



**COWLEY COLLEGE  
& Area Vocational Technical School**

**COURSE PROCEDURE FOR**

**ENGINEERING PROBABILITY AND STATISTICS 1  
MTH 4445 3 Credit Hours**

**Student Level:**

This course is open to students on the college level in either the Freshman or Sophomore year.

**Catalog Description:**

**MTH4445 ENGINEERING PROBABILITY AND STATISTICS 1 (3 Hrs.)**

Graphical and numerical methods for summarizing and describing datasets. Probability, introduction to discrete and random variables, inferential studies about population parameters

**Prerequisites:**

A minimum grade of C in MTH 4440- Calculus II

**Controlling Purpose:**

To equip science and pre-engineering students with a knowledge of graphical and numerical methods of analyzing statistics data. The course requires the student to furnish his or her TI-83 or TI 84 graphing calculator.

**Learner Outcomes:**

Upon completion of the course, the student will:

- Use graphical and numerical methods to summarize and describe data. Demonstrate a basic understanding of probability and statistics. Describe and use different discrete and continuous random variables. Identify bivariate probability distributions, covariance and correlation and the probability distribution of a statistic. Perform estimation and hypothesis testing of population parameters

**Units Outcomes and Clock Hours of Instruction for Core Curriculum:**

The following outline defines the minimum core content not including the final examination period. Instructors may add other material as time allows.

**Evaluation Key:**

- A = All major and minor goals have been achieved and the achievement level is considerably above the minimum required for doing more advanced work in the same field.
- B = All major goals have been achieved, but the student has failed to achieve some of the less important goals. However, the student has progressed to the point where the goals of work at the next level can be easily achieved.

- C = All major goals have been achieved, but many of the minor goals have not been achieved. In this grade range, the minimum level of proficiency represents a person who has achieved the major goals to the minimum amount of preparation necessary for taking more advanced work in the same field, but without any major handicap of inadequacy in his background.
- D = A few of the major goals have been achieved, but the student's achievement is so limited that he is not well prepared to work at a more advanced level in the same field.
- F = Failing, will be computed in GPA and hours attempted.
- N = No instruction or training in this area.

<b>UNIT 1: DESCRIPTIVE STATISTICS- 4hrs.</b> (chapters 1 and 2) Outcomes: Upon Completing this unit the student will be able to use graphical methods to explore, summarize and describe data						
A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Identify statistical concepts and definitions
						classify data as categorical or quantitative
						Display and interpret categorical and quantitative data using graphical tools
						Calculate measures of central tendency, variation, and relative standing

<b>UNIT 2: PROBABILITY-8 hrs.</b> ( chapter 3) Outcomes: Upon Completing this unit the student will be able to demonstrate an understanding of basic probability concepts						
A	B	C	D	F	N	Specific Competencies:
						Demonstrate the ability to:
						Determine outcomes, events, and sample space of a given experiment
						Calculate probability of a simple event
						Determine compound and complimentary events and calculate their probabilities
						Use additive and multiplicative rules to compute probabilities
						Formulate and compute conditional probability
						Identify mutually exclusive and independent events and compute their probabilities
						Apply Bayes Rule
						Apply counting rules (multiplicative, permutations, partition and combinations) to count number of experimental outcomes

**UNIT 3: DISCRETE RANDOM VARIABLES -8 hrs.**

(Chapter 4)

Outcomes: Upon Completing this unit the student will be able to describe and use different discrete random variables.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Define a random variable
						Describe a discrete random variable and its probability distribution
						Calculate the Expected Value and standard deviation of a random variable
						Identify and use Bernoulli, Binomial, Geometric, Negative Binomial and poison random variables (experiment, probability distribution, mean and variance)

**UNIT 4: CONTINUOUS RANDOM VARIABLES- 8hrs.**

(chapter 5)

Outcomes: Upon Completing this unit the student will be able to describe and use different continuous random variables

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Describe a continuous random variable and its probability density function
						Calculate the expected value and standard deviation of a continuous random variable
						Describe uniform, normal and Gamma-type random variables and their properties
						Apply normal approximation to binomial distributions
						Apply descriptive methods for assessing normality
						Calculate the probability of events of a continuous random variable

**UNIT 5: SAMPLING DISTRIBUTIONS -8hrs.**

(chapter 6)

Outcomes: Upon Completing this unit the student will be able to Identify bivariate probability distributions, covariance and correlation of a statistic(sampling distribution)

A	B	C	D	F	N	Specific Competencies:
						Demonstrate the ability to:
						Identify Bivariate probability distribution

						Calculate and interpret covariance and correlation of two random variables
						Describe the sampling distribution of the sample mean
						Describe and apply sampling distributions (Chi-square, T, and F) related to normal distribution and the corresponding probability tables
						Use sampling distributions to calculate the probability of events involving sample statistics and population parameters

**UNIT 6: ESTIMATION USING CONFIDENCE INTERVALS- 4hrs.**

(Chapter 7)

Outcomes: Upon Completing this unit the student will be able to find estimates of population means, proportions, and variances and develop procedures for finding point estimate, confidence interval, and required sample size.

A	B	C	D	F	N	Specific Competencies:
						Demonstrate the ability to
						Describe point and interval estimators
						Construct confidence intervals for population mean with known/ unknown variance.

**UNIT 7: HYPOTHESIS TESTING -8hrs.**

(chapter 8)

Outcomes: Upon Completing this unit the student will be able to perform hypothesis testing of population parameters.

A	B	C	D	F	N	Specific Competencies:
						Demonstrate the ability to:
						Identify hypothesis testing concepts including null and alternative hypothesis, test statistic, rejection region, and type I and type II errors
						Contrast one tailed vs. Two tailed statistical tests.
						Test population mean for large and small samples
						Describe and calculate the observed significance level (p-value)
						Test the difference between population means: independent large (small) samples with identical (different) population variances and matched pairs
						Test population proportion and difference between population proportions: independent large samples
						Test the population variance and the ratio of two population variances

**Projects Required:**

None.

**Textbook:**

Statistics for engineering and the sciences, William Mendenhall and Terry Sincich, 6<sup>th</sup> edition, CRC Press/Taylor& Francis, 2016. Please Contact Bookstore for current textbook.

**Materials/Equipment Required:**

Graphing calculator (TI-83 or TI-84 series calculator)

**Attendance Policy:**

Students should adhere to the attendance policy outlined by the instructor in the course syllabus.

**Grading Policy:**

The grading policy will be outlined by the instructor in the course syllabus.

**Maximum class size:**

Based on classroom occupancy

**Course Time Frame:**

The U.S. Department of Education, Higher Learning Commission and the Kansas Board of Regents define credit hour and have specific regulations that the college must follow when developing, teaching and assessing the educational aspects of the college. A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work for approximately fifteen weeks for one semester hour of credit or an equivalent amount of work over a different amount of time. The number of semester hours of credit allowed for each distance education or blended hybrid courses shall be assigned by the college based on the amount of time needed to achieve the same course outcomes in a purely face-to-face format.

**Refer to the following policies:**

[402.00 Academic Code of Conduct](#)

[263.00 Student Appeal of Course Grades](#)

[403.00 Student Code of Conduct](#)

**Disability Services Program:**

Cowley College, in recognition of state and federal laws, will accommodate a student with a documented disability. If a student has a disability which may impact work in this class and which requires accommodations, contact the Disability Services Coordinator.