LSC Use Only Proposal No:	*UWUCC Use Only* Proposal No: 13-107C
LSC Action-Date: App-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

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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

__x__ Course Revision _____ Course Number and/or Title Change _____ Catalog Description Change

Current course prefix, number and full title: MATH 217 Probability and Statistics

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 Intensive (include W cover sheet)

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

_____ Global Citizenship _____ Information Literacy _____ Oral Communication

__X__ Quantitative Reasoning _____ Scientific Literacy _____ Technological Literacy

Received
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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)		1/30/14
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs	Gail S Schulist	2/4/14

Part II.

1. New Syllabus of Record

I. CATALOG DESCRIPTION

MATH 217 Probability and Statistics 3c-0l-3cr

Prerequisite: For non-math majors

Frequency distributions, measures of central tendency and variation, elementary probability, sampling, estimation, testing hypotheses, correlation and regression. Emphasis will be on applications in the social sciences using appropriate technology, as opposed to theoretical development of topics.

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 from 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 numerical descriptions 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 numerical descriptions of data from experiments and observations in order to draw inference to phenomena from the natural, social, and or technical world.

Objective 3:
Solve problems using the concepts and rules of probability.
Expected Learning Outcomes 1 and 2:
Informed and Empowered Learners
Rationale:
Assignments will require students to have a level of knowledge of probability that will enable them to understand the concepts, properties, and rules of probability. Assignments will also require students to interpret and use the concepts of probability in drawing inferences about probabilistic events from the natural, social, and or technical world.

Objective 4:
Estimate population parameters using confidence intervals.
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 5:
Evaluate statements about a population using tests of significance.
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 6:
Examine social, political, and economic justice issues using statistics.
Expected Student 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 enable students to apply statistical skills to real-world social justice problems.

I. COURSE OUTLINE / TIME SCHEDULE

1.	Basic Sampling Designs, Observational Studies and Experiments	(3 hours)
2.	Graphically Summarizing Qualitative and Quantitative Data	(2 hours)
3.	Numerically Summarizing Quantitative Data	(3 hours)
4.	Scatterplots, Correlation and Regression	(6 hours)
5.	Basic Probability	(3 hours)
6.	The Normal Probability Distribution	(3 hours)
7.	Sampling Distributions for the Mean and Proportions	(2 hours)
8.	Confidence Intervals for the Mean and Proportions	(4 hours)
9.	Hypothesis Testing for the Mean and Proportions	(4 hours)
10.	Inference on Two Samples	(4 hours)
11.	Contingency Tables and the Chi-Square Test for Independence	(optional)

This syllabus leaves an additional 8 hours for tests, other optional topics, etc. The final or culminating activity is an additional 2 academic hours.

II. 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.

III. 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

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

SUPPLEMENTAL READING:

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

VIII. SPECIAL RESOURCE REQUIREMENTS

Most instructors require students to purchase a scientific or graphing calculator.

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).

Moore, D. (2011). *The Basic Practice of Statistics (6th ed.).* New York, NY : W. H. Freeman and Co.

Tufte, E. (1983). *The visual display of quantitative information.* Cheshire, Ct: Graphics Press.

Watkins, D., Schaeffer, R., Cobb G. (2010). *Statistics: From Data to Decision (2nd ed.)*. Hoboken, N.J. : Wiley.

2. SUMMARY OF PROPOSED REVISIONS

1. An additional objective has been included that addresses responsible learners.
2. 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. Objective 6 was added to address responsible learners. 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, and distribution tables to summarize data sets. These are also used in the modeling of populations and in statistical inference procedures applied to the social and natural sciences.

Students in this course learn to apply quantitative techniques to problems within the social science disciplines. These include the following:

- The use of probability to make statements about the social and natural sciences. Examples include the use of probability distributions to model the recidivism rate of criminals and to model the year of age that a teenager gets pregnant.
- The use of confidence intervals and hypothesis testing to make statements about population proportions in the social and natural sciences. Examples include statements regarding the proportion of adults who are considered obese and statements comparing the proportion of males to those of females that hold certain political beliefs.
- The use of confidence intervals and hypothesis testing to make statements about population means in the social and natural sciences. Examples include statements regarding the true mean amount of money spent incarcerating prisoners in the United States 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.

4. Old Syllabus of Record

I. Catalog Description

MATH 217 Introduction to Probability and Statistics 3c-0l-3cr

Prerequisites: none

(For students in the social sciences) Frequency distributions, measures of central tendency and variation, elementary probability, sampling, estimation, testing hypotheses, correlation and regression. Emphasis will be on applications in the social sciences 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 the basic concepts of probability and how to apply them;
4. estimate population parameters using confidence intervals;
5. evaluate statements about a population using tests of significance.

III. Course Outline

12. Basic Sampling Designs, Observational Studies and Experiments (3 hours)
13. Graphically Summarizing Qualitative and Quantitative Data (2 hours)
14. Numerically Summarizing Quantitative Data (3 hours)
15. Scatterplots, Correlation and Regression (6 hours)
16. Basic Probability (3 hours)
17. The Normal Probability Distribution (3 hours)
18. Sampling Distributions for the Mean and Proportions (2 hours)
19. Confidence Intervals for the Mean and Proportions (4 hours)
20. Hypothesis Testing for the Mean and Proportions (4 hours)
21. Inference on Two Samples (4 hours)

22. Contingency Tables and the Chi-Square Test for Independence (optional)

This syllabus leaves 8 hours for tests, 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 will 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

None

VIII. Special Resources and Requirements

None

IX. Bibliography

Sullivan, M. (2007), *Statistics: Informed Decisions Using Data* (2nd ed.), Upper Saddle River, NJ: Pearson Prentice Hall

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 in 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 majors outside the college of Natural Sciences and Mathematics. This course puts more of the emphasis on concepts and applications to the students' fields of studies and less of the emphasis on formulas and theory than does the introductory course (MATH 216) for math and science majors. This emphasis is clear in the objectives for the course.

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 . 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, 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

Item	Points	Points Earned	Comments
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		
Total	**25**		

Additional Comments:

Please attach this page to your assignment.