9. Publications

10: Professional Development Activities
N/A
1. Name
YIZHOU SUN, Assistant Professor, Computer Science

2. Education

<table>
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<tr>
<th>Year</th>
<th>Degree</th>
<th>Institution</th>
<th>Field</th>
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<tbody>
<tr>
<td>Jun 2004</td>
<td>B.Sc</td>
<td>Peking University</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Jun 2004</td>
<td>B.Sc</td>
<td>Peking University</td>
<td>Statistics</td>
</tr>
<tr>
<td>Jul 2007</td>
<td>M. Eng</td>
<td>Peking University</td>
<td>Intelligence Science</td>
</tr>
<tr>
<td>Dec 2012</td>
<td>Ph.D.</td>
<td>University of Illinois at Urbana-Champaign</td>
<td>Computer Science</td>
</tr>
</tbody>
</table>

3., 4. Academic & Non-Academic Experience

(a) UCLA HSSEAS Appointment History
Jul 2016 Appointment to Assistant Professor

 years of service: 2

(b) Employment History

<table>
<thead>
<tr>
<th>Year</th>
<th>Role</th>
<th>Institution</th>
<th>Field</th>
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<tbody>
<tr>
<td>Jun 2016 - present</td>
<td>Assistant Professor</td>
<td>Department of Computer Science, University of California, Los Angeles</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Jun 2013 - May 2016</td>
<td>Assistant Professor</td>
<td>College of Computer and Information Science, Northeastern University</td>
<td></td>
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<tr>
<td>May 2010 - Aug 2010</td>
<td>Research Intern</td>
<td>IBM Watson Research Center</td>
<td></td>
</tr>
<tr>
<td>Apr 2006 - Oct 2006</td>
<td>Research Intern</td>
<td>Microsoft Research Asia</td>
<td></td>
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<tr>
<td>Nov 2003 - Jul 2007</td>
<td>Research Assistant</td>
<td>Spatial Database Lab, Dept. of Intelligence Science, PKU</td>
<td></td>
</tr>
</tbody>
</table>

5. Certifications or Professional Registrations

N/A

6. Current Membership In Professional Organizations

2017 Best Paper Award Committee Member, The 23nd ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD'17), Halifax, Nova Scotia, Canada, Aug. 13-17, Best Paper Award Committee of Data Science Track.

2017 Program Committee Member, 2017 IEEE International Conference on Data Mining (ICDM'17), New Orleans, USA, Nov. 18-21.

2017 Program Committee Member, The 26th International Joint Conference on Artificial Intelligence (IJCAI'17), Melbourne, Australia, Aug. 19-25.

2017 Senior PC, The 23nd ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD'17), Halifax, Nova Scotia, Canada, Aug. 13-17, Senior PC of Research Track.

2017 Senior PC, The 26th Conference on Information and Knowledge Management (CIKM'17), Singapore, Nov. 6-10.

7. Honors and Awards

2016 Distinguished Alumni Educator Award, CS @ ILLINOIS Alumni Awards
2016 Tsinghua Science and Technology 2015 Best Paper Award
2013 ACM SIGKDD 2013 Dissertation Award
2013 Yahoo ACE (Academic Career Enhancement) Award
2013 Yahoo!-DAIS Research Excellence Award, UIUC

8. Service Activities (a) Committee Services

2017 - 2018 Other Committee Member, UCLA CS Master Admission Committee
2016 - 2017 Department Committee member, UCLA CS Diversity Committee
2016 - 2017 Department Committee member, UCLA CS Master Admission Committee
2015 - 2016 Other Committee member, Northeastern hiring committee
9. Publications

Books, Chapters in Books and Editorships
Sun Y., Han, J., Mining Heterogeneous Information Networks: Principles and Methodologies 1-159 (2012)
Sun, Y., Deng, H., Han, J., Probabilistic Models for Text Mining Mining Text Data., 257-294 (2012)
Yang, Y., Sun, Y., Pandit, S., Chawla, N., Han, J., Prospective on MeasurementMetrics for Community Detection Algorithms Mining Social Networks and Security Informatics, 227-242 (2013)
Sun, Y., Han, J., Ranking Methods for Networks Encyclopedia of Social Network Analysis and Mining, 1488-1497 (2014)

Papers Published in Professional & Scholarly Journals

Papers Published in Proceedings or Records of Conf/Symposia
Chen, T., Sun, Y., Shi, Y., Hong, L., On Sampling Strategies for Neural Network-based Collaborative Filtering Proc. of 2017 ACM SIGKDD Int. Conf. on Knowledge Discovery and Data Mining (KDD'17), (Aug 2017)
Gu, Y., Sun, Y., Gao, J., The Co-Evolution Model for Social Network Evolving and Opinion Migration Proc. of 2017 ACM SIGKDD Int. Conf. on Knowledge Discovery and Data Mining (KDD'17), (Aug 2017)
Wang C., Song Y., Li H., Sun Y., Zhang M., Han J., Second-Order Heterogeneous Information Network Similarity for Text Proc. of the 26th ACM Int. Conf. on Information and Knowledge Management (CIKM'17), (Nov 2017)

10: Professional Development Activities
N/A
1. Name
AMEET TALWALKAR, Adjunct Asst. Professor, Computer Science

2. Education
May 2002  BS  Yale University  Computer Science
May 2010  MS, PhD  New York University  Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
No Data

Academic & Non-Academic Experience (b) Employment History
Sep 2010 - Aug 2014  Postdoctoral Fellow  EECS Department - UC Berkeley
2007 - 2009  Intern at Google  New York City
2004 - 2006  Research Technician  Paul Greengard's Neuroscience Laboratory at the Rockefeller University
2003 - 2004  Software Developer  Wireless Generation
2002 - 2003  Consultant at Oliver  Wyman & Company

Academic & Non-Academic Experience (c) Consulting Activities

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
N/A

7. Honors and Awards
2015  Bloomberg Research Grant Award
2015  Google Research Award
2011  Genentech Innovation Postdoctoral Fellowship
2011  Janet Fabri Prize for best doctoral dissertation in NYU's Computer Science Department
2011  NSF Office of Cyberinfrastructure (OCI) Postdoctoral Fellowship

8. Service Activities (a) Committee Services
2015 - present  Department  Co-Chair, Ph.D. Visit Day
2015 - present  Department  Faculty In-Charge, CS-201
2013  Other  Organizer, Systems and Machine Learning Seminar, AMPLab, UC Berkeley
2011  Other  Co-organizer, Workshop on Sparse Representation and Low-Rank Approximation at Neural Information Processing Systems, Sierra Nevada, Spain
2010  Other  NSF Panelist

Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
2013  Organizer, Systems and Machine Learning Seminar, AMPLab, UC Berkeley
2011  Co-organizer, Workshop on Sparse Representation and Low-rank Machine Learning at Neural Information Processing Systems, Sierra Nevada, Spain
2010  Co-organizer, Workshop on Low-rank Methods for Large-scale Machine Learning at Neural Information Processing Systems, Whistler, Canada
2010  NSF Panelist
9. Publications

Books, Chapters in Books and Editorships

Papers Published in Professional & Scholarly Journals

Papers Published in Proceedings or Records of Conf/Symposia

10: Professional Development Activities
N/A
1. Name
YUVAL TAMIR, Associate Professor, Computer Science

2. Education
May 1979 B.S. U. of Iowa Electrical Engineering
Jun 1981 M.S. U. of California, Berkeley Electrical Engineering and Computer Science
Dec 1985 Ph.D. U. of California, Berkeley Electrical Engineering and Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 1985 Appointment to Assistant Professor
Jul 1992 Promotion to Associate Professor
years of service: 33

Academic & Non-Academic Experience (b) Employment History
Jul 1985 - Jun 1992 Assistant Professor UCLA, Computer Science Department
1979 - Jun 1985 Research Assistant U.C. Berkeley C.S. Division
1976 - 1979 Research Assistant University of Iowa Computer Center

Academic & Non-Academic Experience (c) Consulting Activities

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
Mar 2006 Program Committee Member, 2006 International Conference on Parallel Processing, Columbus, Ohio, August 2006
Dec 2002 Program Committee Member, 2002 Pacific Rim International Symposium on Dependable Systems, Tsukuba, Japan, December 2002
1993 Member of the program committee, 1993 Fault-Tolerant Computing Symposium
1991 Member of the program committee, 1991 Distributed Computing Systems Conference

7. Honors and Awards
Nov 2010 Best Paper Award in the Area of Distributed Computing for the paper:Israel Hsu, Andrew Gallagher, Michael Le, and Yuval Tamir, "Using Virtualization to Validate Fault-Tolerant Distributed Systems," International Conference on Parallel and Distributed Computing and Systems, Marina del Rey, CA, pp. 210-217 (November 2010)., International Conference on Parallel and Distributed Computing and Systems
1990 UCLA Career Development Award
1983    California Fellowship in Microelectronics
1979    University of California Graduate Fellowship
1977    University of Iowa College of Engineering Scholarship

8. Service Activities (a) Committee Services
   Oct 2017 - Dec 2017 Department coordinator, Coordinator of the Fall 2017 PhD Written
   Qualifying Exam
   Aug 2017 - Sep 2017 Department chair, Department ad-hoc committee (personnel action)
   Aug 2017 - Sep 2017 Department member, Two department ad-hoc committees (personnel actions)
   Oct 2016 - Jun 2019 Other Department Representative, HSSEAS Executive Committee
   Dec 2015 - Dec 2015 Department member, Two department ad-hoc committees (personnel actions)
   Jan 2015 - Feb 2015 Department member, Department ad-hoc committee (personnel action)
   Jan 2013 - Aug 2015 Other Department Representative to the Academic Senate Legislative
   Assembly
   Oct 2011 - Jun 2017 Department Member, MS Admission Committee
   Mar 2011 - Jun 2011 Other CS201 Coordinator

Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
   09/15/2011 Presented a talk at Xerox, El Segundo: "Low-Cost Resilient Virtual Clusters"
   09/01/2010 Presented a talk at Xerox, El Segundo: "Low-Cost Resilient Virtual Clusters"

9. Publications

Papers Published in Professional & Scholarly Journals
   Aghdaie, N. and Tamir, Y., CoRAL: A transparent fault-tolerant web service The Journal of Systems and
   Software, 82(1):131-143 (Jan 2009)
   Le, M. and Tamir, Y., Fault Injection in Virtualized Systems - Challenges and Applications IEEE

Papers Published in Proceedings or Records of Conf/Symposia
   Le, M., Gallagher, A., Tamir, Y., and Turner, Y., Maintaining Network QoS Across NIC Device Driver
   Failures Using Virtualization 8th IEEE International Symposium on Network Computing and
   Applications, 195-202 (Jul 2009)
   Hsu, I., Gallagher, A., Le, M., and Tamir, Y., Using Virtualization to Validate Fault-Tolerant Distributed
   Systems International Conference on Parallel and Distributed Computing and Systems, 210-217 (Nov
   2010)
   Le, M. and Tamir, Y., ReHype: Enabling VM Survival Across Hypervisor Failures 7th ACM International
   Conference on Virtual Execution Environments, 63-74 (Mar 2011)
   Le, M., Hsu, I., and Tamir, Y., Resilient Virtual Clusters 17th IEEE Pacific Rim International Symposium
   on Dependable Computing, 214-223 (Dec 2011)
   Le, M. and Tamir, Y., Applying Microreboot to System Software IEEE International Conference on
   Software Security and Reliability, 11-20 (Jun 2012)

10: Professional Development Activities
   N/A
1. Name
DEMETRI TERZOPoulos, Professor, Computer Science

2. Education
<table>
<thead>
<tr>
<th>Date</th>
<th>Degree</th>
<th>Institution</th>
<th>Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun 1980</td>
<td>M.Eng.</td>
<td>McGill University</td>
<td>Electrical Engineering</td>
</tr>
<tr>
<td>Feb 1984</td>
<td>Ph.D.</td>
<td>MIT</td>
<td>Computer Science - Artificial Intelligence</td>
</tr>
</tbody>
</table>

3. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 2005    Appointment to Professor
years of service: 13

3. Academic & Non-Academic Experience (b) Employment History
<table>
<thead>
<tr>
<th>Date</th>
<th>Position</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul 2012</td>
<td>Distinguished Professor</td>
<td>University of California, Los Angeles</td>
</tr>
<tr>
<td>Jul 2011</td>
<td>Adjunct Professor, Faculty of Science</td>
<td>University of Ontario Institute of Technology</td>
</tr>
<tr>
<td>07/01/2005</td>
<td>Chancellor's Professor of Computer Science</td>
<td>University of California, Los Angeles</td>
</tr>
<tr>
<td>Jul 2005</td>
<td>Professor (Status-Only)</td>
<td>University of Toronto, Department of Computer Science</td>
</tr>
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</table>

3. Academic & Non-Academic Experience (c) Consulting Activities
2016 - 2020 Consultant and Advisory Board Member, Arizona State University, NIH Grant 1R01HL128785-01A1: "Computer-Aided Diagnosis of Pulmonary Embolism", J. Liang (PI)
2009 - 2009 Consultant, Federal Trade Commission

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
<table>
<thead>
<tr>
<th>Date</th>
<th>Position</th>
<th>Organization</th>
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<tbody>
<tr>
<td>Apr 2014</td>
<td>Fellow</td>
<td>Royal Society of London</td>
</tr>
<tr>
<td>May 2010</td>
<td>EETN Honorary Member</td>
<td>Hellenic Artificial Intelligence Society</td>
</tr>
<tr>
<td>Nov 2007</td>
<td>Life Fellow</td>
<td>Association for Computing Machinery (ACM)</td>
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7. Honors and Awards
<table>
<thead>
<tr>
<th>Date</th>
<th>Award Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun 2015</td>
<td>CIPPRS Award for Research Excellence</td>
<td>Canadian Image Processing and Pattern Recognition Society</td>
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<tr>
<td>Apr 2015</td>
<td>Thousand Talents Program Award</td>
<td>Government of China</td>
</tr>
<tr>
<td>2015</td>
<td>DISTINGUISHED LECTURER:</td>
<td>York University, School of Engineering, Centre for Innovation in Computing (2017)</td>
</tr>
<tr>
<td>2013</td>
<td>Helmholtz Prize</td>
<td>IEEE Computer Society</td>
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8. Service Activities (a) Committee Services
<table>
<thead>
<tr>
<th>Date</th>
<th>Position</th>
<th>Description</th>
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<tbody>
<tr>
<td>Jul 2017</td>
<td>University Wide</td>
<td>Computer Science Department Representative, Henry Samueli</td>
</tr>
<tr>
<td></td>
<td></td>
<td>School of Engineering and Applied Science Faculty ExecutiveCommittee (FEC)</td>
</tr>
<tr>
<td>Jul 2016</td>
<td>Department</td>
<td>Chair, Ad Hoc Faculty Promotion Review Committee, Computer Science Department</td>
</tr>
<tr>
<td>Jul 2016</td>
<td>Department</td>
<td>Chair, Computer Graphics and Vision Field, Computer Science Department</td>
</tr>
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</table>

Service Activities (c) Other Professional Activities
2017 - 2017 Member, IEEE PAMI Computer Vision Awards Selection Committee (Lifetime Achievement Award and Distinguished Researcher Award)
9. Publications

Books, Chapters in Books and Editorships

Liang, J., McInerney, T., Terzopoulos, D., Analyzing the Shape and Motion of the Lungs and Heart in Dynamic Pulmonary Imaging Shape Analysis in Medical Image Analysis, Lecture Notes in Computational Vision and Biomechanics, Vol. 14, S. Li, J.M.R.S. Tavares, 291-314 (2014)

Papers Published in Professional & Scholarly Journals

Chong, K., Jiang, C., Ram, D., Santhanam, A., Terzopoulos, D., Benharash, P., Dutson, E., Teran, J., Eldredge, J.D., Visualization of Vascular Injuries in Extremity Trauma Medical and Biological Engineering and Computing, 1-10 (Feb 2017)

Papers Published in Proceedings or Records of Conf/Symposia

Weiss, T., Nakada, M., Terzopoulos, D., Automated Layout Synthesis and Visualization From Images of Interior or Exterior Spaces Proc. Third IEEE Workshop on Vision Meets Cognition: Functionality, Physics, Intentionality, and Causality (FPIC), Honolulu, HI, 1-7 (Jul 2017)

0: Professional Development Activities

N/A
1. Name
GUY VAN DEN BROECK, Assistant Professor, Computer Science

2. Education
<table>
<thead>
<tr>
<th>Year</th>
<th>Degree</th>
<th>Institution</th>
<th>Field of Study</th>
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<tbody>
<tr>
<td>Jul 2007</td>
<td>B.S.</td>
<td>KU Leuven</td>
<td>B.S. in Engineering: CS and EE</td>
</tr>
<tr>
<td>Jul 2009</td>
<td>M.S.</td>
<td>KU Leuven</td>
<td>M.S. in Engineering: Computer Science</td>
</tr>
<tr>
<td>Jan 2013</td>
<td>Ph.D.</td>
<td>KU Leuven</td>
<td>Ph.D. in Computer Science</td>
</tr>
</tbody>
</table>

3. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 2015 Appointment to Assistant Professor
years of service: 3

4. Academic & Non-Academic Experience (b) Employment History
<table>
<thead>
<tr>
<th>Year</th>
<th>Position</th>
<th>Institution</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul 2015 - present</td>
<td>Assistant Professor and Samuei Fellow</td>
<td>UCLA</td>
<td></td>
</tr>
<tr>
<td>Feb 2014 - Jun 2015</td>
<td>Postdoctoral Researcher and FWO Fellow</td>
<td>KU Leuven</td>
<td></td>
</tr>
<tr>
<td>Feb 2013 - Jan 2014</td>
<td>Postdoctoral Researcher</td>
<td>UCLA</td>
<td></td>
</tr>
<tr>
<td>2009 - 2013</td>
<td>PhD Student and FWO Fellow</td>
<td>KU Leuven</td>
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5. Academic & Non-Academic Experience (c) Consulting Activities
N/A

6. Current Membership In Professional Organizations
<table>
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<th>Year</th>
<th>Position</th>
<th>Conference / Event</th>
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<tbody>
<tr>
<td>2017 - 2017</td>
<td>Program Committee member</td>
<td>AAAI Conference on Artificial Intelligence</td>
</tr>
<tr>
<td>2016 - 2016</td>
<td>Program Committee member</td>
<td>ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD)</td>
</tr>
<tr>
<td>2016 - 2016</td>
<td>Program Committee member</td>
<td>IEEE International Conference on Data Engineering (ICDE)</td>
</tr>
<tr>
<td>2016 - 2016</td>
<td>Program Committee member</td>
<td>International Conference on Principles on Knowledge Representation and Reasoning (KR)</td>
</tr>
<tr>
<td>2016 - 2016</td>
<td>Program Committee member</td>
<td>International Conference on Scalable Uncertainty Management (SUM)</td>
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7. Honors and Awards
<table>
<thead>
<tr>
<th>Year</th>
<th>Award Description</th>
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<tbody>
<tr>
<td>2016</td>
<td>ICML 2016 Outstanding Reviewer Award</td>
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<tr>
<td>2016</td>
<td>Marco Cadoli Student Paper Prize</td>
</tr>
<tr>
<td>2015</td>
<td>UAI-2015 Best Paper Award</td>
</tr>
<tr>
<td>2014</td>
<td>AAAI-2014 Outstanding Paper Award Honorable Mention</td>
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<tr>
<td>2014</td>
<td>ECCAI Artificial Intelligence Dissertation Award 2014</td>
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8. Service Activities (a) Committee Services
<table>
<thead>
<tr>
<th>Year</th>
<th>Position</th>
<th>Department</th>
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<tr>
<td>2015 - present</td>
<td>Department</td>
<td>MS Admission Committee</td>
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Service Activities (b) Community Services
<table>
<thead>
<tr>
<th>Year</th>
<th>Position</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009 - 2014</td>
<td>KU Leuven</td>
<td>Course development and instruction of innovation lab: teaching AI and visual programming to high school students.</td>
</tr>
</tbody>
</table>
Service Activities (c) Other Professional Activities

2016 - 2016  Co-organizer of the 6th International Workshop on Statistical Relational AI (StarAI) at the 25th Inter

2016 - 2016  Co-organizer of the AAAI Workshop on Declarative Learning Based Programming (DeLBP) at the 30th AAAI Conference on Artificial Intelligence, Phoenix

2015 - 2015  Co-organizer of the 5th International Workshop on Statistical Relational AI (StarAI) at the 31st Conference on Uncertainty in Artificial Intelligence (UAI), Amsterdam, The Netherlands

2014 - ongoing  Grant reviewer, Research Foundation Flanders (FWO)

2014 - ongoing  Grant reviewer, The Netherlands Organisation for Scientific Research (NWO)

9. Publications

Books, Chapters in Books and Editorships


Papers Published in Professional & Scholarly Journals


Vlasselaer, J., Meert, W., Van den Broeck, G., De Raedt, L., Exploiting Local and Repeated Structure in Dynamic Bayesian Networks Artificial Intelligence, (2016)


Papers Published in Proceedings or Records of Conf/Symposia


Seyed Mehran Kazemi, Angelika Kimmig, Guy Van den Broeck and David Poole, Domain Recursion for Lifted Inference with Existential Quantifiers Seventh International Workshop on Statistical Relational AI (StarAI), (2017)


10: Professional Development Activities

N/A
1. Name
GEORGE VARGHESE, Professor, Computer Science

2. Education
Aug 1981  B. Tech  Indian Institute of Technology  Electrical Engineering
Aug 1983  M.S.  North Carolina State University  Computer Studies
Feb 1993  Ph.D.  Massachusetts Institute of Technology  Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
No Data

Academic & Non-Academic Experience (b) Employment History

<table>
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<tr>
<th>Date</th>
<th>Position</th>
<th>Institution/Location</th>
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<tbody>
<tr>
<td>Aug 2012 - present</td>
<td>Partner and Principal Researcher</td>
<td>Microsoft Research</td>
</tr>
<tr>
<td>Aug 2011 - Jun 2012</td>
<td>Academic Visitor</td>
<td>Yahoo! Research, Santa Clara, Stanford University</td>
</tr>
<tr>
<td>Aug 2010 - Jul 2011</td>
<td>Distinguished Visitor, Dept. of Computer Science</td>
<td>Stanford University</td>
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Academic & Non-Academic Experience (c) Consulting Activities

<table>
<thead>
<tr>
<th>Year</th>
<th>Activity Description</th>
</tr>
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<tbody>
<tr>
<td>1994 - 2014</td>
<td>Consulting, Various, Consultant for Digital Equipment Corporation, America Online, Microsoft Corporation, Cascade Corporation, Procket Corporation. Fujitsu, ST MicroElectronics, Greenfield Networks, Chiaro Networks Technical Advisory Boards., Various, Memoir Memory Systems (acquired by Cisco); Sanera (acquired by McData), Jibe (acquired by Citrix), and SwitchOn (acquired by PMC-Sierra).</td>
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5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations

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<th>Year</th>
<th>Activity</th>
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<tbody>
<tr>
<td>2017</td>
<td>Program Committee, SIGCOMM 2017 (Los Angeles, UCLA)</td>
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<tr>
<td>Dec 2016</td>
<td>NSF Networking Panel</td>
</tr>
<tr>
<td>2012</td>
<td>TPC Chair, joint with Venkat Padmanabhan, ACM SIGCOMM (Finland)</td>
</tr>
<tr>
<td>Jul 2009</td>
<td>Program Committee, NSF Networking Review Panels</td>
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<tr>
<td>Jul 2005</td>
<td>Program Committee, NSF Networking Review Panels</td>
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7. Honors and Awards

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<tr>
<th>Year</th>
<th>Award Description</th>
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<tbody>
<tr>
<td>Feb 2017</td>
<td>Elected to the National Academy last year, National Academy of Engineering</td>
</tr>
<tr>
<td>2015</td>
<td>Best of CCR Award (P4 Paper), SIGCOMM</td>
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<tr>
<td>2015</td>
<td>IIT Bombay Distinguished Alumnus Award, IIT Bombay</td>
</tr>
<tr>
<td>2014</td>
<td>Koji Kobayashi Award for Computers and Communications for contributions to the field of network algorithmics and its applications to high-speed packet networks, Kobi Kobayashi</td>
</tr>
<tr>
<td>2014</td>
<td>SIGCOMM Lifetime Award for sustained and diverse contributions to network algorithmics, with far reaching impact in both research and industry, SIGCOMM</td>
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8. Service Activities (a) Committee Services

<table>
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<tr>
<th>Year</th>
<th>Department</th>
<th>Activity Description</th>
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<tbody>
<tr>
<td>2017</td>
<td>Other</td>
<td>Member NAE Nomination Committee for UCLA Engineering School, Seek out potential NAE nominations in UCLA</td>
</tr>
<tr>
<td>2016</td>
<td>Department</td>
<td>Chair Awards Committee, Leading an effort to proactively nominate faculty for new awards</td>
</tr>
<tr>
<td>2016 - 2017</td>
<td>Department</td>
<td>Academic Policy Committee</td>
</tr>
<tr>
<td>2016 - 2017</td>
<td>Department</td>
<td>Hiring Committee</td>
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<td>2016 - ongoing</td>
<td>Department</td>
<td>Adhoc committee</td>
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Service Activities (b) Community Services

<table>
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<th>Year</th>
<th>Community Services</th>
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<tr>
<td>2016 - 2017</td>
<td>SIGCOMM PC Member, SIGCOMM</td>
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Service Activities (c) Other Professional Activities

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<tr>
<td>Sep 2015</td>
<td>Distinguished Lecture, UC Berkeley</td>
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<tr>
<td>2015</td>
<td>Tutorials, Network Verification (SIGCOMM)</td>
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</table>

9. Publications

Books, Chapters in Books and Editorships


Papers Published in Professional & Scholarly Journals


Papers Published in Proceedings or Records of Conf/Symposia

- Khoa To, Daniel Firestone, George Varghese, Jitendra Padhye, Measurement Based Fair Queuing for Allocating Bandwidth to Virtual Machines HotMiddlebox@SIGCOMM, (2016)
- B. Awerbuch, B. Patt, G. Varghese, Bounding the Unbounded proceedings of IEEE Infocom Conference, Toronto, (2017)

10: Professional Development Activities

N/A
1. Name
MARIA VASILESCU, Lecturer, Computer Science

2. Education
1997 Eng Massachusetts Institute of Technology Image Processing, Computer Vision
2009 PhD University of Toronto Computer Vision, Computer Graphics, Machine Learning

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
No Data

Academic & Non-Academic Experience (b) Employment History
2013 Chief Science Officer Tensor Vision Technologies
2009 - 2013 Research Scientist UCLA
2005 - 2007 Research Scientist Massachusetts Institute of Technology
Dec 2000 - Jun 2005 Research Scientist New York University

Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
N/A

7. Honors and Awards
N/A

8. Service Activities (a) Committee Services
N/A

Service Activities (b) Community Services
2013 - 2014 Advisory Board Member, UCLA, Startup UCLA
2012 - 2012 Director, UCLA, Startup Weekend Competition

Service Activities (c) Other Professional Activities
N/A

9. Publications
Books, Chapters in Books and Editorships

Papers Published in Proceedings or Records of Conf/Symposia
M.A.O. Vasilescu, Multilinear Projection for Face Recognition via Rank-1 Analysis 1-8 (06/18/2010)

10: Professional Development Activities
N/A
1. Name
WEI WANG, Professor, Computer Science

2. Education
May 1995  M. S.  Binghamton University  Systems Science and Industrial Engineering
Jul 1999  Ph. D.  UCLA  Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 2012  Appointment to Professor

years of service: 6

Academic & Non-Academic Experience (b) Employment History

<table>
<thead>
<tr>
<th>Year</th>
<th>Position</th>
<th>Institution</th>
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<tbody>
<tr>
<td>2012 - present</td>
<td>Professor</td>
<td>UCLA</td>
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<tr>
<td>2010 - 2012</td>
<td>Professor</td>
<td>University of North Carolina</td>
</tr>
<tr>
<td>2006 - 2010</td>
<td>Associate Professor</td>
<td>University of North Carolina</td>
</tr>
<tr>
<td>2002 - 2006</td>
<td>Assistant Professor</td>
<td>University of North Carolina</td>
</tr>
<tr>
<td>1999 - 2002</td>
<td>Research Staff Member</td>
<td>IBM T. J. Watson Research Centers</td>
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Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations

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<th>Year</th>
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<tr>
<td>2017 - present</td>
<td>Steering Committee Member, IEEE Big Data Conference</td>
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<tr>
<td>2015 - 2018</td>
<td>Co-Director, NIH BD2K Centers-Coordination Center</td>
</tr>
<tr>
<td>2015 - present</td>
<td>Board of Directors, ACM Special Interest Group on Bioinformatics, Computational Biology, and Biomedical Informatics (SIGBio)</td>
</tr>
<tr>
<td>2015 - present</td>
<td>Co-Director, Scalable Analytics Institute</td>
</tr>
<tr>
<td>2013 - 2015</td>
<td>Director, Scalable Analytics Institute</td>
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</table>

7. Honors and Awards

<table>
<thead>
<tr>
<th>Year</th>
<th>Award Description</th>
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<tbody>
<tr>
<td>2017</td>
<td>Grand Prize Award of the Yelp Dataset Challenge (Round 9), Yelp</td>
</tr>
<tr>
<td>2016</td>
<td>ACM SIGKDD Service Award, ACM SIGKDD</td>
</tr>
<tr>
<td>2016</td>
<td>Best Research Paper Runner-up Award, ACM SIGKDD</td>
</tr>
<tr>
<td>2016</td>
<td>Leonard Kleinrock Professor, UCLA Computer Science Department</td>
</tr>
<tr>
<td>2013</td>
<td>Okawa Foundation Research Award, Okawa Foundation</td>
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8. Service Activities (a) Committee Services

<table>
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<tr>
<th>Year</th>
<th>Department/Position</th>
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<tbody>
<tr>
<td>2017 - 2018</td>
<td>Department Member, By-law-55 Committee</td>
</tr>
<tr>
<td>2016 - 2016</td>
<td>Other Member, SEAS Data Science Task Force</td>
</tr>
<tr>
<td>2016 - present</td>
<td>Department Member, Faculty Hiring Committee</td>
</tr>
<tr>
<td>2014 - 2015</td>
<td>Department Member, Faculty Hiring Committee</td>
</tr>
<tr>
<td>2013 - present</td>
<td>Department Member, Department Banking Committee</td>
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Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities

<table>
<thead>
<tr>
<th>Year</th>
<th>Activity</th>
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</thead>
<tbody>
<tr>
<td>Apr 2017</td>
<td>Panelist, serving in an NSF CISE IIS panel</td>
</tr>
<tr>
<td>2017</td>
<td>Invited Lecture, China Computer Federation Advanced Disciplines Lecture (CCF-ADL)</td>
</tr>
<tr>
<td>2017</td>
<td>Invited Speech, East China Normal University, Shanghai, China</td>
</tr>
<tr>
<td>2017</td>
<td>Invited Speech, International Conference on Data Science, Shanghai, China</td>
</tr>
</tbody>
</table>
9. Publications

Books, Chapters in Books and Editorships

Papers Published in Professional & Scholarly Journals

Papers Published in Proceedings or Records of Conf/Symposia

10: Professional Development Activities
N/A
1. Name
ROY WOLLMAN, Associate Professor, Chemistry and Bio Chemistry

2. Education
2003 B.A. Tel-Aviv University
2008 Ph.D. University of California, Davis

3. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
2016 Associate Professor

4. Academic & Non-Academic Experience (b) Employment History
2012-2016 Assistant Professor UC San Diego
2015-2016 Hellman Fellow

5. Academic & Non-Academic Experience (c) Consulting Activities
N/A

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
N/A

7. Honors and Awards
N/A

8. Service Activities (a) Committee Services
N/A

Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
N/A

9. Publications
N/A

10. Professional Development Activities
N/A
1. Name
CARLO ZANIOLO, Professor, Computer Science

2. Education
Feb 1968 Engr/EE Padua University, Italy
Jun 1970 M.S. University of California, Los Angeles, California
Jun 1976 Ph.D. University of California, Los Angeles, California

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 1991 Appointment to Professor
years of service: 27

Academic & Non-Academic Experience (b) Employment History
07/01/1991 - present Professor University of California, Los Angeles
Aug 1984 - Laboratory Head Microelectronics & Computer Corp. (MCC), Austin, Texas
06/30/1991 AT&T Bell Laboratories, Murray Hill, New Jersey
Oct 1980 - Jul 1984 Research Staff (MTS) Sperry Research, Sudbury, Massachusetts
Oct 1976 - Sep 1980 Research Scientist Burroughs Corporation, Pasadena, California
Sep 1974 - Sep 1976 Engineer

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
08/24/2014 - Member of Program Committee, KDD 2014: 20th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, August 24-27, 2012, New York City.
08/27/2014 Program Committee Member, KDD 2011: 17th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, San Diego, CA, USA, August 21-24, 2011
06/22/2014 - Member of Program Committee, 2014 ACM SIGMOD/PODS Conference, on the management of Data, Snowbird, Utah, USA on June 22-27, 2014
03/31/2014 - Member of Program Committee, ICDE 2014: 30th International Conference on Data Engineering. Chicago, IL, USA. March 31-April 4, 2014
04/04/2014 Engineering.

7. Honors and Awards
Jun 2014 Best Demo Award for demonstration described in short paper entitled: The Analytical Bootstrap a New Method for Fast Error Estimation in Approximate Query Processing., ACM SIGMOD Conference 2014
Mar 1987 IEEE Recognition Award for Editorial Work
1968 University of California/Padua University, Italy: Cultural Exchange Scholarship
8. Service Activities (a) Committee Services

<table>
<thead>
<tr>
<th>Date</th>
<th>Department</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul 2012</td>
<td></td>
<td>Member, By Law Committee</td>
</tr>
<tr>
<td>06/30/2013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jul 2012</td>
<td></td>
<td>Member, FEC Committee</td>
</tr>
<tr>
<td>06/30/2014</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. Publications

Books, Chapters in Books and Editorships


Papers Published in Professional & Scholarly Journals


Masciari, E., Mazzeo, G., Zaniolo, C., Analysing microarray expression data through effective clustering Information Sciences, 262:32-45 (Mar 2014)

Papers Published in Proceedings or Records of Conf/Symposia

Andrea Dessi, Andrea Maxia, Maurizio Atzori, Carlo Zaniolo, Supporting semantic web search and structured queries on mobile devices 3RD International Workshop on Semantic Search over the Web, SSW '13, 200-204 (Aug 2013)


10: Professional Development Activities

N/A
1. Name
LIXIA ZHANG, Professor, Computer Science

2. Education
Jul 1976  B.S.  Heilongjiang University, Harbin, China  Physics
Jun 1981  M.S.  California State University at Los Angeles  Electrical Engineering
Jul 1989  Ph.D.  Massachusetts Institute of Technology  Computer Science

3., 4. Academic & Non-Academic Experience (a) UCLA HSSEAS Appointment History
Jul 2000  Promotion to Professor
years of service: 18

Academic & Non-Academic Experience (b) Employment History
Jul 2000  Full Professor  University of California, Los Angeles
11/01/1995  Associate Professor  University of California, Los Angeles
Aug 1989 - Oct 1995  Research Staff Member  Xerox Palo Alto Research Center
Jun 1985 - Sep 1985  summer intern  DEC Eastern Research Laboratory
1981 - 1989  Research Assistant  MIT Laboratory for Computer Science

Academic & Non-Academic Experience (c) Consulting Activities
Oct 2010 - Oct 2011  Consultant, Futurewei Technologies, consulting on new internet architecture designs
Oct 2009 - Sep 2010  Consultant, Futurewei Technologies, Consulting on separation of IP addresses from host identifiers.
Sep 2005 - Aug 2006  Consultant, Futurewei Technologies
Aug 2004 - Apr 2005  Consultant, Lockheed Martin
2000 - 2001  Co-founder & CTO, Silvan Networks

5. Certifications or Professional Registrations
N/A

6. Current Membership In Professional Organizations
2015 - present  Advisory board, school of computer science, Jilin University, China
2014 - 2014  TPC co-Chair, ACM Information Centric Networking Conference
2014 - present  Member of Steering Committee, ACM Information Centric Networking Conference
2014 - present  Member of the Editorial Board, The Proceedings of the IEEE
2014 - present  •  Member of the ACM-W Athena Lecturer Selection Committee

7. Honors and Awards
Oct 2014  Best paper award, IEEE Workshop on Secure Network Protocols
07/01/2011  Postel Chair, UCLA
Apr 2010  Best Paper Award, Passive and Active Measurement conference
2009  IEEE Internet Award, IEEE

8. Service Activities (a) Committee Services
2012 - 2013  Department  Member, Recruiting Committee
2012 - 2015  University Wide  Member, Undergraduate Council's (UgC) Honors, Awards and Prizes Committee
2011 - 2012  Department  Member, By-Law Committee
Jul 2008 - Jun 2011  University Wide  member, Committee of Teaching
2008 - 2012  University Wide  Member, Committee on Teaching
Service Activities (b) Community Services
N/A

Service Activities (c) Other Professional Activities
Sep 2012  Lecturer, Invited Talk, "Evolving Internet into the Future via Named Data Networking", Paris LINCS
Sep 2012  Lecturer, Invited Talk, "Named Data Networking: Experimentation with the new architecture", Dagstuhl Seminar
Sep 2012  Lecturer, Invited Talk, CCN Community Meeting hosted by INRIA
Aug 2012  Lecturer, Invited Talk, "How to make ICN research successful", AsiaFI Summer School

9. Publications
Books, Chapters in Books and Editorships

Papers Published in Professional & Scholarly Journals

Papers Published in Proceedings or Records of Conf/Symposia
Moiseenko, I., Wang, L., Zhang, L., Consumer/Producer Communication with Application Level Framing in Named Data Networking ACM Information Centric Networking Conference, 1-10 (Sep 2015)

10: Professional Development Activities
N/A
APPENDIX C – EQUIPMENT

Boelter Hall Room 3760 : Software Construction Lab: CS35L

29 workstations
28 docking stations for laptops
A dedicated and isolated wireless network

Boelter Hall Room 3704 : Computer Networks Lab: CS 117, EE 171L

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP Optical Single-mode spectrum analyzer</td>
<td>1</td>
</tr>
<tr>
<td>HP Optical Single-mode multi-waive meter</td>
<td>1</td>
</tr>
<tr>
<td>HP Laser Transmitter</td>
<td>2</td>
</tr>
<tr>
<td>HP Laser detector</td>
<td>2</td>
</tr>
<tr>
<td>Fiber-Optic single mode cable</td>
<td>20</td>
</tr>
<tr>
<td>Fiber-Optic multi mode cable</td>
<td>20</td>
</tr>
<tr>
<td>HP High frequency (660MHz) signal generator</td>
<td>1</td>
</tr>
<tr>
<td>HP EDF Amplifier</td>
<td>1</td>
</tr>
<tr>
<td>HP Single-mode Multiplexer/Demultiplexer</td>
<td>4</td>
</tr>
<tr>
<td>HP Optical various Adapters</td>
<td>20</td>
</tr>
<tr>
<td>LED transmitter</td>
<td>10</td>
</tr>
<tr>
<td>N/P Photodetector</td>
<td>10</td>
</tr>
<tr>
<td>Wavetek Function Generator</td>
<td>20</td>
</tr>
<tr>
<td>Wavetek Oscilloscope</td>
<td>10</td>
</tr>
<tr>
<td>DEL Desktop Computer</td>
<td>10</td>
</tr>
<tr>
<td>LABVIEW Spectrum analyzer with GPIB board</td>
<td>10</td>
</tr>
<tr>
<td>Optical power meter</td>
<td>3</td>
</tr>
<tr>
<td>Electrical Multi meter</td>
<td>3</td>
</tr>
<tr>
<td>HP Gigahertz Spectrum analyzer</td>
<td>1</td>
</tr>
<tr>
<td>Wi-Fi Access devices</td>
<td>4</td>
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<tr>
<td>Power supply</td>
<td>1</td>
</tr>
<tr>
<td>Data projector</td>
<td>50</td>
</tr>
<tr>
<td>Coaxial various Cable</td>
<td>20</td>
</tr>
<tr>
<td>UTP various Cable</td>
<td></td>
</tr>
<tr>
<td>Smartphones</td>
<td>3</td>
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<tr>
<td>htc</td>
<td>1</td>
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<td>Android</td>
<td>7</td>
</tr>
<tr>
<td>Item</td>
<td>Quantity</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------</td>
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<tr>
<td>LG</td>
<td>12</td>
</tr>
<tr>
<td>Samsung</td>
<td>3</td>
</tr>
<tr>
<td>Nexus</td>
<td>10</td>
</tr>
<tr>
<td>Iphone</td>
<td>3</td>
</tr>
<tr>
<td>Samsung Galaxy</td>
<td>2</td>
</tr>
<tr>
<td>Iphone se</td>
<td>3</td>
</tr>
<tr>
<td>BLE one X2</td>
<td>18</td>
</tr>
<tr>
<td>Raspberry P1,P2,P3,…,P10</td>
<td>12</td>
</tr>
<tr>
<td>Raspberry P11,-P14 with developer kit</td>
<td>4</td>
</tr>
<tr>
<td>AR 1 (arduino one)</td>
<td>3</td>
</tr>
<tr>
<td>Solderless Breadboard</td>
<td>4</td>
</tr>
<tr>
<td>SanDisk regular 8GB</td>
<td>1</td>
</tr>
<tr>
<td>Flow Sensor (Liquid Flow)</td>
<td>1</td>
</tr>
<tr>
<td>USB GPS Receiver</td>
<td>1</td>
</tr>
<tr>
<td>Arduino Shield WiFi</td>
<td>2</td>
</tr>
<tr>
<td>Light Sensor</td>
<td>1</td>
</tr>
<tr>
<td>Accelerometer</td>
<td>1</td>
</tr>
</tbody>
</table>

**Engineering IV Room 18132J Circuits Lab: E110L, E115AL**
- Keysight Oscilloscope DSOX2002A (14)
- Rigol Function Generator DG1022 (14)
- Tektronix Power Supply PS280 (14)

**Boelter Hall Room 3424 Introductory Digital Design Lab: CS 152A**
- Digilent Nexys2 (31)
- Oscilloscopes (14)
- Proto Boards (14)
- PModJSTK Nexys3 Board Extensions (14)
- PModKYPD Nexys3 Board Extensions (7)
- PModSSD Nexys3 Board Extensions (10)
- PModBTN Nexys3 Board Extensions (8)
- PModI2S Nexys3 Board Extensions (10)

**Boelter Hall Room 3436 Digital Design Project Lab: CS 152B**
- Desktop PCs (12)
- DIGILENT VIRTEX 5 FPGA boards (15)
- iRobot (9)
- Pmod Keypads (20)
- Pmod Joystick (6)
- Pmod Bluetooth (12)
Pmod wifi (6)
Pmod switches (10)
Pmod light sensor (10)
Pmod Gyro (10)
Pmod ADC (10)
Pmod Microphone (10)
Touch LCD (15)
Pmod OLED2 (15)
Digilent Camera (17)
Appendix D – Institutional Summary

Programs are requested to provide the following information.

1. The Institution
   a. Name and address of the institution
      University of California, Los Angeles (UCLA)
      405 Hilgard Avenue
      Los Angeles, CA 90095
   b. Name and title of the chief executive officer of the institution
      Gene Block
      Chancellor
   c. Name and title of the person submitting the Self-Study Report
      Jayathi Y. Murthy
      Ronald and Valerie Sugar Dean
      UCLA Samueli
      School of Engineering & Applied Science
   d. Name the organizations by which the institution is now accredited, and the dates of the initial and most recent accreditation evaluations.

      In addition to ABET (EAC and CAC), UCLA is accredited by the Western Association of Schools and Colleges (WASC).
      Initial Accreditation: 1949
      Most Recent Re-Affirmation of Accreditation: June 2012
      Next WASC Accreditation process will begin in 2018

2. Type of Control
   As part of the University of California system, UCLA is a state university.
3. Educational Unit

As indicated in the administrative organization chart below, Dean Murthy reports directly to the Chancellor Gene Block and the Executive Vice Chancellor Scott Waugh.
4. Academic Support Units

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>William Duke</td>
<td>Chair</td>
</tr>
<tr>
<td>Physics and Astronomy</td>
<td>Jean Turner</td>
<td>Chair</td>
</tr>
<tr>
<td>Chemistry and Biochemistry</td>
<td>Catherine Clarke</td>
<td>Chair</td>
</tr>
</tbody>
</table>

5. Non-academic Support Units

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science and Engineering Library</td>
<td>Antonio Aponte</td>
<td>Associate Librarian</td>
</tr>
<tr>
<td>SEASNET (Computing Facilities)</td>
<td>Nicodemus Wibowo</td>
<td>Director</td>
</tr>
<tr>
<td>UCLA Career Center</td>
<td>Christine Wilson</td>
<td>Interim Director</td>
</tr>
<tr>
<td>UCLA Engineering</td>
<td>William Herrera</td>
<td>Director Undergraduate Research &amp; Internship</td>
</tr>
<tr>
<td>UCLA Engineering</td>
<td>Wes Uehara</td>
<td>Community College Outreach Coordinator</td>
</tr>
</tbody>
</table>

6. Credit Unit

At UCLA, one unit represents three hours of work per week per term by the student, including both class attendance and preparation. At UCLA, one academic year represents 30 weeks of classes (three ten-week quarters) exclusive of final examinations.

7. Tables

Table D-1. Program Enrollment and Degree Data

Computer Science & Engineering
Give official fall term enrollment figures (head count) for the current and preceding four academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the on-site visit.

**FT**--full time  
**PT**--part time  
*As reported by SEASnet on 11/26/2017*
Table D-2. Computer Science and Engineering Personnel

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall 2017-18</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>HEAD COUNT</th>
<th>FTE²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative²</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Faculty (tenure-track)³</td>
<td>34</td>
<td>2</td>
</tr>
<tr>
<td>Other Faculty (excluding student Assistants) Lecturer and Adjunct</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Student Teaching Assistants⁴</td>
<td>.85</td>
<td>13.60</td>
</tr>
<tr>
<td>Technicians/Specialists</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>Office/Clerical Employees</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>Others⁵</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Report data for the program being evaluated.

1. Data on this table should be for the fall term immediately preceding the visit. Updated tables for the fall term when the ABET team is visiting are to be prepared and presented to the team when they arrive.

2. Persons holding joint administrative/faculty positions or other combined assignments should be allocated to each category according to the fraction of the appointment assigned to that category.

3. For faculty members, 1 FTE equals what your institution defines as a full-time load.

4. For student teaching assistants, 1 FTE equals 20 hours per week of work (or service). For undergraduate and graduate students, 1 FTE equals 15 semester credit-hours (or 24 quarter credit-hours) per term of institutional course work, meaning all courses — science, humanities and social sciences, etc.

5. Specify any other category considered appropriate, or leave blank.
Signature Attesting to Compliance

By signing below, I attest to the following:

That _______________________ (Name of the program(s)) has conducted an honest assessment of compliance and has provided a complete and accurate disclosure of timely information regarding compliance with ABET’s *Criteria for Accrediting Computing Programs* and ABET’s *Criteria for Accrediting Engineering Programs* to include the General Criteria and any applicable Program Criteria, and the ABET Accreditation Policy and Procedure Manual.

________________________________
Dean’s Name (As indicated on the RFE)

________________________________
_________________
Signa
Signature Attesting to Compliance

By signing below, I attest to the following:

That Computer Science and Engineering (BS) has conducted an honest assessment of compliance and has provided a complete and accurate disclosure of timely information regarding compliance with ABET’s Criteria for Accrediting Engineering Programs to include the General Criteria and any applicable Program Criteria, and the ABET Accreditation Policy and Procedure Manual.

Jayathi Murthy
Dean’s Name (As indicated on the RFE)

____________________
Signature

____________________
Date