Montgomery County Community College
MAT 130
Probability and Statistics
4-4-0

COURSE DESCRIPTION:
A course designed for students in all fields. Topics include organization of data, measures of central tendency, measures of variation, statistical inference, correlation along with some more advanced topics such as analysis of variance and simple/multiple regression. A graphing calculator is required for class, homework and testing. Classroom instruction and programs will be presented using a TI-84 Plus.

REQUISITES:
Previous Course Requirements
* MAT 100 Intermediate Algebra or MAT 100B Intermediate Algebra with Review or MAT 104 Foundations of Mathematics II or MAT 106 Math Applications with a minimum grade of "C"

Concurrent Course Requirements
None

COURSE COMMENTS:
* Elementary Algebra Accuplacer Test Score of 67 to 85 or a College Level Math Accuplacer Test Score of 53 to 85 may be substituted for MAT100/ MAT100B/ MAT104/ MAT106 or
* Quantitative Reasoning, Algebra, and Statistics Accuplacer Test Score of 251 or higher or an Advanced Algebra and Functions Accuplacer Test Score of 237-275.

LEARNING OUTCOMES Upon successful completion of this course, the student will be able to:	LEARNING ACTIVITIES	EVALUATION METHODS
1. Use appropriate statistical notation to explain the determination of the mean, median, mode, midrange, range, variance and standard deviation for a given set of ungrouped data.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects
2. Explain the various rationale for each of the classifications of data	Lectures Small Group Discussions and/or Projects	Exams Quizzes Homework

within each typology.	The Use of TI 84 Graphics calculator	Projects
3. Explain construct and data organization related to frequency tables and statistical graphs including histograms, frequency polygons, ogives, stem and leaf plots and box plots.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects
4. Explain probability solutions using basic probability theory, terminology, notation, the addition and multiplication rules, and complementary events.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects
5. Define probability distribution and random variables.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects
6. Calculate the mean, variance, and solutions to problems involving discrete random variables based on the binomial and Poisson probability distributions.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects
7. Calculate the solutions to problems involving continuous random variables based on the normal, uniform, and exponential probability distributions.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects
8. Use appropriate terminology and sampling distribution notation to explain the application of the Central Limit Theorem.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
9. Use appropriate terminology and notation to explain a hypothesis test and its p-value about a mean or a proportion.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects
10. Perform two-sample hypothesis tests for the population mean and for the difference between two population means.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects
11. Use appropriate terminology and notation to explain the determination of a point estimate and confidence interval estimates for a mean or a proportion.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects
12. Determine minimum sample sizes for a desired level of confidence and margin of error.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects
13. Test for the significance of a calculated correlation coefficient.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects
14. Use a calculated equation for a regression line for prediction.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects
15. Perform χ^2 tests for goodness-of-fit, independence, or homogeneity.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
16. Demonstrate proficiency in the use of the TI 84 calculator using the following commands: a. 1-Var Stats L_1 [and L_2 where appropriate] b. binompdf (n,p,x) and binomcdf (n,p,x) c. normalcdf (LH,RH), tcdf (LH,RH,df), and χ^2cdf (LH,RH,df) d. invNorm (area) invT (area)] e. LinReg(ax+b)	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects
17. Analyze multiple regression problems, including production and use of Excel computer output.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects
18. Use the theory, terminology and notation related to One Way analysis of variance (ANOVA) to compare the solutions and means of three or more groups.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics calculator	Exams Quizzes Homework Projects

At the conclusion of each semester/session, assessment of the learning outcomes will be completed by course faculty using the listed evaluation method(s). Aggregated results will be submitted to the Associate Vice President of Academic Affairs. The benchmark for each learning outcome is that *70% of students will meet or exceed outcome criteria.*

SEQUENCE OF TOPICS:
1. Course Introduction; Types of Data
2. Critical Thinking; Experimental Design
3. Frequency Distributions
4. Histograms; Statistical Graphs
5. Measures of Center
6. Measures of Variation
7. Measures of Relative Standing
8. Fundamentals of Probability
9. Addition Rule of Probability
10. Multiplication Rule of Probability: Basics, Complement and Conditional

11. Discrete Random Variables; Binomial Distribution and Poisson distributions
12. Mean, Standard Deviation for Binomial and Poisson distributions
13. Standard Normal Distribution
14. Continuous Random Variables; Normal, uniform and exponential distributions
15. Sampling Distribution and Estimation
16. Central Limit Theorem
17. Estimating Population Proportions
18. Estimating Population Means: σ Known
19. Estimating Population Means: σ Not Known
20. Basics of Hypothesis Testing
21. Hypothesis Testing: Proportions
22. Hypothesis Testing: Mean σ Known
23. Hypothesis Testing: Mean σ Not Known
24. Hypothesis Testing: Two sample for the population mean.
25. Hypothesis Testing: Difference between two population means
26. Analysis of Variance
27. Multinomial Experiments: Goodness-of-Fit
28. Contingency Tables
29. Correlation
30. Regression
31. Multiple Regression

LEARNING MATERIALS:
Introductory Statistics, 2013 Edition by Barbara Illowsky and Susan Dean, OpenStax College Publishing

Calculator:
TI-84 (Plus or Silver Edition) Graphics Calculator. If a student has a TI-83+, they do not need to buy a TI-84+

Other learning materials may be required and made available directly to the student and/or via the College's Libraries and/or course management system.

COURSE APPROVAL:
Prepared by: Walter Hunter, Professor of Mathematics   Date: 4/2015
Revised by: Brandon Dougherty, Instructor of Mathematics   Date: 8/2016
VPAA/Provost or designee Compliance Verification:
          Victoria L. Bastecki-Perez, Ed.D.   Date: 2/2017

Revised by: Brandon Dougherty, Instructor of Mathematics   Date: 8/2017
VPAA/Provost or designee Compliance Verification: Date: 8/2017

This course is consistent with Montgomery County Community College's mission. It was developed, approved and will be delivered in full compliance with the policies and procedures established by the College.