

LSC Use Only Proposal No: \_\_\_\_\_ UWUCC Use Only Proposal No: 13-107a  
 LSC Action-Date: AP-1/30/14 UWUCC Action-Date: App-2/4/14 Senate Action Date: App-2/25/14

**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 214 Probability and Statistics for Business Majors

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

Received  
NOV 12 2013

**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 Intensive (include W cover sheet)

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

Liberal Studies  
Received  
JAN 31 2014  
Liberal Studies

**3. Other Designations, as appropriate**

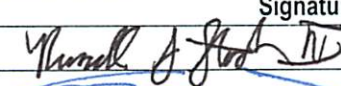
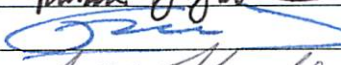
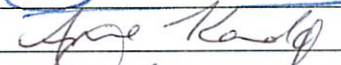
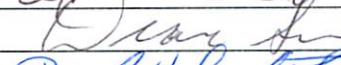
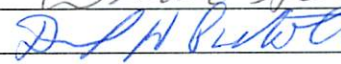

Honors College Course                       Other: (e.g. Women's Studies, Pan African)

**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	Signature	Date
Department Curriculum Committee Chair(s)		4/29/13
Department Chairperson(s)		4/29/13
College Curriculum Committee Chair		10/18/13
College Dean		10/21/13
Director of Liberal Studies (as needed)		1/31/14
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs		2/4/14

## Part II.

### 1. New Syllabus of Record

#### I. CATALOG DESCRIPTION

MATH 214 Probability and Statistics for Business Majors

3 class hours  
0 lab hours  
3 credits  
(3c-0l-3cr)

**Prerequisites:** None

Studies the methods of describing data, probability theory, discrete and continuous random variables, sampling distributions, estimation and tests of hypothesis for means, proportions and variance, and simple linear regression and correlation.

#### II. COURSE OUTCOMES

##### **Objective 1:**

Create and interpret the basic graphical representations of data.

##### **Expected Learning Outcomes 1 and 2:**

Informed and Empowered Learners

##### **Rationale:**

Assignments will require students to have a level of knowledge of graphical representations of data that will enable them to describe and summarize a set of data. Assignments will also require students to critically analyze, interpret, and use graphical representations of data from experiments and observations in order to draw inference to phenomena found in the natural, social, and or technical world.

##### **Objective 2:**

Calculate and interpret basic numerical descriptions of data.

##### **Expected Learning Outcomes 1 and 2:**

Informed and Empowered Learners

##### **Rationale:**

Assignments will require students to have a level of knowledge of descriptive statistics that will enable them to summarize a set of data. Assignments will also require students to critically analyze, interpret, and use numerical descriptions of data from experiments and observations in order to draw inference to phenomena found in the natural, social, and or technical world.

##### **Objective 3:**

Solve problems and make interpretations using discrete and continuous random variables and their probability distributions.

##### **Expected Learning Outcomes 1 and 2:**

Informed and Empowered Learners

##### **Rationale:**

Assignments will require students to have a level of knowledge of discrete and continuous variables and their probability distributions that will enable them to create population models. Assignments will also require students to interpret and

use the concepts of probability in drawing inferences about probabilistic events found in the natural, social, and or technical world.

**Objective 4:**

Solve problems and provide interpretations using sampling distributions and the central limit theorem.

**Rationale:**

Assignments will require students to have a level of knowledge of sampling distributions and the Central Limit Theorem that will enable them to choose appropriate statistical tools. Assignments will also require students to construct and interpret probability statements regarding sampling distributions found in the natural, social, and or technical world.

**Objective 5:**

Calculate and interpret point and interval estimates for population parameters.

**Expected Learning Outcomes 1 and 2:**

Informed and Empowered Learners

**Rationale:**

Assignments will require students to have a level of knowledge of confidence intervals that will enable them to estimate unknown characteristics of a population. Assignments will also require students to construct and interpret confidence intervals to draw inference to unknown characteristics of populations found in the natural, social, and or technical world.

**Objective 6:**

Solve problems and make interpretations using hypothesis testing.

**Expected Learning Outcomes 1 and 2:**

Informed and Empowered Learners

**Rationale:**

Assignments will require students to have a level of knowledge of tests of significance that will enable them to evaluate statements about unknown characteristics of a population. Assignments will also require students to perform and interpret tests of significance to answer research questions about phenomena in the natural, social, and or technical world.

**Objective 7:**

Examine social, political and economic justice using statistics.

**Expected Learning Outcomes 3:**

Responsible learners

**Rationale:**

Assignments in this course will require students to use statistical concepts to explore social issues more deeply. These assignments are designed to help students to apply statistical skills to real world social justice issues.

### **III. COURSE OUTLINE/TIME SCHEDULE**

1. Data Collection and different types of data. (3 hours)
2. Descriptive Statistics and graphical summaries. (2 hours)
3. Basic probability. (5 hours)
4. The Normal Probability Distribution. (3 hours)
5. Sampling Distributions for the mean and proportion. (5 hours)
6. Confidence Intervals for a single population mean and proportion. (6 hours)
7. Hypothesis Testing for a single population mean and proportion. (6 hours)
8. Inference on two population means. (5 hours)

This syllabus leaves an additional 7 hours for tests, other optional topics, etc. The final or culminating activity is an additional 2 academic hours.

### **IV. EVALUATION METHODS**

- 60% Three Tests (20% for each test) – Test will be given during the regular semester  
20% Final Examination. The final examination will be comprehensive.  
20% Homework, Quizzes, and Projects. These will cover textbook assignments and applications.

### **V. EXAMPLE GRADING SCALE**

90% - 100%	A
80% - 89%	B
70%-79%	C
60% - 69%	D
Below 60%	F

### **VI. UNDERGRADUATE COURSE ATTENDANCE POLICY**

Although there is no formal attendance policy for this class, student learning is enhanced by regular attendance and participation in class discussions. The University expects all students to attend class.

[Note: It is recommended that an attendance policy be developed by individual faculty and included in student syllabi. (See undergraduate catalog for Undergraduate Course Attendance Policy.)]

## VII. REQUIRED TEXTBOOKS, SUPPLEMENTAL BOOKS AND READINGS

Anderson, David R.; Sweeney, Dennis J & Williams, Thomas A (2012), *Statistics for Business and Economics* (11th ed.), South-Western, Cengage Learning.

### SUPPLEMENTAL READING:

Schneps L. and Colmez C. (2013). *Math on Trial: How Numbers Get Used and Abused in the Courtroom*.

## VIII. SPECIAL RESOURCES REQUIREMENTS

Calculator with statistical capabilities such as TI 83/84.

## IX. BIBLIOGRAPHY

Consortium for the Advancement of Undergraduate Statistics Education.  
(<http://www.causeweb.org/>).

Journal of Statistics Education Data Archive.  
([http://www.amstat.org/publications/jse/jse\\_data\\_archive.htm](http://www.amstat.org/publications/jse/jse_data_archive.htm)).

Mann, P. (2013). *Introductory Statistics (8<sup>th</sup> ed.)*. Wiley.

Larose, D.T. (2014). *Discovering the Fundamentals of Statistics (2<sup>nd</sup> ed.)*. New York, NY: W.H. Freeman.

Peck, R. (2013). *Statistics Learning From Data (1<sup>st</sup> ed.)*. Brooks/Cole: Cengage Learning.

## 2. SUMMARY OF PROPOSED REVISIONS

1. Objectives: Course objectives were aligned with the Expected Undergraduate Student learning Outcomes as part of Liberal Studies Elective Revisions.
2. Objectives 4 and 6 were combined as each objective covers the same content.
3. An additional objective has been included.
4. An additional supplementary reading was assigned that addresses responsible learners.

## 3. JUSTIFICATION

This course is a currently approved Liberal Studies elective and is being revised to meet the new curriculum criteria for quantitative reasoning. Below we give a justification on why this course meets the guidelines for quantitative reasoning.

Students in this course are engaged in the interpretation, analysis, and use of numerical and graphical data. This includes the use of descriptive statistics, histograms, boxplots, frequency and relative frequency tables to summarize data sets. These are also used in the modeling of populations and in statistical inference procedures applied to the business world.

Students in this course learn to apply quantitative techniques to problems within the business discipline. This includes the following:

- The use of probability to make statements about the business world. Examples include the use of probability distributions to estimate the number of shoppers who will return a certain item and the construction of probability models for the color of a car most preferred by customers.
- The use of confidence intervals and hypothesis testing to make statements about population proportions for applications in the business world. Examples include statements regarding the proportion of students who have at least three credit cards and statements comparing the proportion of males to those of females who will buy a certain product.
- The use of confidence intervals and hypothesis testing to make statements about population means in the business world. Examples include statements regarding the true mean expenses of business travelers and statements comparing the mean salary of male and female workers.

Students in this course develop deductive and non-deductive reasoning. They use descriptive statistics and graphical summaries to describe samples and or populations. Probability is naturally deductive in that it uses a basic set of axioms and deduces from them more general theories. The addition rule, complement rule, and multiplication rule are all derived in the course using this set of axioms. Lastly, students use statistical inferential procedures that use induction to make general statements about a population based on a sample of data. This includes using both confidence intervals and hypothesis testing.

## **Part II.**

### **4. Old syllabus**

#### **I. Catalog Description**

MATH 214 Probability & Statistics for Business Majors

3c-01-3cr

Prerequisites: None

(For students in the College of Business). Frequency distributions, measures of central tendency and variation, elementary probability, sampling, estimation, testing hypotheses. Emphasis will be on applications in the business field using appropriate technology, as opposed to theoretical development of topics.

#### **II. Course Outcomes**

Upon successful completion of this course, students will be able to:

1. Create and interpret the basic graphical representations of data
2. Calculate and interpret basic numerical descriptions of data.

3. Understand basic random discrete and continuous variables and their probability distributions.
4. Calculate and interpret point and interval estimates for population parameters.
5. Understand the concept of sampling distribution and the Central Limit Theorem and its applications.
6. Interpret a confidence interval.
7. Understand and apply the concepts of hypothesis testing and writing appropriate conclusions.

### III. Course Outline

- |   |           |
|---|-----------|
| 9. Data Collection and different types of data.                       | (3 hours) |
| 10. Descriptive Statistics and graphical summaries.                   | (2 hours) |
| 11. Basic probability.  | (5 hours) |
| 12. The Normal Probability Distribution.                              | (3 hours) |
| 13. Sampling Distributions for the mean and proportion.               | (5 hours) |
| 14. Confidence Intervals for a single population mean and proportion. | (6 hours) |
| 15. Hypothesis Testing for a single population mean and proportion.   | (6 hours) |
| 16. Inference on two population means.                                | (5 hours) |

This syllabus leaves 7 hours for tests and other optional topics etc..

### IV. Evaluation Methods

The final grade for the course will be determined by elements such as tests, quizzes, projects, and homework assignments. A substantial proportion of the course grade should be determined by tests.

### V. Example Grading Scale

90% - 100%	A
80% - 89%	B
70%-79%	C
60% - 69%	D
Below 60%	F

VI. Undergraduate Course Attendance Policy

Although there is no formal attendance policy for this class, student learning is enhanced by regular attendance and participation in class discussions. The University expects all students to attend class.

[Note: It is recommended that an attendance policy be developed by individual faculty and included in student syllabi. (See undergraduate catalog for Undergraduate Course Attendance Policy.)]

VII. Required Textbooks, Supplemental Books and Readings

Anderson, David R.; Sweeney, Dennis J & Williams, Thomas A (2008), *Statistics for Business and Economics* (10th ed.), Thomson.

VIII. Special Resources Requirements

Calculator with statistical capabilities.

IX. Bibliography

Anderson, David R.; Sweeney, Dennis J & Williams, Thomas A (2008), *Statistics for Business and Economics* (10th ed.), Thomson.



## **Answers to Liberal Studies Questions**

- A. Most faculty who teach this course are members of the Statistics Curriculum Committee, that meets on a regular basis to talk about issues related to this and the other handful of Statistics-based courses in the department. In addition, most textbooks for this course are fairly uniform in the order and content that they present.
- B. Whenever appropriate, information will be introduced into the classroom discussion which will reflect the contributions made to the development of the fields of probability and statistics by women and minorities. Examples include an article in the New York Times entitled “David Blackwell, Scholar of Probability, Dies at 91” which describes the contributions of David Blackwell an African American probabilist; and a bibliography of Gertrude Cox a female statistician who did pioneering work in several areas of statistics including experimental design.
- C. The book entitled “Math on Trial: How Numbers Get Used and Abused in the Courtroom” by Schneps and Colmez has been chosen as the supplementary reading. The book is written in a prose style and is not a textbook. It describes 10 different real life court cases in which probability and statistics are misused in the court room. Each case is well-known and the results of each case are controversial. Data collection; the concepts and rules of probability; and estimation procedures are some of the topics from the course that play major roles in the cases discussed in this book.
- D. This course is intended for business majors outside the college of Natural Sciences and Mathematics as the first of a two-course sequence. The follow up course is QBUS 215 (Business Statistics). Therefore it is not the only course they will have in statistics.

## Sample Assignment and Rubric

Name: \_\_\_\_\_

### Census Bureau Activity: Best Estimates for Proportions

#### Directions:

1. Go the website: [http://quickfacts.census.gov/qfd/maps/pennsylvania\\_map.html](http://quickfacts.census.gov/qfd/maps/pennsylvania_map.html) . At the bottom of the webpage, you will find links to an alphabetized list of 253 cities and towns in Pennsylvania, organized into five columns of 50 of three cities/towns and one column of three cities/towns.
2. Using the random number feature on your calculator,  $\text{randint}(1,253)$  select a random sample of 12 towns/cities. You may get duplicate id numbers so continue getting random numbers until you have 12 unique ID numbers. Locate the corresponding city/town. ID numbers for the first column are 1-50, for the second column 51-100, etc.
3. Click on the links for your twelve randomly selected towns/cities and record both the 2010 population estimate and the percentage of persons in that city/town who were under 18 years in 2010.
4. Fill in the following summary table with the information from parts 1.-3.

#	Random ID Number	Name of Town/City	2010 Population Estimate	Percentage of people under the age of 18	Number of People Under the Age of 18
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

5. Generate a histogram of the 2010 population estimates and a histogram of the percentage of people under the age of 18. Discuss shapes of the distributions and identify any values that appear to be outliers.
6. Find the mean of the twelve percentages. This is the first estimate of the percentage of people in Pennsylvania who are under the age of 18.
7. Find the sum of the twelve population estimates and the sum of the numbers of people under the age of 18. Use these two statistics to find a second estimate of the percentage of people in Pennsylvania who are under the age of 18.
8. Discuss the differences in the estimates in 6. and 7. Which do you think is the better estimate of the percentage of people in Pennsylvania who are under the age of 18? Why?

**Census Bureau Activity: Best Estimates for Proportions  
Grading Rubric**

<b>Item</b>	<b>Points</b>	<b>Points Earned</b>	<b>Comments</b>
Summary Table	10		
Histogram of the Population Estimates	5		
Histogram of the Percentages of People under the age of 18	5		
Overall Percentages and Discussion	5		
<b>Total</b>	<b>25</b>		

Additional Comments:

**Please attach this page to your assignment.**