New Undergraduate Course Proposal Form

1. Department and Contact Information

<table>
<thead>
<tr>
<th>Tracking Number</th>
<th>Date &amp; Time Submitted</th>
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<td>2010-01-19 14:47:26</td>
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<tr>
<th>Department</th>
<th>College</th>
<th>Budget Account Number</th>
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<tbody>
<tr>
<td>Mathematics and Statistics</td>
<td>Arts &amp; Sciences</td>
<td>1249000</td>
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<table>
<thead>
<tr>
<th>Contact Person</th>
<th>Phone</th>
<th>Email</th>
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<tbody>
<tr>
<td>Leslaw Skrzypek</td>
<td>974-1268</td>
<td><a href="mailto:skrzypek@usf.edu">skrzypek@usf.edu</a></td>
</tr>
</tbody>
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2. Course Information

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Number</th>
<th>Full Title</th>
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<tbody>
<tr>
<td>STA</td>
<td>4102</td>
<td>Computational Methods for Applied Statistics</td>
</tr>
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Is the course title variable? N
Is a permit required for registration? N
Are the credit hours variable? N

<table>
<thead>
<tr>
<th>Credit Hours</th>
<th>Section Type</th>
<th>Grading Option</th>
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<tbody>
<tr>
<td>3</td>
<td>Class Lecture (Primarily)</td>
<td>Regular</td>
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<table>
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<tr>
<th>Total Clock Hours</th>
<th>Abbreviated Title (30 characters maximum)</th>
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<tr>
<td>45</td>
<td>Computational Statistics</td>
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**Prerequisites**

STA 2023 and STA 3024.

**Corequisites**

none

**Co-Prerequisites**

none

**Course Description**

This course introduces fundamentals of the R and SAS statistical software packages. Topics include data manipulation, graphs, regression, ANOVA, hypothesis testing, and non-parametric tests.

3. Justification

A. Indicate how this course will strengthen the Undergraduate Program. Is this course necessary for accreditation or certification?

This is a required course for undergraduate statistics majors. It will expose them to statistical software packages and will require them to use these packages to explore several topics. The course is also intended to meet the computer programming language requirement that is part of the state-mandated common prerequisites for statistics majors. The course is not needed for accreditation or certification.

B. What specific area of knowledge is covered by this course which is not covered by courses currently listed?

Most of the topics introduced in this course are covered in more depth in other statistics courses. The focus in this course is on the use of statistical software. No other undergraduate stat courses have this specific focus.

C. What is the need or demand for this course? (Indicate if this course is part of a required sequence in the major.) What other programs would this course service?
The course will serve the dual purpose of being required for the statistics major and also counting as a computer programming course, which is a state requirement for all stat majors.

D. Has this course been offered as Selected Topics/Experimental Topics course? If yes, what was the enrollment?

Yes. The course has been offered in each of the last three fall semesters, with enrollments of 11, 14, and 12, respectively

E. How frequently will the course be offered? What is the anticipated enrollment?

Once a year in the fall.

F. Do you plan to drop a course if this course is added? If so, what will be the effect on the program and on the students? (Please forward the nonsubstantive course change form regarding the course to be deleted to the Council secretary.)

No course will be dropped to accommodate the addition of this course

G. What qualifications for training and/or experience are necessary to teach this course? (List minimum qualifications for the instructor.)

Ph. D (or ABD) in Statistics, or PhD (or ABD) in Mathematics with Concentration in Statistics

4. Other Course Information

A. Objectives AND Outcomes

Students will learn how to create data arrays, the algorithms necessary to manipulate the data array and obtain descriptive statistics. Students will learn how to manipulate multiple data arrays, the coding behind correlation analysis, regression analysis and residual analysis. Students will create graphic printouts and convert them to more conventional software such as Word for presentation. Students will be able to create one-way and two-way ANOVA tables and perform other basic hypothesis testing such as multiple comparison of means. This is a required course for undergraduate statistics major. It meets the state-mandated computer programming requirements for stat majors.

B. Major Topics

Data manipulation, graphs, regression, ANOVA, hypothesis testing, and non-parametric tests. Programming with R and SAS.

C. Textbooks

Introductory Statistics with R, P. Dalgaard

5. Syllabus

Your college will forward an electronic copy of your syllabus to Undergraduate Studies when your course is approved for submission.
STA 4102 001 – Fall 2010
Computational Methods for Applied Statistics – 3 credit hours

Instructor: TBD (Dept. of Math & Statistics, College of Arts & Sciences)

Office: TBA
Phone: TBA

Office Hours: TBA
Email: TBA

Course Meeting Times: TBD in TBA

Prerequisite(s): STA 3024

Course Description: This course introduces fundamentals of the R and SAS statistical software packages. Topics include data manipulation, graphs, regression, ANOVA, hypothesis testing, and non-parametric tests.

Course Objectives: Students will learn how to create data arrays, the algorithms necessary to manipulate the data array and obtain descriptive statistics. Students will learn how to manipulate multiple data arrays, the coding behind correlation analysis, regression analysis and residual analysis. Students will create graphic printouts and convert them to more conventional software such as Word for presentation. Students will be able to create one-way and two-way ANOVA tables and perform other basic hypothesis testing such as multiple comparison of means. This is a required course for undergraduate statistics majors. It meets the state-mandated computer programming requirement for stat majors. This is a required course for undergraduate statistics majors. It meets the state-mandated computer programming requirement for stat majors.

Text: Introductory Statistics with R, P. Dalgaard

References:
(1) An Introduction to R (http://cran.r-project.org/doc/manuals/R-intro.pdf)
(2) Practical Regression and Anova using R (http://cran.r-project.org/doc/contrib/Faraway-PRA.pdf)
(3) Use Software R to do Survival Analysis and Simulation. A tutorial (http://www.ms.uky.edu/~mai/Rsurv.pdf)

Software: Students will need to obtain a copy of the statistical software package R. This can be downloaded for free at http://www.r-project.org. Students will also work with the statistical package SAS (http://www.sas.com).
Course Grades: The university’s +/- grading policy will be used in assigning course grades. If your overall percentage of total points falls into the following range, you will receive the corresponding grade:

- 97-100 (A+), 93-96 (A), 90-92 (A-), 87-89 (B+), 83-86 (B), 80-82 (B-),
- 77-79 (C+), 73-76 (C), 70-72 (C-), 67-69 (D+), 63-66 (D), 60-62 (D-), 0-59 (F).

Homework: Approximately six homework sheets will be assigned. The lowest homework score will be dropped. Late homework will not be accepted. Students are expected to work independently on all homework assignments.

Project: A course project will be assigned. The instructor will provide more information about the nature of this project. Late submission of projects will be not accepted.

Project Presentation: Students will present their projects during the last week of classes. Students unable to present the project should make the arrangements with the instructors.

Exams: Three exams will be given during the semester. The tentative dates for the exams are:
- Exam 1 (Paper Exam): TBD (Week 4)
- Exam 2 (Computer Exam): TBD (Week 8)
- Exam 3 (Take-Home Exam): TBD (Week 12)

The lowest of your three exam scores will be dropped.

Makeup Exams: Makeup exams will be given at the discretion of the instructor. Thorough documentation of the student’s reason for missing an exam must be provided before a makeup will be considered.

Attendance: Attendance is expected and will be checked periodically.

Grading: Best two Exam Scores (of three): 20% each; Homework: 15%; Project: 15%; Project Presentation: 30%

Retaining Records: You should keep all of your returned homework and exams until you receive your final grade. You will need these to demonstrate that a grade was incorrectly recorded, should that happen.

Contingency Course Plan: In the event of an emergency, it may be necessary for USF to suspend normal operations. During this time, USF may opt to continue delivery of instruction through methods that include but are not limited to: Blackboard, Elluminate, Skype, and email messaging and/or alternate scheduling. It is the responsibility of the student to monitor the main USF website, emails and MoBull messages for important information about the closure. For information about the continuation of instruction, students are directed to their individual blackboard course sites.

Miscellaneous Policies:
• *Please* do not hold conversations, either with your classmates or your cell phone, during the lecture sessions. (Turn your cell phone off and keep it out of sight at all times.)

• Cheating will **not** be tolerated. Please refer to the Undergraduate Catalog for clarification of the university policy on Academic Dishonesty.

• Students who must miss a class period due to a major religious observance must notify the instructor of this absence, in writing, by the end of the second week of classes.

• Any student with a disability is encouraged to meet privately with the instructor during the first week of classes to discuss accommodations. The student must bring a current Memorandum of Accommodations from the Office of Student Disability Services (SVC 1133). This is a prerequisite for receiving accommodations. Exam accommodations through SDS usually require two weeks advance notice.

  Note: If you need extra time on exams, you **must** make arrangements to take your exams with the SDS office. You **cannot** receive extra time if you choose to take your exams with the course instructor.

• You are encouraged to take notes during lectures, but your notes are not to be sold.

• All unauthorized recordings of class are prohibited. Recordings that accommodate individual student needs must be approved in advance and may be used for personal use during this semester only; redistribution is prohibited.

• The last day to withdraw from this course and receive a tuition refund is Friday, TBD (by 5:00 p.m.). Students who have not registered or paid for this course by this date and time must stop attending, unless the instructor has given written permission otherwise.

• The last day to withdraw from this course and receive a grade of “W” is Saturday, TBD (by 5:00 p.m.).

• S-U Policy: Students who want to take this course for a grade of S-U must sign the S-U contract no later than the end of the third week of classes. There will be no exceptions.

• A grade of “I” indicates incomplete work and will only be considered when most of the coursework has already been completed with a passing grade (C or better).

**Tentative Course Outline:**

1. Data Manipulation
2. Graphs
3. Parametric Hypothesis Testing
   a. Test Statistics and critical region
   b. Significance and p-values
   c. One sided and two-sided tests
   d. Tests based on a single Normal sample
   e. Comparative tests based on two Normal samples
   f. Tests based on Binomial samples
4. Non-Parametric Testing
   a. Anderson-Darling test
   b. Cochran’s Q
   c. Friedman two-way analysis of variance by ranks
   d. Kendall’s tau
   e. Kolmogorov-Smirnov test
   f. Kruskal-Wallis one-way analysis of variance
   g. Mann-Whitney U
   h. Median test
   i. Turkey test
   j. Wilcoxon signed-rank test

5. ANOVA
   a. One-Way Anova
   b. Two-Way Anova

6. Regression
   a. Linear Model
   b. Matrix Representation
   c. Least squares estimation
   d. Goodness of Fit

7. Survival Analysis
   a. Kaplan-Meier and Nelson-Aalen estimator
   b. The Log-rank test and relatives
   c. Parametric regression models
   d. Cox regression models
   e. Simulation : Model comparison

8. Categorical Data Analysis