California State University, East Bay

Department of Mathematics and Computer Science

Five Year Program Review for

Computer Science: B.S. and M.S.
Computer Networks: M.S.
Mathematics: B.S. and M.S.

2011

Self Study and 5-Year Plan approved by faculty on May 1, 2011

External Reviewer report received (C.S. & Computer Networks): May 16, 2011

External Reviewer report received (Mathematics): May 25, 2011

Programs Response to C.S. & Computer Networks review completed on: May 24, 2011

Programs Response to Mathematics review completed on: May 30, 2011

Complete 5-Year Review Report submitted to CAPR on: June 3, 2011

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1.0. Introduction and Summary for next 5 years

The Department of Mathematics and Computer Science offers a wide variety of courses, majors, graduate programs, and certificates. It is the only department left in the CSU system that combines the two fields into one Department.

For the official review, there are three programs included in this document

- Mathematics, B.S. and M.S.
- Computer Science, B.S. and M.S.
- Computer Networks, M.S.

All Degree programs:

- B.S., Mathematics
- B.S., Computer Science
- Minors: mathematics, computer science, Software Systems
- M.S., Mathematics
- M.S., Computer Science
- M.S., Computer Networks (begun as joint program with College of Business)

Other programs

- Remedial Mathematics
- Foundational Mathematics
- Service courses for other majors
- General education mathematics requirements

The distinctions between the populations served have made particular demands on the Department. Meeting the needs of the students in this era of severe budget constraints will be a true challenge.

One important area for discussion over the next five years will be the possible split into two Departments. Historically, computer science began as a division of mathematics at most universities, but has become a separate department almost everywhere.

Summary of plans for all programs, next five years

- New faculty in both Mathematics and Computer Science
- Unify the department (offices consolidated, more opportunities for faculty to work together, etc)
- Improve student experience at CSUEB (revive Math Lab, increase advising, get student feedback)
- Ease burden placed by budget restriction (revive student grading, increase faculty travel funding, etc)
- Develop department leadership

- Improve relationship with ITS (Instructional Technology Services).
- Work on student preparation for courses in a sequence
- Improve support from library
- Discuss future of Department (combined or split)
- Complete integration of Computer Networks into the Computer Science program

1.1. Summary: Mathematics

The major impacts of the past five years include (1) system wide CSU budget declines, (2) the continued loss of regular faculty members and recent loss of long-term lecturers, and (3) the influx of a large freshman class through our math courses. These years have been a time of retrenchment. Now as enrollment gradually increases, we expect that the next five years will be a time of growth and renewal.

Last Five Year Review: The 2005 Department plan listed these goals, with a summary of actions

1. Continue analysis of need for new faculty – 2 new hires in last 5 years
2. State approval of Single Subject Prep Program – done
3. Strengthen ties to community colleges – done, can do more
4. Arrange more meaningful spatial configurations for faculty and students – gains and losses
5. Support new and current faculty – few gains, mostly losses
6. Focus groups of students to learn more about student needs – only done on ad hoc basis
7. Continue to analyze and strengthen applied math options – no real progress

Our ability to accomplish all of our goals has been negatively impacted by the on-going budget crisis.

Students and Faculty: Overall, Mathematics enrollment has been fairly stable, with a huge increase in the number of remedial math sections, which are mostly taught be graduate Teaching Associates. Once done with remediation, this group of students then go on to take GE Math courses. Some continue on into Calculus. Because of the shortage of regular faculty, fewer of our Calculus courses are being taught by PhDs in Mathematics.

CSUEB students continue to be largely commuting, upper-division and graduate, students, usually working and with family responsibilities. Many students transfer from community colleges. There is a demand for evening courses, which are often difficult to staff with regular faculty.

Plan: **Students** The Department will continue to try to provide a high caliber, creative undergraduate and graduate math program. The challenge is to retain high quality regular faculty and to maintain a large enough student demand in order to be able to provide these courses. The quality of these courses is also put at risk by lack of funding for graders, which has always been central to the effective delivery of our math courses.

It also needs to ontinue to be responsive to the needs of entering freshmen who are taking remedial math courses. Several aspects of the remedial math program have been changed over the last five years, which has improved the student flow through these courses and increased the amount of mathematical feedback within the courses.

Plan - Curriculum Continue to be responsive to the needs and requirements of local K-12 schools in the preparation of future teachers. Continue to update curriculum to provide innovative and challenging experiences for our undergrad and grad math majors. Continue to investigate ways to improve student preparation, so that meeting a prerequisite should enable a student to succeed in future courses.

Plan - Faculty Hire new faculty in appropriate areas of expertise and retain the faculty that the Department already has. Try to increase faculty support funds for travel and research.

Outside Reviewer's Report Main points suggested were (1) increase number of sections of upper division math courses, and decrease their size, (2) encourage faculty cohesiveness, (3) encourage faculty research

Program Response to Outside Reviewer's Report The Department would indeed like to have better physical offices for faculty, and smaller classes offered more often; it agrees that it needs to encourage faculty research and cohesion. The relatively low number so students taking upper division course, plus the severe budget restrictions, will make achieving some of these goals very difficult.

1.2. Summary: Computer Science and Computer Networks

The two major impacts of the past five years have been (1) the nationwide steep decline in Computer Science enrollment, and (2) system wide CSU budget declines. These years have been a time of retrenchment. Now as enrollment gradually increases, we expect that the next five years will be a time of growth and renewal.

In 2005, the Computer Networks degree was known as the M.S. in Telecommunication Systems, and was a joint program between the Department of Accounting and Computer Information Systems and the Department of Mathematics and Computer Science. Its faculty included Dr. Hongwei Du from the College of Business, and its courses included some with a CIS or TC prefix. With the steep decline in enrollments is both Computer Science and in Computer Information Systems, the College of Business did a major revision in 2008. The Department of Accounting and Computer Information Systems became the Department of Accounting and Finance. There are no longer any CIS (or TC) courses. At this time, the M.S. in Telecommunication Systems was taken over by the Department of Mathematics and Computer Science and underwent many revisions, although courses are still being added and revised as students in the old program graduate and the new program becomes more thoroughly integrated.

Last Five Year Review: The 2005 Department plan listed these goals, with a summary of actions

1. Analyze new ACM (Association for Computer Machinery) curriculum -- done
2. Explore new areas of Computer Science for possible new courses -- done
3. Receive feedback from the Computer Science Advisory Committee -- done
4. Consider new options in the C.S. M.S. program – considered, none implemented
5. Offer new B.S. in Computer Engineering in cooperation with the Department of Engineering - done
6. Explore new C.S. option in Computational Intelligence – not implemented
7. Increase opportunities for undergraduate research – no real progress

The areas that were not implemented are, in hindsight, largely a result of the decline in enrollment. This was not the time for new options in the degree. The new B.S. in Computer Engineering was implemented, but has a fairly small enrollment.

Note that Computer Networks had no plan in our Self Study in 2005; that is because it was still a joint program with the College of Business, and was not specifically part of the Department document.

Students and Faculty: Computer Science enrollment plummeted, reaching a low of 255 undergraduate students and 128 graduate students in 2007. At its highest (2001) there were 762 undergraduate majors and 424 C.S. M.S. students. Enrollment is increasing now – in 2009, CSUEB had 281 undergraduate and 183 graduate students in Computer Science. Computer Networks numbers are not known since the program (in its current form) is quite new. It should be emphasized that these trends are not unique to CSUEB; see the nationwide Taulbee report statistics in Appendix C.

CSUEB students are largely commuting upper-division and graduate students, usually working and with family responsibilities. There is a demand for evening and online sections of courses. Many students transfer from community colleges. Five years ago, many were second degree students, but CSUEB no longer accepts students in this category.

As compared to the University as a whole, there are – as across the U.S. – fewer Black and Hispanic students in Computer Science, and more foreign students. 91% of the C.S. M.S. in Networks are nonresident aliens, as are 37% of the C.S. students (as compared to only 9% of the University as a whole).

Due to the decline in enrollment, there have been no faculty hires in the past five years. The Department has lost almost all of its lecturers. And the faculty is aging – none under age 40, five (out of 15) over age 60. Eighty percent (80%) of current faculty are white Caucasian.

Plan: In simplest terms, the goal of the Department is to meet an increasing enrollment and to keep abreast of changes in the field of Computer Science.
To do this, the Department must add classes (as appropriate for new emerging technologies) and faculty (with new areas of expertise and new outlooks on the field).

Plan: Students: Increase presence on local community college campuses. Participate in University outreach programs in India and China.

Plan: Curriculum: Continue to consider ABET accreditation. Continue to update curriculum. Note that there was a recent update to the introductory sequence, and a new course is Mobile and Web Programming is in the process of approval.

Plan: Faculty: Hire new faculty in appropriate areas of expertise; use lecturers to fill in gaps. Try to increase faculty support funds (travel, etc.).

Outside Reviewer's Report Major problems are: (1) lack of computer labs, (2) insufficient technical and budget support, (3) not enough faculty members, and (4) need for better student advising.

Program Response to Outside Reviewer's Report The Department recognizes the issues raised and largely agrees with all of them. Within the limitations of current and expected budget restrictions, it will do its best to address them.

2.1. Self Study, Mathematics

2.1 Summary of previous review and plan, with progress made

In 2005, the Department recognized that it had faced and was still facing a number of challenges. The Department saw the following as the most important parts of the plan for the 2005 to 2010 period:

- Need for new math faculty

  Over the last 5 years, the Department has had an adequate number of tenure track math faculty. In addition to math professors, we had a number of CS professors who would teach math courses, when there wasn't sufficient demand for CS courses, due to the DotCom bust. We also had nine long term contract lecturers teaching a number of math classes. Just this past year, though, we have lost or are about to lose 2 regular faculty members due to resignations, 2 regular faculty members at the end of their FERP and 5 contract lecturers. Only the loss due to FERP was anticipated. Unexpectedly, the Department is now having a difficult time staffing all of the needed courses for next academic year. Though the resignations are officially categorized as faculty members taking a "leave of absence," clearly the Department will need to additional positions in the near future.

- Strengthen ties to community colleges – faculty and students

  Representatives from the Department have met with math faculty at area community colleges to continue to improve the accurate articulation of our curriculum. The goal has been for Community colleges to provide a clear pathway for their students to successfully transfer to CSUEB and efficiently complete their Bachelor's degree.

- Arrange more meaningful spatial configurations for dept. offices, labs, library, workroom.

  In the past five years, the Department has suffered setbacks when it comes to access to space, most of them having to do with computer science. On the math side, we had a Math Major Lab in North Science 111 where our undergraduate and graduate math majors could meet to form community and work together as they learned. This room was used by several other groups of students, including lower division math students and tutoring programs centered in the Sciences. This room functioned in a way totally separate from the University Tutoring Center (SCAA), which specifically serves the remedial and lower division math and English needs of undergraduate students at CSUEB. In all of the other sciences, students regularly take lab courses, where they must collaborate with each other. This collaboration is important for their intellectual development and their retention by the University. Mathematics, on the other hand, tends to be an isolating activity, hence the importance of having a Math Lab where our majors are encouraged to work with each other. Unfortunately, our Math Lab, in North Science 111, was needed by another program, which was experiencing fast growth.

- Meet the challenge of losing Warren Hall offices (13 faculty at present)

  The Warren Hall professors were moved to Robinson Hall in 2007. It's been beneficial to have 9 math professors along a single hallway. Yet, there are several downsides. There are still 4 math professors who have their offices spread around in the Science building, so the math faculty isn't quite united in its location. In addition, Robinson Hall is on the other side of campus from the Department office in the Science building. Our contract lecturers are also split between the Science building and Meiklejohn Hall. Our graduate Teaching Associates are just now being moved from a Trailer, which is located next to Robinson Hall, to the other side of campus in Meiklejohn, which is neither close to our math professors nor the Department office.

- Maintain support for new and current faculty (release time, support funds, travel, etc)

  Our two new faculty members received sufficient start up funds and 1 course release when they were hired in 2007. The University has a mini-grant program, often focused on newer faculty members, which comes and goes as the State budget expands and contracts. The same is true for travel funds. In the last two years, travels funds have been scarce, though untenured professors have been encouraged to request funds. This current year, travel funds are available to everyone in the department, though there is not a specific allocation per professor.

- Properly allocate release time for necessary faculty projects (new for CTC coordinator who handles teaching credentialing questions)

  Easily being the largest department in the College, Math & CS receives 10 administrative course releases per year for the position of Chair and Associate Chair. In addition, for other department activities, our released time from the Dean has varied from a high of 9 courses per year in 2005 down to the present level of 5 courses (1 for CCTC coordination, 1 for grad Networks, 1 for grad Math and 2 for grad CS). This decrease was partly due to a large decrease in the size of our computer science programs and the State budget crisis. That said the amount of released time is below what it should be to run several programs in a very large department. The grad CS program is very large and complicated. Most of our admits are international students, so evaluating their transcripts and dealing with visa issues is time intensive. Yet, our CS grad coordinator receives 2 course releases. Our Math coordinator receives 1 course release for a large and viable program, with responsibilities throughout the year. Our grad math comprehensive exams are administered by a math professor with no released time.

- Run focus groups of majors to learn more about student needs

  Over the last 5 years, this has been done on an ad hoc basis. This anecdotal feedback has been regularly filtered to the undergraduate and graduate committees. In particular, our undergrad math committee has had a lengthy discussion of our proof based courses and the feeling of students that they are not ready for these courses and that some of the courses

are taught at too high of a level. Partly based on this student feedback, we have changed the prerequisite for Math 3000, Introduction to Proofs, to encourage students to take it earlier. We have also shared with each other all of our assignments in order to improve the alignment between different professors who teach these upper division proofs courses.

- meet new CTC requirements for mathematics majors who intend to teach

  Our CTC Single Subject Program was approved in 2007. As part of that process, we 1. Increases Senior Seminar from 2 units to 4 units 2. Changed the required statistics course 3. Included Teacher Ed 3001 which gives the college student classroom experience 4. Reconfigured our abstract algebra sequence to place rings and fields into the first course in the sequence 4. Made explicit the topics covered in Geometry so that it includes all topics relevant to future high school math teachers.

- add new position of CTC Coordinator to Department Administrative assignments

  The Dean now provides 1 course release per year for the administration of the Single Subject program. Not only do we evaluate our own students for meeting the requirements of this program, but we also welcome any student throughout the State to be evaluated for free.

- analyze applied math courses; possibly add new topics in applied math

  With the loss of three newly hired applied math professors over the past decade, the Department has decided not to aggressively expand our applied program it but does need to maintain the level of expertise that we currently have. One of our key applied mathematicians is ending his FERP period this year. The challenge is to compete monetarily with other institutions and companies who are also seeking out applied mathematicians. There may be other causes explaining why we haven't retained the applied math new hires.

2.1 b Outside Reviewer Report 2005

In 2005, Dr. Dale Oliver, the Outside Reviewer, complimented the Department on

- Math faculty that are well-qualified, enthusiastic, and supportive, especially in the preparation of secondary math teachers and community college instructors
- Math curriculum, which is sound and up to date, with improvement planned by the Department
- Students expressed a high degree of satisfaction with their instructors at both the undergraduate and graduate level. They are also happy with the Math/CS support staff, who give careful attention to their needs and concerns
- The number of math majors was up by approximately 40% in the past few years, which puts the Department in an enviable position

Dr. Oliver stressed the importance of maintaining the strength of the faculty, especially in light of the fact that the Department had recently lost a number of faculty members. He felt that the Department might consider curricular changes that better serve prospective middle school teachers and change-of-career teachers and to seek to promote applied mathematics in its broadest sense.

The department now has a Foundational Math program, serving middle school teachers. It hasn't, however, expanded its applied math program.

Dr. Oliver saw no need for the Math and CS Department to split in two.

Back in 2005, several students talked to Dr. Oliver about the importance of the "Math Lab," a gathering place for informal cooperative learning and tutoring. This room served as an important focal point for the student mathematical community and represented a valuable resource for students – particularly in lower division courses – to get free drop-in tutoring serves, which is supported by the Department.

He also noted that the Department supported several important projects and events that promote the learning of math in the broad university and regional community. Most recently, Project ACCLAIM, the 2004 MAA Section Meeting, Math Awareness Week,

Dr. Oliver felt that the Department had several challenges, which have been addressed:

1. Vector Calculus is offered at many campuses throughout the United States but not at CSUEB, which has a potential negative impact on physical science and engineering majors and math majors within some of their upper division courses.

Math 2305, Calculus IV, was added to the curriculum in 2010 and is now required of the pure and applied undergraduate math majors. This course, which is currently offered once a year, is also available to majors in physics, engineering and the other sciences. The Department will monitor whether this course can be offered more often.

2. Senior Seminar was only 2 units as opposed to 4 units, which makes it more difficult to cover necessary topics for future high school math teachers

The Department increased this course to 4 units as part of the CTC approval process.

3. The faculty could be much more collaborative and cohesive. The separation of faculty into MWF and TTh teaching schedules further isolates faculty members, especially junior members. Also, the faculty is spread across several buildings on campus, far from the Department Office. The lack of a consistent Colloquium Series contributes to lack of faculty cohesion.

Though there has been some consolidation of faculty in Robinson Hall, there remains the issue of MWF and TTh teaching schedules. The colloquium series remains sporadic. The distance from the Department Office increases the sense of isolation and lack of cohesive engagement.

4. The Department and College needs to support the development of faculty to assume leadership roles in the Department. Some tasks are being done by highly experienced faculty with less released time than one might normally associate with such tasks. As the more active experienced faculty move toward retirement actually retire, more investment of released time and mentorship of less-experience faculty will be required.

- The Department agrees with Dr. Oliver's observation. In addition, many of our younger faculty members are greatly involved in projects sponsored by the Chancellor's Office or various educational grants, for which they receive released time. While these projects are sorely needed and are appropriate for our math faculty members to be involved, it is also true that these projects pull our faculty members out of the classroom and give them less opportunity for interaction and contribution within the Department.

In recognizing that our faculty play a significant ongoing role in State level grants and projects, the University should realize that this requires additional tenure track position so that our primary function of educating undergraduate and graduate level math students is not compromised.

5. Option II of the masters program, Mathematics and Teaching at Hayward, as designed was not meeting a need in the educational community. The Department should investigate alternatives, such as a program in conjunction with the Education department to allow credentialing teachers to earn their Masters degree at the same time.

In the past 5 years, our Department has decided that there were more urgent needs, such as the development of the Foundational Math program, an increased involvement with ACCLAIM and the Math Academies, a variety of other outreach activities throughout two counties and the renewal of the Sing Subject Matter Prep Program.

6. The Department should encourage the continued scholarly activity of its faculty. Also, the College might supply a small amount of released time to stimulate particular research projects.

That support money has come in the form of RSCA grants, which have recently come and gone.

2.1c. Progress

Details are included above. The important areas of progress can be summarized as

- Approval of CTC Single Subject Program (2007)
- Addition of Vector Calculus course to the major (2010)
- Addition of eight new mathematics courses for upper division majors and graduate students (2005-2011)
- New program in Foundational Math for future teachers at the middle school level (2008)
- Changes in teaching techniques to include online resources (2005-2011)

2.2. Curriculum and Student Learning:

(1) Mathematics major:

The major is a combination of required knowledge in several areas of mathematics, plus flexibility to choose courses to match the student's interests. There are three different options within the mathematics major; each student must choose an option. These are:

Option A ("general" or "pure" mathematics)
Applied mathematics
Mathematics teaching

However, it is fairly easy to change options at any point in one's courses.

Classes required for all options include: Introduction to Abstract Mathematics and Proofs (3000), Differential Equations (3331), Abstract Algebra I (3121), Analysis I (3300), and Linear Algebra (3100). It is stressed that these five courses above are basic to the major and are taken early in upper division standing. Second, majors need at least one of the sequences 3121-3122, 3300-3301, 3215-4215 – so all students have some depth in either algebra, analysis, or (for teachers, possibly) geometry.

These goals for undergraduate majors are listed in the Assessment document:

- :The ability to apply the techniques of Calculus to Mathematics, Science, and Engineering
- The ability to develop and analyze linear models systems in mathematics, science and engineering, using matrix theory and differential equations.
- The ability to understand and use axiomatic definitions to create and analyze examples in groups, rings and real analysis.
- The ability to read and create proofs.
- The ability to solve problems as individuals and in a group setting, to combine ideas from several areas in mathematics, and to present results effectively to others
- Understand the role of Calculus in Mathematics, Science, and Engineering.
- Understand the role of linear systems and models in Mathematics, Science, and Engineering.
- Understand the relation between the modern formulation of algebraical systems and the classical problems of algebra such as solving systems of polynomials and classical construction problems.
- Understand the role of precise definitions and proofs in the structure of real analysis.
- Understand how the mathematics learned in various courses tie together.

(2) Mathematics M.S. program:

At this level, there are two active options:

(i) Option I emphasizes coursework drawn from fundamental branches of mathematics: algebra, topology, and real and complex analysis.

(ii) Option II has been suspended. It was intended for those who hold secondary teaching credentials and who intend to pursue a career in secondary education. It is called the M.A.T.H. program (Mathematics And Teaching at Hayward/CSUEB).

(iii) Option III is designed to expose students to various aspects of applied mathematics, while allowing some coursework in "pure" mathematics as well.

Many of our Option I and III students intend to teach at the community college level.

Desired outcomes for M.S. students include all those desired at the B.S. level, plus:

- The ability to analyze and classify structures in different areas of Mathematics.
- Comprehend sophisticated mathematical articles.
- A command of the material covered in the four major areas of applied mathematics: Applied Analysis and Differential Equations, Linear Programming, Numerical Analysis, and Probability ***or***
- A command of the material covered in the four major areas of theoretical mathematics: Algebra, Complex Analysis, Real Analysis, and Topology.

(3) Other Mathematics programs

Minor: The math minor is often chosen by majors in closely related fields – for instance, those in Computer Science. This option allows students to add to their mathematical knowledge, and to have this fact noted on their transcript.

Remedial Math: With the large increase in the freshman class starting in 2006, the total number of remedial sections went from 17 in the Fall of 2005 to a peak of 46 sections in the Fall of 2009. The number of students needing remediation went from 373 in 2005 to 1,282 in 2009. This number steeply declined to 28 sections in the Fall of 2010 with the State of California budget crisis, leading to a smaller freshman class that was better prepared.

<u>In the past 5 years the following curricular changes have been introduced:</u>

Math 800 Introduction to Algebra (which simplifies the remedial sequence). Introduced new 4th quarter of calculus (Math 2305: Calculus IV) required for all math majors (introduced in 2010; the first course offered in 2011). CBE no longer required 1820 (eliminated during the 2008-2009 academic year). Math 4030 Advanced Study of School Mathematics (developed for Foundational Credential Program). We now require an early Math 3000: An introduction to Mathematics and Proofs for all math majors.

In addition we have introduced several new graduate and upper division undergraduate elective courses based upon new expertise among our faculty.
Math 6000 Advanced Topics via a Research Paper
Math 6251 Symplectic Geometry
Math 6600 Advanced Number Theory

Math 6850/4850 Topics in Variational Calculus
Math 6935/4100 Mathematical Logic
Math 6875/3875 Topics in Mathematical Physics

Foundational Mathematics Certificate Program

The Foundational Mathematics certificate program is designed for students who would like to teach middle school math or would like to become K-5 math specialists. Credentialed teachers who complete this program and pass the Math CSET I and II exams qualify for the Foundational-level Added Authorization in Mathematics.

Candidates for this program should have or plan to obtain their Multiple Subjects teaching credential or a Single Subject teaching credential in a subject other than mathematics. Students who complete this program will be well prepared to teach mathematics at the K-8 level, will have completed the State required Methods Courses in Single Subject Mathematics and will have the content knowledge required to pass the Math CSET I and II exams.

Calculus IV
Calculus IV – An additional quarter of calculus is now required for Option A and B math majors. This course covers the usual topics in Vector Calculus and has become a standard requirement for math majors at most universities.

Early Proofs Class
Earlier introduction to abstract mathematics and proofs – the prerequisite for Math 3000 Introduction to Abstract Mathematics and Proofs was changed to Calculus II, thus allowing students to take this course earlier in their program to better prepare them to understand the proofs in their courses and to avoid the "bottleneck" of just taking one math course at a time until later in their major.

Online Teaching
The Department has slowly moved into teaching some courses on-line or hybrid on-line. In Summer 2007 and Summer 2008, it offered the now defunct remedial course Math 899 as a hybrid course (remedial mathematics is a special challenge to teach in the summer; there are rarely enough students to fill sections but some students must take the course). In Fall, 2007, it began teaching some sections of Math 1810 online and it continues to do so. In Fall, 2009, it offered Math 950 online; it was last offered online in Summer 2010.

Additionally, online homework assignments are given in many remedial courses and in College Algebra. This innovation was a direct response to the loss of all student assistant help in grading. At least one instructor uses East Bay Replay so that her lectures are available to her students.

Other Student Learning
We've had student attendance at several local conferences, including several Bay Area Discrete Math Days (BAD Math Days), the Joint meetings of the MAA & AMS in January 2010, and the

regional undergrad math conferences. CSUEB hosted the BAD Math Day on our campus in Fall of 2009.

CSUEB had several undergraduate students taking the Putnam exam this year, for the first time in a long time.

2.3. Students, Advising, and Retention

a. Students demographics of majors, minors, and options

Overall Enrollment by Ethnicity and Gender

California State University, East Bay

Fall .2009

		Fall 2009												
		Degree Level									Total			
		Bachelor			PostBaccalaureate			Master						
		GENDER		All	GENDER		All	GENDER		All	GENDER		All	All
		Female	Male		Female	Male		Female	Male		Female	Male		
Mathematics	Race/ethnicity unknown	6	11	17	1		1	6	7	13	13	18	31	20%
	Black, non-Hispanic	3	2	5				2	4	6	5	6	11	7%
	Asian or Pacific Islander	5	5	10	1		1	13	13	26	19	18	37	24%
	Hispanic	5	3	8				2	4	6	7	7	14	9%
	White	11	16	27				9	20	29	20	36	56	36%
	Am. Indian or Alaska Native		1	1								1	1	1%
	Nonresident aliens	1	1	2				1	2	3	2	3	5	3%
	Multiple ethnicity								1	1		1	1	1%
	All	31	39	70	2		2	33	51	84	66	90	156	
	All (percent)	44%	56%					39%	61%		42%	58%		
Entire University		6854	4475	11329	596	321	917	1543	940	2483	9005	5744	14749	14749
Entire University		60%	40%		65%	35%		62%	38%		61%	39%		

Source: CSU ERSS Statistical Extract

Transfer students vs Students entering as Freshmen

		Entering Freshmen	Entering Transfer
2009	Mathematics	7	12
	University	1445	2000
2010	Mathematics	9	29
	University	1211	1401

b) **Student level of majors, minors, and options**

	Fall Quarter

Headcount Enrollment	2005	2006	2007	2008	2009
Math					
1. Undergraduate	102	87	74	84	70
2. Postbaccalaureate	10	9	3	1	2
3. Graduate	68	61	70	57	84
4. Total Number of Majors	180	157	147	142	156

The above tables are from Institutional Research but do not always seem accurate, and are from 2009. In 2011, the Department counted file folders and came up with the numbers in the left column below; it also made a Blackboard inquiry of majors (List All) and was give the numbers on the right.

2011 File Folder Count	2011 Blackboard Student count
Math MS: 134	124
Math BS: 94	121

Future Enrollment Trends: Mathematics enrollment varies a bit up and down, but has never experienced major swings. The biggest one-year change was seen in 2005-2006.

We expect enrollment to increase slightly with the STEM initiative at CSUEB, and with expected strong employment opportunities in teaching high school mathematics.

Assessment: Certain courses have been identified as Gateway Classes, and student progress is monitored

Math 2304 and Math 3100 for all students
Math 3301 or 3122 for Options A and B
Math 4901 for Option C

M.S. Comprehensive Exams: All M.S. students (except those in Option II – which means essentially all M.S. students) must pass comprehensive exams -- four sections, each covering one area of mathematics. In Option I, the areas are: Real Analysis, Complex Analysis, Algebra, and Topology. For Option III, they are: Applied Analysis, Numerical Analysis, Linear Programming, and Probability.

Gateway courses: These reflect the challenging nature of mathematics – no automatic good grades in any course. The relatively low pass rate in Math 2304 (roughly 2/3 of those who begin manage to end the course with a C or better; more than 10% usually withdraw) reflects also the many non-math majors who must take this course. Of the upper division courses, analysis (Math 3300) is difficult for many students. But on the whole, upper division math students do succeed in the courses that they take.

Math 3301 and Math 3122 are higher level courses with already difficult prerequisites. In order to succeed in these courses students must have a solid foundation in the prerequisites. In these courses students are asked to use and prove sophisticated theorems in mathematics.

In Math 4901 Senior Seminar students

- Revisit and learn how to present important concepts, theorems and proofs from undergraduate mathematics
- Increase their repertoire of problem solving techniques
- Learn how to read and understand a math journal paper and how to present the results of the paper

Student course evaluations and faculty self-evaluations of this course indicate that it is succeeding in meeting its goals.

2.4 Faculty

Tenure Track Hiring: last five years

In the past five years, there have been two successful tenure track searches and two new appointments – however, one of these faculty members has just been enticed elsewhere. These two positions were described in 2006:

> [2006 memo] We propose a search for two faculty members to
> . - teach courses for undergraduate and graduate majors
> . - teach and supervise the content and teaching of some service courses
> . - participate in curricular development for major and some service courses
> . - participate in curriculum development for future teachers of secondary mathematics
> . - participate in teaching and development of the graduate mathematics program
> . - possibly contribute to the ACCLAIM program
> . - maintain a strong research program in an area of need such as: applied mathematics, combinatorics, number theory, control theory, optimization, numerical analysis.

Of all of the professors in the Department who teach math courses, one retired in 2006 and two will be finishing up their FERP period this Spring. In addition, two tenured faculty members have resigned, one in 2006 and the other in 2011. This is a loss of five professors who have taught mathematics. Since only one of our two new hires is remaining, this leaves the Department with a net loss of four professors who have taught mathematics, equivalent to slightly more than three full time positions. Going forward, the Department will have real difficulties in teaching enough upper division and graduate courses to sustain our BS and MS programs.

New Tenure Track Faculty 2006-2011

Fall 2007: Julia Olkin: Ph.D., Rice University in Linear and Nonlinear Optimization. She has taught a large variety of courses including applied math. She is a Co-PI on the Math Academies which seek to improve math instruction in K-12 schools. She is also heading up administration of our Grad Comprehensive exams in mathematics.

Fall 2007: Ellen Veomett: Ph.D., University of Michigan in Discrete and Computational Geometry. Dr. Veomett has been very active in the Department since she arrived in 2007. She has taught 15 different courses, has developed a new course in graduate research, is supportive of the

students as the advisor for the Student Math Group, is active in the local research community in discrete mathematics and is active on our Department committees.

2.5. Resources: The Mathematics programs share most resources with the Computer Science and Computer Networks programs. There are many mutual concerns – particularly for technical support (for Blackboard, faculty workstations, instructional computer facilities) and for library resources. The many joint concerns are addressed together in Appendix A.

2.6. Units: 180 units are required. The major is fairly small.

3. Plan, Mathematics

Critical elements:

- New faculty hire: the Department is short on faculty able to teach upper division and graduate level mathematics.
- Unify the department (offices consolidated, more opportunities for faculty to work together, etc) while at the same time studying whether to split the Department or not.
- Improve student experience at CSUEB (revive Math Lab, increase advising, get student feedback), This is very important. Cutbacks in enrollment have led to fewer course offerings, fewer evening sections, limited summer courses. Find some way to re-institute the survey of graduating seniors.
- Ease burden place by budget restriction . We need graders for courses, more travel money for faculty, better library offerings
- Improve preparedness of students – work on ways to insure that prerequisite courses adequately prepare students for the following course(s).

3.1. Curriculum.

The mathematics department plans to engage in work related to the new STEM center as appropriate.

The mathematics department continues to be open to discussions with other College of Science departments about the possibility of introducing courses geared towards specific majors though there are no plans currently in progress.

The department continues to consider expanding its online offerings within the context of our general requirement that the course includes some face-to-face culminating experience such as a final examination.

3.2. Students. We currently have a very healthy number of students in the math graduate program. We should be able to maintain this and even increase the number of students with continued support for qualified faculty. Opportunities for graduates in industry and college level teaching will likely be good in the future. The number of undergraduate majors is likely to remain fairly steady – though it will be influenced if the opportunities for teaching high school math improve or decline.

If the University continues toward an identification as a "STEM centered" institution, mathematics should grow as a department. The Department will continue to participate in campus discussions of this initiative.

New programs enhance the discipline. The Department mentored a student's research through the McNair program during the 2009-2010 school year (Phillip Williams); he is now working at the Stanford Linear Accelerator program. The Noyce Scholars Program encourages students who will become math teachers in high-need school districts.

Advising :
Advising occurs on a relatively ad-hoc basis. Students seek advising from professors with whom they are familiar and feel comfortable. Student retention is supported by individual professors as well as groups such as the math club. Various activities have been held, a Ph.D. program panel in the fall and a jobs panel in the spring, both of which were quite well attended and well received.

Learning Goals : The math department remains dedicated to our learning goals. The requirement of Math 3000 (Introduction to Abstract Mathematics and Proofs) ensures achievement of the goals to read proofs, write proofs, and understand the role of proofs. Support of faculty actively engaged in research will help in our goals of preparing students for graduate school and exposing them to math research and contemporary issues.

Outreach: The math club has been and will continue to be a good way to reach out to students and increase enrollment and involvement. This past year we also had a "welcome meeting" for the graduate students (new and returning) to give them a chance to meet each other and some faculty in the department. We plan to continue this meeting and hope that it will improve retention and atmosphere.

Resources required; As with the entire university and state, the department in particular and University as a whole is sorely underfunded. The lack of grant money within the University has made it difficult for our faculty to have the time to do research and obtain the kind of publishing record they would need to obtain outside funds.

3.3. Faculty. As noted in 3.1, we will need faculty whose areas of expertise are crucial for specific advanced ar**ea**s of mathematics. It will be important that support for research be available

It would benefit the department to have opportunities to communicate about teaching and research. This is not happening and seems infeasible with our current schedules, workloads and lack of communal space.

We anticipate about 5 retirements and hope for 5 to 7 hires. We would like to hire in a "research cluster" mode in order to provide greater support community for our faculty.

Hiring in research clusters would greatly enhance faculty ability to collaborate and engage students in undergraduate research. Having opportunities for reduced teaching for faculty who have active research programs would allow greater productivity, job satisfaction, retention, student engagement, and recruitment.

Also, there has recently been an emphasis on new faculty teaching a large number of different courses. While this breadth can be a benefit to the department, the goal of breadth has put an enormous pressure and time strain on new faculty. These faculty members must continually write new course material and are unable to implement improvements in previously taught courses, apart from service courses such as Calculus.

Dr. Christopher Morgan has an on-going active research program, even into his retirement. The mathematics portion involves algebraic group theory and functional equations. His early work resulted in a doctoral dissertation and two research articles in *Aequationes Mathematicae* on functions that have rational autoaddition formulas. Currently, he is exploring proofs of the fundamental classification theorem for algebraic groups that he used to classify all functions having such a formula. He plans to involve the Department as appropriate.

Faculty Climate Issues: The administration needs to more genuinely engage faculty in what is needed to support them in their work as instructors, researchers and in providing service to our community.

The Department should put more effort into connecting faculty instructional practices in order that articulation between courses is clearer to faculty and students. The Department should provide more guidance to faculty teaching courses for the first time as well as allowing faculty to come together to discuss course content and pedagogy.

RTP issues: (1) Fear and dislike of mathematics may prejudice instructor evaluations, especially in remedial and service mathematics courses, (2) Department uses its own student evaluation form, which complicates RTP discussions at the College and University levels, and (3) publication productivity naturally varies between areas of mathematics and other sciences.

3.4. Resources.

Graders Graders are required for many math courses, especially for faculty teaching a full course load.

Research needs: Release time and opportunities for collaboration is required if we would like our faculty to maintain an active research program.

Particular needs include funds for graders, professional development (including travel), technology, copying, etc.

For library and technological resource requirements, see Appendix A.

4. CSUEB MATHEMATICS -EXTERNAL REVIEW

1. Visit

My campus visit began at 9:30 and ended at 4:30 on May 5, 2011. The day was filled with a variety of visits and discussions with faculty and students including a working lunch.

1.1. The meeting schedule 9:30-10:30-Dean Michael Leung
10:30-11:00-Kevin Callahan, Associate Chair
11:00-11:30-Eddie Reiter, Chair of Mathematics and CS
11:30-12:00-Visit M3122, Abstract Algebra
12:00-1:15-Lunch with faculty
1:30-2:00-Discussions with department staff
2:00-2:30-Visit M3000
2:30-3:00-Visit with graduate faculty
3:30-4:00-Wrap-up with Dean and Chair

4:00-4:30-Visit Robinson Building

1.2. I had discussions during the day with faculty: Eddie Reiter, Kevin Callahan, Julia Olkin, Kathy Hann, Stu Smith, Ellen Veomett, Chung-Hsiang OuYang, Sue Benjamin

2. Students

2.1. Findings. Meetings with graduates and undergraduates indicate that the students really appreciate that many faculty are excellent and dedicated teachers.

- Students are really interested in their major.
- There are some scholarships available for credential students.
- The faculty are supportive of undergraduate research and the students appreciate it.
- Many graduate students find good jobs teaching at local junior colleges. They gain important experience in teaching of the lower courses. This is quite impressive.
- It is good to see that there is a significant rise in the number of majors.

2.2. Student Complaints. Many students want to see more summer courses offered. Some complain that course content is not consistent, but changes with instructor. Students do not like

Power-Point presentations of course materials. They find that they are not helpful as a teaching tool.

Several complaints from students that faculty are not readily accessible outside of class. Possibly faculty could offer office hours by appointment in addition to the usual regularly scheduled office hours.

However the number one complaint from students is that not enough courses are available. There should be more course offerings during all hours of the day.

2.3. Recommendations. There are some scholarship monies available. Possibly the Math Club could help in raising money by book donations and resales.

The Math Club needs nurturing and collaboration with faculty on reviving the colloquia at a time that faculty and students are available.

The classes I visited were quite large. More sections should be offered. Possibly there could be a limit of 20 students in upper-division courses in the major.

The Department could implement a Math Lab where students can drop in and discuss problems, homework, and get some help. This could also provide 1 unit workshops for students, as an aid in learning and and provide more help with homework in those courses where students need more help outside of class. These workshops or Math Lab could be handled by senior undergraduates or graduate students. The 1 unit could be a mandatory Lab that all students enrolled would be required to take.

3. Faculty

3.1. Complaints from faculty.

- Lack of cohesion. Need a separate location for Math Department.
- Younger faculty need more consideration in number of preps–possibly not have all new preps every quarter.
- Losing faculty.
- Need money for graders.
- Faculty need to be available for meetings.
- A split is inevitable.

3.2. Teaching Load. The teaching load is consistent with faculty loads of the CSU. Some release time is possible with grant buy-outs and for administrative work. This amount of release time is quite minimal.

3.3. Salary. A list of salaries with rank and years in rank was provided. It seems that the salary levels are consistent with salaries at my campus.

There is an okay ratio of tenure or tenure-track to part-time faculty if faculty size is maintained.

3.4. Recommendations.

3.4.1. Advising. New students and transfer students can be redirected to the appropriate course by a qualifying exam over algebra or precalculus courses. This could provide some extra funds for

the department, possibly help with payments for graders.

Majors need more advising and they know it. Students need to be advised that the proofs' course is required as a prerequisite. This should be enforced by PeopleSoft.

3.4.2. The department uses a successful and interesting idea of tiered courses with graduates and undergraduates, but class sizes should not exceed 20 students in these courses.

3.4.3. Computers and Travel. Faculty need newer computers and funds for travel to present their results. More faculty need to be involved in activities of a scholarly nature. It is very surprising to me that so little research or other scholarly activity takes place. Possibly when faculty are more closely located, some collaborative research can take place. There are a significant number of grants and that is excellent, but not a replacement for scholarship.

3.4.4. Meetings. Faculty meetings could be scheduled during the same afternoon as colloquia– presumably Fridays are a good time for everyone to meet.

3.4.5. Expansion of Degree Requirements. The department has room for expansion of the course requirements in mathematics. New courses should be added to the major. There are opportunities for new courses in the areas of genomics or quantitative finance which can also collaborate with other departments of biology, statistics and business.

Offer courses using Matlab, Maple or other computer software. Such expertise could enhance the training for undergraduates and make them more marketable.

4. Program Response to Outside Reviewer

Students

Findings

- We're glad to hear that both our undergraduate and graduate math students appreciate our faculty and the major.
- The Department awards eight scholarships each year, five of them to math students, with one of them being awarded to a student enrolled in the credential program.
- Undergraduate research in mathematics is rather unusual. The Department is fortunate to have faculty members able to engage math students at this level.
- The Department has a good record of having its Masters graduates hired by local Community Colleges. CSUEB is one of the few campuses in the system that has remedial math courses taught by graduate Teaching Associates. This experience strengthens our grad program and our students employability.

Student Complaints

The students complained about the number of courses being offered. We see three issues at play: 1. the actual demand for upper division and graduate level courses, 2. the number of faculty members available to teach these courses, 3. The CSUEB budget.

1. Dr. Alperin observes that a number of our upper division courses were quite large and recommended that class size limits be changed from 35 students to 20. With such large classes and a lack of money for graders, we feel that the quality of student learning is negatively impacted. In addition, when a class is large, it can be offered fewer times each year, which makes it more complicated for students to efficiently move through our program. For example, Math 3300 was offered in Fall 2010, with 36 students and Spring 2011, with 26 students. Because it wasn't offered in the Winter Quarter, it makes it more difficult for students to move through our program in a timely fashion. If the class size had been 20, we could have offered a section of Math 3300 each Quarter, which would improve the student learning experience within the classroom, provide more courses for students to take each quarter and result in a smoother flow through our program.
2. The poor mathematical training of K-12 students and K-12 teachers has received much attention over the last two decades. The State and the Chancellor has rightly called upon Math Departments within the system to respond to this need by establishing a large variety of programs, which our math faculty are called upon to lead and participate in. Though the number of course releases for any one program is not very large, considering the commitments the faculty members make, in the aggregate, some of our most talented math professors are pulled out of a lot of classes. Next year, two of our math professors will only be teaching four courses each, due to ongoing STEM and educational grant commitments. This makes it particularly difficult to staff our upper division and graduate level math courses.
3. The CSUEB budget has also had a negative impact on our ability to offer a good quality program. In the Summers of 2007 and 2008, the Department offered six upper division and graduate level courses. This dropped to three courses in the Summer of 2009 and zero in the Summer of 2010, when the University offered courses under self-support. In the Summer of 2011, we will be offering 3 upper division and grad level courses. If CSUEB is to continue to be a year-round campus, it will need to commit to supporting summer courses. The process of not offering courses, because of lower enrollment, becomes a feedback loop where students learn not count on a dependable Summer Quarter, thereby making Summer plans that don't include taking courses.

We are circulating our Five Year Review documents to all Department members. In particular, we'll be highlighting some important points, such as the student lack of interest in PowerPoint presentations, the importance of faculty accessibility to students, whether through email or additional office hours, and student requests that classes be offered at a larger range of hours.

Recommendations

With five math scholarships currently being given, we don't consider it a top priority to increase the number of scholarships right now. That said, the Department is intrigued by the idea of the Math Club running a book donation/resale program in order to raise money for additional student scholarships.

We agree with Dr. Alperin that the College of Science needs to re-create a Math Lab for our undergraduate and graduate math students. Unlike the other sciences, Mathematics doesn't have experimental labs where students must spend time with each other and investigate mathematical problems. It's more often the case that students just attend class and then go home, by themselves, to work on problems. The Department believes that this social isolation negatively impacts student understanding of the material and student success/persistence within the major. A number of our faculty members run their courses in which there are group activities, but only so much time can be spent doing so in an upper division or graduate level course, which is dense with difficult content. In short, the students need a place to get together so that they can form communities. This isn't naturally going to happen in The Cave or The Library, at least not for the majority of our majors.

In the past, our Math Lab was used not only by our math majors but also by students in Calculus or other lower division math courses who were looking for free tutoring. We offered a number of our math majors 1-unit of credit to provide this tutoring. The SCAA doesn't provide tutoring in 2101 Linear Algebra, 2150 Discrete Math, 3331 Diff Eqs, so the need for a Math Lab with free tutoring still exists. Dr. Alperin suggested a 1-unit Lab, which all students (perhaps in calculus courses) are required to take, along with their 4-unit lecture course. These labs would be taught by undergraduate or graduate math majors. This is a model which we haven't considered before and see some logistical problems with, though this "recitation section" system exists at many other universities.

Faculty Complaints

The External Reviewer correctly read the attitude among most math professors that there is a lack of cohesion in the Department which is having negative consequences.

- In the past, math faculty were spread around campus. With a number of retirements and a move to Robinson Hall, a greater portion of the math faculty are now located in one place, but the Department Office is on the opposite side of campus. This cheats the math faculty of a natural place to congregate to form a sense of community and creates a natural distance from the Chair and staff, who have reduced interaction with the math faculty.
- It may be that this lack of cohesion has significantly contributed to the Department losing six of its last nine hires.
- The Department only holds one meeting per year on the first day of the year. In addition, because of the MWF and TTh teaching schedules, at the very least, the math faculty is split in two. The Department needs to shift the culture in which the math faculty have an opportunity to get together as a group and are expected to attend. This could be a return of our Math Colloquia or a meeting once a Quarter to address issues facing our math curriculum.

- Splitting the current Department and creating a Math Department in Robinson Hall could be an important step in creating much needed cohesion.

In the past, a large portion of the Department budget has been spent on graders, from the Calculus level up to graduate courses. Thinking of mathematics as a foreign language makes it clear that the only way to learn math is to actively do math. As a result, our faculty regularly assign homework which must be evaluated so that students receive timely feedback. With the ongoing budget crisis, the Department has either eliminated all grading for the year or has cut it back very sharply. This has put a large stress on our faculty members who are either grading over a hundred homework sets each week or are paying for a grader out of their own pockets. This costs well over $300 for each course. In response, the Department has promoted the use of web based math homework (with serious concerns about student learning) at the level of College Algebra and Calculus. But, very importantly, there are no online math homework systems above calculus. Thus, faculty members have relatively large upper division courses for which they are having to spend a large amount of time grading. The negative impact on our math faculty cannot be overstated.

Dr. Alperin misstates the Department course assignment practice concerning young faculty members and new preps. The goal of the Department has been for young faculty members to have at most one new prep per quarter so that they are able to teach a large variety of courses, especially since a large number of our senior faculty receive released time to work on CSU projects. That said, young faculty should be consulted before the Annual Schedule is created so that they'll have a rough idea of what courses, including new preps, they'll be called upon to teach in the following year.

Teaching Load
Dr Alperin points out that though the teaching load is standard for the CSU system, the amount of released time to work on administrative duties is quite minimal. This same observation was made by the last external reviewer, Professor Dale Oliver, in 2005.

As the administrative responsibilities shift from senior faculty members who have been performing duties for many years to more junior faculty members, the amount of released time for executing those duties is actually decreasing instead of increasing. For example, one of our contract lecturers used to receive two course releases per year to observe and evaluate our graduate TAs each Quarter. This past year, that released time was eliminated. As it turns out, this seems to be in violation of the contract, which calls upon the graduate Teaching Associates to be evaluated. For next year, the Department has been granted only one course release for the year for evaluating TAs across all the three quarters. The lecturer has opted not to do this work for less course release. The same is true for the administration of our graduate programs.

Recommendations

Advising
Dr. Alperin suggests that new and transfer students take a math placement exam for a small fee. This is to place students in our College Algebra, Trigonometry, or Calculus courses. Placement exams are not uncommon across the CSU system. This would help with our finding that students

often place themselves into the wrong courses, with negative impacts on themselves and the courses they enroll in.

The Department agrees with Dr. Alperin that our majors would benefit from more advising. We are looking into whether we should establish mandatory advising, which would be spread across all math faculty, or perhaps run advising sessions at regular intervals.

Tiered Courses
We agree with Dr. Alperin that tiered courses should be small than 35 students.

Computers and Travel
We agree with Dr. Alperin that the faculty would benefit from newer computers and more available travel funds. In the past five years, we have always tried to provide travel funds for our untenured math faculty.

Dr. Alperin points out the low rate of faculty scholarship. We feel that this is due to a lack of cohesion within the Department and the large number of administrative and educational grant commitments which preclude the faculty's ability to perform research. There is a small number of people doing a lot of work.

Meetings
Friday or Wednesday noon meetings/colloquia are both good times to meet.

Expansion of Degree Requirements
We are interested in Dr. Alperin's suggestions of increases to our major requirements. In this past, we have tried to keep requirements to a minimum so that our students would have the greatest flexibility to design a program that fits their needs and interests. That said, it behooves us to investigate possible new electives in areas such as mathematical genomics and quantitative finance. The undergraduate math curriculum committee will investigate what other CSU campuses are doing in broadening their offerings to improve their major programs.

We are also interested in Dr. Alperin's suggestion that we offer courses using MatLab, Maple or other computer software. At this point in time, we don't see that as a feasible option. Many computer teaching labs have been closed across campus. We've had a hard time placing our existing computer science courses into labs for several years.

Move to Robinson Hall and Splitting the Department
The Department as a whole and the math faculty in particular need to decide if it wants to split. The space that the Department already has in Robinson Hall is sufficient to support a Math Department, so the ability to physically consolidate is not an issue. This would place the whole Math Department far away from the Science Building, but the benefits of department cohesion may outweigh the lack of proximity to other science department or the Dean's office.

Hiring New Faculty
The Department agrees with Dr. Alperin that we sorely need to replace faculty that we have lost and that new faculty will need sufficient start up funds that can be spent over a several year period.

The Math Department is responsible for addressing the math education needs of students from K-12 (in the projects that we administer), through remedial math and undergraduate math degrees, up to the masters level program, which prepares many community college instructors. We can't meet the challenges that we're called upon to address with the current size of our Department.

6. 2. Self Study, Computer Science

6.1.a Summary of Previous Review, Plan & Progress

In 2005, Dr. Michael Feldman, the Outside Reviewer, complimented the Department on

- C.S. faculty that are well-qualified, enthusiastic, and supportive
- C.S. curriculum that is solid and up to date
- Students who are very positive about their CSUEB experience
- Dean Michael Leung who is well thought of, and supportive of the program

One of the biggest problems in the Computer Science curriculum was identified as CS 3240, the course in data structures. This is a "critical course" and a "foundation course". It is a course often taken as a first course at CSUEB by transfer students. The main problems with the course (as identified by the Outside Reviewer) are (a) varying student backgrounds and (b) too ambitious syllabus for the course,

Another major problem identified by both the self-study and the Outside Reviewer was the issue of space. The Department wrote that it "is critically short of space". Many faculty had offices in Warren Hall, although the home building is Science (North and South).

6.1.b Summary of Previous Plan. Goals of the Department are that its students demonstrate:

- Mastery of fundamental concepts
- Ability to apply knowledge and problem solving skills
- Available collegiate and social experiences

To meet these goals in Computer Science, the Department planned to:

1. Analyze new ACM (Association for Computer Machinery) curriculum
2. Explore new areas of Computer Science for possible new courses
3. Receive feedback from the Computer Science Advisory Committee
4. Consider new options in the C.S. M.S. program
5. Offer new B.S. in Computer Engineering in cooperation with the Department of Engineering
6. Explore new C.S. option in Computational Intelligence
7. Increase opportunities for undergraduate research.

6.1c. Progress

ABET Accreditation: The Department has indeed carefully read the new ACM curriculum, and has revised its major requirements to be very close to these requirements. However, budget and time constraints have prevented the Department from seeking an accreditation – and will continue to do so for at least the next year.

Updates to the Major: New areas of computer science have led to new courses. A list is below

> Winter 2007 new course CS 2020 : Introduction to Web Design and Technology Technology and design of web sites, systems and services. Human factors issues, computer-human interfaces design, web system design and development and testing; evaluation processes. Website development using multimedia, graphics, image, and animation tools. Topics from e-commerce solutions and networking fundamentals

Fall 2007 CS 6591 Communication Network Analysis and Design The practice of network analysis and design. Topics include estimation of traffic demand, requirements specification, topology design, network cost analysis, routing, wired and wireless technologies, design tools, fault tolerance, and design of a LAN or WAN

Fall 2007 New course CS 6899 Development of an original telecommunications project which is summarized in a written abstract. Both the project and the abstract are submitted to the department which specifies their formats. Supervision by a department committee, at least one of whom must be a Cal State East Bay faculty member. Oral defense required. Prerequisite: advancement to candidacy.

Fall 2008 Modification of M.S. in Telecommunications to M.S. in Computer Networks: Modify name, program description and requirements to respond to discontinuance of COB Telecommunications program

Fall 2008 New courses CS 4526/6526 This course covers comprehensive new topics in Wireless, Mobile, Grid and Pervasive computing which includes IEEE 802.11 Wireless security, Security in Mobile Telecom Networks (GPRS, UMTS), Security in Mobile Ad Hoc Networks (MANETs), Security in Vehicular Ad Hoc Networks (VANETs), Security in Wireless Sensor (WSN) networks, Bluetooth Security, VoIP security, Grid Security and Mobile Agents Security.

Spring 2009 new course : CS6330 Security in Wireless, Mobile, Grid and Pervasive computing. Secure Software Development Security and safety in software design and development. Vulnerability detection and avoidance. Introduction to software analysis tools. Topics include authentication, principle of least privilege, buffer overflows, race conditions, time-of-check vs time-of-use, trust management, access control, and other security relevant issues.

Spring 2009: Modification of B.S. in C.S. to require CS 3340 Object Oriented programming plus a new third course in the introductory sequence, CS Intro to Computer Science III . Third quarter of calculus removed from requirements.

New course CS 2370: Continuation of CS 2360. Further development of programming and problem solving skills in Computer Science. Topics include elementary data structures (stacks and queues), object oriented design, and more on searching, sorting and other algorithms

Spring 2010: Modification of M.S. in Computer Networks: to add a new course to the breadth requirement (CS 6526 Security in Mobile, wireless, Grid, and Pervasive Computing).

Summer 2010: revision of capstone experience in M.S. in C.S : The CS Masters program currently has a comprehensive exam system which is labor intensive for the Department. This meets the "Capstone Experience" required by the University. Because of the economic crisis in the State of California, the University can not currently fund this component of the masters program. The Department has decided to offer CS 6901, Capstone Experience, which will primarily consist of three exams, in the areas of Theory, Systems and Data Structures. Passing this course will replace the capstone experience of passing the three comprehensive exams.

Winter 2011: new course CS 1080 Introduction to Media Computation – introductory course Introduction to computer programming through manipulation of digital media such as images and sound. Topics include: control structures, arrays, functions, and use of libraries. Intended for non-majors

Courses modified to be taught hybrid or online in last 5 years: CS 3590, 4525, 6520, 6525, 6715

The Computer Science Advisory Committee has met several times. However, the last meeting was in 2009. The Department is planning a meeting in Fall 2011.

The B.S. in Computer Engineering is in place. However, the Department did not move ahead with an option in Computational Intelligence or any new options in the M.S. program, and opportunities for research – undergraduate or graduate – remain limited.

6.2. Curriculum and Student Learning:

Online courses: Many courses are now offered online or as hybrids. We expect more Computer Science classes to be offered on-line or hybrid on-line. Before 2007, there were no on-line or hybrid classes offered. Since then, there have been ten on-line or hybrid sections each academic year. This number is probably fairly stable – the Department's policy has been that most of these courses have a standard in-class on-ground section of the same course in alternating quarters.

This results in a good set of options for students – students can choose from an on-line course one quarter or an on-ground course the next. On-line courses add to the flexibility needed by working students, but the Department finds that many students need the discipline of face-to-face class meetings.

Courses offered Hybrid and Online									
2006-7	3340	4310	4311						
2007-8	3340	3590(2)	4310	4311	4320/6320	6560(2)	6660	6825	
2008-9	1020	3340	3590	4020	4310	4320	4590(2)	6320	6560
2009-10	3340	4020(2)	4311(2)	4594/6594	4525/6525	6520	6594	6715	
2010-11	2020	3590(2)	4020	4320	4525/6525	4590	6520	6825	6901

B.S. Updated. In the last five years, the Department has (1) added the new courses listed in the previous section, (2) revised the introductory sequence, (3) begun an experiment with Python as an introductory language, (4) revised online and hybrid course offerings, and (5) added Object Oriented Programming as a requirement for the B.S. degree.

M.S. Computer Science:

Changes in M.S. program: Several changes to the M.S. curriculum have taken place in the last two years. A fifth programming course in Object-Oriented Design was added as an admission requirement, while Calculus III was removed. The comprehensive examination system was also significantly revised: the tests are now administered as part of a student-directed review course entitled Graduate Capstone Experience; the subject matter was also redistributed into three distinct examinations: Systems, Software, and Theory.

C.S. Comprehensive Exam/ Capstone Experience: The Graduate Capstone Experience course serves as a strong measure of learning outcome for our M.S. program. Several curricular changes to the degree have been made to improve student success rate based on exam performance. In fall 2010, there was a 70% pass rate for the Graduate Capstone Experience.

C.S. Master's Theses: Only the better students are allowed to do a thesis, and even for a good student, it can be hard to find a topic and an advisor. If we had more faculty research, we would have more students doing theses

2006:

- Bhat, Anuradha, "A Genetic Algorithm for Image Alignment in Multiple Projector Display Systems"
- Farrell, James, "Induction of Cooperating Grammar Systems by Grammar-based Genetic Programming"
- Hofmann, Katja "Subsymbolic User Modeling in Adaptive Hypermedia: A case Study in Educational Context"
- Katikireddy, Anitha, "A Genetic Algorithm with Backtracking for Protein Structure Prediction"
- Krishnagiri, Shruti, "Infrastructure Design of Direct: A Disaster Recovery Tool"
- Manam, Leela, "Network Security and Authentication for Remote Access to Scientific Equipment"

2007

- Biswas, Kamalendu, "Distributed Authorization Cache"
- Kang, Hea, "Database de-Duplication for Immunization Registries"
- Panda, Jayalalitha, "Mobile Agent Security"
- Sonaseth, Munira, "Privacy Preserving Data Mining for n-ary Attributes using Randomized Response"
- Vaidehi, "Applications of Homomorphic Encryption Schemes to Provide Security in Computer Networks, Wireless Sensor Networks and Wireless Mobile Ad Hoc Networks"
- Vakil, Sreelatha, "Highlighting and Personal Annotation for Fast and Efficient Access to Web Page Content"

2008

- Sharma, Abhishek, "Issue Logic Design on ASIC/FPGA"
- Yang, Johan Hadiwijaya, "Performance, Feasibility & Scalability of Homomorphic Encryption Schemes in Securing Wireless Sensor Networks"

2009

- Master, Oksana, "Applying Data Mining Techniques in Genome Sequencing Data Quality Control"
- Pandey. Sushmita, "Peer-pressure Advertisement Recommendation System"
- Punj, Arvind, "A Knowledge Management System for Mathematical Text"

2010

- Garg, Prachi, "Linking People with Similar Interests and Activities"
- Khaskel, Vadim, "Gnutella Protocol Enhancement for Mobile Ad Hoc Network"

M.S. Computer Networks:

In Fall 2008, the MS degree in Telecommunications Systems Computer Technologies, previously a joint degree with the College of Business, was redesigned and re-launched as the MS degree in Computer Networks. Modifications were made to the program description and course requirements. Unlike the old degree, all courses supporting this degree are housed in the Department of Math and Computer Science. Courses added to support the degree include:

- CS 6591 Communication Network Analysis and Design, a required course for all students in the program.

- CS 6526 Security in Wireless, Mobile, Grid and Pervasive Computing, CS 6592 Network Management, CS 6596 Wireless and Mobile Networking, each a breadth requirement course.
- CS 6899 Project, the required capstone course for the degree.

In addition, course changes were made to allow offering some courses in an online or hybrid format. There are currently seven courses which can be taken in these formats.

There are currently 35 students enrolled in the MS Computer Networks degree with six anticipated to graduate this year. Nearly all students are international coming from India and China. Students previously enrolled in the MS degree in Telecommunications Computer Technologies were allowed to finish their degree under the old degree name. Unfortunately, these students are not counted in enrollment statistics. Twelve students graduated in either the MS Telecommunications or MS Computer Networks in 2009-10.

Capstone Experience MS Computer Networks:: All students pursuing a degree in Computer Networks complete a Capstone Project in a course titled CS 6899. Students work in a group to complete a faculty proposed project or alternatively create their own projects. Students give a presentation, write a report and create an e-porfolio about their project.

Eportfolios are tools that interweave learning and assessment. Some benefits of portfolios are : more responsibility and increase your autonomy

1. Get a broader, more in-depth
2. Actively monitor learning and understanding about the course
3. May help improve reading and writing skills
4. Reflect understanding
5. increase awareness of strengths and weaknesses
6. Create and improve continuosly reporsoitory of knowledge to use whenever you need.
7. Gain experience in creating portfolios which later can be used for other purposes such as to document professional and academic resumes. Users can export their porftolios to be viewed outside of Blackboard, as an HTML package

Below is a list of publications that have resulted from the CS 6899 course

Levent Ertaul, A. R. Pasham, and H. Patel, “Enterprise Security Planning using Zachman Framework: A Designer's Perspective, 2011 International Conference on Security and Management, July 18-21, 2011, Las Vegas, USA).

Levent Ertaul, S. Vandana, and K. Gulati, “Enterprise Security Planning Using the Zachman Framework – A Builder's Perspective”, 2011 International Conference on Security and Management,(July 18-21, 2011, Las Vegas, USA).

Levent Ertaul and J. Hao, “Enterprise Security Planning with Department of Defense Architecture Framework (DODAF), 2011 International Conference on Security and Management, (July 18-21, 2011, Las Vegas, USA).

Levent Ertaul, Ahmad Movasseghi, and Sunny Kumar, “Enterprise Security Planning with TOGAF-9, 2011 International Conference on Security and Management, (July 18-21, 2011, Las Vegas, USA).

Levent Ertaul, Ahmad Movasseghi, and Sunny Kumar, “Strategy for Information Security: TOGAF,” 2011 International Conference on Security and Management, (July 18-21, 2011, Las Vegas, USA).

L. Ertaul, R. Sudarsanam, "Security Planning Using Zachman Framework for Enterprises", Proceedings of the European Mobile Government Conference), University of Sussex, Brighton, UK, July 2005,

Independent Project: Pritesh Kothari, "USB Attached SCSI Protocol Implementation, December 2010.

General Education: none. The Department believes that the University should have a Technological Literacy component to the General Education package. We have worked (and will continue to work) for such a component.

6,3. Students, Advising, and Retention

6.3a. Student demographics of majors, minors, and options. Data from Fall 2009 is shown. The demographics are very similar for each of the previous years.

Overall Enrollment by Ethnicity and Gender

California State University, East Bay

Fall 2009

University Level		Degree												
		Bachelor			PostBaccalaureate			Master						
		GENDER			GENDER			GENDER			GENDER			
		Female	Male	All	Female	Male	All	Female	Male	All	Female	Male	All	PERCENT
University	Black, non-Hispanic	898	439	1,337	39	13	52	158	76	234	1,100	530	1,630	11%
	American Indian or Alaska Native	35	16	51	3	3	6	5	4	9	43	23	66	0%
	Asian or Pacific Islander	1,691	1,289	2,980	115	74	189	327	173	500	2,133	1,536	3,669	25%
	Hispanic	1,239	670	1,909	47	28	75	127	82	209	1,415	780	2,195	15%
	White	1,493	972	2,465	240	106	346	427	258	685	2,163	1,339	3,502	24%
	Race/ethnicity unknown	1,113	685	1,798	126	82	208	260	136	396	1,501	906	2,407	16%
	Nonresident aliens	385	404	789	26	15	41	239	211	450	650	630	1,280	9%
	All	6,854	4,475	11,329	596	321	917	1,543	940	2,483	9,005	5,744	14,749	
	All (Percent)	60%	40%		65%	35%		62%	38%		61%	39%		

		Degree Level									Total			
		Bachelor			PostBaccalaureate			Master						
		GENDER		All	GENDER		All	GENDER		All	GENDER		All	
		Female	Male		Female	Male		Female	Male		Female	Male		PERCENT
Computer Network	White								1	1		1	1	4%
	Nonresident aliens							6	15	21	6	15	21	91%
	Multiple ethnicity								1	1		1	1	4%
	All							6	17	23	6	17	23	
Computer Science	Race/ethnicity unknown	3	24	27		3	3	8	10	18	11	37	48	10%
	Black, non-Hispanic	4	20	24		1	1		3	3	4	24	28	6%
	Asian or Pacific Islander	16	75	91	3	3	6	24	6	30	43	84	127	26%
	Hispanic	9	26	35		1	1	1		1	10	27	37	8%
	White	5	47	52		3	3	2	7	9	7	57	64	13%
	Nonresident aliens	4	46	50	1	4	5	51	71	122	56	121	177	37%
	Multiple ethnicity		2	2								2	2	0%
	All CS	41	240	281	4	15	19	86	97	183	131	352	483	
	All CS (Percent)	15%	85%		21%	79%		47%	53%		27%	73%		

Student Diversity: In computer science, the student body does differ from the rest of the University. First, there are fewer African-American and Latino students. We believe this is a result of the relatively poor science and mathematics preparation at many of the high schools that serve these populations. Second, there are many Asian Indian and Pacific Rim students. CSUEB has some presence in India, Japan, and China. Many of these students are interested in computer science. Note that in the C.S. M.S. program, 30 students are Asian/Pacific Islander; 122 students are Nonresident Aliens.

b) **Student level of majors, minors, and options**

	Fall Quarter				
Headcount Enrollment	**2005**	**2006**	**2007**	**2008**	**2009**
Computer Science					
1. Undergraduate	326	282	255	266	281
2. Postbaccalaureate	23	17	10	12	19

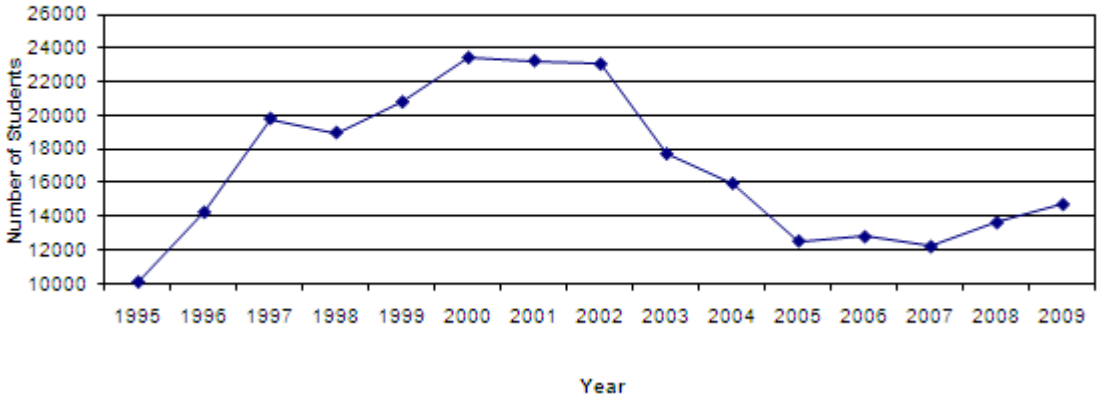
3. Graduate	128	120	128	179	183
4. Total Number of Majors	477	419	393	457	483
Computer Network					
1. Undergraduate	0	0	0	0	0
2. Postbaccalaureate	0	0	0	0	0
3. Graduate	0	0	0	1	23
4. Total Number of Majors	0	0	0	1	23

The above tables are from Institutional Research but do not always seem accurate, and are from 2009. In 2011, the Department did a survey and found the numbers on the left below (which includes some students not currently active who only have a few units to complete).. It also asked Blackboard for a list of all declared majors and got the numbers on the right

Count from Dept. Files	Blackboard Count
CS MS: 442	237
Networks MS: 62	40
CS BS 247	336

The figure below is from the latest report of the Computer Research Association (CRA), and demonstrates the national trend in computer science. Note that the trend at CSUEB is quite similar.

Figure 7. Newly Declared CS/CE Undergraduate Majors



Transfer students vs. Students entering as Freshmen: A large percent of our major students are transfers, many from community colleges in the area.

The tables below show that roughly 40% of new students declaring a Computer Science major are transfer students – lower than the roughly 60% of University students as a whole. However, experience has shown that many entering freshmen who think they will be C.S. majors will change their minds during their first mathematics and computer science sequences; this is less true of the transfer students.

		Entering Freshmen	**Entering Transfer**
2009	Computer Science	60	39

	University	1445	2000
2010	Computer Science	44	29
	University	1211	1401

Lower vs. Upper division In Computer Science, there are relatively few lower division courses. This is a result of (1) distribution of courses in the major, (2) number of students who transfer in with lower division satisfied, and (3) relatively few service courses.

Feedback from students: Five years ago, we were able to survey almost all graduating seniors since they had to physically pick up forms from the Math/CS student center – and we could distribute an exit survey at that time. Now, almost all interaction is online. The Department has tried USPS mailed questionnaires (with very low return rate), and has asked about an online exit survey (and been told that the University has no good way to implement this). We have discussed an exit survey that could be distributed in multiple ways – in classrooms in early June, during graduation ceremonies to those attending, and during comprehensive examinations for M.S. students (in both C.S. and math). We plan to try the last plan, but work toward an online survey.

6.4. Faculty: No new faculty have been hired in the last five years. The Department is graying, and it will be important to have new faculty. Two computer science faculty retired five years ago (and are in their final year of teaching as a FERPER); two more retired one year ago. There have been no replacements for these lost faculty. The age distribution of CS Faculty is: none under 40, 7 in 40-49, 3 in 50-59, 5 in 60+.

Faculty CompCore: In 2006 the Dean created the CompCore lab in VBT217 and VBT218 to support computational research in computer science and the college. It consists of a 40core cluster (5x Dell 2950 servers, with 2x 4core cpus and 4GB ram each), and twelve (12) Dell Precision 490n machines (2core Xeon 2GB RAM) each with a 640MG NVidia 8800GTS GPU. There are also three Sun x4100 servers. These are administered by faculty and used for research and some graduate instruction. All of the machines are now out of warranty.

Authoring System: Dr. Christopher Morgan is pursuing an active research program into his retirement. The computer science involves developing a system for authoring mathematics. The intention is to use this system to help manage and publish his research in algebraic group theory. Dr. Morgan intends to involve the Department of Mathematics and Computer Science at CSU East Bay as much as is appropriate in both the computer science and mathematical aspects of this research.

Faculty Diversity: The composition of the faculty differs in several important ways from the campus as a whole. Twenty percent (20%) of the computer science faculty are female (3 out of 15) while 47% of University tenure-track faculty are female. CS faculty are, 13% Asian, 80% white, and 7% nonresident alien. The University figures are 20% Asian, 59% white, and 0% nonresident alien.

In short, the Computer Science faculty are less diverse by gender and race than are the faculty as a whole. However, across the United states, only 17% of CS faculty are female so we are slightly more diverse in gender. CSUEB C. S. faculty are less diverse ethnically than either the University or the field (80% white Caucasian vs. 59% or 66%). With zero hires in the last five years, the CSUEB faculty has had no opportunity to become either younger or more diverse.

In the current quarter, there are only two Computer Science lecturers – an Asian male and a Caucasian female.

6.5. Resources: There have been difficulties with library resources and computer support, but the difficulties are much the same for all programs in the Department, with the note that computer and technical support is even more crucial for Computer Science and Computer Networks. All concerns are detailed in Appendix A below.

6.6. Units. 180 units are required

7. Plan, Computer Science

Critical elements:

- New faculty: no current faculty under the age of 40
- Unify the department (offices consolidated, more opportunities for faculty to work together, etc) This somewhat less important in C.S. than in math; most C.S. faculty are in the Science buildings
- Improve student experience at CSUEB (offer labs,, increase advising, get student feedback) Very important. Cutbacks in enrollment have led to fewer course offerings, fewer evening sections, limited summer courses. Find some way to re-institute the survey of graduating seniors.
- Ease burden place by budget restriction . We need graders for courses, more travel money for faculty, better library offerings
- Develop department leadership. It has been hard to find anyone willing to be Department Chair.
- Improve relationship with ITS (Instructional Technology). There has been a lot of friction here this year. Maintain and improve library research support.
- Improve preparedness of students – work on ways to insure that prerequisite courses adequately prepare students for the following course(s).
- Maintain M.S. Computer Networks program, attracting students and maintaining currency in the curriculum.

7.1. Plan: Curriculum.

Undergraduate: The core CS areas are currently covered. There are specific courses for Java, .NET, Web, and Database applications. Currently, most of the CS job postings are for Java, .NET, Web, and Database developers. By keeping up with the changing technology we can attract more students, but of course this also means that we need up to date equipment.

There have been standard syllabi for the core courses. These syllabi are now out of date. They need to be re-visited.

A New Course proposal has just (March 2011) been submitted for a course Mobile and Topics in Web Programming. If approved by the College and the University curriculum committees, this could be offered beginning Fall 2011.

Computer Science Curriculum must always be aware of changes and ready to adapt since it is one of the newest fields of study. The Department must

- Carefully consider ABET accreditation
- Continue to update the introductory sequence
- Add new courses to meet new fields or changes in existing fields

General Education: Many faculty believe that the CSUEB General Education component should include a Computer component. We will advocate such a change and work to develop suitable course(s).

Current plans include (a) new introductory computer science course in Python, approved for Fall 2011, (b) new offerings in mobile applications, and (c) possible new courses in the area of computer security.

M.S. C.S Several proposals are currently under consideration for the program. The Breadth Requirement for the M.S. degree currently places most graduate-level courses in one of two loose categories (either Theory/Development or Systems/Architecture). Students are required to take two courses from each category as part of their studies. Under consideration: focusing the breadth requirement into one smaller list of core courses, and require students to take three courses from this abbreviated and more focused list.
Another point of concern is the "Area D elective" option which allows students to earn credit for 3000 and 4000-level courses they have not already studied as part of their undergraduate coursework. Due to the limitations of PeopleSoft with importing student records from undergraduate programs outside of the CSU, it is administratively difficult and time-consuming to verify which courses can apply as "Area D". There is also the concern that 3000-level offerings may be too basic for graduate-level credit. Under consideration: remove the "Area D "option altogether (our Computer Networks program does not allow this), or remove 3000-level courses as from the option.

M.S. Computer Networks: Over the next five years, increasing student enrollment and continuing to tune current and add additional classes are primary goals. We have added a new wireless security course to the breadth category and enabled three courses to be offered in a tiered and or hybrid format. A proposal to increase our online course offerings is being considered along with the idea of offering students the choice to complete the degree entirely online. We do not have any additional resources or faculty to help with this process, however, it is anticipated that this would be attractive to students and would help increase enrollment. There is no proposal to accredit this degree as there is no organization that accredits computer network degrees. Enrollment has decreased with a similar trend to that observed in the computer science field nationally. A CSUEB graduate school recruitment grant of $1,000.00 was given to the department for advertising the degree. A newspaper ad was purchased. Evaluating effective ways to spend the current remaining balance is in progress. The Bureau of Labor Statistics has published data indicating that the field of Computer Networks, Systems, and Database technology is expected to grow 30% by 2018. (http://www.bls.gov/oco/ocos305.htm). It would be beneficial to capitalize on this predicted need of specialists

7.2. Plan: Students.

The Computer Science community as a whole anticipates a slow growth in enrollment, following the increase we have seen since the bottom of the enrollment slump (2006 for undergraduate; 2007 for graduate). Most students in computer science courses are majors.

The Department expects the usual continuing change in the curriculum and job opportunities for our graduates. Jobs labeled "programmer" will likely decrease (see Appendix D); jobs in security, network support, and as applications and systems software engineers are forecast to increase.

To attract new students, the Department must keep in contact with the community colleges – these are a major source for Computer Science majors. . Having our own alumni on the Computer Science faculty at most of them is a definite plus. It is hard to know how to have a more effective outreach program to these schools but the Department should continue to try to improve its means of reaching these students.

Despite the recent decline in CS enrollment nationwide, our graduate program remains strong with roughly 300 enrolled students. Job growth projections for the STEM/IT sector over the next decade is expected to generate even higher salaries for computer scientists (see Appendix D). This, combined with our proximity to the Silicon Valley, suggests we will experience an increase (perhaps large) in our student population in the next few years.

The spaces issues and revision of computer support at CSUEB have resulted in the loss of all open computer labs in the College of Science. We need a computer lab where students can work together on their programming projects, conveniently located in the College of Science.

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The graduate Computer Science program benefits from strong outreach efforts by the International Education Center. Several CSU personnel make periodic recruiting visits to Indian institutions with strong ties to CSUEB and the Bay Area. The graduate coordinator will be accompanying IEC on some future visits, and additional efforts in China will soon be launched.
Computer Science is a rapidly changing field, so it is difficult to predict future technologies and the resulting career opportunities made available. Software Engineering and Networking jobs are predicted to be in high demand within the next ten years, however, and our program has strong offerings in these areas.

7.3. Plan: Faculty.

In Computer Science, fully one third of the faculty (5 out of 15) are age sixty or older; none are younger than 40. There have been no new hires in the last five years. It is clear that the Department will have to be hiring in the next five years. Hiring should be in the areas most needed at the time of the hire.

In the next five years, we expect approximately five retirements (the five faculty now older than 60). These faculty must be replaced. If enrollment grows, we will need even more new faculty. Loss of senior faculty to retirements will mean that the Department needs new leadership.

Several faculty members have retired in recent years (or are FERPing); several more are nearing retirement age. Some necessary courses in the M.S. program will become difficult – if not impossible –to staff in the near future if additional hires are not made. Software Engineering and Theory courses are in particular need of additional faculty support.
There is no time support for advising graduate theses; nevertheless, many faculty members do supervise student research projects.

The lack of space has meant that most mathematics faculty – and some Computer Science faculty – have offices in Robinson Hall on the other side of campus. We need to get all department faculty back into one central location. We need to find other methods to develop a loyal faculty who feel connected to each other, and who are willing to take on leadership roles.

C.S. Graduate Coordinator: Advising for all graduate students is performed solely by the graduate coordinator, with support from the Student Center coordinator. The graduate coordinator is also responsible for curricular oversight, the evaluation of all graduate student applications, and the administration of the new Graduate Capstone course requirement. Due to the large number of students in the M.S. program, the current compensation (two released courses) is inadequate.

7.4. Plan: Resources

Facilities: A new STEM building is slated for construction within the next ten years. This will benefit the department by placing all faculty offices together in one building. We are also currently discussing the possibility of splitting our joint Math/Computer Science department into separate entities.

Software and hardware issues in computer labs and faculty offices must be resolved.

The Cloud Initiative (and the consolidation of physical equipment by Information Technology Services) has been executed with limited (and sometimes no) feedback from our program. Faculty morale with regards to this issue is low: many feel that the administration does not recognize our discipline as a laboratory science. Graduate students have also expressed their frustration to the graduate coordinator.

Readers and T.A.'s: The necessary reader and teaching assistantships necessary to support graduate courses are no longer available: this places additional strain on faculty, and fails to foster aspiring teachers within our student population. Faculty travel support is diminished.

Library: Library support has also become tenuous. The ACM portal is available on limited access, and the IEEE Computer Society Digital Library is on a one-year only renewal. These repositories are necessary in support of many graduate courses including our CS6000 Research Methodologies requirement, for student theses, and of course for faculty research.

We are fortunate to have strong office support for the program, although perhaps this too will be impacted by the next round of cuts.

Travel money has been quite restricted, and the budget forecast is quite grim. However, faculty have expressed the need for more money to support attendance at conferences. In 2010-2011, the University has granted a few travel requests but all non-critical spending is discouraged.

8.0 Outside Reviewer's Report

PROGRAM REVIEW COMPUTER SCIENCE (B.S, M.S.); COMPUTER NETWORKS (M.S.) MATHEMATICS AND COMPUTER SCIENCE DEPARTMENT CSU EAST BAY

Sigurd Meldal (Computer Science and Networks Programs)

Visit Date: April 11, 2011

Introduction and summary

The Mathematics and Computer Science Department at CSU East Bay (CSUEB) offers a BS and an MS Computer Science degree, an MS Computer Networks degree, as well as degree programs in Mathematics. This report focuses on the Computer Science and Networks degrees and their support. In the following, references to "the CS programs" are meant to include the faculty, staff, students and curricula directly involved in the *computer science* and *computer networks* programs.

The CS programs are staffed by 15 faculty members (down significantly since 2009). In addition there are three admin support personnel (for the whole department) and one technical support person located in the department (with responsibility for the whole College of Science).

According to the (latest) 2009 reports, the CS programs enroll 300 undergraduate majors and 200 graduate students. The average section size is 21 students and the overall student/faculty ratio is 18.8 (2009). The student population consists largely of commuting students with significant non-study -oriented responsibilities – both family and work. The graduate program has a significant fraction of non-California resident students, and recruits globally, with increased recruiting planned.

After some years of radically reduced enrollment in the majors, CSU East Bay has lately experienced a slow upwards trend in students entering the CS majors, in line with the national trend (which started an upwards swing in 2007).

The department is engaged in a continuing process of assessment, reflection and improvement of its curricula, and has created and put into play a number of curriculum revisions in order to conform to curricular standards (such as the ACM model curriculum) and to stay current with the needs of the stakeholders (principally the technology leaders of Silicon Valley).

There have been no new tenure-line faculty members hired the last five years; four faculty members have retired, and the faculty indicate that there will be further attrition soon due to retirements. More than 30% of the faculty members are aged above 60.

The faculty gender diversity is in line with the national numbers. With respect to ethnic background the faculty is less diverse than the national norm.

The department has *no* instructional laboratories. There are no technical staff members of the department, and for the whole College of Science there is only *one* IT technical staff person, and he reports to the COS..

The job market for the graduates of the CS programs is robust, and in line with (or ahead of) the national trends – 2/3 of all engineering-related jobs being created are in computer science and related fields, and the IT professions are still the fastest-growing (and among the better paid) in the US.

The department is well aligned with the mission of the university.

The department serves its students very well, and has in place a dedicated faculty and staff. However, the department is in quite a challenging resource position, and the continued wellbeing of the program and the quality of the learning environment is critically dependent upon due consideration and support when the resource situation improves.

The review process Prior to the visit, the university and the department provided the reviewer with (1) a self-study and (2) supporting material for the self-study.

The visit itself provided the reviewer with access to the Department Chair, to the tenured (there are no probationary) members of the department faculty, to the staff members of the department, to the Dean Leung of the College of Science, to the officers of the student clubs and to a representative sample of upper division and graduate students by means of two class visits.

The reviewer also had an opportunity to inspect the facilities that support the students' learning environment.

All the conversations were congenial, and the reviewer would like to express his appreciation for the overall welcoming and collegial atmosphere of the visit.

The Department Chair and the Dean both indicated an interest in the possibility of an ABET accreditation for the program.

The reviewer agrees that an accreditation by the Accreditation Board for Engineering and Technology (ABET) would be a valuable external, public recognition of the strength of the program. Accreditation is of importance to the graduates as they embark upon their professional careers: Most computer science graduates enter the software engineering profession, and often into organizations with strong engineering traditions. Engineering organizations typically place a premium on the accreditation status of the student's degree program, and the lack of accreditation may put a graduate at some disadvantage. Also, if CSU East bay is interested in developing an increasingly international student body then an ABET accreditation would be a significant factor when international students are evaluating where they want to pursue their studies in the US.

ABET accreditation also provides a framework for systematic assessment of learning effectiveness and program improvement, and its national reach provides the institutions being accredited with a normative framework for evaluating their own learning environments.

Consequently the reviewer will use terminology drawn from the standard accreditation processes, and this report will follow the layout frequently used in such reports. However, the ABET review process and documentary support is significantly different from that employed by CSU East Bay and other CSU campuses in their internal program review processes. Thus this review should *not* be construed as having a scope beyond the review processes of CSU East Bay, and it has no formal bearing on a possible accreditation process at some future date.

Program Strengths

1. The department faculty members are well qualified and they demonstrate a strong and heartfelt dedication to the department and its students. The dedication manifests itself in a will ingness to volunteer for extra tasks, to accept assignments that are personnel-intensive and to discharge these with high professional quality. More broadly, the level of dedication is demonstrated through the innovation and quality of instruction and the strong appreciation articulated by the students in conversations about their learning environment. The faculty members were strongly supportive of each other, and demonstrated a good, collaborative and collegially harmonious team relationship.
2. The faculty members' penchant for high quality student course deliverables and achievements was demonstrated by their enthusiastic descriptions of the courses they were teaching, and confirmed by the students – and also *appreciated* by the students; they articulated well the importance of a good work ethic and ambitious goals for their education.

3. The curriculum is being assessed and updated in a systematic manner. The faculty is current with the Association for Computing Machinery (ACM) recommended model curriculum, and has demonstrated a thoughtfully creative approach to resource optimization of the delivery of the courses in the curriculum.

On the whole, the department faculty and staff should be applauded for their success under very challenging resource circumstances.

Program Deficiencies

In ABET terminology a *deficiency*

"*…indicates that a criterion, policy, or procedure is not satisfied. Therefore, the program is not in compliance with the criterion, policy, or procedure.*" (ABET accreditation policy and procedure manual)

Facilities and Support.

1. Lack of computer labs: Computer Science is an *experimental science.* To teach the discipline requires laboratories under faculty members' curricular control, as well as open laboratories where students can congregate to explore the challenges of the discipline and build a culture of innovation and collaborative development.
Program-specific laboratories cannot be replaced by generic computing equipment, much less by virtualized environments. Such an organization of computing "laboratories" deprives the students of the necessary opportunity to engage in the experiments in the discipline necessary for their

professional preparation. (To draw an analogy: it would be similar to teaching chemistry without access to any wet labs, with computer simulations being the only mode of experimental exploration).
2. Insufficient faculty influence on curricular infrastructure decisions: The faculty has to be in control of the decisions re. how laboratories are to be used and equipment (efficiently) deployed to serve the curricular needs. The requirement that *faculty exercise curriculum control* implies that the faculty have to be deeply involved in proposals to change educational infrastructure components such as laboratories, and have the ultimate decision authority when the curriculum has to change to accommodate resource constraints. It seems the CS faculty has been deprived of such authority with respect to how the experimental and experiential curricular components are to be delivered.

3. Insufficient technical support: The daily support is very well managed by the COS-supplied technical support person for the college, but *one person* (regardless of report structure) is insufficient to systematically maintain and upgrade the equipment to enable students to achieve the program's outcomes and to support faculty teaching needs and scholarly activities. Design and implementation of hardware infrastructure is carried out by ITS, and not by Math/CS or the College of Science.

4. Insufficient budget support: The financial support for the program is deficient. The OE&E budget is inadequate for the basic needs of the department, the teaching infrastructure and the faculty members' continued maintenance. There is no evidence of longer-term funding that is reliably available for professional development support.

The institutional facilities including the library, other electronic information retrieval systems, computer networks, classrooms, and offices are minimally adequate to support the program.

In summary – there is a lack of evidence that the support and resources are sufficient to provide assurance that the program will retain its strength.

Program Weaknesses. In ABET terminology a *weakness*

> "*…indicates that a program lacks the strength of compliance with a criterion, policy, or procedure to ensure that the quality of the program will not be compromised. Therefore, remedial action is required to strengthen compliance with the criterion, policy, or procedure prior to the next evaluation.*"
>
> (ABET accreditation policy and procedure manual)

1. Faculty size and workload. There are not enough full-time faculty members to provide continuity, oversight, and stability, to cover the curriculum reasonably, and to allow an appropriate mix of teaching, professional development, scholarly activities, and service for each faculty member. The programs in their current form and mode of delivery are of good quality, but are carried out on the backs of the enthusiasm of the faculty members. In order to meet accreditation standards this situation would have to be systematically addressed.

The number of faculty members is inadequate for the number of students they support, the breadth of the discipline they are supposed to cover and the age curve (and consequent expectations of attrition due to retirements). Of particular concern is the fact that there is only *one* faculty member teaching software engineering (*the* central field for a successful career in Silicon Valley), and only *two* faculty members teaching the theoretical foundations of computer science.

2. Advising. The responsibility of student advising in the undergraduate major is spread across the faculty, and the responsibility for general education advising is handled outside the department. This is an inadequate structure, in that the advising is inconsistent and somewhat haphazard. Students are frequently taking classes out of order with a consequent damage to their learning and progression towards the degree. The faculty is aware of the problems, but cannot find a way to offer adequate advising.

The fact that the students' learning achievements are of such quality in spite of the faculty workload demonstrates the caliber of the volunteer overload work performed by the faculty and staff – but an organization is unlikely to be able to sustain itself on such a volunteer basis.

Program Concerns. In ABET terminology a *concern*

> "*…indicates that a program currently satisfies a criterion, policy, or procedure; however, the potential exists for the situation to change such that the criterion, policy, or procedure may not be satisfied.*"
>
> (ABET accreditation policy and procedure manual)

1 Continuous improvement. The program does not have a systematic approach to learning objectives assessment, but the faculty members have engaged in a process of assessment-based program improvement, closing the loop and implementing program improvements based on the analysis performed.

2 Curriculum. The use of scheduled instructor-supervised laboratory sections is of concern. Computer Science prepares the students for a career of design, implementation and deployment of software. The importance of supervised experience with turning designs into working implementations cannot be overstated – as in engineering in general, the application of abstract knowledge through repeated (and increasingly challenging) design and implementation experiences is necessary for the proper internalization of the whole range of knowledge necessary for a successful professional.

Program Observations

In ABET terminology an *observation*

"*…is a comment or suggestion which does not relate directly to the accreditation action but is offered to assist the institution in its continuing efforts to improve its programs.*" (ABET accreditation policy and procedure manual)

1 The close interaction between students and faculty members is a program advantage, and the small class sizes in the major strengthen the formal interaction of instructors with students. The program would benefit if *informal interactions* were better facilitated by a closer proximity between the faculty offices and student laboratories, and in particular if there were suitable laboratory space close to the faculty offices set aside for a capstone experience and for the support of informal and formal student/faculty interaction.

2 The Career Center seems to be of limited utility to the (graduating) students, seemingly due to a lack of connections to Silicon Valley employers. The location of CSU East Bay could be a major,

positive differentiator, but it has to be enabled by a close connection from the Career Center to the department, and an ability by the center to bring the students of the department together with relevant, likely, employers. Primary responsibility for contacting employers should lie with the Career Center, in cooperation with the Department.

3 The Department needs – and would like – better relationships with its alumni. Support for this would be expected to be provided by the university as part of its overall strategy for alumni relations and outreach.

Department Observations

1. Given the role science and technology – and in particular information technologies – play in shaping our world and our society, CSU East Bay is well positioned to provide curricular leadership in ensuring that the broad student population be technologically literate and well prepared as citizens to participate in social decision-making processes which will be shaped by technologies (e.g., understanding the interplay of policy, privacy and technology is particularly urgent at this time).

   The Computer Science Department has faculty members well prepared to provide the non-science student population with insights in this area, and the reviewer would urge the university to avail itself of their expertise in order to broaden the general offering in computing and information technology use beyond the skills-oriented courses commonly encountered. An increase in service courses, *e.g.*, with a General Education component, would increase department FTES and presumably increase department resources.

Conclusion

The department benefits from a dedicated faculty and staff who are well prepared to deliver high-quality education. The level of volunteer work they provide to the university is very impressive, and the degree of innovation exhibited within a somewhat constrained version of the standard curriculum is noteworthy. The resource situation is precarious, with a danger of personnel burnout. This should be addressed when the resource situation improves. The laboratory situation requires immediate attention.

9. **C.S. Program Response to Outside Reviewer**

Response to Reviewer, Computer Science and Computer Networks.

Dr. Sigurd Meldal, Chair of Computer Engineering at San Jose State University, spent a day with faculty, staff, students and the Dean of CSUEB. He asked questions, solicited opinions, and seemed to get a good sense of the strengths and problems with the Computer Science and Computer Networks programs. As he wrote, “In [his report], references to “the CS programs” are meant to include the faculty, staff, students and curricula directly involved in the *computer science* and *computer networks* programs.”

The following addresses some of the issues raised in his report. His report also notes various strengths in the Department – it "serves its students very well, and has in place a dedicated faculty and staff" with a curriculum that "is being assessed and updated in a systematic matter."

There were no surprises in the comments. The Department has discussed the issues below – some (accreditation) for several years, others (lack of computer labs) are relatively recent problems, but have become very serious issues.

1. ABET accreditation. Dr. Meldal believes that ABET (Accreditation Board for Engineering and Technology" would be a "valuable external, public recognition of the strength of the program." and would be a "significant factor when international students are evaluating" a potential school.

The Department has considered accreditation and – according to an informal poll of the faculty – would like to pursue it. However, the process requires significant time, effort, and monetary resources, and has been deemed to be beyond current capabilities. It is something that should continue to be considered. If and when there is money for the required fees, released time for faculty, and outside expertise to help in the process, then the Department should discuss and decide whether to pursue accreditation.

2. Lack of computer labs, more faculty input needed on infrastructure, insufficient technical support: These items go together. The current situation, with no open computer labs in the College of Science and no computer labs totally scheduled by the Department (with partial control of only two labs) is a result of economy measures and reorganization of ITS. We are told that ITS may be re-organized once more with a return to some degree of decentralization. This is seen as extremely desirable by the faculty and students in Computer Science.

The lack of labs and technical support has significantly impacted instruction. Students working together on group programming projects – an integral part of most Software Engineering courses but also found in other areas of Computer Science – have no good place to go to work. Courses cannot be scheduled at the best times for students and faculty because there is no room available. Classes that the Department has scheduled in a large lab are moved without consultation for some other course in another department. Equipment failures in instructional computers are not solved in a timely manner.

3. Insufficient budget support: The Department agrees entirely; it is lacking funds to support instructional assistance, department hardware maintenance, and professional development funds.

4. Faculty size and workload. The reviewer reports that "the number of faculty members is inadequate for the number of students they support [and] the breadth of the discipline." The Department does feel the need for new faculty with recent degrees in Computer Science, and possibly with experience with ABET accreditation. It is difficult to find faculty to teach Software Engineering courses, the introductory sequence in C++, and some other classes. The composition of the faculty suffers from no new hires in the last seven years. There was a nation-wide plunge in Computer Science enrollment after the dot com crash and thus no new faculty were needed.

However, now enrollment is slowly but steadily increasing, new subject areas are emerging (the Cloud, security issues, and more) and the Department is in need of new people with new ideas.

5. Advising. This is a known and on-going issue. The faculty has discussed how to better advise students, so that students take courses appropriate to their level and their goals. With roughly 500 combined graduate and undergraduate students, innovative thinking is needed. Some new ideas have emerged this year, perhaps making better use of the excellent staff help available in the Math/Computer Science Student Center. Of course, funds for released time for advisors would be one solution, but it isn't something that the Department expects in the foreseeable future.

In short, many of the issues above are dependent on resources and, as Dr. Meldal writes, "should be addressed when the resource situation improves." The lack of computer labs and technical support cannot wait that long; the Department is hoping that an expected ITS reorganization will offer at least some relief in this area.

APPENDICES

Appendix A. Support from campus units (joint concern)

Library: Faculty have reported that library sources are inadequate for their purposes, especially for supporting student research. There are more complaints from C.S. faculty than from the Math faculty. One very recent development is the re-addition of the IEEE database

Tom Bickley Math/CS Library Liaison (3/30/2011) Dear Math and CS Colleagues, I am delighted to report that access is restored for IEEE! You can get to it via the library website under Databases A-Z: IEEE Computer Society From off campus your net ID and password will get you in. Thank you for your support in getting that back. Let the searching begin!

CS 6000 (Graduate Research Methods Course):. Library holdings are inadequate, limited to the ACM portal (even that was missing for a while). The IEEE CS Digital Library almost made up for the many holes in online coverage, but that has been eliminated for a couple of years now One faculty reports that he must buy the IEEE CSDL from my own salary to stay informed.

C.S. Print offerings: not comprehensive. O'Reilly safari expire after three years, without warning. Many trade paperbacks on programming in e-library listings, of dubious merit. Faculty report sending students to the Stanford Universities Library or the U.C. Berkeley Engineering library to do rigorous literature reviews. The CSUEB library lacks access to the INSPEC Database for publications in Computer Science.

C.S. Faculty (Grewe): It is completely inadequate. I am forced to go to (as would a student who needed to do any rigorous literature review) Stanford Universities Library and use it as a guest (which is limited). I understand budget issues but, not have access to INSPEC a premier database for our areas publications is not acceptable when doing research

Math Research: I've used the library a lot, and it's been adequate thus far for research purposes. {Veomett}

Databases relevant to Math and CS: access to 6000+ journals and books

ACM Portal (The database includes entries for articles from the foremost U.S. and international computing journals, computer science books and monographs, papers from U.S. and international conference proceedings, doctoral theses, reports and the newsletters from the ACM Special Interest Groups.)

Emerald Journals (research journals dealing with management issues including significant holdings in Computer Science)

IEEE (access restoration in process; decision made on 10 Mar 2011; continuation dependent on usage and budget)

JSTOR (Multidisciplinary: includes Humanities, Social Sciences, Business, General Sciences, Mathematics, Statistics, Ecology and Botany.)

MathSciNet (A database of bibliographic information and reviews (summaries) for mathematical research literature created and maintained by the American Mathematical Society. Includes books, 1700 journals and serials, conference proceedings.)

Project Muse (Full-text of articles published in over 100 journals from from Johns Hopkins University Press and other university and academic publishers.)

Safari Books Online (3,635 full text e-books from Prentice Hall, O'Reilly Media, Addison-Wesley, Microsoft Press, Adobe Press, Sams, John Wiley & Sons, Apress, Manning, Sybex, Syngress, Oracle Press, Cisco Press, Pearson Certification, Packt Publishing, Que, Peachpit, New Riders, FT Press, Career Press, Course Technology, Jossey-Bass, McGraw-Hill, Morgan Kaufmann, AMACOM, Focal Press, and SAS Publishing. Titles are not held permanently, but are available for a three-year period.)

Science Direct (Indexing and full text to over 1,100 journals in 16 fields of science including chemistry, materials science, economics, business & management science, physics, social and behavioural sciences, clinical medicine and more.)

Springer Journals (Biomedicine, life science, clinical medicine, physics, engineering, mathematics, computer science, humanities, and economics)

Statistical Theory and Method Abstracts (Statistical Theory & Method Abstracts (STMA) provides worldwide coverage of published articles on mathematical statistics and probability. These abstracts provide valuable information on new developments in all fields of probability theory, estimation, linear models, stochastic processes, operations research, testing of hypothesis, experimental design and time series analysis. Each year approximately 6,000 abstracts are published summarizing articles from journals of all parts of the world.)

Web of Science/Science Citation Index (Indexed disciplines include agriculture, astronomy, biology, chemistry, computer science, mathematics, medicine, physics, psychiatry & veterinary science **Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.**.)

Wiley Online Library (Business, finance & management; chemistry, computer science, earth sciences, engineering, life and medical sciences, mathematics & statistics, physics and psychology.)

Changes in Technical Support

Information Technology Services (ITS). ITS is particularly important for a department with a technological emphasis.

The ITS Baseline Project (beginning in 2007-2008) had an objective to " replace lab computers every three years and faculty and administrative computers every four years". This has not been done.

ITS News "The General Access Lab in College of Science S146 has been merged with the adjacent S152 to create a large Instructional Lab. There are now 3 Instructional Labs at CSUEB that can accommodate 50+ students, a much needed resource." The instructional labs were needed, but more are still needed. The loss of the COS General Access lab means that computer science students have no access lab close to their classrooms.

ITS Support: Faculty desktops sorely need updating. Support for teaching is eroding. ITS staffers are not trained in supporting development. ITS makes arbitrary and bizarre configurations on lab machines, and requested software is usually installed late (even when requests are made on their deadline) or misconfigured.

ITS supports the Smart classrooms. This support system was recently revised, and it is not yet clear how well it will work. This is of definite concern. For the most critical problems, the ITS goal is that 90% will be resolved within 4 hours (**Resolve** Critical 4 hours 90%). This is not very useful when technology goes down in a classroom during a 70- or 110-minute class.

In 2005,

- the MCS Department had a full time technician for computer support. This tech maintained two student computer labs, one with 22 PC's available in NS 336 and another with 22 PC's in NS 104.
- There was also an open computer lab ScS 140 hosted by the College of Science with 20 Linux workstations and 10 Sun workstations. The Sun workstations were maintained by the MCS IT tech.
- Hardware, software, licenses were paid for out of MCS budget, although faculty and administrative workstations were supplied by the University.

In 2008, there was an ITS reorganization. There was an effective freeze on server and workstation upgrades. The MCS tech was transferred to ITS but his duties were changed to 80% MCS support and 20% COS support. The position remained almost totally autonomous. Then in 2009 this Position was transferred back to the COS with the same approximate duties.

In 2010, the open computer lab in ScS 146 was taken over by central ITS. There were 37 PCs in that room. ITS raised the PC count in that to 51 to accommodate large class sizes. ITS also assumed responsibility for the functioning of this room.

The open computer lab (ScS 140) is no longer open. It is to be virtualized. This set of Workstations are served by various servers (Sun and Linux) maintained by the COS tech.

Essentially hardware is now provided by ITS. Software is a mix between ITS, COS, and MCS budgeting. Support is broken into two areas. We have baseline support and above baseline support. Specialized IT equipment and Software is supported by COS staff. Baseline hardware and software is supplied and maintained by ITS.

There is a process for replacing servers with a (SARF) form submitted to ITS. MCS has gotten 8 servers so far. But, it is not clear on how to replace staff or faculty workstations.

Software is primarily the same as in the past. But, funding is limited so not too much is being said for that.

Grewe: The biggest issue is timeliness of completing service requests. Also, I have not had to deal with them on server issues (only Richard) and suspect they would not be able to do so --- as I often have to redirect them on desktop issues and they want me to do tests with them. I think using ITS would be a big problem for CS to function on server accounts, server software, system, opening of ports and security, etc.

Machines in MCS Domain				
Name	Age (years)		Servers:	Age
Mcs	5		2 DB servers	8
Zzporter	9.5		2 DB servers	6
Disk array	5		Web server	7
			4 faculty research	6
Desktop PCs			Apple Macs	
4 GS760	2.5		2 Pro	4
10 755	3.5		3 64	6
3 GX 620	4.5			
23 GX 280	6			
At least 100 computers in service older than 6 years.				

Appendix B: Support for Training Math Teachers

Grant: Robert Noyce Teaching Fellowship program at CSU Eat Bay, funded by NSF. Awarded $1.5 million for the period 9/1/09-6/30/16. The CSUEB Noyce Scholarship Program is designed to increase the number of qualified math and science teachers obtaining their credential at CSUEB and going on to serve at high needs schools. Noyce Scholarships will be used to attract academically successful community college transfers, senior mathematics and science majors and STEM (Science, Technology, Engineering and Mathematics) professionals to become highly effective teachers in urban school districts. Each scholar will be supported for $10,000 per year for one to two years and will be required to teach at a high needs school two years for every year of support. Kathy Hann, PI

Grant: Robert Noyce Scholarship program at CSU East Bay, funded by NSF. Awarded $750,000 for the period 9/15/08-8/31/2012. The College of Science and the College of Education and Allied Studies at California State University, East Bay (CSUEB), the Alameda County Office of Education (ACOE), the Stephen D. Bechtel Jr. Foundation, and the Edward Teller Foundation collaborate on the CSUEB Noyce Teaching Fellowship program. The goal of this program is to increase the number of highly qualified science and math students who obtain a teaching credential and master's degree at CSUEB. This program will provide scholarships for the first credential/master's year and salary supplements for the subsequent four teaching years for two cohorts of eight Fellows. Each fellow will receive a total of $60,000 in support from the Noyce program. Noyce Fellows will complete an innovative cohort-based teacher preparation program, acquire laboratory experience and take advantage of a professional support network and mentoring that help them succeed as teachers in high-need school districts. Kathy Hann, PI

LIST OF CURRENT NOYCE RECIPIENTS

	NOYCE SCHOLARS			
2009-10				
Aubert, Lianne	science		Addicott, Neal	env eng/science
Cannon, Clarence	science		Alano-Lind, Estellie	math
Chapot, Paul	biology		Smith, Brent	math
Crawford, Azi	math		Chambers, Bryan M	biology
Garcia, Paula	math		Kirshner, Daniel A	biology
Garland, Randall	biology		Liang, Jinyu	math
Hay, Phooi	science		Qian, Rong	physics
Johnson, Lisa	math		Pakter, Alexander	math
Kosic, Thomas	Chemistry			
Memory, Erica	math			
Merdinger, Matt	biology		Fellows who started June 2010	
Norling, Robert	engineering/math		Dressen, Darren	SS Chemistry
Northcutt, Cathlyn	math		Fuller, Jonathan	SS Math
Reitz, David	math		Lamar, Cerina Kae	SS Biology
Stewart, Richard	math		Mott, James	SS Math
Zahidy, Soudabeh	math		Nguyen, Ann	SS Science
			Richins, Alison	SS Biology
			Seidler, Hanna	SS Biology
2010-11			Shambaugh, Michael	SS Found Math
Credential Students	Field			
BrodmanLarson, Laura	Marine Biology			
Bullock, Sylvia	BA Math, BS Accounting			
DeMarinis, Franco	Physics			
Hopfer, Talitha	CS			
Littlefield, Abigail	Biology			
Wagner, Stephanie	Biotech			
West, Paul	Chemistry			
Nesbitt, Nicholas	Biology			
Seniors	BS			
Matthews, Arianna	Math			
Wilkinson, Jesse	Math			
Eman, Shad	Math			
Hin, Sasha	Biology			

MSTI, Math and Science Teaching Initiative, grant from the CSU Chancellor's office, Co-PI. An ongoing project to increase the number of well qualified students completing their Math or Science Teaching Credential at CSUEB. Activities include creating formal partnerships with six

area Community Colleges, providing support and training for CSUEB and community college students to serve as Teaching Assistants in local high schools, a scholarship program and Math/Science teaching workshops for students who are interested in the possibility of becoming math or science teachers. Spring 2007-present

Innovations in Middle School Mathematics Education in California: Recruiting and Training Future Middle School Mathematics Teachers and Developing Instructional Materials Based on Real-World Applications,
funded by PG &E. This project serves to enhance the newly created CSUEB Foundational Mathematics program through the addition of applied examples that align with the content standards.

Bechtel Community College Articulation Project– Hold a series of faculty Dialogues with faculty from each of the science disciplines as well as mathematics from three community colleges and CSUEB to discuss ways to formalize articulation for math and science students interested in teaching, establish mechanisms to provide advisement for undergraduate math and science students interested in teaching at both CSUEB and
partner CC's, and discuss new ways to recruit students. Fall 2008-June 2010

Appendix C: Data on C.S Students nation-wide (from the CRA Taulbee Report)

Table 9a. Gender of Bachelor's Recipients

	CS		CE		I		Total	
Male	7,031	88.7%	1394	91.3%	1291	86.9%	9,716	88.9%
Female	892	11.3%	132	8.7%	194	13.1%	1,218	11.1%
Total have Gender Data for	**7,923**		**1,526**		**1,485**		**10,934**	
Unknown	177		17		143		337	
Total	**8,100**		**1,543**		**1,628**		**11,271**	

Table 9b. Gender of Master's Recipients

	CS		CE		I		Total	
Male	5,364	77.9%	732	79.3%	789	47.3%	6,885	72.6%
Female	1,522	22.1%	191	20.7%	880	52.7%	2,593	27.4%
Total have Gender Data for	**6,886**		**923**		**1,669**		**9,478**	
Unknown	5		0		0		5	
Total	**6,891**		**923**		**1,669**		**9,483**	

Table 10a. Ethnicity of Bachelor's Recipients

	CS		CE		I		Total	
Nonresident Alien	377	6.2%	102	8.2%	25	2.0%	504	5.9%
American Indian or Alaska Native	16	0.3%	2	0.2%	3	0.2%	21	0.2%
Asian	878	14.4%	235	18.8%	137	11.2%	1,250	14.6%
Black or African-American	207	3.4%	62	5.0%	105	8.6%	374	4.4%
Native Hawaiian or Pacific Islander	38	0.6%	7	0.6%	1	0.1%	46	0.5%
White	4,198	68.9%	794	63.6%	865	70.7%	5,857	68.4%
Multiracial, not Hispanic	24	0.4%	2	0.2%	1	0.1%	27	0.3%
Resident Hispanic, any race	355	5.8%	45	3.6%	87	7.1%	487	5.7%
Total have Ethnicity Data for	**6,093**		**1,249**		**1,224**		**8,566**	
Resident, race/ethnicity unknown	781		161		102		1,044	
Residency unknown	1,226		133		302		1,661	
Total	**8,100**		**1,543**		**1,628**		**11,271**	

Table 10b. Ethnicity of Master's Recipients								
	CS		CE		I		Total	
Nonresident Alien	3,858	62.2%	508	62.8%	275	19.7%	4,641	55.2%
American Indian or Alaska Native	15	0.2%	6	0.7%	6	0.4%	27	0.3%
Asian	550	8.9%	105	13.0%	151	10.8%	806	9.6%
Black or African-American	96	1.5%	15	1.9%	86	6.2%	197	2.3%
Native Hawaiian or Pacific Islander	24	0.4%	2	0.2%	5	0.4%	31	0.4%
White	1,561	25.2%	150	18.5%	796	57.0%	2,507	29.8%
Multiracial, not Hispanic	2	0.0%	4	0.5%	10	0.7%	16	0.2%
Resident Hispanic, any race	97	1.6%	19	2.3%	68	4.9%	184	2.2%
Total have Ethnicity Data for	**6,203**		**809**		**1,397**		**8,409**	
Resident, race/ethnicity unknown	280		83		168		531	
Residency unknown	408		31		104		543	
Total	**6,891**		**923**		**1,669**		**9,483**	

Data on C.S Faculty nation-wide (from the CRA Taulbee Report)

CRA statistics for faculty diversity across the United States are shown below:

Table 21. Gender of Current Faculty														
	Full		Associate		Assistant		Teaching Faculty		Research Faculty		Postdocs		Total	
Male	1,797	87.7%	1,298	84.1%	729	75.7%	526	73.2%	439	83.8%	476	87.2%	**5,265**	83.0%
Female	253	12.3%	245	15.9%	234	24.3%	193	26.8%	85	16.2%	70	12.8%	**1,080**	17.0%
Total gender known	**2,050**		**1,543**		**963**		**719**		**524**		**546**		6,345	
Gender unknown	8		6		2		2		0		0		**18**	
Total	**2,058**		**1,549**		**965**		**721**		**524**		**546**		6,363	

Table 22. Ethnicity of Current Faculty														
	Full		Associate		Assistant		Teaching Faculty		Research Faculty		Postdocs		Total	
Nonresident Alien	6	0.3%	35	2.6%	147	16.6%	16	2.5%	77	16.3%	165	37.5%	**446**	8.0%
American Indian or Alaska Native	2	0.1%	2	0.2%	1	0.1%	2	0.3%	0	0.0%	1	0.2%	**8**	0.1%
Asian	398	21.8%	346	26.1%	279	31.5%	52	8.1%	59	12.5%	80	18.2%	**1,214**	21.7%
Black or African-American	10	0.5%	16	1.2%	22	2.5%	16	2.5%	4	0.8%	7	1.6%	**75**	1.3%
Native Hawaiian or Pacific Islander	13	0.7%	2	0.2%	7	0.8%	1	0.2%	5	1.1%	0	0.0%	**28**	0.5%
White	1,342	73.6%	887	66.9%	406	45.8%	542	84.3%	314	66.4%	175	39.8%	**3,666**	65.6%
Multiracial, not Hispanic	19	1.0%	2	0.2%	4	0.5%	1	0.2%	1	0.2%	0	0.0%	**27**	0.5%
Resident Hispanic, any race	33	1.8%	35	2.6%	21	2.4%	13	2.0%	13	2.7%	12	2.7%	**127**	2.3%
Total have Residency Data for	**1,823**		**1,325**		**887**		**643**		**473**		**440**		5,591	
Resident, race/ethnicity unknown	69		83		36		31		39		63		**321**	
Residency Unknown	166		141		42		47		12		43		**451**	
Total	**2,058**		**1,549**		**965**		**721**		**524**		**546**		6,363	

Appendix D: Employment Outlook in Computer Science

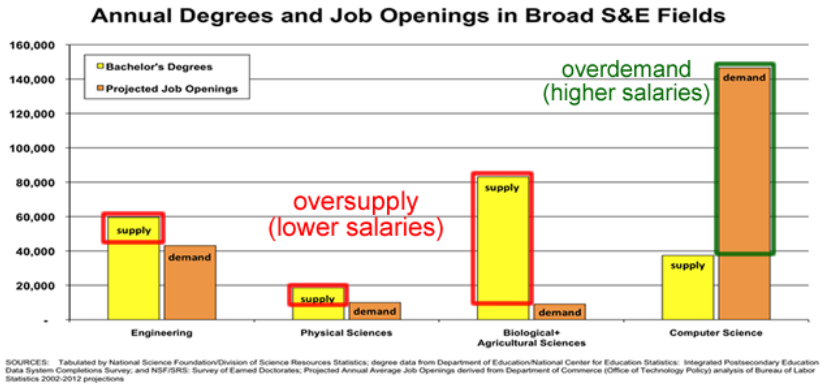
Jobs Occupational Outlook Quarterly • Spring 2009 Employment in combined IT occupations is expected to increase by more than 800,000 jobs over the 2006–16 projections decade. This increase represents expected job growth of 24 percent—compared with 10 percent growth for all occupations. So, opportunities should be plentiful for workers who hope to enter the IT field.

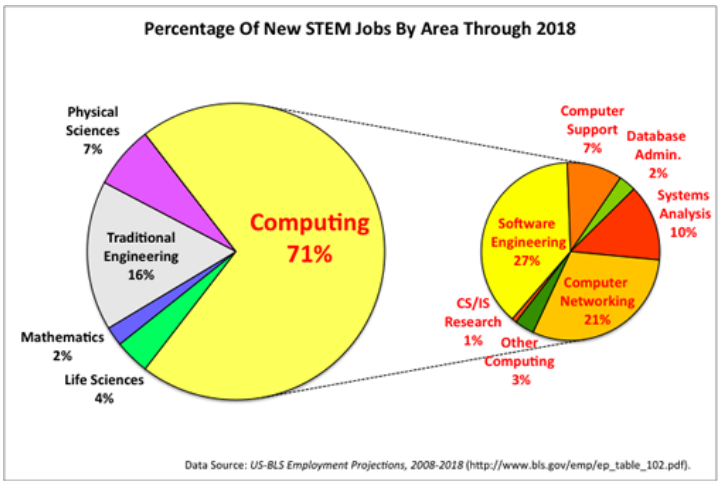
IT workers are needed in nearly all types of organizations, from retail establishments to manufacturing plants. As IT operations expand across the economy, demand for IT workers should expand along with them.

Although offshoring is likely to continue, BLS research suggests that job opportunities in information technology will continue to be excellent. And a study by the Association for Computing Machinery finds that even though offshoring may increase, prospects for IT workers in the United States will be strong.

As the chart shows, employment in several IT occupations is expected to grow especially fast over the 2006–16 decade. With a projected employment increase of 53 percent—more than 5 times the rate for all occupations—network systems and data communications analyst is projected to be the fastest growing IT occupation. It's also projected to be the fastest growing of all occupations in the United States. As businesses and other organizations continue to adopt newer, more efficient computer networks, these workers will be in high demand.

But one occupation is expected to see employment declines. Employment of computer programmers is projected to decrease by 4 percent from 2006–16. Continued offshoring in this occupation, as well as increased efficiency, will reduce demand for programming services during the projections decade





Occupational Outlook Handbook, 2010-11 Edition (U.S. Bureau Labor Statistics)

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-18 Number	Change, 2008-18 Percent	Detailed Statistics
Computer software engineers and computer programmers	—	1,336,300	1,619,300	283,000	21	—
Computer programmers	15-1021	426,700	414,400	-12,300	-3	[PDF]
Computer software engineers	15-1030	909,600	1,204,800	295,200	32	[PDF]
Computer software engineers, applications	15-1031	514,800	689,900	175,100	34	[PDF]
Computer software engineers, systems software	15-1032	394,800	515,000	120,200	30	[PDF]

NOTE: Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook*.

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-18 Number	Change, 2008-18 Percent	Detailed Statistics
Computer network, systems, and database administrators	—	961,200	1,247,800	286,600	30	—
Database administrators	15-1061	120,400	144,700	24,400	20	[PDF]
Network and computer systems administrators	15-1071	339,500	418,400	78,900	23	[PDF]

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-18 Number	Change, 2008-18 Percent	Detailed Statistics
Network systems and data communications analysts	15-1081	292,000	447,800	155,800	53	[PDF]
All other computer specialists	15-1099	209,300	236,800	27,500	13	[PDF]

NOTE: Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook*.

The Contra Costa Times (December 2010) wrote an article about the dismal job market in the Bay Area but also said ‘Despite the dreadful job trends, some industries are hiring, executives with employment services agencies said. "Technology remains an area where there is still a lot of hiring and investment dollars flowing into companies," said Mark Howard, managing director with the Berkeley office of MRINetwork Management Recruiters. Gene Kim, director of permanent placement services for Robert Half International's East Bay and San Francisco territories said he also sees areas of strength. "High tech, software, professional services, consumer packaged goods are doing well," Kim said. He defined consumer packaging as an industry that consists of firms that manufacture or distribute consumer products. ‘

Simply Hired Job Report Dec 2010 lists the 5 major SF area companies hiring

Hewlett-Packard	227 jobs (34.7%)	(Parentheses denote month-over-month change)
AOL	227 jobs (-27.1%)	
Sutter Health	203 jobs (-3.7%)	
Apple	184 jobs (36.0%)	
Google	184 jobs (-0.4%)	

Appendix E: Employment Outlook in Mathematics

The Bureau of Labor Statistics 2010-2011 handbook writes that "Employment of mathematicians is expected to grow much faster than average. However, keen competition for jobs is expected. Employment change. Employment of mathematicians is expected to increase by 22 percent during the 2008–18 decade, which is much faster than average for all occupations. Advancements in technology usually lead to expanding applications of mathematics, and more workers with knowledge of mathematics will be required in the future. However, jobs in industry and government often require advanced knowledge of related scientific disciplines in addition to mathematics. The most common fields in which mathematicians study and find work are computer science and software development, physics, engineering, and operations research. Many mathematicians also are involved in financial analysis and in life sciences research.Job prospects. Job competition will remain keen because employment in this occupation is relatively small and few new jobs are expected. Ph.D. holders with a strong background in mathematics and a related discipline, such as engineering or computer science, and who apply mathematical theory to real-world problems will have the best job prospects in related occupations. In addition, mathematicians with experience in computer programming will better their job prospects in many occupations"

Many CSUEB math majors find jobs in teaching – either secondary school, or – for M.S. graduates – community colleges. The BLS does expect teaching opportunities to expand in the next ten years. The NCTM writes "The National Assessment of Educational Progress (NAEP) highlights the importance of staffing schools with well-trained math teachers. Studies indicate that students taught by teachers with mathematics degrees or mathematics education degrees learn more than students taught by teachers without these qualifications."

TeachCalifornia states that "Mathematics is one of the highest need subject areas in California, and the demand for mathematics teachers has increased because eighth graders will soon be required to take algebra. In order to offer all 8th graders Algebra I, the state might need as many as 1,900 additional middle school algebra teachers (*The Center for the Future of Teaching and Learning, 2008*)."

However, public school teaching in California is –as always – subject to constraints imposed by local and state budget difficulties.

APPENDIX F: Mathematics Faculty Publications & Awards

Shirley Yap, The Poincare Lemma and an Elementary Construction for Vector Potentials", March 2009, American Mathematical Monthly. [cited in several textbooks]

Shirley Yap, "Differential Equations: Not Just a Bag of Tricks", February 2010, Mathematics Magazine.

Shirley Yap, "Visualizing Symmetries of Differential Equations," (accepted for publication pending revision), Loci.

Kathy Hann, Governor, Northern California, Nevada and Hawaii section of the Mathematical Association of America. Represent the section at bi-annual national meetings, serve on the board of governors to set policy and select national award recipients and officers. Serve on the section program committee which plans the annual section meeting, sets section policy and selects section award recipients and officers. 2005 – 2008.

Ellen Veomett, "Spaces of Small Metric Cotype" (with Kevin Wildrick of the University of Jyvaskyla Finland) in the Journal of Topology and Analysis, Dec 2010

Jack Carter, "An Analysis of Students' Research on Model Lessons That Integrate GeoGebra into School Mathematics". In *Proceedings of Fourteenth Asian Technology Conference in Mathematics, December 17-21, 2009, Beijing Normal University, China*, ISBN 978-0-9821164-2-5(hardcopy), ISBN 1940-2279(CD), pp. 185-192.

Jack Carter, Getting a Bead on It (2009) *Mathematics Teaching in the Middle School*, **15**, 5, pp. 268-73.

Jack Carter, "Proportional Reasoning Models in Developing Mathematics Education Curricula for Prospective Elementary School Teachers". In L. Paditz and A. Rogerson (Eds.), *Proceedings of the 10th International Conference "Models in Developing Mathematics Education", September 11-17, 2009, Dresden, Saxony, Germany*, (pp. 162-165). ISBN 83-919465-9-2.

Jack Carter, Compositions of Dilations and Isometries in Calculator-Based Dynamic Geometry (2008), *Teaching Mathematics and Computer Science* **6**(2), pp. 257-266.

Jack Carter, Enhancing Prospective Mathematics Teachers' Pedagogical Knowledge of Mathematical Relations and Equivalence Relations (2008) *The Electronic Journal of Mathematics and Technology* **2**(1)(February 2008).

Jack Carter, Using a Model Approach to Enhance Algebraic Thinking in the Elementary School Mathematics Classroom (2008). In C.E. Greenes and R. Rubenstein (Eds), *Algebra and Algebraic Thinking in School Mathematics, National Council of Teachers of Mathematics Seventieth Yearbook* (pp. 195-210). Reston, VA: The Council.

Jack Carter, "Using Videotaped Components of Lesson Study to Build Communities of Practice for Prospective Mathematics Teachers". In *Proceedings of Twelfth Asian Technology Conference in Mathematics, December 16-20, 2007, Taipei, Taiwan*, ISSN 1940-2279(CD), ISSN 1940-4204(online).

Jack Carter, Comparative Study of Arithmetic Problems in Singaporean and American Mathematics Textbooks (2006). In F.K.S. Leung, K.-D. Graf, and F.J. Lopez-Real, (Eds), *Mathematics Education in Different Cultural Traditions, A Comparative Study of East Asia and the West, The 13th International Commission on Mathematical Instruction Study*(pp. 213-226). New York, NY: Springer.

Jack Carter, "Prospective Mathematics Teachers' Technology-Based Presentations on Proportional Reasoning", 15th Asian Technology Conference in Mathematics, Kuala Lumpur, Malaysia, December 18, 2010

Jack Carter, "Prospective Elementary School Teachers' Perceptions of Mathematics Activities on the GeoGebra Wiki", 5th European Workshop on Mathematical and Scientific e-Contents, Salamanca, Spain, September 9, 2010

Jack Carter, "Proportional Reasoning Models in Developmental Mathematics Education: Enhancing Under-Prepared Students' Transition at the College-Level", Joint Mathematics Meeting of Mathematical Association of America and American Mathematical Society, San Francisco, CA, January 14, 2010

Jack Carter, "An Analysis of Students' Research on Model Lessons That Integrate GeoGebra into School Mathematics", 14th Asian Technology Conference in Mathematics, Beijing Normal University, China, December 19, 2009

Jack Carter, "Using Reasoning Skills to Power Up Students' Performance", National Council of Teachers of Mathematics Regional Conference and Exposition, Boston, MA, October 22, 2009

Jack Carter, "Proportional Reasoning Models in Developing Mathematics Education Curricula for Prospective Elementary School Teachers", 10th International Conference of the Mathematics Education into the 21st Century Project, Dresden University of Applied Sciences, Dresden, Germany, September 13, 2009

Jack Carter, "Incorporating Calculators into Primary School Mathematics: Prospective and Practicing Teachers' Beliefs about Their Role", 13th Asian Technology Conference in Mathematics, Suan Sunandha Rajabhat University, Bangkok, Thailand, December 16, 2008

Jack Carter, "Using GeoGebra to Enhance Prospective Elementary School Teachers' Understanding of Geometry", 4th European Workshop on Mathematical and Scientific e-Contents, Norwegian University of Science and Technology, Trondheim, Norway, September 13, 2008

Jack Carter, “Using Videotaped Components of Lesson Study to Build Communities of Practice for Prospective Mathematics Teachers”, 12th Asian Technology Conference in Mathematics, National Taiwan Science Education Center, Taipei, Taiwan, December 17, 2007

Jack Carter, “Compositions of Dilations and Isometries in Calculator-Based Dynamic Geometry”, First Central- and Eastern European Conference on Computer Algebra and Dynamic Geometry Systems in Mathematics Education, University of Pecs, Pecs, Hungary, June 22, 2007

Jack Carter, “Transformational Geometry on the TI-84 for Middle School Teachers”, National Council of Teachers of Mathematics Annual Meeting and Exposition, Atlanta, GA, March 22, 2007

Jack Carter, “Products of Geometric Transformations: Developing Expertise by Using the TI-84’s Cabri Jr.” 11th Asian Technology Conference in Mathematics, The Hong Kong Polytechnic University, Hong Kong, China, December 15, 2006

Jack Carter, various CMC research notes

APPENDIX G: Computer Science Faculty and Student Publications

2010 L.Ertaul, S. Singhal, G. Saldamli, “ Security Challenges in Cloud Computing ”, WORLDCOMP2010, The 2010 International Conference on Security and Management SAM'10, July, Las Vegas.

2010 L.Ertaul, S. Natte, G. Saldamli,” Security Evaluation of CDMA2000”, WORLDCOMP2010, The 2010 International Conference on Wireless Networks ICWN'10, July, Las Vegas.

2010 L. Ertaul, S. Chelivendri, G. Saldamli, “Security Issues for Mobile Government”, WORLDCOMP2010, The 2010 International Conference on Security and Management SAM'10, July, Las Vegas.

2010 B. Karaoglan, L. Ertaul, “A Practice in using E-Portfolio in a Higher Education Course Taught at Distance”, Journal of Electronics and Electrical Engineering, No:6(102), ISSN 1392 – 1215, June

2010 B. Karaoglan, L. Ertaul, “A Practice in using E-Portfolio in a Higher Education Course Taught at Distance”, European Association for Education in Electrical and Information Engineering Council (EAEEIE) annual conference, 28-30 June,Palagna, Lithuania.

2010 N. Lundback, T. Threlkel and . Thibault, “Method for simplifying the imaging of objects with non-Lambertian surfaces,” US Patent No. 7,717,574, May 18, 2010.

2010 W. Thibault, “Camera-based Calibration for Scalable Immersive Rendering,” in Proceedings of ACM SIGGRAPH 2010, (Los Angeles, July 2010) (poster)

2009 L. Ertaul, D. Ibrahim, “Evaluation of Secure Routing Protocols in Mobile Ad Hoc Networks (MANETs)”, The 2009 International Conference on Security and Management SAM'09, July, Las Vegas.

2009 L. Ertaul, S. Mullapudi, “The Security Problems of Vehicular Ad Hoc Networks (VANETs) and Proposed Solutions in Securing their Operations”, The 2009 International Conference on Wireless Networks ICWN'09, July, Las Vegas.

2009 L. Ertaul, O. Catambay, “Today and Tomorrow: IEEE 802.11 WLAN Security”, The 2009 International Conference on Security and Management SAM'09, July, Las Vegas.

2009 L. Ertaul, M. Ganta, “Security in Wireless Sensor Networks - A Study”,The 2009 International Conference on Wireless Networks ICWN'09, July, Las Vegas.

2008 Leann Christianson and Kevin Brown Computer Science Students' Online Learning Experience and Workload: Perception vs. Reality, The 2008 International Conference on Frontiers in Education: Computer Science and Computer Engineering (FECS '08), July 14-17, Las Vegas, Nevada.

2008 L. Ertaul, J. H. Yang, “Implementation of Domingo Ferrer’s a New Privacy Homomorphism (DF a New PH) in Securing Wireless Sensor Networks (WSN)”, The 2008 Applied Cryptology and Network Security (ACNS08), July, Las Vegas.

2008 L. Ertaul, E. Celebi, M. Gozutok, “Implementation of Montgomery Multiplication Algorithms in Machine Languages”, The 2008 Applied Cryptology and Network Security (ACNS08), July, Las Vegas.

2008 J. H. Yang, L. Ertaul, “Performance, Feasibility & Scalibility of Hommorphic Encryption Schemes in Securing Wireless Sensor Networks”, M.Sc Thesis, California State University, East Bay, May.

2008 Nancy P.Y. Yuen and William C. Thibault, "Inexpensive Immersive Projection," Proceedings of the IEEE Virtual Reality Conference (VR 2008) (Reno, NV, USA, March 2008).

2007: Kevin Brown and Leann Christianson Improving Student/Student and Student/Instructor Communication for Non-Native English Speakers in Computer Science Courses, The 2007 International Conference on Frontiers in Education: Computer Science and Computer Engineering (FECS '07), June 25-28, Las Vegas, Nevada.

2007 L. Ertaul, Vaidehi, ”Implementation of Homomorphic Encryption Schemes for Secure Packet Forwarding in Mobile Ad Hoc Networks (MANETs)”, IJCSNS International Journal of Computer Science and Network Security, VOL. 7 No. 11 pp. 132-141, November.

2007 L. Ertaul, Vaidehi, “Computing Aggregation Function Minimum/Maximum using Homomorphic Encryption Schemes in Wireless Sensor Networks (WSNs)”, The 2007 International Conference on Wireless Networks, ICWN'07, June, Las Vegas

2007 Vaidehi, L. Ertaul, ”Applications of Homomorphic Encryption Schemes to Provide Security in Computer Networks, Wireless Sensor Networks (WSN) and Wireless Mobile Ad Hoc Networks (MANETS)” MSc. Thesis California State University, East Bay, October.

2007 L. Ertaul, N. Chavan, ”RSA and Elliptic Curve- ElGamal Threshold Cryptography (ECCEG-TC) Implementations for Secure Data Forwarding in MANETs”, The 2007 International Conference on Security & Management, SAM'07, June, Las Vegas

2007 E. Cuervo1, F. Henriquez, D. Arroyo, L. Ertaul, “A PDA Implementation of an Off-line e-Cash Protocol” The 2007 International Conference on Applied Cryptography & Network Security, ACNS07, June, Las Vegas.

2007 G. Silva1, F. Henriquez, N. Cortes , L. Ertaul, “On the Generation of X.509v3 Certificates with Biometric Information”, The 2007 International Conference on Security & Management, SAM'07, June, Las Vegas

2007 J. Panda, L.Ertaul, “Mobile Agent Security”, M.Sc. Thesis, California State University, East Bay, June (Download implementation software)

2007 L. Ertaul, N. Chavan, “Elliptic Curve Cryptography based Threshold Cryptography (ECC-TC) Implementation for MANETs”, IJCSNS International Journal of Computer Science and Network Security, VOL.7 No.4, page 48-61 April .

2006 Johnson, C.M., Bhat, A.P., and Thibault W., "A genetic algorithm for solving the camera-projector alignment problem," Proceedings of the Genetic and Evolutionary Computation Conference (GECCO '06) (Seattle, WA, USA, July 8-12, 2006), Morgan-Kaufmann, San Francisco, CA, 2006.

2006 L.Ertaul, Vaidehi, “Finding Minimum Optimal Path Securely Using Homomorphic Encryption Schemes in Computer Networks”, The 2006 International Conference on Security & Management, SAM'06, June, Las Vegas

2006 L. Ertaul, J. Panda, “Mobile Agent Security”, The 2006 International Conference on Security & Management, SAM'06, June, Las Vegas

2006 L. Ertaul, B. Kasim, ”GSM Security II” The 2006 International Conference on Wireless Networks, ICWN'06, June Las Vegas

2006 Leann Christianson and Kevin Brown Student Projects in Computer Networking: Simulation versus Coding, The 2006 International Conference on Frontiers in Education: Computer Science and Computer Engineering (FECS '06), June 26-29, 2006, Las Vegas, Nevada.

Ching-Ching Lee and Kamalendu Biswas, "Distributed Authorization Cache", The 2008 International Conference on Security and Management (SAM'08: July 14-17, 2008), Las Vegas, Nevada

Sreelatha Vakil and Ching-Cheng Lee, "Highlight and Personal Annotation for Fast and Efficient Access to Web Page Contenta", IEEE International Conference on Information Re-use and Integration, Las Vegas, Nevada, August 13-15, 2007.

Ching-Cheng Lee, Yipkei Kwok "Power-Aware Data Management for Mobile Devices" IEEE International Conferencees on Cybernetics & Intelligent Systems and Robitics & Mechatonics (CIS-RAM 2006), Bangkok, Thailand, June 7-9, 2006.

Appendix H Data from Institutional Research

California State University, East Bay
APR Summary Data
Fall 2005 - 2009

Math & Computer Science					
	Fall Quarter				
	2005	**2006**	**2007**	**2008**	**2009**
A. Students					
1. Undergraduate	428	369	329	350	351
2. Graduate	229	207	211	250	311
3. Total Number of Majors	657	576	540	600	662
4. FTES Generated	791.0	768.4	767.1	900.7	985.0
	College Years				
B. Degrees Awarded	**04-05**	**05-06**	**06-07**	**07-08**	**08-09**
1. Undergraduate	172	124	98	89	57
2. Graduate	130	108	99	74	50
3. Total	302	232	197	163	107
	Fall Quarter				
	2005	**2006**	**2007**	**2008**	**2009**
C. Faculty					
Tenured/Track Headcount	Computer Science and Mathmeatics Combined				
1. Full-Time	31	28	28	28	28
2. Part-Time	1	4	3	3	3
3. Total Tenure Track	32	32	31	31	31
Lecturer Headcount	Computer Science and Mathmeatics Combined				
4. Full-Time	3	3	2	3	3
5. Part-Time	15	15	12	20	20
6. Total Non-Tenure Track	18	18	14	23	23
7. Grand Total All Faculty	50	50	45	54	54
Instructional FTE Faculty	Computer Science and Mathmeatics Combined				
8. Tenured/Track	27.0	20.1	21.0	22.2	19.5
9.Lecturer	16.2	17.8	17.9	20.1	21.5
10. Total Instructional FTEF	43.2	37.9	38.9	42.2	41.0
Lecturer Teaching	Computer Science and Mathmeatics Combined				
11. % Lecturer/Total Instructional FTEF	37.6%	46.8 %	46.0 %	47.5 %	52.5 %
12. FTES Taught by Lecturer	441.1	504.5	465.7	564.3	612.5
13. % FTES Lecture/FTES Generated	55.8%	65.7 %	60.7 %	62.6 %	62.2 %
D. Student Faculty Ratios	Computer Science and Mathmeatics Combined				

1. Tenured/Track	13.0	13.1	14.4	15.2	19.1
2. Lecturer	27.2	28.4	26.1	28.1	28.5
3. SFR By Level (All Faculty)	18.3	20.3	19.7	21.3	24.0
4. Lower Division	24.7	27.5	25.4	26.3	28.1
5. Upper Division	13.2	13.4	12.6	14.4	18.9
6. Graduate	10.6	9.0	10.7	11.5	15.0
7. Number of Sections Offered	146	130	134	154	151
8. Average Section Size	22	23	24	23	26

Source and definitions available at: http://www.csueastbay.edu/ira/apr/summary/definitions.pdf

	Fall Quarter				
Headcount Enrollment	**2005**	**2006**	**2007**	**2008**	**2009**
Computer Science					
1. Undergraduate	326	282	255	266	281
2. Graduate	151	137	138	191	202
3. Total Number of Majors	477	419	393	457	483
Computer Network					
1. Undergraduate	0	0	0	0	0
2. Graduate	0	0	0	1	23
3. Total Number of Majors	0	0	0	1	23
Math					
1. Undergraduate	102	87	74	84	70
2. Graduate	78	70	73	58	86
3. Total Number of Majors	180	157	147	142	156

	College Years				
Degrees Awarded	**04-05**	**05-06**	**06-07**	**07-08**	**08-09**
Computer Science					
1. Undergraduate	140	96	75	67	42
2. Graduate	116	91	87	48	38
3. Total Number of Majors	256	187	162	115	80
Computer Network					
1. Undergraduate	0	0	0	0	0
2. Graduate	0	0	0	0	0
3. Total Number of Majors	0	0	0	0	0
Math					
1. Undergraduate	32	28	23	22	15
2. Graduate	14	17	12	26	12
3. Total Number of Majors	46	45	35	48	27

D. Student Faculty Ratios	Computer Science				
1. Tenured/Track	11.2	11.8	12.6	13.5	17.8
2. Lecturer	21.6	23.4	23.0	23.4	22.3
3. SFR By Level (All Faculty)	12.5	13.0	13.5	14.8	18.8
4. Lower Division	16.0	20.5	20.8	19.6	26.7
5. Upper Division	12.7	13.2	13.8	14.5	18.0
6. Graduate	10.0	8.9	10.7	12.9	16.6
7. Number of Sections Offered	63	47	46	50	47
8. Average Section Size	16	16	16	17	21
D. Student Faculty Ratios	Math				
1. Tenured/Track	15.8	15.6	16.4	17.0	20.4
2. Lecturer	28.1	28.9	26.3	28.6	29.4
3. SFR By Level (All Faculty)	22.8	24.9	22.7	24.4	26.3
4. Lower Division	26.2	28.3	25.7	27.0	28.2
5. Upper Division	14.2	13.7	11.0	14.2	20.4
6. Graduate	14.4	9.4	10.7	5.8	10.1
7. Number of Sections Offered	83	83	88	104	104
8. Average Section Size	26	27	27	26	28

Appendix I Courses Offered Fall 2010 with Enrollments

Subject	Catalog Nbr	Section	Enroll Tot	Course Title	Instructor
CS	1160	01	37	Intro to Computer Science I	Thibault,William C
CS	1160	02	31	Intro to Computer Science I	Christianson,Leann M
CS	2360	01	31	Intro to Computer Science II	Mahoney,Michael K
CS	2430	01	35	Comp Org & Assem Lang Prog.	Doering,Roger
LD CS			165	33	
CS	3120	01	30	Programming Language Concepts	Prock,Andrew C
CS	3240	01	25	Data Structures and Algorithms	Jurca,Dan
CS	3340	01	14	Intro Obj Orient Prog & Design	Grewe,Lynne L
CS	3430	01	21	Computer Architecture	Doering,Roger
CS	3432	01	6	Digital Design Lab	Doering,Roger
CS	3520	01	25	Web Site Development	Mahoney,Michael K
CS	3560	01	10	Intro Systems Programming	Roohparvar,Farzan
CS	3590	01	31	Data Commun & Networking	Brown,Kevin A
CS	3898	01	12	Cooperative Education	Callahan,Kevin E
CS	4170	01	9	Theory of Automata	Simon,Istvan
CS	4245	01	28	Analysis of Algorithms	Simon,Istvan
CS	4310	01	28	Software Engineering I	Yang,David K
CS	4320	01	18	Soft Testing & Quality Assur	Yang,David K
CS	4320	02	24	Soft Testing & Quality Assur	Yang,David K
CS	4526	01	1	Principles Wireless Security	Ertaul,Levent
CS	4560	01	25	Operating Systems	Brown,Kevin A

CS	4596	01	8	Wireless and Mobile Networking	Brown,Kevin A
CS	4660	01	23	Database Architecture	Yu,Ytha Y
UD CS			394	19.7	
CS	6000	01	15	Research Methodologies	Thibault,William C
CS	6000	02	16	Research Methodologies	Thibault,William C
CS	6260	01	19	Computational Complexity	Johnson,Clayton M
CS	6170	01	27	Automata and Formal Languages	Simon,Istvan
CS	6260	02	15	Computational Complexity	Johnson,Clayton M
CS	6320	01	10	Soft Eng of Web-based Systems	Grewe,Lynne L
CS	6320	02	23	Soft Eng of Web-based Systems	Lee,Ching-Cheng
CS	6520	01	20	Cryptography and Data Security	Ertaul,Levent
CS	6526	01	23	Wireless Security	Ertaul,Levent
CS	6560	01	30	Operating Systems Design	Roohparvar,Farzan
CS	6580	01	18	Distributed Systems	Thibault,William C
CS	6580	02	27	Distributed Systems	Lee,Ching-Cheng
CS	6596	01	12	Wireless & Mobile Network Arch	Brown,Kevin A
CS	6660	01	21	Database Systems	Yu,Ytha Y
CS	6825	01	16	Computer Vision	Grewe,Lynne L
CS	6900	01	1	Independent Study	Ertaul,Levent
CS	6901	01	15	Graduate Capstone Experience	Johnson,Clayton M
GRAD CS			368	18.4	
MATH	801	02	31	Elementary Algebra A and B	Ackerson,Iris
MATH	801	03	24	Elementary Algebra A and B	Tomutiu,Maria Valeria
MATH	801	04	28	Elementary Algebra A and B	Lee,Minyoung
MATH	801	05	21	Elementary Algebra A and B	Andrade,Rodolfo A
MATH	801	06	23	Elementary Algebra A and B	Coreno,Christine Allison
MATH	801	07	26	Elementary Algebra A and B	Fujimura,Dorothy E
MATH	801	08	26	Elementary Algebra A and B	Lavender,Seth A
MATH	801	09	23	Elementary Algebra A and B	Heath,Chunmee
MATH	801	10	21	Elementary Algebra A and B	Tomutiu,Maria Valeria
MATH	900	02	35	Elementary Algebra	Rashid,Noella
MATH	900	03	35	Elementary Algebra	Christianson,Leann M
MATH	900	04	36	Elementary Algebra	Christianson,Leann M
MATH	900	05	35	Elementary Algebra	Jesse,Michaela T
MATH	900	06	37	Elementary Algebra	Cortese,Frank Lorence
MATH	900	07	34	Elementary Algebra	Nguyen,Dan Quynh Thien
MATH	900	08	35	Elementary Algebra	Angell,John P
MATH	900	09	35	Elementary Algebra	Leum,Leonard Richard
MATH	900	10	35	Elementary Algebra	Singh,Amit
MATH	900	11	34	Elementary Algebra	Fujimura,Dorothy E
MATH	950	01	36	Intermediate Algebra	Rashid,Nahrin
MATH	950	02	34	Intermediate Algebra	Fujimura,Dorothy E
MATH	950	03	28	Intermediate Algebra	Chu,Yung En
MATH	950	04	30	Intermediate Algebra	Yu,Ytha Y
MATH	950	06	30	Intermediate Algebra	Nguyen,Trung Anh
MATH	950	08	36	Intermediate Algebra	Gangar,Joghinda Singh
MATH	950	09	35	Intermediate Algebra	Grener,Nicholas J

MATH	950	10	35	Intermediate Algebra	Ertaul,Levent
MATH	950	11	28	Intermediate Algebra	Luu,Tony
MATH	950	12	12	Intermediate Algebra	Chan,Jobic
REMEDIAL MATH			878	29.26666667	
MATH	1110	01	21	The Nature of Mathematics	Benjamin,Susan A
MATH	1130	01	33	College Algebra	Lippman,Gary E
MATH	1130	02	35	College Algebra	Lippman,Gary E
MATH	1130	03	34	College Algebra	Simutis,Jean S
MATH	1130	04	34	College Algebra	Jurca,Dan
MATH	1130	05	37	College Algebra	Olkin,Julia A
MATH	1130	06	34	College Algebra	Fujimura,Dorothy E
MATH	1130	07	33	College Algebra	Carter III,Jack A
MATH	1130	08	33	College Algebra	Carter III,Jack A
MATH	1130	09	27	College Algebra	Carter III,Jack A
MATH	1130	10	34	College Algebra	Malek,Massoud S
MATH	1130	11	35	College Algebra	Benjamin,Susan A
MATH	1300	01	31	Trig & Analytic Geometry	Benjamin,Susan A
MATH	1300	02	32	Trig & Analytic Geometry	Malek,Massoud S
MATH	1304	01	26	Calculus I	Lippman,Gary E
MATH	1304	02	41	Calculus I	Hann,Kathleen M
MATH	1304	03	29	Calculus I	Wolitzer,Donald L
MATH	1304	04	32	Calculus I	Smith,Stuart P
MATH	1304	05	29	Calculus I	Morgan,Christopher L
MATH	1305	01	32	Calculus II	Veomett,Ellen R
MATH	1305	02	34	Calculus II	Malek,Massoud S
MATH	1810	01	35	Math for Business & Soc Sci I	Glass,Julie S
MATH	1810	02	33	Math for Business & Soc Sci I	Ouyang,Chung-Hsing
MATH	1810	03	28	Math for Business & Soc Sci I	Yap,Shirley L
MATH	1810	04	33	Math for Business & Soc Sci I	Slivinsky,Vincent W
MATH	1810	05	35	Math for Business & Soc Sci I	Slivinsky,Vincent W
MATH	2011	01	29	Number Systems	Hann,Kathleen M
MATH	2011	02	12	Number Systems	Slivinsky,Vincent W
MATH	2101	01	36	Elements of Linear Algebra	Jurca,Dan
MATH	2150	01	34	Discrete Structures	Simon,Istvan
MATH	2304	01	27	Calculus III	Yap,Shirley L
LD MATH			978	31.5483871	
MATH	3000	01	19	Intro to Abstract Math & Proof	Ouyang,Chung-Hsing
MATH	3100	01	40	Linear Algebra	Ouyang,Chung-Hsing
MATH	3300	01	36	Analysis I	Wolitzer,Donald L
MATH	3331	01	14	Differential Equations	Yap,Shirley L
MATH	3841	01	35	Linear Programming	Keller,Edward L
MATH	4012	01	13	Geometry and Measurement	Simutis,Jean S
MATH	4350	01	18	Theory Func of a Real Variable	Smith,Stuart P
MATH	4750	01	25	Numerical Analysis II	Olkin,Julia A
UD MATH			200	25	
MATH	6005	01	7	Teaching Math (Univ Level)	Callahan,Kevin E
MATH	6100	01	17	Applied Algebra	Smith,Stuart P

MATH	6210	01	11	Convex Polytopes	Veomett,Ellen R
MATH	6900	01	1	Independent Study	Veomett,Ellen R
GRAD MATH			28	14	

Appendix J: C.S.: Comparison to Other CSU Majors

The following table compares the CSUEB C.S. major with two other CSU majors. CSUEB and Sonoma State are quite similar (16 required CS courses vs. 17); CSULA has 26-27 required CS courses. Course names and materials are quite similar. .

CSUEB		**Sonoma State**		**CSULA**
Required LD CS: 4		Required LD CS: 4		Required LD CS: 6
Required UD CS: 5		Required UD CS: 8		Required UD CS: 14
Limited Choice UD CS: 4		Limited Choice UD CS: 1		Elective UD CS: 6-7
Elective UD CS: 3		Elective UD CS: 3		Math & Stat: 6
Math & Stat: 5		Math & Stat: 4		

	COMPARISON CSUEB, SONOMA STATE, CSULA	
CSUEB	**Sonoma State (not accredited)**	**CSU LA (ABET accredited)**
84 quarter units	**124 semester units**	**126-129 sem units**
Math Requirements (20 units)	**Major Core Requirements**	**LD requirements (60-63 units)**
	CS 115 Prog. I(4)	CS 120 Intro. to Web Site Dev (3)
MATH 1304, 1305 Calculus I, II (8)	CS 210 Intro. to Unix (1)	CS 122 Using Relational DBs and SQL (
MATH 2101 Elemts of Linear Alg (4)	CS 215 Prog. II(4)	CS 201 Intro. to Prog. (5)
MATH 2150 Discrete Structures (4)	CS 242 Disc StrucT for C.S.(4)	CS 202 Intro. to Object Oriented Prog
STAT 3601 Intro Stat & Prob for Sc/Eng (	CS 252 Intro Comp. Org(4)	CS 203 Prog. with Data Structures (5)
(or STAT 3401 or 3502)	CS 315 Data Structures(4)	CS 245 Using OS & Networks (3)
	CS 351 Comp. Architecture(4)	MATH 206 Calculus I (4)
LD C.S. Required Courses	CS 355 DB Management Syst(4)	MATH 207 Calculus II (4)
CS 1160 Intro. to C.S. I (4)	CS 370 Software Design & Dev(4)	MATH 208 Calculus III (4)
CS 2360 Intro. to C.S. II (4)	CS 415 Algorithm Analysis(4)	MATH 248 Discrete Mathematics (4)
CS 2370 Intro. to C.S. III (4)	CS 450 Operating Systems(4)	MATH 255 Intro. to Matrix Theory (4)
CS 2430 Comp. Org. & Assem. Lang. Pro	CS 454 Theory of Computation(4)	MATH 270 Prob with Applications (4)
	CS 460 Prog. Languages(4)	PHYS 101 or 211 Gen Phys I or Mech
U.D. C.S.: Required Courses (20 units)		PHYS 102 or 212 Gen Phys II or Waves
CS 3120 Prog. Language Concepts (4)	Total units in the major core: 49	PHYS 103 or 213 Gen Phys III or Elec
CS 3240 Data Struct & Algor (4)		
CS 3340 Intro. to OOP and Design (4)	**Major Electives**	**UD required courses (42 units)**
CS 3430 Comp. Architecture (4)	9 units of elective courses	CS 301 Comp. Ethics in the Info Age (1
CS 4560 Operating Systems (4)		CS 312 Data Struct & Algorithms (4)
	Capstone Experience Requirement	CS 320 Web and Internet Prog. (3)
UD Concentration: 4 courses from	One course from the following:	CS 332F Functional Prog. (2)
CS 3560 Intro. to Systems Prog. (4)	CS 470 Adv Software Design Proj(3)	CS 332L Logic Prog. (2)
CS 3590 Data Comm. & Networking (4)	CS 495 Special Studies 3 units	CS 332C C++ Object Oriented Prog. (2)
CS 4660 Database Architecture (4)		CS 337 Software Design (3)
CS 4110 Compiler Design (4)	**Required Supporting Courses**	CS 386 Intro. to Automata Theory (4)
CS 4170 Theory of Automata (4)	MATH 161 Calc & Anal Geom I(4)	CS 437 Software Engineering (5)
CS 4245 Analysis of Algorithms (4)	Two courses from the following:	CS 440 Intro. to O.S. (4)
CS 4310 Software Engineering I (4)	MATH 165 Elem Statistics(4)	EE 444 Comp. Architecture (4)
MATH/CS 3750 Numerical Analysis I (4)	MATH 211 Calcu & Anal Geom II(4)	CS 490 C.S. Recapitulation (2)
	MATH 222 Linear Algebra(3)	CS 491A Software Design Lab (3)
UD Electives: 3 courses	MATH 241 Calculus III (4)	CS 491B Software Design Lab (3)
	MATH 306 Number Theory(3)	
	MATH 316 Graph Theory(3)	**Elecitives (24 units)**
	MATH 352 Numerical Analysis(3)	Select 24 units of CS electives
	MATH 416 Graph Theory(3)	
	MATH 430 Linear Systems Theory(3)	
	MATH 470 Mathematical Models(3)	
	PHYS 214 Intro. to Phys II(4)	

APPENDIX K: Student Learning Outcomes: Mathematics

Students graduating with a B.S. in Mathematics from Cal State East Bay will:

1. possess technical competence including uses of calculus, linear systems, differential equations; understanding of axiomatic systems; abilities to read and create proofs;

2. possess a fundamental understanding of Mathematics theory including: (a) applications of calculus, linear systems, (b) relations of algebraic systems and classical problems, and (c) roles of definitions and proofs in algebra and analysis;

3. be able to work effectively as a team member;

4. have an understanding of their professional and ethical responsibilities and appreciate the impact of mathematics in the societal context;

5. communicate effectively, both in written and oral form

Students graduating with an M.S. in Mathematics from Cal State East Bay will have acquired the knowledge and skills listed below:

1. Technical competence including uses of calculus, linear systems, differential equations; understanding of axiomatic systems; ability to read and create proofs; ability to analyze and classify structures in different areas of mathematics;

2. A fundamental understanding of Mathematics theory including: (a) applications of calculus, linear systems; (b) relations of algebraic systems and classical problems; and (c) roles of definitions and proofs in algebra and analysis;

3. A command of the fundamental areas of Applied Mathematics, Theoretical Mathematics, or the teaching of Mathematics; the ability to read mathematical articles;

4. Ability to work effectively as team members;

5. An understanding of their professional and ethical responsibilities and appreciation of the impact of mathematics in the societal context;

6. Ability to communicate effectively, both in written and oral form.

APPENDIX L Student Learning Outcomes: Computer Science and Computer Networks

Students graduating with a B.S. in Computer Science from Cal State East Bay possess technical competence to: 1) design and implement computer programs; 2) use data structures in program design; 3) know and use modern programming techniques; and 4) use software engineering design principles.

Students possess a fundamental understanding of Computer Science theory including: 1) mathematical problem solving skills; 2) design and analysis of algorithms; 3) understanding of

computer architecture and operating system concepts; 4) analysis of programming languages.

Students 1) are able to work effectively as team members; 2) have an understanding of their professional and ethical responsibilities and appreciate the impact of computer science solutions in the societal context; and 3) can communicate effectively, both in written and oral form.

Students graduating with an M.S. in Computer Science from Cal State East Bay will have acquired the knowledge and skills listed below.

1. Technical competence to: (a) design and implement large and complex computer programs, (b) use data structures in program design, (c) know and use modern programming techniques, and (d) use software engineering design principles;

2. A fundamental understanding of Computer Science theory including: (a) mathematical problem solving skills, (b) design and analysis of a wide variety of algorithms, (c) understanding of computer architecture and operating system concepts, (d) analysis of programming languages;

3. Able to work effectively as a team member;

4. An understanding of their professional and ethical responsibilities and appreciation of the impact of computer science solutions in the societal context;

5. Able to communicate effectively, both in written and oral form.

Students graduating with an M.S. in Computer Networks from Cal State East Bay will have acquired the knowledge and skills listed below.

1. Technical competence to: a) design and implement computer network programs running on multiple machines, b) manage network devices, c) use protocol and service design principles, d) design a solution to a consumer request using current technologies;

2. A fundamental understanding of Computer Networks theory including: (a) mathematical basis for network traffic analysis, (b) design and analysis of a wide variety of network algorithms, (c) understanding of network architectures and protocols, (d) network security concepts and applications;

3. Able to work effectively as a team member;

4. An understanding of their professional and ethical responsibilities and appreciation of the impact of computer network solutions in the societal context;

5. Able to communicate effectively, both in written and oral form

CALIFORNIA STATE UNIVERSITY
EAST BAY

College of Science

25800 Carlos Bee Boulevard, CA 94542-3088, College of Science, Office of the Dean
Telephone (510) 885-3441 Fax: (510) 885-2067

Memorandum

Date: May 31, 2011

To: Mathematics Program Review Committee

From: Michael Leung, Dean of the College of Science

Subject: Five Year Review

I would like first to commend the Chair and the Committee for having completed a thorough review of its department. I am also thankful to the external reviewer for having provided valuable input and insight. The department was able to achieve most of the planned goals and objectives outlined in the last review. The program overall is strong in curriculum and faculty have shown good teaching performance and professional development. Its number of majors has remained relatively stable at around 160 graduates and undergraduates for the last five years. With its offerings of remedial, support and major courses, the department has been able to make some gains in SFR from 22.8 to 26.3 from 2005 to 09. The department is to be complimented on its impressive achievements in mathematics education both in grant awards and services to K-12 teacher professional development. The Committee has done a careful analysis of the current status of their department and has provided well-conceived plans for the future. I am in support of their future plans as outlined in the review. However, I need to point out that all items which require resources for implementation will necessarily rely heavily on availability of funding. This is particularly true when the university is anticipating serious budget reductions in the coming years. Additionally, the college has the responsibility of having to distribute its funding equitably to all departments dependent on the priority of their needs. Overall, I am encouraged by the progress the department has made and look forward to its future accomplishments.

cc: Edna Reiter, Chair of Department of Mathematics and Computer Science

5 Year Review Attachments 11

CALIFORNIA STATE UNIVERSITY
EAST BAY

College of Science

25800 Carlos Bee Boulevard, CA 94542-3085, College of Sciences, Office of the Dean
Telephone: (510) 885-3441 Fax: (510) 885-2085

Memorandum

Date: June 2, 2011

To: Computer Science Program Review Committee

From: Michael Leung, Dean of the College of Science

Subject: Five-Year Review

I would like first to commend the Chair and the Committee for having completed a thorough review of its program. I am also thankful to the external reviewer for having provided valuable input and insight. The program was able to achieve most of the planned goals and objectives outlined in the last review. The program overall is strong in its curriculum and faculty have shown good teaching performance. Since the crash of the hi-tech industry in 2001 which had led to a loss of more than 50% of its enrollment, the program is beginning to see signs of growth in majors and FTES. It has also made enhancements in its SFR from 12.5 to 18.8 from 2005 to 2009.The current anticipated upward trend of the technology industry is providing a good opportunity for the program to regain some of its enrollment loss. I am encouraged by the program's efforts to make continuous curricular adjustments to its offerings based on the needs of the industry, a process that is essential to an applied discipline such as computer science. The Committee has done a careful analysis of the current status of their program and has provided well-conceived plans for the future. I am in support of their future plans as outlined in the review. However, I need to point out that all items which require resources for implementation will necessarily rely heavily on availability of funding. This is particularly true when the university is anticipating serious budget reductions in the coming years. Additionally, the college has the responsibility of having to distribute its funding equitably to all departments dependent on the priority of their needs. Overall, I am encouraged by the progress the department has made and look forward to its future accomplishments.

xc: Edna Reiter, Chair of Department of Mathematics and Computer Science