MEMORANDUM

To: Ms. Jinawa McNeil  
Chair, UMES Senate

From: Dr. Latasha Wade  
Chair, Senate Academic Affairs Committee

Date: September 2, 2015

Re: Proposal for Course, Program, or Curriculum Status Changes from the Department of Mathematics and Computer Science

On March 12, 2015, the Senate Academic Affairs Committee (SAAC) received proposals from the Department of Mathematics and Computer Science to:

1. Update catalog description for computer science business focus business electives
   a. Replace MKTG 310, FINA 441, BUAD 303, and BUAD 412 with BUAD 304, BUAD 313, and BUAD 430

2. Create five new courses (all 3-credit courses)
   a. MATH 219 – Sampling Techniques and Survey Research Methods
   b. MATH 319 – Bayesian Inferences and Risk Analysis
   c. MATH 330 – Foundations of Mathematics II
   d. MATH 333 – Computational Statistics and Computer Packages
   e. MATH 419 – Multivariate Statistics

3. Create a new minor in Applied Statistics
   a. 21 credit hours
      b. Courses include:
         i. MATH 210
         ii. MATH 219
         iii. MATH 309
         iv. MATH 310 or MATH 360
         v. MATH 319
         vi. MATH 333
         vii. MATH 419

4. Update catalog description for minor programs in department
Members of the SAAC independently reviewed the course proposals on August 31st.

On September 1st, members of the SAAC voted electronically to approve the requested course changes with no recommended modifications.

SAAC Members:
Kate Brown, Ph.D.       Malinda Cecil, Ph.D.
Derrek Dunn, Ph.D.      Kingsley Ejiogu, Ph.D.
Nydia Gregory, Ph.D.   Ali Ishaque, Ph.D.
Gail Lankford, M.Ed.    Latasha Wade, Pharm.D.
MEMORANDUM

TO: Dr. Patrick R. Liverpool  
    Provost and Vice President for Academic Affairs

FROM: Dr. Ayodele J. Alade  
      Dean, School of Business and Technology

DATE: March 10, 2015

SUBJECT: Proposal for Program, Curriculum or Course Status Forms  
           Department of Mathematics and Computer Science - Changes

The following Proposal for Program, Curriculum or Course Status Forms on behalf of the School of Business and Technology’s (SBT) Department of Mathematics and Computer Science Program are attached:

- Curriculum Change – Computer Science Business Focus Business Electives Catalog Description
- Curriculum Change – Masters of Science in Applied Computer Science Catalog Description
- CSDP 616 Data Mining Security to CSDP 616 Data Mining and Applied Analytics
- CSDP 619 Artificial Neural Networks to CSDP 619 Applications of Neural Networks
- CSDP 697 – Special Topics
- Change – MATH 102 – Applications of College Mathematics Catalog Prerequisite
- Change – MATH 109 – College Algebra – Catalog Prerequisite
- Change – MATH 110 – Trigonometry and Analytic Geometry Catalog Prerequisite
- New Course – MATH 330 – Foundations of Mathematics II
- New Program – Applied Statistics Minor
- Program Change – Minor Programs Catalog Description
- New Course – MATH 219 – Sampling Techniques and Survey Research Methods
- New Course – MATH 319 – Bayesian Inferences and Risk Analysis
- New Course – MATH 333 – Computational Statistics and Computer Packages
- New Course – MATH 419 – Multivariate Statistics
The following members of the SBT Curriculum Committee met on March 10, 2015:

Dr. Mohammad Ali – Dept. of Business, Management & Accounting
Dr. Karl Binns – Dept. of Hospitality and Tourism Management
Dr. Ibibia Dabiri – Dept. of Engineering & Aviation Sciences
Dr. Aaron Rababaah – Dept. of Mathematics & Computer Science
Dr. Joseph Arumala – Dept. of Technology (SBT Curriculum Committee Chair)

If you have any questions, please contact me.
MEMORANDUM

TO: Dr. Ayodele J. Alade
Dean, School of Business and Technology

FROM: Dr. Joseph Arumala
Chair, SBT Curriculum Committee

DATE: March 10, 2015

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- Program Change – Minor Programs Catalog Description
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Dr. Joseph Arumala – Dept. of Technology (SBT Curriculum Committee Chair)

If you have any questions, please contact me.
December 8, 2014

Dr. Julius Alade, Dean
School of Business and Technology
University of Maryland Eastern Shore
Princess Anne, Maryland 21853

Dr. Alade:

The Department of Mathematics and Computer Science submits the following Proposal for Course, Program or Curriculum Status forms:

1. **Curriculum Change: Advanced Business Electives.** The students completing the Computer Science towards Business are required to complete Advanced Business electives. The current options include MKTG 310, FINA 441, BUAD 303, and BUAD 412. Upon advice from Dr. Kate Brown, Chair, Department of Business, Management, and Accounting, these courses are being replaced with BUAD 304, BUAD 313, and BUAD 430.

2. **Curriculum Change: Masters of Science in Applied Computer Science.** The Graduate Catalogs: 2009-11, 2011-13, and 2013-15 incorrectly states that the program requires thirty-three (33) credits (ten courses and CSDP 698) in the non-Thesis option. This form corrects that error as the requirements should read thirty-two (32) credits (8 graduate level CSDP courses and CSDP 698 and CSDP 798).

3. **Course Change: CSDP 616.** The course description has been changed to reflect current trends in the subject matter.

4. **Course Change: CSDP 619.** The course description has been changed to reflect current trends in the subject matter.

5. **Course Change: CSDP 697 - Special Topics.** Special topics courses can be repeated for a maximum of 9 total credits.

6. **Course Change: MATH 102.** The Department wishes to remove the statement “or two years of high school mathematics (Algebra I or higher)” from the list of prerequisites. The Department uses the ACCUPLACER® place students in college credit MATH courses.
7. Course Change: MATH 109. The Department wishes to remove the statement “or two years of high school mathematics (Algebra I or higher)” from the list of prerequisites. The Department uses the ACCUPLACER to place students in college credit MATH courses.

8. Course Change: MATH 110. The Department wishes to remove the statement “or two years of high school mathematics (Algebra I or higher)” from the list of prerequisites. The Department uses the ACCUPLACER to place students in college credit MATH courses.

9. New Course: MATH 330 - Foundations in Mathematics II. Students in mathematics need an additional course in introductory proof writing, set theory, and function theory. It is envisaged that this course would enhance the opportunity for success in advanced 400-level MATH courses.

10. New Program: Minor in Applied Statistics. The faculty has identified an area of statistics that would give our students an advantage in multiple employment opportunities in business, research, and scientific environments.


15. Catalog Entry: New language regarding the minor programs offered in the Department to replace current information in the undergraduate catalog.

Thanks,

[Signature]

Robert A. Johnson, Jr., Ph.D.
Chair

Enclosures
PROPOSAL FOR COURSE, PROGRAM OR CURRICULUM STATUS

DIRECTIONS:

Provide one set of forms for each course, curriculum or program change. Submit one signed copy. All proposals must have the following: old catalogue description, new catalogue description, start date, course prerequisites, course co-requisites, course outline (topics only), course objectives, and course learning outcomes, effects on staff and/or facility, and lab fees.

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School: ☐Ag & Natural Sciences ☐Arts and Professions ☑Business and Technology

☐Health Professions ☐Library Services

DEPARTMENT _______ Department of Mathematics and Computer Science

☐Change ☐Eliminate ☐Add

Prefix & Number ___________________________ Credit Hours: ___________________________

Title: __________________________________________

Start Date: ☐Fall ☐Spring ☐Summer I ☐Summer II ☐Summer III ☐Winter Year: ________

NEW COURSE

Prefix & Number ___________________________ Credit Hours: ______

Title: ______________________________________

Start Date: ☐Fall ☐Spring ☐Summer I ☐Summer II ☐Summer III ☐Winter Year: ________
Program

☐ New  ☐ Change  ☐ Eliminate  ☐ Add

Title:

Start Date: ☐ Fall  ☐ Spring  ☐ Summer I  ☐ Summer II  ☐ Summer III  ☐ Winter  Year: ________

Curriculum

☐ New  ☒ Change  ☐ Eliminate  ☐ Add

Title: Computer Science Business Focus Business Electives

Start Date: ☒ Fall  ☐ Spring  ☐ Summer I  ☐ Summer II  ☐ Summer III  ☐ Winter  Year: __2015__

Course Title:

Old Catalogue Description: *ADVANCED BUSINESS ELECTIVES (CHOOSE 1)

MKTG 310, MKTG 312, MKTG 314, MKTG 315, MKTG 401, MKTG 404, FINA 341, FINA 440, FINA 441, BUAD 303, BUAD 412, BUAD 420

New Catalogue Description: Advanced Business Electives (Choose 1 for which prerequisites are met)

MKTG 312, MKTG 314, MKTG 315, MKTG 401, MKTG 404, FINA 341, FINA 440, BUAD 420, BUAD 304, BUAD 313, BUAD 430.

Prerequisites:

Co-requisites:

Course Outline (Topics Only):
Course Objectives: 

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Course Learning Outcomes: 

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Lab Fee (if required): None

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Revised 12/9/14
PROPOSAL FOR COURSE, PROGRAM OR CURRICULUM STATUS

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School:  □ Ag & Natural Sciences □ Arts and Professions □ Business and Technology
□ Health Professions □ Library Services

DEPARTMENT

PRESENT COURSE

□ Change □ Eliminate □ Add

Prefix & Number ____________ Credit Hours: ____________

Title: ______________________

Start Date: □ Fall □ Spring □ Summer I □ Summer II □ Summer III □ Winter Year: ______

NEW COURSE

Prefix & Number MATH 219 Credit Hours: 3

Title: Sampling Techniques and Survey Research Methods

Start Date: □ Fall □ Spring □ Summer I □ Summer II □ Summer III □ Winter Year: 2015
Program

☐ New  ☐ Change  ☐ Eliminate  ☐ Add

Title:

Start Date: ☐ Fall  ☐ Spring  ☐ Summer I  ☐ Summer II  ☐ Summer III  ☐ Winter  Year:

Curriculum

☐ New  ☐ Change  ☐ Eliminate  ☐ Add

Title:

Start Date: ☐ Fall  ☐ Spring  ☐ Summer I  ☐ Summer II  ☐ Summer III  ☐ Winter  Year:

Course Title: Sampling Techniques and Survey Research Method

Old Catalogue Description:

New Catalogue Description: This course covers scientific data collection methods, sampling techniques, Exploratory Analysis, Social Research Survey Principles and Design, Cross Tabulations, Chi-Square Fitness Tests, and quantitative research methods. The course will also serve non-exact humanities and social science students.

Prerequisites: MATH 210 - Elementary Statistics

Co-requisites:

Course Outline (Topics Only):
Course Objectives: 1. To review the basic designs for selecting samples for applied survey research.

2. To develop an understanding of and appreciation for the process of designing survey.

3. To develop problem-solving skills in designing survey sample plans.

Course Learning Outcomes: __________

Lab Fee (if required): None

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Revised 12/4/14
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
MATH 219
“Sampling Techniques and Survey Research Methods”

INSTRUCTOR:

CLASS HOURS:

OFFICE HOURS:

Textbooks:
2. P.V. Sukhatme, B.V Sukhatme, S. Sukhatme and C. Asok, *Theory of Sample surveys with applications*, IASRI, Delhi

Prerequisites:

MATH 210 (or equivalent) and coverage of most of General Ed courses

Course Syllabus

The field of survey methodology draws on theories and practices developed in several academic disciplines like mathematics, statistics, psychology, sociology, computer science, and economics. To become competent in the survey research field requires a mastery of research literatures as well as experience designing, conducting, and analyzing surveys.

Principles of sample surveys; Simple, stratified and unequal probability sampling with and without replacement; ratio, product and regression method of estimation: Systematic sampling; cluster and subsampling with equal and unequal sizes; double sampling, sources of errors in surveys. Research methods and definition of the researched problem and the subsequent steps will be covered in this course.

This course introduces the student to a set of principles of survey design that are the basis of standard practices in the field. The course exposes the student to research literatures that use both observational and experimental methods to test key hypotheses about the nature of human behavior that affect the quality of survey data. It will also present important statistical concepts and techniques in sample design, execution, and estimation, as well as models of behavior describing errors in responding to survey questions, models of measurement error, postsurvey processing, and estimation in surveys.

Statistical techniques most popular in survey research are covered including exploratory analysis, cross-tabulations, contingency analysis and Chi-square fitness tests among other methods.

The course is intended as an introduction to the field. Lectures and course readings assume that students understand basic statistical concepts (at the level of an undergraduate course) and have exposure to elements of social science perspectives on human behavior. For those lacking such a background, supplementary readings are recommended.

Course Objectives:

Specific objectives include the following:

1. To review the basic designs for selecting samples for applied survey research.
2. To develop an understanding of and appreciation for the process of designing survey
PROPOSAL FOR COURSE, PROGRAM OR CURRICULUM STATUS

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School:  □Ag & Natural Sciences   □Arts and Professions   □Business and Technology
□Health Professions     □Library Services

DEPARTMENT __________________________ Department of Mathematics and Computer Science

PRESENT COURSE

□Change  □Eliminate  □Add

Prefix & Number ____________________ Credit Hours: __________

Title: ___________________________

Start Date:  □Fall   □Spring   □Summer I   □Summer II   □Summer III   □Winter   Year: ______

NEW COURSE

Prefix & Number__ MATH 319 ____________________ Credit Hours:  3

Title: Bayesian Inferences and Risk Analysis

Start Date:  □Fall   □Spring   □Summer I   □Summer II   □Summer III   □Winter   Year: 2015
PROGRAM

☐ New  ☐ Change  ☐ Eliminate  ☐ Add

Title: ____________________________________________

Start Date: ☐ Fall  ☐ Spring  ☐ Summer I  ☐ Summer II  ☐ Summer III  ☐ Winter  Year: __________

CURRICULUM

☐ New  ☐ Change  ☐ Eliminate  ☐ Add

Title: ____________________________________________

Start Date: ☐ Fall  ☐ Spring  ☐ Summer I  ☐ Summer II  ☐ Summer III  ☐ Winter  Year: __________

Course Title: Bayesian Inferences and Risk Analysis

Old Catalogue Description: ________________________________________________________________


Prerequisites: MATH 310 or MATH 360 or permission of the instructor.

Co-requisites: ________________________________________________________________

Course Outline (Topics Only): ___________________________________________________________
Course Objectives:

1. Gain a solid understanding of the basic Bayesian approach to inference.
2. Ability to express uncertainty in terms of conditional probability distributions.
3. Introduction to common practice in setting and interpreting Bayesian models in applied problems.
4. Interpret the results for each technique studied (i.e., be able to use the outcomes of data analysis to address the research question/hypotheses).
5. Test the assumptions underlying a statistical analysis and state the limitations of a study.
6. Write a multivariate statistics research report.

Course Learning Outcomes:

Lab Fee (if required): None

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Revised 12/4/14
Textbooks:
- Kelly, Dana, Smith, Curtis. Bayesian Inference for Probabilistic Risk Assessment, Springer Series in Reliability Engineering, 2011, XII, 228 p

Prerequisites: MATH 310 or MATH360 (or equivalent) or permission of the instructor

Course Syllabus:
This course covers Bayesian Inference theory, principles and practice. It defines and applies a-priori and Posterior Modeling, Stochastic Processes, Risk Analysis and Management Software, Logistic Regression Methods facilitated by special use of risk statistical packages.

The course provides a Bayesian foundation for modelling probabilistic problems and performing inference on them. The inference adopted in this course will employ the modern computational approach of Markov chain Monte Carlo using custom-written routines or existing general purpose commercial or open-source software like OpenBUGS (commonly referred to as WinBUGS) to solve the inference problems. The course provides analysis “building blocks” that can be modified, combined, or used as-is to solve a variety of other analogous problems.

The course will provide students the analytical structure for combining information from various sources and data and to generate estimates of the parameters of uncertainty distributions popularly implemented to model risk and reliability models.

Course Goals:
To help the student to:
- gain a solid understanding of the basic Bayesian approach to inference,
- be able to express uncertainty in terms of conditional probability distributions,
- to be introduced to common practice in setting and interpreting Bayesian models in applied problems,
- to learn how to handle hierarchical model specification and computational techniques,
- to practice in reading statistics articles from the literature and presenting statistical ideas to others

Grading Scheme: Quizzes: 10%, Class tests: 20%, Mid-term Test: 20%, Projects: 30%, Final Exam: 20%
These weights get compiled and translated in the following letter grades:
A : 90% and above
B : 80% - 89%
C : 70% - 79%
D : 60% - 69%
DIRECTIONS:

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School:  □ Ag & Natural Sciences  □ Arts and Professions  □ Business and Technology
         □ Health Professions  □ Library Services

DEPARTMENT  Mathematics and Computer Science

PRESENT COURSE

□ Change  □ Eliminate  □ Add

Prefix & Number  Credit Hours:

Title:

Start Date:  □ Fall  □ Spring  □ Summer I  □ Summer II  □ Summer III  □ Winter  Year:

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NEW COURSE

Prefix & Number  MATH 330  Credit Hours:  3

Title: Foundations of Mathematics II

Start Date:  □ Fall  □ Spring  □ Summer I  □ Summer II  □ Summer III  □ Winter  Year: 2015
Title:

Start Date: □ Fall □ Spring □ Summer I □ Summer II □ Summer III □ Winter Year: 

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CURRICULUM

Title: Foundations of Mathematics II

Start Date: □ Fall □ Spring □ Summer I □ Summer II □ Summer III □ Winter Year: 

Course Title: Foundations of Mathematics II

Old Catalogue Description:

New Catalogue Description: This continuation of Foundations of Mathematics applies the proof skills to the central fundamental problems in modern mathematics: formal number theory, axiomatic set theory, and recursive function theory.

Prerequisites: MATH 300 - Foundations of Mathematics

Co-requisites:

Course Outline (Topics Only): Axioms for Number-Theoretic Functions, Arithmetization and Gödel Incompleteness, Church's Undecidability; Axioms for Set Theory, Cardinal and Ordinal Numbers, Consistency and Independence results in Set Theory; Turing Machine and Computability, Recursive Enumerability, and Unsolvable Decision Problems.
Course Objectives:
1. To advance student skill in abstractive and proof.
2. To introduce student to formal systems in number theory, set key, and recursion.
3. To prepare students for the style and content of graduate mathematics.

Course Learning Outcomes:
1. Students will be prepared to carry out correct proofs in their upper-level course.
2. Students will have sufficient experience and contact with 20th century mathematics to send article in 21st century mathematics.
3. Students will be able to construct algorithms for the solution of realistic mathematical problems.

Effects on staff and/or facility: Since this course will just add one more upper-level elective for math majors and some computer science majors and will fit into the rotation of elective course, it will not require additional staff.

Lab Fee (if required): None

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Revised 12/2/14
UNIVERSITY OF MARYLAND EASTERN SHORE
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

MATH 300: Foundations of Mathematics
Spring 2015 – Chapin


MEETINGS: MWF 1:00-1:50PM/Kiah Hall 1132

OFFICE HOURS: M-F 3:00-3:50 and T Th 1:00 – 1:50 in Kiah 1116 or call (410-651-6428; e-mail to ewchapin @ umes.edu)

PREREQUISITES: MATH 112

GRADING: In-class tests- eighty percent; final examination-twenty percent. There are no late tests or examinations for any reason, so that students needing to be absent on a testing day must make arrangements to take the test ahead of time. No calculators or other electronic devices will be used during tests and examinations.

DEPARTMENTAL ATTENDANCE POLICY: The Department will require all faculty to record attendance every class period into the Hawk Web online reporting system. Upon a student’s third unexcused absence, a letter will be forwarded to the student alerting him that upon his sixth unexcused absence, he will receive a final grade of “F” for the course. The student can elect to withdraw from the course to avoid the grade of “F”.

GOALS AND OBJECTIVES: This course provides the student with an introduction to the more formal/abstract ideas of mathematics through the study of the propositional and first-order logic, the formal basis of number systems and recursion, the axioms of set theory, the foundations of the concept of computability, together with the concomitant ideas of completeness, incompleteness and independence. The emphasis is on the students becoming skillful and competent at doing proofs. The student, upon completion of this course, should be able to:

1. Explain the propositional calculus from the point of view of truth tables and from the point of view of various alternative formal axiomatizations;

2. Apply the axioms of first order quantification theory and its model theory to discussions of completeness, decidability and categoricity;

3. Demonstrate the construction of standard basic number systems and the consequences of Gödel’s incompleteness theorem for arithmetic;

4. Describe the results of axiomatic set theory up through the properties of infinite cardinals and ordinals;

5. Explain the meaning of Church’s thesis on the definition of computability and its relationship to recursively undecidable problems;

6. Use proof skills gained in carrying out proofs in other advanced mathematics.
PROPOSAL FOR COURSE, PROGRAM OR CURRICULUM STATUS

DIRECTIONS:
Provide one set of forms for each course, curriculum or program change. Submit one signed copy. All proposals must have the following: old catalogue description, new catalogue description, start date, course prerequisites, course co-requisites, course outline (topics only), course objectives, and course learning outcomes, effects on staff and/or facility, and lab fees.

Each reviewing committee must complete a memorandum with the following information. Date proposal was received, list of members of the committee, the vote of the committee for approval, and a minority report if objections or reservations were raised about the proposal. This memorandum will proceed to the next level with a copy sent to the department of origin for the proposal. The one hard copy of the forms must be sent through the process. All proposals must be sent in electronic form for easier review by the various committees.

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School: ☐Ag & Natural Sciences ☐Arts and Professions ☒Business and Technology
☐Health Professions ☐Library Services

DEPARTMENT Department of Mathematics and Computer Science

PRESENT COURSE
☐Change ☐Eliminate ☒Add

Prefix & Number _______________ Credit Hours: _______________

Title: _______________________

Start Date: ☐Fall ☐Spring ☐Summer I ☐Summer II ☐Summer III ☐Winter Year: __________

NEW COURSE

Prefix & Number MATH 333 Credit Hours: 3

Title: Computational Statistics and Computer Packages

Start Date: ☒Fall ☐Spring ☐Summer I ☐Summer II ☐Summer III ☐Winter Year: 2015
Course Title: Computational Statistics and Computer Packages

Old Catalogue Description:

New Catalogue Description: This course encourages the application of computer statistical methods and using statistical packages in general with focus on Multiple Regression, ANOVA, Graphical Representations and Exploration, Design of Experiments and other statistical analyses, and simulation using random variable generators. This may include SAS, SPSS, and R-Programming among others.

Prerequisites: MATH 210 or MATH 310 or MATH 360 or permission of the instructor.

Co-requisites:

Course Outline (Topics Only): This course prepares the student to learn how to perform an analytical task in at least two of the available packages such as SPSS, SAS, and R, without having to navigate through the extensive, idiosyncratic, and sometimes unwieldy software documentation. The course will cover many common tasks, such as
data management, descriptive summaries, inferential procedures, regression analysis, and the creation of graphics, along with more complex applications.

Course Objectives: 1. Understand and use a broad set of data management, analysis, and graphical tasks in SAS and R.
2. Provide parallel examples in SAS and R and/or SPSS to demonstrate how to use the software and derive identical answers regardless of software choice.
3. Gain insight into the process of statistical coding from beginning to end by supplying worked examples of complex coding tasks.
4. Exposure to gentle introductions to complex issues and stumbling blocks new users encounter.
5. Understand and use the ODS and new graphics of SAS 9.2.
6. Grasp an index for each software, allowing users to easily locate procedures.
7. Retrieve the SAS and R data sets and code available online.

Course Learning Outcomes:

Lab Fee (if required): None

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Revised 12/4/14
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

MATH 333
Computational Statistics and Computer Packages

INSTRUCTOR:

OFFICE HOURS:

Textbooks:


Prerequisites: MATH 210 (or equivalent), MATH 310 or MATH360 (or equivalent) or permission of the instructor

Course Syllabus:
This course prepares the student to learn how to perform an analytical task in at least two of the available packages like SPSS, SAS and R, without having to navigate through the extensive, idiosyncratic, and sometimes unwieldy software documentation. The course will cover many common tasks, such as data management, descriptive summaries, inferential procedures, regression analysis, and the creation of graphics, along with more complex applications.

In this course the student will be able to

1. Understand and use a broad set of data management, analysis, and graphical tasks in SAS and R
2. provide parallel examples in SAS and R and/or SPSS to demonstrate how to use the software and derive identical answers regardless of software choice
3. get insight into the process of statistical coding from beginning to end by supplying worked examples of complex coding tasks
4. be exposed to gentle introductions to complex issues and stumbling blocks new users encounter
5. understand and use the ODS and new graphics of SAS 9.2
6. grasp an index for each software, allowing users to easily locate procedures
7. retrieve the SAS and R data sets and code available online

Datasets will be provided/chosen by the instructor,

Grading Scheme: Quizzes: 10%, 50% of the grade will be based on homework assignments. Students will also conduct analysis of a research dataset based on one of the presented techniques and write up the conclusions in a scientific paper that will be 20% of the grade. A Final exam will weigh 20% of the grade.
PROPOSAL FOR COURSE, PROGRAM OR CURRICULUM STATUS

DIRECTIONS:

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School: □ Ag & Natural Sciences □ Arts and Professions □ Business and Technology
□ Health Professions □ Library Services

DEPARTMENT ____________________________
Department of Mathematics and Computer Science

□ Change □ Eliminate □ Add

Prefix & Number ____________________________ Credit Hours: ________________

Title: ____________________________________

Start Date: □ Fall □ Spring □ Summer I □ Summer II □ Summer III □ Winter
Year: ____________________

NEW COURSE

Prefix & Number ______MATH 419__________ Credit Hours: __3____

Title: Multivariate Statistics

Start Date: □ Fall □ Spring □ Summer I □ Summer II □ Summer III □ Winter
Year: 2015
Multivariate Statistics

This course introduces Multivariate Normal (and other) Distributions, Matrix-based Models and Eigenvalues and Vectors analysis, MANOVA; Principal Components, Discrimination Analysis, Classification and introduction to Demography and Population Studies.

Prerequisites: MATH 310 (Mathematical Statistics I)/or MATH360 (Statistics for Scientists) or permission of the instructor.

Co-requisites:

Course Outline (Topics Only): This course introduces Multivariate Normal (and other) Distributions, Matrix-based Models and Eigenvalues and Vectors analysis, MANOVA; Principal Components, Discrimination Analysis, Classification and introduction to Demography and Population Studies.
Course Objectives: 1. Summarize the objectives of a study, specify variables of interest in a study and identify their level of measurement.

2. Prepare the data file for analysis (i.e., screening for out of range and missing values, outliers, checking the distributional properties of the variables to be used in the study, understand when it is appropriate to transform variables and be able to transform variables when appropriate.

3. Analyze the data using a statistical package/software (i.e., be able to identify and apply the correct technique to address the study’s research questions/hypotheses).

4. Interpret the results for each technique studied (i.e., be able to use the outcomes of data analysis to address the research question/hypotheses).

5. Test the assumptions underlying a statistical analysis and state the limitations of a study.

6. Write a multivariate statistics research report.

Course Learning Outcomes:

Lab Fee (if required): None

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Revised 12/4/14
INSTRUCTOR:

OFFICE HOURS:

Textbooks:

Prerequisites: MATH 310 or MATH 360 or permission of the instructor.

Course Syllabus:
The course covers multivariate analysis methods including multivariate regression and ANOVA, data reduction through the use of principal components or factor analysis, multivariate classification and clustering methods. Where applicable, nonparametric and/or categorical adaptations of traditional multivariate normal analyses will also be presented.

Datasets will be provided/chosen by the instructor.

Learning Objectives:
At the completion of this unit students will be able to:

1. Summarize the objectives of a study, specify variables of interest in a study and identify their level of measurement.
2. Prepare the data file for analyses (i.e., screening for out of range and missing values, outliers, checking the distributional properties of the variables to be used in the study, understand when it is appropriate to transform variables and be able to transform variables when appropriate.
3. Analyze the data using a statistical package/software (i.e. be able to identify and apply the correct technique to address the study’s research questions/hypotheses).
4. Interpret the results for each technique studied (i.e., be able to use the outcomes of data analysis to address the research question/hypotheses).
5. Test the assumptions underlying a statistical analysis and state the limitations of a study.
6. Write a multivariate statistics research report.

Grading Scheme: Quizzes: 10%, 50% of the grade will be based on homework assignments. Students will also conduct analysis of a research dataset based on one of the presented techniques and write up the conclusions in a scientific paper that will be 20% of the grade. A Final exam will weigh 20% of the grade.

These weights get compiled and translated into the following letter grades:
A : 90% and above
B : 80% - 89%
C : 70% - 79%
D : 60% - 69%
F : 50% or below
PROPOSAL FOR COURSE, PROGRAM OR CURRICULUM STATUS

DIRECTIONS:

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School: □Ag & Natural Sciences □Arts and Professions □Business and Technology
□Health Professions □Library Services

DEPARTMENT Mathematics and Computer Science

PRESENT COURSE

□Change □Eliminate □Add
Prefix & Number ____________________________ Credit Hours: __________

Title: ____________________________________

Start Date: □Fall □Spring □Summer I □Summer II □Summer III □Winter   Year: ________

NEW COURSE

Prefix & Number ____________________________ Credit Hours: __________

Title: ____________________________________

Start Date: □Fall □Spring □Summer I □Summer II □Summer III □Winter   Year: ________
Title: Applied Statistics Minor

Start Date: ☑ Fall   ☐ Spring   ☐ Summer I    ☐ Summer II   ☐ Summer III   ☐ Winter   Year: 2015

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PROGRAM

☐ New   ☐ Change   ☐ Eliminate   ☐ Add

CURRICULUM

☐ New   ☐ Change   ☐ Eliminate   ☐ Add

Title: 

Start Date: ☐ Fall   ☐ Spring   ☐ Summer I    ☐ Summer II   ☐ Summer III   ☐ Winter   Year: 

Old Catalogue Description: None: new program

New Catalogue Description: APPLIED STATISTICS: A student can minor in Applied Statistics by taking the following 21 credits: Math 210 (Elementary Statistics), Math 219 (Sampling Techniques and Survey Research Methods), Math 309 (Probability), Math 319 (Bayesian Inferences and Risk Analysis), Math 333 (Computational Statistics and Computer Packages), Math 419 (Multivariate Statistics) and Math 310 (Mathematical Statistics 1) or Math 360 (Statistics for Scientists).

Prerequisites: 


Co-requisites: 


Course Outline (Topics Only): 


Course Objectives:


Course Learning Outcomes:


Effects on staff and/or facility:


Lab Fee (if required):


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Revised 12/4/14
Proposal for a Minor in Statistics

"Usually the name Statistics does not appear in either the list of undergraduate departments or that of undergraduate majors from which entering students choose. Statistics is thus not seen as a Discipline, nor as a possible career . . . Statistics has completely missed the opportunities for recruitment that occur during freshman college enrollment. The availability of undergraduate degree programs would remedy this". Paul D. Minton

In the past most statisticians learned about statistics as graduate students having earned an undergraduate degree in another field, such as mathematics. According to the American Statistical Association President Robert H Rodriguez in his President’s Comment August 1st 2012 “… although bachelor’s degree programs in statistics existed as early as the 1940s, the number of degrees granted remained small for decades”. He continued to state that a landmark in the evolution of undergraduate statistics programs was a 1983 article in The American Statistician by Paul Minton, who pointed out that the lack of such programs, diminished the recognition of statistics as a discipline. However, it was not until 15 years ago, when more high-school students began taking Advanced Placement (AP) Statistics, that the numbers of college majors and minors in statistics began to climb. Today, that number is at an all-time high and the demand is getting higher as more disciplines including social sciences and even politics requires probabilistic and statistical reasoning and evidence that is largely developed via statistical methods and theory.

In 2001, the American Statistical Association recognized a list of curriculum guidelines for BS degrees in statistics (see: www.amstat.org/education/pdfs/BS-curriculum.pdf). At Cal Poly San Luis Obispo, where the number of students applying as statistics majors is on the rise, the program emphasized writing and communication skills, statistical programming, senior projects, and a capstone class that exposes students to working with clients. Graduates are highly employable, often receiving multiple offers. At Brigham Young University, a strong background in mathematics is essential for majors considering graduate school in statistics or biostatistics. The department now offers three undergraduate degrees with distinct goals: statistical science as preparation for graduate work, actuarial science as preparation for an actuarial career, and applied statistics/analytics as preparation for corporate environments in which such skills are in demand.

Successful undergraduate programs anticipate and deliver the training their students will require when they move into employment or graduate studies, whether in statistics or another field. For business-minded students, graduate programs in analytics is an increasingly attractive option. Considering the strong demand in business, government, and scientific research for skills needed to analyze Big Data, classroom opportunities for students deal with large data sets are essential.

A review of AmStat News, Amstat Online, and the web sites of companies advertising in Amstat News, found employers including the Mayo Clinic, Cleveland Clinic, Environmental Risk Analysis, GMAC, Census Bureau, Bureau of Labor Statistics, and others advertising bachelor’s level jobs with varied titles such as data coordinator, risk management analyst, SAS programmer, medical statistician, quality analyst, and, of course, statistician and statistical analyst. These ads shared an emphasis on the ability to analyze data, interpret results, review trends, write reports, manage data bases, and program in SAS. Together with data mining, data warehousing, neural networking, and predictive modeling are included in our undergraduate program as endeavors that require statistical thinking.

On May 25, 1999, the Undergraduate Statistics Education Initiative (USEI) later on sponsored by the American Statistical Association (ASA) worked as a body of representatives from the industry, academia, government and NSF. They deliberated and stated vision and mission statements. The vision is for student to have ample opportunities to avail themselves of sound undergraduate educational programs in quantitative reasoning,
receive a broad quantitative foundation for further study in specialized disciplines, and have increased quantitative literacy within the modern workforce. The mission is to expand and improve undergraduate statistical education through organizing symposia and workshops to create guidelines for programs marketing the potential for programs in, and products of statistical education, and supporting the continuing development and delivery of modern statistics curricula. Many activities followed as a continuation of the USEI in Alexandria VA followed by a symposium entitled, “Improving the Workforce of the Future: Opportunities in Undergraduate Statistics Education,” held August 12 and 13, 2000 in Indianapolis, Indiana.

In the paper entitled: “Curriculum Guidelines for Bachelor of Science Degrees in Statistical Science” (G. Rex Bryce, et al) the conclusive remark was: “We emphasize that at many institutions (particularly liberal arts colleges), the statistics degree must also be marketed to mathematicians. A second document entitled, "Curriculum Guidelines for Bachelor of Arts Degrees in Statistical Science" (Tarpey, et al., 2001) addresses the issues involved in offering statistics degrees within mathematics departments. In addition a paper that develops the ideas from the workshop and symposium relative to minors is being prepared for publication in the Journal of Statistical Education.” That is why it is natural for UMES to consider the minor within the Department of Mathematics and Computer Science. Additionally, all the brochures, mission(s) and catalogs of this Department for at least 12 years explicitly stated statistics as an area of focus and specialization of this department; it is time for that long time capacity to be realized in terms of educational opportunity for our students and formalized in terms of an Applied Statistics Minor. Fortunately, much of the necessary coursework already exists among our current offerings. Four new offerings will be proposed and offered within existing resources. The new course proposals are currently under review:

**MATH 333 Computational Statistics and Computer Packages**
This course encourages the application of computer statistical methods and using statistical packages in general with focus on Multiple Regression, ANOVA, Graphical Representations and Exploration, Design of Experiments and other statistical analyses, and simulation using random variable generators. This may include SAS, SPSS, and R-Programming among others.  
*Prerequisites:* MATH 210 or MATH 310 or MATH360 or permission of the instructor

**MATH 219 Sampling Techniques and Survey Research Methods**
This course covers scientific data collection methods, sampling techniques, Exploratory Analysis, Social Research Survey Principles and Design, Cross Tabulations, Chi-Square Fitness Tests, and quantitative research methods. The course will also serve non-exact humanities and social science students.  
*Prerequisites:* MATH 210

**MATH 319 Bayesian Inferences and Risk Analysis**
*Prerequisites:* MATH 310 or MATH360 or permission of the instructor.

**MATH 419 Multivariate Statistics**
This course introduces Multivariate Normal (and other) Distributions, Matrix-based Models and Eigenvalues and Vectors analysis, MANOVA; Principal Components, Discrimination Analysis, Classification and introduction to Demography and Population Studies.  
*Prerequisites:* MATH 310/MATH360 or permission of the instructor.
PROPOSAL FOR COURSE, PROGRAM OR CURRICULUM CHANGE

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School:  ☐ Ag & Natural Sciences  ☐ Arts and Professions  ☐ Business and Technology
        ☐ Health Professions  ☐ Library Services

DEPARTMENT  Mathematics and Computer Science

☐ Change  ☐ Eliminate  ☐ Add

Prefix & Number  
Credit Hours: 

Title:

Start Date: ☐ Fall  ☐ Spring  ☐ Summer I  ☐ Summer II  ☐ Summer III  ☐ Winter  Year: 

NEW COURSE

Prefix & Number  
Credit Hours: 

Title:

Start Date: ☐ Fall  ☐ Spring  ☐ Summer I  ☐ Summer II  ☐ Summer III  ☐ Winter  Year: 
PROGRAM

☐ New ☒ Change ☐ Eliminate ☐ Add

Title: Minor Programs

Start Date: ☒ Fall ☐ Spring ☐ Summer I ☐ Summer II ☐ Summer III ☐ Winter Year: 2015

CURRICULUM

☐ New ☐ Change ☐ Eliminate ☐ Add

Title:

Start Date: ☐ Fall ☐ Spring ☐ Summer I ☐ Summer II ☐ Summer III ☐ Winter Year:

Course Title:

Old Catalogue Description: MINOR PROGRAMS

The Department offers a minor in both Computer Science and in Mathematics as well as a graduate program leading toward an M.S Degree in Applied Computer Science (unique in the state of Maryland). A grade of "C" or better is required in the courses taken to satisfy the minor. In accordance with the particular guidelines given below, specific minor programs for individual students will be set up and approved by the Chair of the Department, or a designee, in consultation with the student involved. Students in a program (like computer science directed toward science or business) that requires Calculus I or the first computer course cannot do any of our minors since all these specifically require MATH 112 or CSDP 221.

For double majors, students are allowed to substitute other upper-level courses, approved by the chair, for such duplicate required courses.

MATHEMATICS: A student can minor in Mathematics by taking 20 credits in Mathematics including Math 112 (Calculus I), Math 211 (Calculus II) and at least three 3-credit 300 and 400 level courses in Mathematics. A 3-credit 300 or 400 level computer science course may be used in place of one of the 300 or 400 level mathematics courses.

COMPUTER SCIENCE: A student may minor in Computer Science by taking the following courses: CSDP 221 (Introduction to Computer Programming: Intensive), CSDP 222 (Advanced Programming), CSDP 250 (Data Structures), CSDP 332 (Internet Programming), and two 3-credit 400-level computer science courses. Twenty (20)
credits are needed for the minor in Computer Science.

COMPUTER SCIENCE WITH BUSINESS FOCUS: A student may minor in Computer Science with business focus by taking the following courses: CSDP 221 (Introduction to Computer Programming: Intensive), CSDP 222 (Advanced Programming), CSDP 250 (Data Structures), CSDP 332 (Internet Programming), CSDP 404 (Data base management), CSDP 407 (Advanced Data base management). Twenty (20) credits are needed for the minor in Computer Science with Business Focus.

New Catalogue Description: The Department offers a minor in both Computer Science, Computer Science towards Business, Mathematics, and Applied Statistics.

A grade of “C” or better is required in courses taken to satisfy the minor. In accordance with the particular guidelines given below, specific minor programs for individual students will be set up and approved by the Chair of the Department, or a designee, in consultation with the student involved.

For all minors and for double majors, students are allowed to substitute other upper-level courses, approved by the Chair, for any required courses which are also required by another major or minor that the student is pursuing.

MATHEMATICS: A student can minor in Mathematics by taking 20 credits in Mathematics including Math 112 (Calculus I), Math 211 (Calculus II) and at least three 3-credit 300 and 400 level courses in Mathematics. A 3-credit 300 or 400 level computer science course may be used in place of one of the 300 or 400 level mathematics courses.

COMPUTER SCIENCE: A student may minor in Computer Science by taking the following courses: CSDP 221 (Introduction to Computer Programming: Intensive), CSDP 222 (Advanced Programming), CSDP 250 (Data Structures), CSDP 332 (Internet Programming), and two 3-credit 400-level computer science courses. Twenty (20) credits are needed for the minor in Computer Science.

COMPUTER SCIENCE WITH BUSINESS FOCUS: A student may minor in Computer Science with business focus by taking the following courses: CSDP 221 (Introduction to Computer Programming: Intensive), CSDP 222 (Advanced Programming), CSDP 250 (Data Structures), CSDP 332 (Internet Programming), CSDP 404 (Data base management), CSDP 407 (Advanced Data base management). Twenty (20) credits are needed for the minor in
Computer Science with Business Focus.

**APPLIED STATISTICS:** A student can minor in Applied Statistics by taking the following 21 credits: Math 210 (Elementary Statistics), Math 219 (Sampling Techniques and Survey Research Methods), Math 309 (Probability), Math 319 (Bayesian Inferences and Risk Analysis), Math 333 (Computational Statistics and Computer Packages), Math 419 (Multivariate Statistics) and Math 310 (Mathematical Statistics I) or Math 360 (Statistics for Scientists).

**Prerequisites:**

**Co-requisites:**

**Course Outline (Topics Only):**

**Course Objectives:**

**Course Learning Outcomes:**

**Effects on staff and/or facility:** None

**Lab Fee (if required):** None
# Signatures for Approval

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<th>Role</th>
<th>Date Received</th>
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<tr>
<td>Chair, Departmental Curriculum Committee</td>
<td>24 Sept 2014</td>
<td>30 Sept 2014</td>
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<td>Chair, Department Curriculum Committee (non-departmental courses only if applicable)</td>
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<td>Department Chair:</td>
<td>11/1/14</td>
<td>12/8/14</td>
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<td>Chair, School Curriculum Committee</td>
<td>3/10/2015</td>
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<td>Graduate Office (if a graduate program):</td>
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<td>Chair, Senate Academic Affairs Committee</td>
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Revised 12/2/14