Course number and name	END 493E / Applied Statistics
Credits, contact hours, categorization of credits	3 credits / 42 hours / Engineering topic
Instructor or course coordinator	Erkan IŞIKLI
Text book and other supplemental materials	• Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. (2014). *Multivariate Data Analysis*, 7th ed. USA: Pearson Education Limited. • Tabachnick, B.G., Fidell, L.S. (2013). *Using Multivariate Statistics*, 6th ed. USA: Pearson. • R and IBM SPSS 22.0 or later

Course information	
Content	This course examines the application of multivariate methods to the analyses of data related to the field of industrial engineering. The course will begin with a brief review of univariate statistics and related concepts. Some time will also be spent on issues in data screening. Major emphasis will be given to dependence techniques such as multivariate analysis of variance (MANOVA), general linear models, and multiple linear regression; however, interdependence techniques such as factor analysis and cluster analysis will also be covered. As an applied course, emphasis will be less on formulae and their derivation, and more on the review of (1) major assumptions, (2) the conditions under which the analysis might be appropriate, (3) implementation of the analysis in major statistical packages (SPSS and R).
Prerequisites	END 311E Statistics, 4th class
Type	Selected elective

Course learning outcomes

Students who pass the course will:
  I. have understood the assumptions and conditions governing the appropriateness of the most widely used statistical techniques in the literature;
  II. have developed an appreciation of problem solving in practice;
  III. be an informed user of SPSS and R statistical software, be able to implement each of the major analytic techniques on a computer, and be able to interpret the results;
  IV. be able to identify which procedures are best suited for particular research questions.

Student outcomes	Level of contribution
SO1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	Partial
SO2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	Partial
SO3. An ability to communicate effectively with a range of audiences.	Not applicable
SO4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	Little
SO5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	Little
SO6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	High
SO7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	Partial

Week	Topics	Learning outcome(s)
1	Introduction; Basic Concepts	III
2	Review of Univariate Statistics	III
3	Multivariate Data Analysis	III
4	Data Screening	III
5	Exploratory Factor Analysis	I-IV
6	Cluster Analysis	I-IV
7	Multiple Linear Regression	I-IV
8	Logistic Regression	I-IV
9	Multiple Discriminant Analysis	I-IV
10	Classification and Regression Trees (CART)	I-IV
11	Multivariate Analysis of Variance	I-IV
12	Canonical Correlation	I-IV
13	Conjoint Analysis	I-IV
14	Multidimensional Scaling	I-IV