MET-2430: ENGINEERING PROBABILITY AND STATISTICS

Cuyahoga Community College

Viewing: MET-2430 : Engineering Probability and Statistics

Board of Trustees:
2016-03-31

Academic Term:
Fall 2020

Subject Code
MET - Mech Eng/Manuf Ind Eng Tech

Course Number:
2430

Title:
Engineering Probability and Statistics

Catalog Description:
Course covers probability and statistics for engineers. Course topics include: measures of central tendency and dispersion, probability axioms and rules, standard discrete distributions, standard continuous distributions, point and confidence interval parametric values, central limit theorem, sampling distributions, hypothesis testing for one-sample and two-sample means and proportions, relationships between two random variables, correlation analysis, and simple linear regressions. Examples, problems, and case studies can be from manufacturing, mechanical, civil, electrical, and construction engineering.

Credit Hour(s):
3

Lecture Hour(s):
3

Requisites

Prerequisite and Corequisite
MATH-1610 Calculus I.

Outcomes

Course Outcome(s):
Calculate measures of central tendency and dispersion.

Essential Learning Outcome Mapping:
Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):
1. Summarize data in Stem-and-Leaf Diagrams, Histograms, Box Plot, Time Series Plots, and summarize Multivariate Data
2. Apply the Bionomial Distribution and Poisson Distribution
3. Calculate Mean and Variance

Course Outcome(s):
Perform correlation analysis.

Essential Learning Outcome Mapping:
Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):
1. Apply Hypothesis Testing, calculate p-Value, and Errors
2. Perform Simple Linear Regression and Multiple Regression to engineering samples

3. Create Control Charts applicable to quality control in manufacturing

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Course Outcome(s):

Perform simple linear regression.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Apply Hypothesis Testing, calculate p-Value, and Errors
2. Perform Simple Linear Regression and Multiple Regression to engineering samples

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Course Outcome(s):

Know probability axioms and rules.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Apply the Bionomial Distribution and Poisson Distribution
2. Calculate Mean and Variance
3. Create Control Charts applicable to quality control in manufacturing

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Course Outcome(s):

Describe the shape, mean, and variance of standard discrete distributions.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Summarize data in Stem-and-Leaf Diagrams, Histograms, Box Plot, Time Series Plots, and summarize Multivariate Data
2. Define Random Variables and Probability
3. Apply the Bionomial Distribution and Poisson Distribution
4. Calculate Mean and Variance
5. Create Control Charts applicable to quality control in manufacturing

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Course Outcome(s):

Describe the shape, mean, and variance of standard continuous distributions.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Summarize data in Stem-and-Leaf Diagrams, Histograms, Box Plot, Time Series Plots, and summarize Multivariate Data
2. Define Random Variables and Probability
3. Apply the Normal Distribution, Lognormal Distribution, Gamma Distribution, Beta Distribution, and Weibull Distribution
4. Calculate Mean and Variance
5. Create Control Charts applicable to quality control in manufacturing

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Course Outcome(s):

Estimate point and confidence interval parametric values.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Apply Hypothesis Testing, calculate p-Value, and Errors
2. Create Control Charts applicable to quality control in manufacturing

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Course Outcome(s):

Explain and apply the central limit theorem.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Apply the Normal Distribution, Lognormal Distribution, Gamma Distribution, Beta Distribution, and Weibull Distribution
2. Apply the Bionomial Distribution and Poisson Distribution
3. Calculate Mean and Variance

Course Outcome(s):

Analyze sampling distributions.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Apply the Normal Distribution, Lognormal Distribution, Gamma Distribution, Beta Distribution, and Weibull Distribution
2. Create Control Charts applicable to quality control in manufacturing

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Course Outcome(s):

Conduct hypothesis testing for one-sample and two-sample means and proportions.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Apply Hypothesis Testing, calculate p-Value, and Errors
2. Create Control Charts applicable to quality control in manufacturing

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Course Outcome(s):

Explain relationships between two random variables including dependence and joint distributions.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Apply the Normal Distribution, Lognormal Distribution, Gamma Distribution, Beta Distribution, and Weibull Distribution
2. Apply Hypothesis Testing, calculate p-Value, and Errors

Methods of Evaluation:

1. Assignments and projects
2. Quizzes and/or midterm examination
3. Final Examination

Course Content Outline:

1. General Introduction
   a. Overview of statistical process and engineering
   b. Types of engineering data
   c. Differences between mechanistic and empirical model
2. Summarizing of Data and Presentation Approaches
   a. Stem-and-leaf Diagram
   b. Histograms
   c. Box plot
   d. Time series plots
   e. Multivariate data
3. Continuous and Discrete Random Variables
   a. Defining random variables
   b. Defining probability density functions, cumulative distribution function, mean, and variance
4. Continuous Probability Distributions
   a. Normal distribution
   b. Lognormal distribution
   c. Gamma distribution
   d. Weibull distribution
   e. Beta distribution
   f. Plotting probability distribution
5. Discrete Probability Distributions
   a. Binominal distribution
   b. Poisson distribution
   c. Approximation of binomial and Poisson distribution with normal distribution
   d. Introduction to dependence/independence of variables
   e. Central limit theorem
6. Decision Making, One and Two Samples
   a. Point estimation
   b. Hypothesis testing
   c. Type II errors
   d. Sample sizes
   e. Confidence intervals
7. Regression Analysis Introduction
   a. Lease square estimation
   b. Confidence intervals in regression analysis
   c. Multiple regression and estimation of parameters
8. Design of Experiments Introduction
   a. Strategy of experimentation
   b. Factorial experiments
9. Statistical Quality Control Introduction
   a. Introduction to quality control processes
   b. Introduction to control charts
   c. Measurement systems limitations

Resources

Montgomery, Douglas C., George C. Runger, and Norma Faris Hubele. *Engineering Statistics.* 5th Edition. Hoboken, NJ: John Wiley, 2011.

Navidi, William Cyrus. *Principles of Statistics for Engineers and Scientists.* 1st Edition. Dubuque, IA: McGraw-Hill, 2010.

Chege, Paul. *Probability and Statistics.* {ts '2010-11-16 00:00:00'}.

Instructional Services

OAN Number:
Transfer Assurance Guide OES004

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