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| Department |      Math | College | Science |
| Course Rubric & Number | Math 4056 | Date | 11-11-2014 |

**FORM C**

**ADMINISTRATIVE**

**USE ONLY**

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|  | UACM |  | UPRE |
|  | UREL |  | HIST |
|  | DIST |  | ESP |
|  | CAT |  |  |

Effective: \_\_\_\_\_\_\_\_\_\_\_

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| Present Course Description |
| Title |      Mathematical Statistics |
| Semester Hours of Credit |      3 |
| If combination course type, # hrs. of credit for  | Lecture: 3 | Lab/Sem/Rec: 0 |
| Repeat Credit Max. (if repeatable): | N |
| Graduate Credit? | Yes X | No      |
| Credit will not be given for this course and: |       |
| Contact Hours Per Week: (Indicate hours in appropriate course type.) |
| Lecture   3   | Lab  0    | Seminar   0   | Recitation   0   | Res/Ind  0    | Clin/Pract   0   |
| Total Weekly Contact Hours: 3 |       |
| Grading System: | Letter Grade X | Pass/Fail       |
| Course Description: (Include course number, title, etc. exactly as it appears in the *General Catalog*)Prereq.: MATH 3355. Suggested for preparation for actuarial exams. Experimental design, sampling methods, nonparametric methods, hypothesis testing and regression. |

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| Proposed Course Description |
| Title |       Mathematical Statistics |
| Short Title | M |  A TTTTTTTT    |  T     |  H     |  E     |  M     |  A     |  T     |  I     |  C     |  A     |  L     |       |  S     |  T     |  A     |  T     |       |       |
| Semester Hours of Credit |      3 |
| If combination course type, # hrs. of credit for  | Lecture: 3 | Lab/Sem/Rec:      |
| Repeat Credit Max. (if repeatable): | N |
| Graduate Credit? | X Yes |      No |
| Credit will not be given for this course and: |       |
| Contact Hours Per Week: (Indicate hours in appropriate course type.) |
| Lecture 3 | Lab 0     | Seminar   0   | Recitation   0   | Res/Ind   0   | Clin/Pract  0    |
| Total Weekly Contact Hours: 3 |       |
| Grading System: | Letter Grade X | Pass/Fail       |
| Course Description: (Include course number, title, etc. exactly as it appears in the *General Catalog*)Prereq.: MATH 3355. Statistical inference including hypothesis testing, estimators, and goodness-of-fit. Analysis of time series including moving-average, regression, autoregressive, and autoregressive-moving-average models. |

**THESE QUESTIONS MUST BE ANSWERED COMPLETELY AND ACCURATELY OR PROPOSAL WILL BE RETURNED.**

Has this change been discussed with and approved by all departments/colleges affected? **Yes** **No****N/A X\_**

Is this course included in any curricula, concentrations, or minors? **Yes \_X\_ No**If yes, please list on a separate sheet.

Is this course a prerequisite or corequisite for other courses? **Yes****No****\_X\_** If yes, list courses; use separate sheet.

Is this course on the General Education list? **Yes****No** **X**

**JUSTIFICATION/EXPLANATION:** Use separate sheet.

**Note:** IF COURSE IS OR WILL BE CROSS-LISTED, SEPARATE FORMS MUST BE SUBMITTED BY EACH DEPARTMENT.

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| Approvals |
| Department Faculty Approval Date |       | College Faculty Approval Date |       |

\_Charles Delzell\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Department Chair Signature (date) College Dean Signature (date)

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Graduate Dean Signature (date) Chair, FS C&C Committee (date)

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College Contact E-mail Academic Affairs Approval (date)

NOTE: Form C is not to be used for changes in course rubric or numbering. When the number/rubric of a course is being changed, Form A *and* Form B must be submitted to add the course with the new number/rubric and to drop the course with the original number/rubric.

**One original copy of each request must be submitted.**

All questions must be answered. The course proposal will be delayed until the form is filled out completely and correctly. Proposals should be submitted early enough to obtain final approval before the desired effective date.

**Dates** of departmental and college approval of the proposal must be recorded. The Faculty Senate Courses and Curricula Committee will not consider curricular proposals that have not been approved by college/departmental curriculum committees. Please provide the **college/division/departmental contact’s name and email address**, in case of further questions/concerns that may be related to the proposal.

Most items are self-explanatory. The complete present and proposed catalog entries must be provided. Proposed **course descriptions** should follow standard catalog format (See Appendix C for a key to catalog abbreviations and standard catalog wording). Although there is no specific word limit, course descriptions should be concise.

The **short title** appears on transcripts and in the scheduling booklet. It may not exceed 19 characters.

For group courses (lecture, lab, seminar, recitation) **contact hours** refer to the number of hours spent each week with faculty in a classroom or lab setting. For lecture, seminar, and recitation courses, contact hours are generally equal to semester credit hours. For laboratory courses, two or more laboratory contact hours are required to yield a single laboratory credit hour. For individual courses (such as research/ independent study, clinical practicum, or internships) contact hours are less well defined, as these courses may involve minimal contact with faculty in classroom settings. For these courses, contact hours are generally set to equal the maximum number of credit hours permitted for the course.

Departments with curricula that include this course and/or courses for which this course is a prerequisite or corequisite must be identified and notified in writing. Any responses from colleges/departments affected by the proposal should be attached to form C. **If changes to this course affect any curricula, concentrations or minors, separate proposals to change any affected areas must also be submitted before this proposal will be presented to the Faculty Senate Courses and Curricula Committee.**

If the course is on the general education list, the Faculty Senate General Education Committee must also be notified by the department.

If the course is cross-listed, catalog descriptions for both departments and approval signatures of each dean and chair concerned should be submitted.

**Justification**

MATH 4056 is required in two mathematics concentrations: Actuarial Science and Mathematical Statistics. Student enrollment in MATH 4056 is primarily from the Actuarial Science concentration since Actuarial Science has more than 3 times the enrollment of the Mathematical Statistics. Credentialing for actuaries from the Society of Actuaries has components satisfied through a series of exams and through Validation through Educational Experience (VEE). The VEE requirements in statistics are met in a series of two required courses: EXST 3201 (for regression) and MATH 4056 (time series). The newly submitted description makes clear that time series is covered in MATH 4056. The syllabus reflects the way the course is presently taught and was described to the Society of Actuaries in order to gain VEE credit. Note that “Suggested preparation for actuarial exams” is dropped from the catalog description, as the Society of Actuaries has not explicitly examined the subject for 15 years.

**Courses, Curricula, Colleges, Offices, Concentrations, and Minors that mention Math 4056**

A. *College of Science*

A.1. Minor in Math.

A.2. Concentration in Mathematical Statistics, Curriculum in Math (Department of Math).

A.3. Concentration in Actuarial Science, Curriculum in Math (Department of Math).

**MATH 4056: Mathematical Statistics**

**Instructor:** TBA

**Office hours:** TBA

**Format:** This is a 3-credit lecture course. Students are expected to spend a minimum of 6 hours per week on reading and homework outside of class.

**Prerequisite:** Probability Theory (MATH 3355)

**Overview:** The aim of the course is to understand the mathematical theory of statistical inference. The emphasis will be on the conceptual understanding of the material, and the underlying mathematical methods. Homework will be assigned most weeks. Attendance of classes is very important.

**Academic Integrity:** Cheating will not be tolerated and students are required to abide by the LSU Code of Student Conduct. Students may not use cell phones, apple watches, or any other electronic device in an exam that is not explicitly approved by the instructor prior to the exam.

**Required Texts:**

Introduction to Statistical Theory by P. G. Hoel, S. C. Port and C. J. Stone.

Course notes by P. Sundar.

**Grading system:** There will be two tests, ten homework assignments, ten quizzes, and a final examination. The weight of each element is as follows:

Test 1: 20%

Test 2: 20%

Homework: 25%

Quizzes: 10%

Final Exam: 25%

**Grading scale:** The course grade will be decided by averaging the weighted scores from the items in the grading system. The cut-offs for course grades are:

A: 85% - 100%

B: 75% - 84%

C: 60% - 74%

D: 40% - 59%

**Topics:**

1. (1 week) Sampling distributions: Normal, Chi-squared, t and F distributions, and their properties.

2. (1 week) Unbiased estimators and Cramer-Rao lower bound, efficiency.

3. (1 week) Maximum likelihood estimators and Bayesian estimators.

4. (1 week) Testing of Hypotheses: Neyman-Pearson Lemma, and most powerful tests.

5. (1 week) Likelihood ratio tests, Uniformly most powerful tests.

6. (1 week) Two-sample problems, approximate tests of hypothesis.

7. (1 week) Goodness of fit tests and contingency tables.

8. (1 week) Confidence Intervals: Exact and approximate confidence intervals.

9. (1 week) Regression Analysis: Simple linear regression, estimation, tests and confidence intervals for regression coefficients.

10. (1 week) Multiple linear regression analysis, residual analysis and best fit.

11. (1 week) Time-Series Analysis: moving average (MA) models, exponential smoothing.

12. (1 week) Evaluation of MA models and forecasts.

13. (1 week) Regression models in time series, evaluation and forecasts.

14. (1 week) Autoregressive (AR) models. And ARMA models.