

WINONA STATE UNIVERSITY
PROPOSAL FOR GENERAL EDUCATION PROGRAM COURSES

Department Mathematics and Statistics

Date 1/20/14

STAT 100
Course No.

Numbers and Data in Society
Course Name

3
Credits

Prerequisites none

GEP Goal Area(s):*

CORE GOAL AREAS

- | | |
|-------------------------------------|--|
| <input type="checkbox"/> | Goal 1: Communication |
| <input type="checkbox"/> | Goal 3: Natural Science |
| <input checked="" type="checkbox"/> | Goal 4: Mathematics/Logical Reasoning |
| <input type="checkbox"/> | Goal 5: History and the Social and Behavioral Sciences |
| <input type="checkbox"/> | Goal 6: The Humanities and Fine Arts |

THEME GOAL AREAS

- | | |
|--------------------------|--|
| <input type="checkbox"/> | Goal 7: Human Diversity |
| <input type="checkbox"/> | Goal 8: Global Perspective |
| <input type="checkbox"/> | Goal 9: Ethical and Civic Responsibility |
| <input type="checkbox"/> | Goal 10: People and the Environment |

* Courses may be submitted for up to two Goal Areas.

Additional Requirement Categories (list number of credits desired in appropriate category):

☐ Intensive:

- | | |
|--------------------------|----------------------------|
| <input type="checkbox"/> | 1. Writing |
| <input type="checkbox"/> | 2. Oral Communication |
| <input type="checkbox"/> | 3a. Mathematics/Statistics |
| <input type="checkbox"/> | 3b. Critical Analysis |

☐ Physical Development and Wellness

Provide information as specified in the previous directions.

Attach a ***General Education Program Approval Form***.

Department Contact Person for this Proposal:

Tisha Hooks
Name (please print)

457-2595
Phone



thooks@winona.edu
e-mail address

[Revised 9-6-11]

WINONA STATE UNIVERSITY
GENERAL EDUCATION PROGRAM APPROVAL FORM

Routing form for General Education Program Course approval.

Course STAT 100 - Numbers and Data in Society

Department Approval		
 _____ Department Chair	<u>1/24/14</u> _____ Date	<u>bdeppa@winona.edu</u> _____ e-mail address
Dean's Recommendation <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No*		
 _____ Dean of College	<u>1/29/14</u> _____ Date	
*If the dean does not approve the proposal, a written rationale should be provided to the General Education Program Subcommittee.		
GEPS Recommendation <input type="checkbox"/> Approved <input type="checkbox"/> Disapproved		
_____ Chair, General Education Program Subcommittee	_____ Date	
A2C2 Recommendation <input type="checkbox"/> Approved <input type="checkbox"/> Disapproved		
_____ Chair of A2C2	_____ Date	
Faculty Senate Recommendation <input type="checkbox"/> Approved <input type="checkbox"/> Disapproved		
_____ President of Faculty Senate	_____ Date	
Academic Vice President Recommendation <input type="checkbox"/> Approved <input type="checkbox"/> Disapproved		
_____ Academic Vice President	_____ Date	
Decision of President <input type="checkbox"/> Approved <input type="checkbox"/> Disapproved		
_____ President	_____ Date	
Please forward to Registrar.		
Registrar _____ Date entered	Please notify department chair via e-mail that curricular change has been recorded.	

STAT 100 – Numbers and Data in Society

Proposal for GEP Program – Goal 4

Course Description:

Credits: 3

Prerequisites: none

Grading method: Grade and P/NC option

The purpose of this course is to help students develop a better understanding of numbers and data in today's society. Quantitative and statistical reasoning skills will be developed through a variety of topics for which numbers and data are commonly encountered (e.g., government, politics, medicine, media, advertising, and sports). A conceptual understanding of these topics and how they affect many aspects of everyday life will be emphasized. Meets GOAL 4 – Mathematical/Logical Reasoning.

Course Outline:

1. Historical Appreciation of Numbers and Data in Society
 - a. Historical purpose of collecting numbers and data (e.g., history of U.S. Census bureau, Centers for Disease Control, World Health Organization, World Bank, etc.)
 - b. Visual depictions of numbers and data of historical importance (e.g., John Snow's visual depiction of contaminated wells, Florence Nightingale's rose diagrams, Napoleon's march to Moscow, the Challenger Explosion, etc.)
2. Numbers and Data in Government
 - a. Why governments collect data
 - b. Understanding large numbers
 - c. The use of percentages and rates for large numbers
 - d. Concept of percent change (e.g., percent change in national debt)
 - e. Concept of rates (e.g., debt / citizen, murders / 10,000 people, etc.)
 - f. The use of estimates in government (e.g., poverty line, population growth, etc.)
 - g. (Optional) Additional topics related to statistical issues commonly found in government data
 - h. Case study dealing with government data
3. Numbers and Data in the Media
 - a. Why journalists use numbers and data
 - b. Rights and responsibilities of public data
 - c. Numbers and data in opinion polls and elections
 - i. Concept of population versus sample
 - ii. Concept of random samples and sampling variation
 - iii. Concepts of representative samples and scope of inference
 - iv. Concepts of bias, confounding, etc., in studies and surveys
 - v. Concept of margin-of-error and statements of confidence
 - vi. Drawing conclusions about the population based on information obtained in a random sample
 - d. Telling a complete and fair story with numbers and data
 - e. (Optional) Additional topics related to statistical issues commonly found in the media
 - f. Case study: Prepare a newsworthy story for general consumption using numbers, data, and visualization

4. Numbers and Data in Sports
 - a. The use of numbers and data to evaluate performance
 - i. Summaries of numerical data (e.g., mean, median, standard deviation)
 - ii. Numerical and graphical summaries useful for making comparisons
 - b. Methods and issues of rankings
 - c. Evaluation of streaks from a probability perspective
 - d. (Optional) Additional topics related to statistical issues commonly found in sports data
 - e. Case study dealing with sports data
5. Numbers and Data in Medicine and Public Health
 - a. Understanding risk
 - i. Concept of conditioning in a 2x2 table
 - ii. Purpose of row/column percentages
 - iii. Methods to compare row/column percentages (e.g., absolute difference, relative risk ratio, percentage difference)
 - iv. Understanding absolute risk versus relative risk
 - b. Tests for identifying diseases
 - i. Concerns and issues with testing for disease conditions
 - ii. Measuring the accuracy of tests (e.g. , calculating sensitivity, specificity, positive and negative predictive value)
 - c. Designed Experiments versus Observational Studies
 - i. Understand the difference between experimentation and observation
 - ii. Identify elements of a well-designed experiment
 - iii. Understand the concept of correlation and its distinction from causation
 - iv. Understand the concept of confounding and limitations on conclusions that can be drawn from observational studies
 - d. (Optional) Additional topics related to statistical issues commonly found in public health data
 - e. Case study dealing with public health data
6. (Optional) Additional topics at discretion of instructor
 - a. Topics must promote quantitative and statistical reasoning skills
 - b. Topics must be of general interest to all students

Possible Textbook/Resources:

- *Statistics: Concepts and Controversies* by David S. Moore and William I. Notz. W.H. Freeman & Company, 2013. ISBN 10: 1-4641-2566-X; ISBN-13: 978-1-4641-2566-9
- *Statistical Reasoning for Everyday Life* by Jeff Bennett, William L. Briggs, and Mario F. Triola. Pearson, 2012. ISBN-10: 0321890132; ISBN-13: 9780321890139
- Resources from the CATALST project (<http://www.tc.umn.edu/~catalst/about>)
- Timely articles from various news sources involving numbers and data

Learning Outcomes:

A successful student will...

- Discuss and apply basic concepts which are essential for statistical literacy, including percentages and rates, basic graphical representations of data, basic data summaries, sampling variation, probability, and risk
- Understand how data are produced and what makes data trustworthy and reliable
- Appreciate how data can be used to enhance our understanding of our world and in decision making
- Critically evaluate the presentation and use of data by others
- Interpret numbers and data and communicate the information contained therein effectively themselves

Rationale for GEP - Goal Area 4:

Numerical and statistical literacy are becoming increasingly important for our students, both in their professional futures and as they become more informed citizens. This course will equip students with the core skills they need to be numerically and statistically literate. Quantitative and statistical reasoning skills will be developed through a variety of topics for which numbers and data are commonly encountered (e.g., government, politics, medicine, media, advertising, and sports). A conceptual understanding of these topics and how they affect many aspects of everyday life will be emphasized. This course is intended for students of all majors/backgrounds.

General Discussion of Each Student Competency as it Relates to Learning Activities in STAT 100:

Goal 4 Competencies: Students will be able to...	Learning Opportunity	Assessment and Evaluation
Illustrate historical and contemporary applications of mathematical/logical systems	<ul style="list-style-type: none">• The course will focus on why we have collected and why we continue to collect data in our world to make informed decisions.• Students will be introduced to various methods for summarizing data. Some of these graphic summaries have historic context (e.g., John Snow's visual depiction of contaminated wells illustrating a cholera outbreak in London); others may be used to address contemporary issues (such as the current distribution of wealth in the United States).• Every statistical topic addressed in the course will be introduced in the context of a motivating application from the media, government, politics, sports, etc. For example, students will review the calculation of ratios and percentages in the context of understanding our national debt; they will learn about surveys, random samples, and the concept of margin of error in the context of a recent opinion poll; and they will learn about 2x2 tables and the calculation of relevant probabilities and risks in the context of motivating examples from medicine/public health.	Students will be assessed through a series of homework assignments, case studies, and exams. Each of these may require students to discuss and/or apply basic concepts (such as the calculation of percentages and rates, data summarization, making decisions in the presence of sampling variation, probability, and risk) in the context of both historical and contemporary examples.

Goal 4 Competencies: Students will be able to...	Learning Opportunity	Assessment and Evaluation
Clearly express mathematical/logical ideas in writing	<ul style="list-style-type: none"> Students will be required to critically evaluate the presentation and use of data by others. Throughout the semester, students will be required to interpret numbers and data and to communicate the information contained therein effectively by themselves, as well. 	<p>Students will be assessed through a series of homework assignments, case studies, and exams. On exams and homework assignments, students will be required to critically evaluate the work of others. For example, students may be given a recent news article that misuses or misrepresents statistics and asked to write a letter to the editor that explains the errors in the original article and gives a correct representation of the data. On homework assignments and case studies, students will be required to interpret data and communicate their own results. For example, one case study requires students to prepare a newsworthy story for general consumption using numbers, data, and data visualization techniques.</p>
Explain what constitutes a valid mathematical/logical argument (proof);	<ul style="list-style-type: none"> Students will discover what makes data that are obtained through both observation and experimentation trustworthy and reliable. Students will learn about making decisions in the presence of sampling variation. This involves a discussion of what it means to get a “statistically significant” result to support a research hypothesis. Students will discover when it is (and is not) appropriate to draw cause-effect conclusions based on how the data were collected. 	<p>Students will be assessed through a series of homework assignments, case studies, and exams. Each of these may contain questions that require students to consider both the data collection process and the statistical significance of the results to determine what impact this has on conclusions that can be drawn about research hypotheses.</p>
Apply higher-order problem-solving and/or modeling strategies	<ul style="list-style-type: none"> Students will use computers to model random events and investigate probabilities. For example, in one case study, students may simulate a basketball player shooting baskets in order to estimate the probability of “streaks” or “hot hands” occurring by chance. In another potential case study investigating a 	<p>Students will be assessed through a series of homework assignments, case studies, and exams. The case studies and homework assignments are more likely to require the students to set up, carry out, and interpret the results</p>

Goal 4 Competencies: Students will be able to...	Learning Opportunity	Assessment and Evaluation
	<p>discrimination claim, students simulate sampling a jury pool from a population of registered voters to determine how likely a jury pool was to have obtained only a small number of minorities, by chance, in an unbiased selection process. Students use the results of such simulations to determine whether sufficient evidence exists to support a particular hypothesis.</p>	<p>of a simulation study which requires them to model some random event; the exams are more likely to require students to simply set up a simulation study or to interpret the results.</p>

Winona State University - Department of Mathematics & Statistics

Minutes of the Department Meeting on 1/24/14

Present: Joyati Debnath, Brant Deppa (chair), Jeff Draskoci-Johnson, Eric Errthum, Tisha Hooks, April Kerby, Steve Leonhardi, Chris Malone, Mike Markegard, Barry Peratt, Sam Schmidt, Samuel Tsegai, Aaron Wangberg, Nicole Williams, Lee Windsperger

New Business: Note: All of the items below were considered after the department waived the 40-hour rule without objection.

Motions from the Statistics Subgroup

1. STAT 100 – new course proposal and GEP proposal

The new STAT 100 course proposal and GEP proposal were approved without objection.

2. New program: B.S. Data Science (DSCI) major, minor, and courses

- (i) The department approved two versions of the major, both without objection. The Math department indicated a preference for Version 2, but voted to accept Version 1 if Computer Science preferred that one. Chris was directed to submit whichever one Computer Science preferred. (Their discussion was still pending as of our meeting.)
- (ii) The minor was approved without objection, also with the understanding that Computer Science might want to edit certain courses in the elective list.
- (iii) All new courses associated with the proposed data science major were approved without objection. These include DSCI 210, DSCI 310, DSCI 395, DSCI 488, DSCI 492, and DSCI 495.
- (iv) The notifications for the conversion of STAT 325 to DSCI 325 and STAT 425 to DSCI 425 were approved without objection.

3. Program revisions: B.S. Statistics (STAT) major, minor, and courses

- (i) All revisions, both to the major and to the minor were approved without objection.
- (ii) STAT 395 and STAT 495, i.e. the analogous courses to DSCI 395 and DSCI 495, were approved without objections.

Supporting documentation for items 1 – 3 above were sent to the department by Tisha Hooks (STAT 100) and Chris Malone (DSCI and STAT programs) via e-mail (01/22/14).

4. Notifications re: STAT

The following notifications seek Departmental approval. 1) In Spring, 2013, the department voted to make STAT 310 the prerequisite for a number of upper-division STAT courses. Either this paperwork was not submitted, or got lost. 2) The note in the course description for STAT 305 was corrected to read STAT 305 instead of Math 305. 3) A notification to edit course description slightly and to allow ECON 222 to serve as a possible prerequisite for STAT 310. 4) Include DSCI 210 as a prerequisite for STAT 370.

The department approved the submission/resubmission of all of these notifications.

5. Notifications re: MATH courses

The following notifications were submitted for departmental approval. (i) A change in course title for MATH 112 from "Modeling with Functions" to "Applied Precalculus" (ii) A change in the catalog description of MATH 112. (See the catalog language at the end of these minutes.) (iii) A change in number for MATH 140 to MATH 132 AND a change in prerequisites from "MATH 112 - Modeling with Functions, MATH 115 - College Algebra, or MATH 120 - Precalculus" to "MATH 112 – Applied Precalculus, MATH 115 - College Algebra, or MATH 120 - Precalculus" (iv) A change in the catalog description of MATH 132. (See the catalog language at the end of these minutes.)

The department approved all of these changes without objection.

6. Proposal re: MATH 117 from Steve, Barry, and Jeff

The department approved without objection the proposal to submit MATH 117 as a new course and also the proposal to submit it as a GEP course under Goal 4. Since the Math Subgroup had not had a chance to vote on the committee's work, the department waived normal procedures without objection. (The documents were handed out in the meeting.)

Secretary's note: If there is any confusion as to what, exactly, the department agreed to in Items 1-6 above, I can supply copies of the A2C2 paperwork upon request. Summaries of the proposals re: data science and statistics are attached below.

7. Adjourn

We adjourned about 12:50 p.m.

Respectfully submitted,
Jeff Draskoci-Johnson