TO: The Engineering Faculty
FROM: The Faculty of the School of Engineering Education
DATE: April 23, 2019

The Faculty of the School of Engineering Education has approved the revision to the prerequisite list for the undergraduate IDES/Multidisciplinary Engineering course listed below. This action is now submitted to the Engineering Faculty with a recommendation for approval.

Summary of Proposed Changes:

Current Listing: IDE 36000 Multidisciplinary Engineering Statistics
Sem. 1 or 2, Lecture 3, Credit 3.
Prerequisite: MATH 162. Declared major in IDE/MDE

Proposed Listing: IDE 36000 Multidisciplinary Engineering Statistics
Sem. 1 or 2, Lecture 3, Credit 3.
Prerequisite: MATH 162000 or MATH 16600. Declared major in IDE/MDE

Effective Date:

Effective immediately.

Course Description:
Statistical methodology is critical to the engineering problem-solving process. This course introduces engineering students to the role of statistics in problem solving, and to the design and presentation of simple models and experiments. An emphasis will be placed on using computer software to perform statistical analyses and to the interpretation of the software results. This is a recommended course for the MDE statistics elective.

REASON: Include the complete list of existing equivalent math option pathways.

Donna Riley,
Kamyar Haghighi Head Professor of Engineering Education

IDE 36000 Multidisciplinary Engineering Statistics

Course Instructor: Dr. Joyce Main

Course Description:

Statistical methodology is critical to the engineering problem-solving process. This course introduces engineering students to the role of statistics in problem solving, and to the design and presentation of simple models and experiments. An emphasis will be placed on using computer software to perform statistical analyses and to the interpretation of the software results. This is a recommended course for the MDE statistics elective.

Course Goals/Learning Objectives:

Students who successfully complete this course will be able to:

- Describe the role of statistics in engineering
- Construct and interpret summary statistics and visual data displays using computer software.
- Apply probability models to describe uncertainty and to make decisions.
- Perform statistical analyses using computer software and to interpret the software results.
- Construct simple empirical models from data, and design simple controlled experiments.
- Formulate research questions, collect and analyze data, and present findings through a written report and oral presentation.
- Work effectively in problem-solving teams and carry out meaningful performance assessments of individual team members.

Course outline:

Week	Course Topics
1	**The role of statistics in engineering**: engineering method and statistical thinking, types of data, mechanistic and empirical models, advantages of designed experiments in data collection
2	**Working and learning in teams**: introduction and expectations Data summary and presentation: sample mean, sample variance, population mean, and population variance
3	**Data summary and presentation**: stem-and-leaf diagram, histograms, box plot, time series plots, and multivariate data Random variables and probability distributions: continuous random variables: probability density function, cumulative distribution function, mean and variance
4	**Random variables and probability distributions**: continuous distributions (normal, lognormal, gamma, Weibull), probability plots, discrete random variables, binomial distribution, Poisson process,
5	**Designing an empirical study**: formulating research questions, elements of a well-formulated research question, research methods follow problem choice
6	**Random variables and probability distributions**: normal approximation to the binomial and Poisson distributions, and central limit theorem Designing an empirical study: context setting, data collection and analyses

7	**Decision Making for a Single Sample**: statistical inference, point estimation, hypothesis testing, inference on the mean of a population (variance known and unknown)
8	**Decision Making for a Single Sample**: inference on the variance of a normal population, inference on a population proportion, prediction interval, summary tables of inference procedures for a single sample, goodness of fit, decision tree for a single sample
9	**Decision Making for Two Samples**: Inference on the means of two populations (variances known and unknown) the paired t-Test, inference on the ratio of variances of two normal populations, inference on two population proportions, summary tables for inference procedures, and decision tree for two samples
10	**Working and learning in teams**: evaluations and constructive feedback
11	**Building Empirical Models**: simple linear regression
12	**Building Empirical Models**: multiple linear regression and other aspects of regression
13	**Building Empirical Models**: other aspects of regression: polynomial models, categorical regressors, techniques for selecting variables Designing an empirical study: interpreting output and presenting findings
14	**Design of Engineering Experiments**: factorial experiments, 2^k factorial design, and center points and blocking in 2^k designs Working and learning in teams: reflections
15	**Semester Research Project Presentations**

Total = 15 weeks

Required and Supplementary Text:

Montgomery, D.C, Runger, G.C., and N.F. Hubele. 2011. Engineering Statistics. Fifth ed. John Wiley & Sons, Inc., New York, NY. Also available at the Engineering Library Reserves: QA276.12 .M6453 2011.