COMMITTEE ON INSTRUCTION AND CURRICULUM

15-16 CIC 73
Monday, June 06, 2016

TO: The Academic Senate
FROM: Committee on Instruction and Curriculum (CIC)
SUBJECT: 15-16 CIC 73: Revision request for Statistics M.S.
PURPOSE: Information to the Academic Senate

ACTION REQUESTED: That the Senate accept the information that the revision request for M.S. Statistics program and its concentrations has been approved by CIC.

BACKGROUND INFORMATION:
The Senate process for approving transformed degree programs for the semester calendar is defined by 14-15 CIC 36. The Graduate Programs Subcommittee unanimously approved the M.S. Statistics program and its concentrations at its meeting on May 12 with the acknowledgement that some non-substantive changes may occur in the Catalog copy. The program was approved by consent of CIC per the policy on June 6, 2016. The proposal may be viewed within Curriculog; per the request of ExCom, a PDF attachment with information from Curriculog is provided.
Master of Science in Statistics
1. Semester Conversion Request for Approval of Revision of the Graduate Degree Program/Major

**General Catalog Information**

Select Shared Core unless otherwise instructed by APGS

- **Select** SHARED CORE
  - Program
  - Shared Core

**Year:** Fall 2018

**Catalog:** 2018-2019

**Notes:** If you want to move an existing degree program to online (i.e. 50% or more of the program can be completed online (a hybris course counts as .50 online), elevate an option to a degree, or change the degree type, please e-mail Donna Wiley, Interim Associate Vice President, Academic Programs and Graduate Studies; and copy Sarah Aubert, Catalog and Curriculum Specialist, Academic Programs and Graduate Studies; for additional instructions as soon as possible.

**Department:** Department of Statistics and Biostatistics

**Full and exact title of Major including degree earned:**

Master of Science in Statistics

**Has your program received transformation funding?**

- Yes
- No

**If the program received transformation funding, please summarize the transformative changes made:**

Required courses are now 4 semester units. Some requirements and all electives are 2 units. This allows for a stronger core and greater flexibility for the students. Introduction of new courses, including BSTA 668, DATA 653, DATA 670, STAT 641, and STAT 673 into the curriculum.
**PROGRAM DESCRIPTION**

The Department of Statistics and Biostatistics offers graduate study leading to the degree Master of Science in Statistics. The program is flexible in order to serve the needs of students with varying backgrounds (including statistics, mathematics, computer science, engineering, business, economics and other quantitative fields) and with different career objectives. The program includes concentrations in Applied Statistics, Data Science, Mathematical Statistics, and Actuarial Science. All students are expected to master a wide variety of applied statistical, computational, and probabilistic techniques and the theoretical foundations upon which these techniques are based. Students are expected to be familiar with recent developments in the field and to be able to use the statistical literature to learn new techniques and theories throughout their professional careers. In addition to the general requirements stated elsewhere in this catalog, students must satisfy the departmental requirements stated in the following paragraphs.

Students interested in pursuing an M.S. degree in Biostatistics should see the Biostatistics chapter in the university catalog.

**CAREER OPPORTUNITIES**

Statistician, Data Analyst, Data Scientist, Teacher, Actuary.

**ADMISSION REQUIREMENTS**

1. A baccalaureate degree or equivalent.
2. Differential and Integral Calculus (MATH 130, 131).
3. Departmental approval.

In addition to the above minimal requirements for admission, if students have some of the following background they will be at an advantage both as to selection for admission to the program and optimal progress toward the degree if admitted:

- interest or experience in a setting where studies or experiments are conducted for the collection of data.
- multiple integration and infinite series
- matrix algebra
- basic statistics and probability
- knowledge of a computer programming language

**STUDENT STANDING and PROGRESS TOWARD the DEGREE**

**Advancement to Candidacy Requirements**

1. Completion of at least 16 semester units of approved coursework beyond the baccalaureate, with an average of "B" (3.0) or higher.
Fulfillment of the University Writing Skills Requirement. For information on meeting the University Writing Skills Requirement, see the Testing Office website at www.csueastbay.edu/testing or call 510.885.3661.

3. Departmental approval.

Cause for Dismissal from Program

Students may be dismissed from the program at any time "for cause." "For cause" includes, but is not limited to, poor academic performance, violation of the student code of conduct, academic dishonesty, and/or interference with the educational environment.

PROGRAM LEARNING OUTCOMES

Students graduating with an M.S. in Statistics from Cal State East Bay will be able to:

1. Apply statistical methodologies, including a) descriptive statistics and graphical displays, b) probability models for uncertainty, stochastic processes, and distribution theory, c) hypothesis testing and confidence intervals, d) ANOVA and regression models (including linear, and multiple linear) and analysis of residuals from models and trends.
2. Derive and understand basic theory underlying these methodologies
3. Formulate and model practical problems for solutions using these methodologies
4. Produce relevant computer output using standard statistical software and interpret the results appropriately
5. Communicate statistical concepts and analytical results clearly and appropriately to others; and
6. Understand theory, concepts, and terminology at a level that supports lifelong learning of related methodologies.

Major Requirements*

Foundation Requirements

The M.S. in Statistics program consists of at least 32 semester units of approved upper division and graduate work. The university requirement for the minimum number of 600-level units applies. All work applied toward the 32 units must be at an average grade of "B" (3.0) or higher. No graduate-level required course may be at a grade below "B-."
Core Courses (22 units)

- STAT 620 Probability and Statistical Theory
- STAT 630 Statistical Methods
- STAT 631 Analysis of Variance
- STAT 632 Linear and Logistic Regression
- STAT 640 Mathematical Statistics
- One of the following:
  - STAT 641 Bootstrap
  - STAT 675 Advanced Stochastic Processes and Simulation

Concentrations (8 units)

Students must select one of the following concentrations:

Actuarial Statistics (8 units)

Choose six (6) units from the following:
- BSTA 661 Categorical Data Analysis
- BSTA 662 Survival Analysis
- BSTA 668 Longitudinal Data Analysis
- STAT 673 Nonparametric Statistical Methods
- STAT 674 Time Series

Choose at least 2 units from

An additional course listed above

- STAT 672 Advanced Multivariate Statistics

An approved course from the College of Business and Economics

Courses not listed above require advance approval from the graduate advisor.

Applied Statistics (8 units)

Choose eight (8) units from the following:

- BSTA 661 Categorical Data Analysis
- BSTA 662 Survival Analysis
BSTA 668 Longitudinal Data Analysis
STAT 650 Advanced R for Data Science
STAT 651 Data Visualization
STAT 652 Statistical Learning
STAT 653 Statistical Natural Language Processing
STAT 660 Advanced SAS Programming
STAT 672 Advanced Multivariate Statistics
STAT 673 Nonparametric Statistical Methods
STAT 674 Time Series
STAT 681 Bayesian Methods

Courses not listed above require advance approval from the graduate advisor.

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**Data Science (8 units)**

Choose eight (8) units from the following:

MATH 210 Linear Algebra with Differential Equations
MATH 330 Analysis I
MATH 331 Analysis II
STAT 650 Advanced R for Data Science
STAT 651 Data Visualization
STAT 652 Statistical Learning
STAT 653 Statistical Natural Language Processing

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**Mathematical Statistics (8 units)**

Choose eight (8) units from the following:

MATH 210 Linear Algebra with Differential Equations
MATH 330 Analysis I
MATH 331 Analysis II
STAT 650 Advanced R for Data Science
STAT 675 Advanced Stochastic Processes and Simulation
STAT 681 Bayesian Methods
Capstone (2 units)

STAT 692 Comprehensive Exam Review

To revise an existing concentration (formerly option) or create a new concentration, select form 1a. Semester Conversion Request for Approval of New or Revised Graduate Concentration.

**Total Units Required**

<table>
<thead>
<tr>
<th>Quarter Based Program:</th>
<th>48</th>
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<tbody>
<tr>
<td>Semester Based Program:</td>
<td>32</td>
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**Comprehensive Examination**

Successful completion of a departmental examination is required. This written examination will cover the contents of the courses in the candidate's approved program. Other material may be included, the general nature of which will be specified in advance. The examination is given only in the Fall and Spring semesters, and will cover both applied and theoretical topics. Students may take STAT 692 to receive a maximum of 2 units of academic credit for preparation for the comprehensive examination.

In each semester of offering, the Department Chair will appoint three or more members of the graduate faculty to administer the examination. Each student will generally take the Comprehensive Examination in the semester of intended graduation or in the preceding semester, after consulting with the graduate advisor. Students enrolled in the Actuarial Science Option may substitute a passing grade on an approved national actuarial exam for a designated portion of the comprehensive examination, with the approval of the graduate advisor. The examination committee is the final departmental authority in deciding eligibility to take the examination.

**Is this major approved as an online degree program?**

- Yes
- No

**If no, is there any pathway in the revised degree that is more than 50% online?**

- Yes
- No
### Consultation with other affected departments and programs:

<table>
<thead>
<tr>
<th>The following department(s) has (have) been consulted and raised no objections:</th>
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<tbody>
<tr>
<td>The Department has discussed some of the courses in the program with the Department of Mathematics, as some of the courses listed were cross-listed with Math under quarters. The Math Department expressed no objections.</td>
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<table>
<thead>
<tr>
<th>The following department(s) has (have) been consulted and raised concerns:</th>
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<tbody>
<tr>
<td>NONE</td>
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</tbody>
</table>
Attachments

Did you attach your Curriculum Maps, Five Year Assessment Plan or other supporting documents to this proposal?

☑ Yes
☐ No

Please scroll to the top of this form and select the Files icon to attach the following documents to your proposal:

- Master's Degree Roadmap
- Curriculum Map 1 - PLOs to Courses
- Curriculum Map 2 - PLOs to ILOs
- Five Year Assessment Plan

Catalog Item Types

Degree Type Master of Science

Program Type Master
Attachments for Master of Science in Statistics

- **CM MSStatistics_Semesters_29Nov15.xlsx** (uploaded by Sarah Aubert, 4/26/2016 4:55 pm)
- **RoadmapMS_Statistics.xlsx** (uploaded by Sarah Aubert, 4/26/2016 4:55 pm)
- **Statistics MS five-year-plan.docx** (uploaded by Sarah Aubert, 4/27/2016 9:26 am)
- **Data Science Concentration_New_CSU Implementation.pdf** (uploaded by Sarah Aubert, 4/28/2016 3:31 pm)