Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person(s) **Russell Stocker**	Email Address **rstocker@iup.edu**
Proposing Department/Unit **Mathematics**	Phone **357-3798**

Check all appropriate lines and complete all information. Use a separate cover sheet for each course proposal and/or program proposal.

1. Course Proposals (check all that apply)

[✓] New Course   [ ] Course Prefix Change   [ ] Course Deletion

[ ] Course Revision   [ ] Course Number and/or Title Change   [ ] Catalog Description Change

Current course prefix, number and full title: **MATH 411 (Univariate Data Analysis)**

Proposed course prefix, number and full title, if changing:

2. Liberal Studies Course Designations, as appropriate

This course is also proposed as a Liberal Studies Course (please mark the appropriate categories below)

[ ] Learning Skills   [ ] Knowledge Area   [ ] Global and Multicultural Awareness   [ ] Writing Across the Curriculum (W Course)

[ ] Liberal Studies Elective (please mark the designation(s) that applies – must meet at least one)

    [ ] Global Citizenship   [ ] Information Literacy   [ ] Oral Communication

    [ ] Quantitative Reasoning   [ ] Scientific Literacy   [ ] Technological Literacy
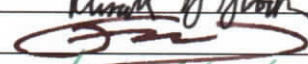
3. Other Designations, as appropriate
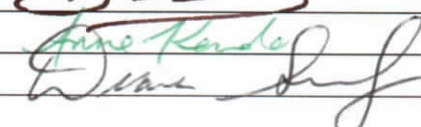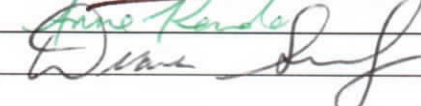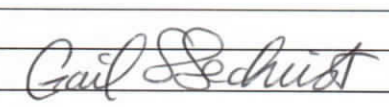
[ ] Honors College Course   [ ] Other: (e.g. Women's Studies, Pan African)

4. Program Proposals

[ ] Catalog Description Change   [ ] Program Revision   [ ] Program Title Change   [ ] New Track

[ ] New Degree Program   [ ] New Minor Program   [ ] Liberal Studies Requirement Changes   [ ] Other

Current program name:

Proposed program name, if changing:

5. Approvals

Approvals	Signature	Date
Department Curriculum Committee Chair(s)	*Russell D Stocker IV*	8/25/2014
Department Chairperson(s)	*[signature]*	8/25/14
College Curriculum Committee Chair	*Anne Kondo*	9/16/14
College Dean	*[signature]*	9/22/14
Director of Liberal Studies (as needed)		
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs	*Gail Sechrist*	10/23/14

I. Catalog Description

MATH 411 Univariate Data Analysis   (3c-0l-3cr)
Prerequisites: MATH 214, 216, or 217 or permission of the instructor.

An applied statistics course in descriptive statistics, statistical inference procedures, regression analysis, analysis of variance, and analysis of deviance. Inference procedures for population means and proportions are developed. Simple linear regression, multiple linear regression, one way ANOVA, two way ANOVA, Poisson regression, and logistic regression models are used to analyze data. Emphasizes the applied aspects of these statistical models and uses computer software for data analysis.

II. Course Outcomes

Students completing this course will be able to

1. Create and interpret both numerical descriptive statistics and graphical displays of data.
2. Construct and interpret confidence interval estimates of parameters.
3. Evaluate statements about populations using statistical hypothesis testing.
4. Model and make statistical inferences about populations using the general linear regression model.
5. Model and make statistical inferences about populations using the generalized linear regression model.

III. Detailed Course Outline

A. Review of Basic Statistical Methods (3 hours)
1. A review of numerical descriptive statistics including measures of central tendencies, measures of dispersion, and measures of position.
2. A review of graphical and tabular displays of data including frequency distributions, bar charts, histograms, and box plots.

B. Statistical Inference Procedures for Population Proportions (5 hours)
1. Hypothesis testing and confidence intervals for the population proportion.
2. Hypothesis testing and confidence intervals for comparing two population proportions.
3. Tests of independence and homogeneity.

C. Statistical Inference Procedures for Population Means (6 hours)
1. Hypothesis testing and confidence intervals for the population mean.
2. Hypothesis testing and confidence intervals for comparing two population means.
3. The one factor analysis of variance for comparing several population means.
4. Multiple comparison procedures for controlling experimental error rate.

Exam 1 (1 hour)

D. The Simple Linear Regression Model (4 hours)

1. Statement of the simple linear regression model with the assumption of normally distributed errors.
2. Estimators of the regression coefficients and the estimator of the variance.
3. Statistical inference procedures to make statements about the parameters.
4. Graphical and numerical methods for verifying the model assumptions.

E. The Multiple Linear Regression Model (8 hours)

1. Statement of the multiple linear regression model with the assumption of normally distributed errors.
2. Multiple linear regression with quantitative predictor variables.
3. Multiple linear regression with qualitative and/or quantitative predictor variables.
4. Polynomial regression model.
5. Graphical and numerical methods for verifying the model assumptions.

Exam 2 (1 hour)

F. Principles of Experimental Design (2 hours)

1. Defining and contrasting observational and experimental studies.
2. Basic concepts and designs of experimental studies.
3. Basic concepts and designs of observational studies

G. The Two Factor Analysis of Variance Model (5 hours)

1. Statement of the factor effects model with the assumption of normally distributed errors.
2. Difference between the additive and non-additive model.
3. Statistical inference procedures to make statements about the parameters.
4. Graphical and numerical methods for verifying the model assumptions.

H. Regression Analysis of Count Data (3 hours)

1. The Poisson distribution and its properties.
2. The nature of the problem and construction of the link function.
3. Obtaining parameter estimates and how to interpret them.
4. Statistical inference procedures to make statements about the parameters.
5. Graphical and numerical methods for verifying the model assumptions.

I. Regression Analysis of Binary Data (3 hours)

1. The nature of the problem and construction of the link function.
2. Obtaining parameter estimates and how to interpret them.
3. Statistical inference procedures to make statements about the parameters.
4. Graphical and numerical methods for verifying the model assumptions.

Exam 3 (1 hour)

Final Exam (2 hours)

IV. Evaluation Methods

The final grade in the course will be determined as follows:

60% Three in-class exams.

15% Homework. Homework will be regularly assigned and graded.

25% Final Exam. A cumulative final exam will be given during exam week.

V. Example Grading Scale:

The following is an example grading scale that could be used in the course:

A: $\geq$ 90% B: 80-89% C: 70-79% D: 60-69% F: < 60%

VI. Undergraduate Course Attendance Policy Attendance will conform to that outlined in the Undergraduate catalog.

VII. Required Textbooks(s), Supplemental Books and Readings

Freund, Mohr and Wilson (2010). *Statistical Methods*, 3rd ed. Academic Press.

VIII. Special Resource Requirements

There are no special resources or fees required for the course.

IX. Bibliography

Dobson, A. and Barnett, A. (2008), *An Introduction to Generalized Linear Models*, 3rd ed., Chapman and Hall.

Freund, R., Mohr, D., and Wilson, W. (2010), *Statistical Methods*, 3rd ed., Academic Press.

Kokoska, Stephen (2011), *Introductory Statistics: A Problem Solving Approach*, 1st ed, W.H. Freeman and Company.

Kunter, M., Nachtsheim, C., Neter, J., and Li, W. (2004), *Applied Linear Statistical Models*, 5th ed, McGraw-Hill.

Ott, L. and Longnecker, M. (2008), *An Introduction to Statistical Methods and Data Analysis*, 6th ed., Duxbury Press.

Course Analysis Questionnaire

A Details of the Course

A1 This course will be the first part of a new required core course sequence in the Applied Statistics minor. This course is designed for both majors and non-majors who are part of the Applied Statistics minor. No other courses in the department cover similar material.

A2 This course will require a change in the Applied Statistics minor. A comprehensive proposal for the revision of the Applied Statistics minor program will be submitted.

A3 This course has not been offered at IUP on a trial basis.

A4 This course will not be a dual-level course.

A5 This course is not to be taken for variable credit.

A6 Similar courses are offered at the following institutions.

> Texas Tech University: Applied Statistics I (STAT 5302)
>
> Georgetown University: Applied Statistics (MATH 240)
>
> Oregon State University: Introduction to Statistical Methods (ST 352)

A7 No professional society, accrediting authority, law or other external agency recommends or requires the content or skills of this proposed course.

B Interdisciplinary Implications

B1 This course will be taught by one instructor from the Mathematics Department.

B2 The content of this course does not overlap with any other at the University.

B3 This course will not be cross-listed with other departments.

C Implementation

C1 A new faculty member is not required to teach this course. The department currently offers MATH 417 every fall semester. The new proposed course will take the place of MATH 417 and MATH 417 will no longer be offered.

C2 Other resources:

(a) Space: The current space allocations in the department are adequate to offer this course.

(b) Equipment: The department has a computer laboratory in Stright 220 that is needed for demonstrating statistical software.

(c) Laboratory Supplies with other Consumable Goods: No laboratory supplies are needed for this course.

(d) Library Materials: Current library materials are adequate for this course.

(e) Travel Supplies: Travel supplies are not needed for this course.

C3 None of the resources for this course are funded by a grant.

C4 We plan to offer this course every academic year.

C5 We plan to offer one section of this course during a semester.

C6 Stright 220 has 30 computers available. Therefore we plan to accommodate 30 students in a section of this course.

C7 No professional societies recommend enrollment limits or parameters for a course of this nature.

C8 This course is not a distance learning course.

D Miscellaneous

No additional information is necessary.

Subject: RE: MATH proposals
   From: Edel Reilly <ereilly@iup.edu>
   Date: 09/16/14 02:07 PM
      To: 'Anne E Kondo' <akondo@iup.edu>

Yes,

Russ has contacted the Chair of Economics to let him know of the changes.

Edel

-----Original Message-----
From: Anne E Kondo [mailto:akondo@iup.edu]
Sent: Tuesday, September 16, 2014 1:20 PM
To: ereilly@iup.edu
Subject: MATH proposals

Dear Edel,
  I popped up to sign the MATH proposals, but didn't see any indication that
ECON was notified about MATH 417 being deleted. Has that been done?
Cheers,
Anne