I. INTRODUCTION

The Department of Statistics at Cal State East Bay (formerly Cal State Hayward) offers graduate study leading to the Master of Science in Statistics. This brochure describes the University and the Statistics MS program and summarizes application procedures and degree requirements from the University Catalog. It also explains mandatory Statistics Department procedures to apply for admission that are not included in the Catalog and answers some commonly asked questions about the program.

The entire Catalog is available online at www.csueastbay.edu/ecat/. (Select the latest version, and look under Graduate Programs ► Statistics ► MS.) The Catalog in effect at the time you enter the program provides the official statement of your graduation requirements.

1. Multi-Purpose Program

Our admission requirements are flexible enough to accommodate a wide range of backgrounds and interests. Successful graduates have come to the program with undergraduate majors in such fields as biology, business administration, political science, computer science, education, economics, and engineering — as well as mathematics and statistics. Also, it is not unusual for students with MS and doctoral degrees in fields other than statistics to enter the program.

Most of our graduates work as applied statisticians in industry or government. Many have moved into managerial roles as their careers have matured. Department contacts with alumni and Bay Area employers enable new graduates to seek opportunities with organizations familiar with the quality of our program.

Individually designed programs of study have also prepared students for PhD work in statistics at universities with international reputations, for teaching in community colleges, and for other careers in statistics and related fields. Faculty make every effort to assist students in devising programs that meet their individual needs.

Our program is highly respected by employers in the Bay Area and beyond because it provides students with a mixture of practical applied methods and sufficient theoretical background for continuing the study of new methods after leaving the University. The same contacts with alumni and local businesses that provide our students with employment opportunities also provide our faculty with an opportunity to cooperate with employers in keeping our program up to date.

2. Schedules — For Working or Full-Time Students

Because many of our graduate students are also employed off campus, statistics courses are scheduled so that the MS degree can normally be completed by taking courses after 4:00 p.m. Most classes related to the MS program are scheduled for two nights a week. (Some full-time employers allow flexible work schedules, for example, to permit attending classes starting at 4:00 p.m. on two days a week.) Students who can also attend during the daytime will sometimes have a wider selection of courses and quarters of offering.

Most students complete the program within two years. In the past few years, about 25 students have graduated from the MS program each year, and the program is growing steadily. This makes ours one of the largest professional statistics MS programs in the US.

3. Ideal Environment

Cal State East Bay is located in the rolling foothills on the eastern shore of San Francisco Bay with magnificent views of the Bay Area. The climate is mainly dry, with some rain November through April. Temperatures are mild: freezing weather is rare, and usually only a few summer days exceed 85-90 degrees Fahrenheit (30-32 degrees Celsius).
The Bay Area is a center of much cultural and statistical activity. Stanford University and the University of California, Berkeley and San Francisco are each within 40 miles of campus. The San Francisco Chapter of the American Statistical Association has a regular calendar of events. Also, companies in the biotechnology, pharmaceutical, computer, defense, and financial sectors participate in the statistical life of the Bay Area.

A modern computer laboratory, equipped with a wide range of statistical software, is available for Statistics classes and for student use outside of class. Important statistical software is licensed for student use off campus. Class sizes are relatively small, usually averaging 30-45 for the beginning courses in the program and smaller for some advanced graduate-level courses.

Personal contact with faculty members outside of class is encouraged. Several times a year current students, graduates of the program, and faculty get together for informal social events.

II. ADMISSION TO THE PROGRAM

Here is a step-by-step explanation of the admission process. This section explains some procedures required by the Statistics Department, but not included in the Catalog. They are intended to ensure that your application for admission receives the most prompt and favorable consideration possible.

Step 1: Verify Course and Degree Requirements For Admission

The following information is provided so that you can assess whether you are eligible for admission to the Statistics MS Program. Admission is a two-stage process: (1) Admission to the University as a graduate student, and (2) Acceptance into the Statistics MS Program. The only way to know for sure whether you are qualified for admission is for the University and the Statistics Department to evaluate your transcripts, letters of recommendation, and other evidence listed below in Steps 2 and 3. However, for applicants who meet the following criteria, the acceptance rate has been very high:

- The University ordinarily requires a 4-year baccalaureate degree from an accredited institution.
- The University ordinarily requires that work taken during your junior and senior years averages B (GPA 3.0) or better. In borderline cases, the Admissions Office may request an opinion from the Statistics Department based on grades in courses in mathematics, statistics, and other sciences, on performance in other graduate programs, or on other factors.
- The Statistics Department absolutely requires a background in college mathematics through elementary calculus, including multiple integration and infinite series. (Specifically, we require the equivalent of CAN MATH SEQ C. At CSU East Bay, the equivalent final course is MATH 2304: Calculus III. See the latest online Catalog under Undergraduate Programs ► Mathematics ► Courses. This is "math major" calculus. Simplified courses, such as those designated for majors in biology and business, are seldom adequate.)
- Students who have some of the following additional background may be at an advantage for admission to the program and for progress towards the degree after acceptance.
  - Basic statistics and probability courses, especially those requiring calculus as a prerequisite. (Examples: STAT 3401, 3502, or beyond. See the Catalog under Undergraduate Programs ► Statistics ► Courses.)
  - Additional courses in mathematics, especially linear algebra and analysis. (See the Catalog under Undergraduate Programs ► Mathematics ► Courses — specifically MATH 2101, MATH 3100, MATH 3300, and so on.)
  - Knowledge of a computer programming language or experience using statistical software (especially SAS) to analyze data.
  - Experience in a setting where studies or experiments are conducted for the collection of data, especially if this involved writing statistically oriented reports.

**Flexibility.** Exceptions require clear evidence of your ability and motivation to succeed in our program — where almost all grades must be As or Bs. For example, such evidence may be found in Graduate Record Exam scores, recent coursework, relevant work experience, and informative letters of recommendation.

Calculus prerequisite and GPA. If you do not meet these minimal requirements, it may be feasible for you to apply to the University as a “nonobjective post-baccalaureate student” and seek acceptance into the Statistics MS program upon completion of specified additional work. If you plan to take this path, you should get advice in advance from the Statistics Department as to the feasibility of your plan, how to improve your chances for acceptance into the program, and perhaps about a few courses you might take before acceptance into the program that would count towards the program. Such advice is given in good faith, but it does not carry any guarantee of acceptance.
Three-year baccalaureate degrees: In certain countries (for example, India and China), three-year technical baccalaureate degrees are customary. The California State University system does not ordinarily consider these as equivalent to US baccalaureate degrees without some additional undergraduate or graduate coursework. Circumstances vary so widely that it is necessary to handle this issue on an individual basis. Please contact the Statistics Department before applying to the University.

Step 2: Application for Graduate Admission to the University (Send to Admissions Office)

Deadlines. Students are usually admitted to the Statistics MS program starting in Fall quarter (beginning late September). We are able to accept some students with previous background in statistics starting in Winter quarter, (early January). In some cases, it is possible to admit students starting in Spring (March) or Summer (June).

Your application and transcripts should arrive at the Admissions Office before the application deadline date for the quarter in which you intend to enter the program. For some programs, including the Statistics MS program, deadlines for application are sometimes extended beyond the published dates. If you have missed a deadline, do not assume that applications are closed without asking.

A. APPLICATION FORM.

Apply for graduate admission to the University by completing the appropriate web form. Follow the instructions at www.csumentor.edu/AdmissionApp. Be sure to: (1) indicate “East Bay” as your choice of campus and "Statistics” as your proposed MS “major,” (2) complete all parts of the application (including the questions used to determine residency status for tuition purposes), and (3) pay the required processing fee. (Usually, applications submitted after the formal deadline need to be submitted on paper, because online applications are not available.)

If possible, make printed copies of your online application for your own records and for the information packet required by the Statistics Department (see Step 3).

There is not enough room on the Application for a statement of purpose of the kind required by the Statistics MS Program. On the application form mark that your statement of purpose has been “Sent to Statistics Department.”

You do not need to specify an “option” on the Application form; in our program, Options are often selected after admission.

B. TRANSCRIPTS.

As soon as you submit your application, arrange to have official transcripts sent to the Admissions Office by all colleges and universities you have attended. Your application to the University will not be processed until all transcripts have been received. Failure to supply official transcripts promptly is a major cause of delayed admission.

C. Required of all foreign language applicants: TOEFL SCORES.

If your undergraduate degree is from a place where English is not the principal language of instruction, you must complete the TOEFL (Test of English as a Foreign Language). The lowest acceptable score is 550 (or 213 for computer-based tests), but higher scores are preferable. Have scores sent to the Admissions Office.

D. Required of all non-US applicants: AFFIDAVIT OF SPONSORSHIP OR EVIDENCE OF FUNDS.

The Statistics Department welcomes students from outside the US, and many international students have done excellent work in our program. However, neither the University nor the Statistics Department has funds to offer international students for financial aid or scholarships towards tuition, academic expenses, or living expenses. Permission to work in the US is difficult to obtain because of immigration restrictions.

Students who are not citizens or permanent residents of the US can be accepted at Cal State East Bay only if they have funds available to cover all educational and living expenses for the length of time necessary to complete the degree. Depending on educational background, it has been our experience that most international students take about two years to complete the Statistics MS program. You must provide the Admissions Office with evidence that you have personal funds available or with an affidavit from a financial sponsor. The total amount required depends on the current tuition and estimated living expenses (recent estimate: about $17,000 per year; or about half that amount if a sponsor provides room and board without charge).

International students must also be covered by a health insurance policy during their time at the University.
Step 3: Information on Qualifications for MS in Statistics (Send to Statistics Department)

All of the following information and documentation must be sent in a single package to the Department of Statistics — not to the Admissions Office. Address your package to the Graduate Coordinator, Department of Statistics, CSU East Bay, Hayward CA 94542, USA

A. COPY OF YOUR APPLICATION. In this package, please include a printout from your web Application, showing at least the following: (1) desired starting quarter, (2) contact information (postal address, telephone, email address), (3) academic history (institutions attended, dates, degrees), and (4) references. If you are not able to make a copy of your web application, please supply all of this information on a separate sheet of paper.

B. UNOFFICIAL COPIES OF TRANSCRIPTS. In this package, please send original or readable photocopies of transcripts. (This is in addition to the official transcripts you send to the Admissions Office).

Some universities make it possible for you to access your courses and grades online; a clear printout of such an online list is acceptable provided it is accurate and up to date.

If a transcript from an institution you attended does not show your grade point average (GPA) in the usual North American system (A = 4.0, B = 3.0, and so on) then provide this information as an attachment. If you do not know the equivalent GPA, explain the grading system briefly. (For example: What is the lowest passing grade in a course? The average grade necessary for graduation? The average grade necessary for honors?)

C. COURSE LISTS. Separate from your transcripts, make an organized chronological list of your previous work in mathematics, statistics, and related quantitative courses. Include this in the package for the Statistics Office.

- **Calculus-prerequisite courses (required).** Provide a clear statement of how and where your basic calculus prerequisite was met. Give course names, dates, grades (converted to the North American system if necessary), institutions, and brief course descriptions. This information must be precise so that we can verify on your transcript(s) that our calculus requirement has been met.

- **List of other relevant courses.** If applicable, provide a list of your most recent or most advanced post-calculus courses in statistics, mathematics, and related fields with dates, grades (North American system), and — as far as known — instructors and textbook authors. Below it is explained that the equivalent of either Math 3100: Linear Algebra or Math 3300: Analysis I is required for the Statistics MS degree. If you believe you have already taken such courses, please tell us which courses may be equivalent and why. (For course descriptions see the latest online Catalog under Undergraduate Programs ► Mathematics ► Courses.)

D. STATEMENT OF PURPOSE. Please include in your package a straightforward statement of about 1.5 pages in length discussing your background (especially academic), career objectives (to the extent known), and reasons for seeking an MS degree in statistics.

If you do not believe that your transcripts or past grades accurately represent your current ability to perform to a high standard in the Statistics MS Program, please explain why not.

This Statement of Purpose must be provided directly to the Department of Statistics — not included in a few lines of your online Application.

E. LETTERS OF RECOMMENDATION. If possible, include letters of recommendation as part of your packet (preferably in envelopes sealed by their authors). Normally, we require at least two, preferably three, letters of recommendation from people familiar with your academic background in mathematics, statistics, or other quantitative courses, and who can provide informative assessments of your aptitude for graduate work. These should correspond to the references named on your application form. If your references prefer to send letters separately, please request that they be sent to Graduate Coordinator, Department of Statistics, CSU East Bay, Hayward CA 94542, USA — with the notation “Letter of Recommendation” in the lower-left corner of the envelope. There is no special form for submitting letters of recommendation.

We realize that some applicants will seek to enter the program some years after their previous degree work was completed, and so academic references may be difficult to obtain. If you cannot provide at least two recent, informative, and relevant academic letters of recommendation, then you must take the general GRE and have the scores sent to the Department of Statistics (see below). Usually, recent means within 5 years, informative means providing assessments beyond what is obvious from a transcript, relevant means based on performance related to statistics or mathematics, and academic means based on coursework at a university.
F. GRADUATE RECORD EXAM (GRE) SCORES. We do not require GRE scores of all applicants. However, in any of the following circumstances, we require scores for the General GRE (Verbal, Quantitative, Writing):

- If you cannot supply at least two academic letters of recommendation as explained in Section E above.
- If your GPA is below B (3.0) in any of the following categories: (a) Average for all of your undergraduate work, (b) Average for courses in the mathematical sciences (including statistics and computer science) at the undergraduate level, (c) Average for your post-baccalaureate work at any institution.
- If you intend to pursue PhD work after your MS degree.

If GRE scores are available at the time you submit your packet to the Statistics Department, include a photocopy of the GRE report in your packet, and have your official scores sent to the Statistics Department separately. But do not delay your application waiting for GRE scores. If scores are not available when you send your packet, please have official scores sent to the Statistics Department as soon as they are available. (Usually, immediately after you finish taking the GRE, you are given estimated scores. Please report these unofficial estimated scores to the Statistics Office, in terms of both points and “percent below,” pending arrival of the official test scores.)

In evaluating you for admission to the Statistics MS program, the Department will consider GRE scores along with your previous grades, letters of recommendation, and statement of purpose. In addition to providing important information for admission, GRE scores can be useful for advising students once they are admitted to the program. Also, a score of 53 or better on the writing part of the General GRE satisfies the University Writing Skills Requirement (see below.)

III. DEGREE REQUIREMENTS

Here we give brief, informal summaries of the degree requirements. For official information on specific requirements, consult the university Catalog. (In the online Catalog for the academic year of your entrance into the program, select Graduate ► Statistics.)

Requirement 1: University Writing Skills Requirement (UWSR)

The Writing Skills Requirement is intended to make sure students can express themselves effectively in written English during their degree work and after graduation. It is satisfied by taking the Writing Skills Test (WST) administered by the University during the first quarter of residence in the program and, if necessary, by taking designated English composition course(s). In order to continue in the program, you must complete this requirement, and your status in the program will be "unclassified" until you do so. (See the Catalog for more information on the UWSR as it applies to graduate students.)

If you scored 53 or higher on the writing part of the General GRE, you can submit that score in place of the WST.

If you have already satisfied the Writing Skills Requirement as a graduate or undergraduate student at any California State University, you need not do so again.

Requirement 2: Unit and Grade Requirements

The minimal unit and grade requirements are as follows:

- The MS program consists of at least 45 quarter units of approved upper-division and graduate coursework. Of these, at least 29 units must be approved graduate (6000 level) courses.
- All work applied toward the 45 units must be at an average grade of B (3.0) or higher, and no required graduate-level course may be at a grade below B.

However, depending on mathematics and statistics background before entry into the program and career objectives upon graduation from the program, many students will need or want to take more than 45 units to finish the program. (Taking approximately 12 additional units is not uncommon.)

Requirement 3: Course Requirements

All courses to be submitted towards the Statistics MS must be approved by a graduate advisor in advance of registration. Except for the prerequisite courses, any of the courses listed below may, in appropriate circumstances, be approved for meeting the above unit requirements. If the number of a course is in italic type, then the material of that course is routinely included in the Comprehensive Exam (see below). Unless otherwise noted, all courses are 4 units.
A. PREREQUISITE COURSES.

The following two courses are prerequisites to required courses. These courses do not count towards the 45-unit requirement. Students who have not taken equivalent post-calculus courses in statistics and probability will be required to take them — usually in their first quarter in the program.

STAT 3401: Introduction to Probability Theory, I
STAT 3502: Statistical Inference, I

In addition, several required courses make extensive use of statistical software (for example, SAS), the use of such software is tested on the Comprehensive Exam, and employers expect competency in its use. Therefore, students who enter the program without experience in using statistical software are encouraged to take:

STAT 4950: Advanced Statistical Packages for Data Analysis

STAT 3401 and STAT 3502 are offered almost every quarter; STAT 4950 is usually offered in Fall and Spring.

B. REQUIRED UPPER-DIVISION UNDERGRADUATE COURSES (16 units)

Required upper-division courses are:

- MATH 3100: Linear Algebra or MATH 3300: Analysis, I
- STAT 3402: Introduction to Probability Theory, II
- STAT 3503: Statistical Inference, II
- STAT 4401: Introduction to Stochastic Processes

In most years, STAT 3401-3402-4401 and STAT 3502-3503-6509 are offered as sequences in Fall-Winter-Spring quarters, respectively. STAT 3402 is usually offered only in Winter; STAT 4401 and STAT 6509 only in Spring; STAT 3503 in Winter and often in Spring.

Students entering the program with acceptable credit for any of these courses (or equivalents) will select additional courses from approved graduate-level coursework, Section C below, or courses from other departments designated as acceptable by a Graduate Advisor. (Students intending to pursue PhD studies in statistics should take both MATH 3100 and MATH 3300, plus additional higher-level mathematics courses.)

C. REQUIRED GRADUATE-LEVEL COURSES (17 units minimum)

Ordinarily, all of the courses in Sections A and B must be completed before taking STAT 6401-6501-6502, which is ordinarily taken in Fall-Winter-Spring of a student's second year.

STAT 6401: Advanced Probability, I
STAT 6501, 6502: Mathematical Statistics, I and II
STAT 6509: Theory and Application of Regression
STAT 6898: Cooperative Education (1-4 units) or STAT 6895: Practicum in Statistics (1-4 units)

D. OPTION (12 units) Each student will select one Option. This need not be done at the time of admission, and is usually done after completing the requirements of Section B. Wherever a choice is indicated among the requirements for an Option, it must be approved by a graduate advisor. Depending on subject matter, a specific Selected Topics course may be considered as appropriate for several options, regardless of name or number (for example, a computational course that uses mainly biostatistical examples).

1. Theoretical and Applied Statistics.

   Required Courses: Three graduate courses in Statistics chosen in consultation with a Graduate Advisor. At least two of these must be related to methodology. (12 units)

2. Actuarial Statistics. Graduate coursework in the College of Business and Economics relevant to insurance, finance, and operations research is recommended. MATH 3100 is recommended (in preference to MATH 3300). Areas of interest include stochastic modeling, force of mortality, life tables, and other topics from actuarial mathematics.
Required Courses:
- STAT 6402: Advanced Probability, II
- One 6000-level course from the College of Business and Economics (4 units)
- STAT 6851-6859 Selected Topics in Actuarial and Decision Science (4 units)

3. Biostatistics. Relevant coursework in biology should be undertaken at least at the undergraduate level, particularly in genetics. Advanced coursework in biological sciences is recommended. Topics of interest include logistic regression, clinical trials, survival analysis, and other topics from biostatistics.

Required Courses:
- One upper-division or (preferably) graduate-level course in biological sciences (4 units),
  - Either: (a) Two from STAT 6841-6849: Selected Topics in Biostatistics or
  - (b) One from STAT 6841-6849: Selected Topics in Biostatistics and
  - one from STAT 6860-6869: Selected Topics in Graduate Probability and Statistics

4. Computational Statistics. Advanced coursework in applied mathematics and computer science is recommended. Topics include Markov Chain Monte Carlo, bootstrapping, and other computationally intensive methods.

Required Courses:
- STAT 6515: Advanced Multivariate Analysis or STAT 6601: Advanced Statistical Computing,
- One upper-division or (preferably) graduate-level course in computer science (4 units),
- One course from STAT 6860-6869: Selected Topics in Graduate Probability and Statistics

5. Mathematical Statistics. Advanced coursework in mathematics is strongly recommended, particularly measure theory, real analysis, and complex analysis.

Required Courses:
- STAT 6402: Advanced Probability, II
- Two upper-division or (ordinarily) graduate-level courses in mathematics (8 units).

E. ELECTIVE COURSES.

Additional graduate-level courses, if needed, for a total of at least 29 units at the 6000-level and 45 units overall are required. A graduate advisor may approve for inclusion in a student’s program any 6000-level Statistics course or any course outside the department. Not more than one elective graduate-level course from outside the Statistics Department can be counted towards the degree. Substitutions for material already taken elsewhere must have the written approval of a graduate advisor.

Recent Seminar and Topics courses. Recent Graduate Seminar and Selected Topics courses have dealt with statistical consulting, discrete multivariate analysis, bootstrapping, Bayesian estimation, time series, reliability theory, and problems of analyzing real data. Undergraduate Seminars have covered robust estimation, exploratory data analysis, quality management, and a variety of computer-intensive methods using SAS and S-Plus. The topics for these courses (several each year, including Summer Quarters) are selected according to current faculty and student interest.

Requirement 4: Comprehensive Examination

The MS Comprehensive Exam tests for general knowledge of the fields of statistics and probability and an understanding of methods of application to “real world” situations—including the use of statistical software such as SAS and S-Plus/R. The exam may cover the contents of courses in your approved program (especially courses with numbers printed in italics in the list above) as well as other material, the general nature of which will be specified in advance.

Students who have made normal progress are eligible to take the exam after completing at least 36 of the 45 total units, of which at least 16 must be graduate level. Normally, MATH 3100/3300 and the four required graduate-level courses must be included among these (except that STAT 6502 may be taken concurrently). The exam is given in Fall and Spring Quarters. Usually, students take the exam during their last quarter in the program. If necessary, the exam may be repeated.

For students in the Actuarial Option, one approved professional actuarial exam may be substituted for a designated part of the Comprehensive Exam.
IV. FINANCIAL AID

The Catalog describes various loans and scholarships that are administered by the University. You can obtain additional information from the Financial Aid Office. Within the Statistics Department, a few possibilities for limited financial support may be available for students who have proved their ability to do good work in the program.

Department Graduate Assistantships. The Statistics Department has a limited number of graduate assistantships (approximately $500 per quarter; grading for professors, etc.). Selected students who have already been in the program for at least one quarter are hired for these positions. The main selection criteria are quality of work in the program, suitability for the tasks required, and financial need. No teaching assistantships are available.

Internships. In recent years, a few paid internships (course credit for on-the-job experience) have been available for advanced students. Usually, students make their own arrangements for internships in an area of interest, often with present or possible future employers.

Department Scholarships. Four scholarships ($100 – $500) have been established through the generosity of alumni, faculty, staff, and friends of the Department. Contact the Department Office for details.

Limited Options for International Students. For many years, the Department has welcomed students from countries around the world. However, students who are neither citizens nor permanent residents of the US must provide evidence of financial sponsorship or of their ability to meet all tuition and living expenses from their own resources. (See above.) Unfortunately, because of budgetary limitations and immigration rules, it is difficult for the Statistics Department to provide financial support for international students and impossible to make advance commitments.

V. FURTHER INFORMATION

If you have questions not answered here or in the Catalog, please contact the Department of Statistics.

• Mail: Department of Statistics; CSU East Bay; Hayward, CA 94542 USA
• Phone: (510) 885-3435; FAX: (510) 885-4714
• Graduate Coordinator, Email: bruce.trumbo@csueastbay.edu. (For quickest, most relevant response, please include the characters STAT-MS=Inquiry at the beginning of the subject line, and provide brief information about citizenship/residency/visa status and prior degrees/dates/GPA in the body of your email along with your questions. Please do not send attachments, unless requested.)

VI. GRADUATE FACULTY

Shenghus Kelly Fan (PhD 1999, University of Minnesota). Biostatistics

Jaimyoung Kwon (PhD 2000, University of California, Berkeley). Biostatistics, statistical computing.


Michael Orkin (PhD 1970, University of California, Berkeley). Game theory, decision theory. Director, CSUH CableNet TV Studio.

