EASTERN MEDITERRANEAN UNIVERSITY
DEPARTMENT OF INDUSTRIAL ENGINEERIN
IENG385 STATISTICAL APPLICATIONS IN ENGINEERING
COURSE OUTLINE

COURSE CODE	IENG/MANE 385	**COURSE LEVEL**	Third year
COURSE TITLE	Statistical Applications in Engineering	**COURSE TYPE**	Area Core
CREDIT VALUE	(3, 0, 1) 3	**ECTS VALUE**	8
PRE-REQUISITE(S)	Junior Standing	**CO-REQUISITE(S)**	MATH 322
PREPARED BY	Dr. Faramarz KHOSRAVI	**SEMESTER / ACADEMIC YEAR**	Spring 2020 - 2021

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ASSISTANT(S)				
COURSE SCHEDULE	Tuesdays 10:30-12:20 (IE-D203); Thursdays 10:30-12:20 (IE-D203) Office Hour: Wednesdays 10:30-12:30			
COURSE WEB LINK	http://staff.emu.edu.tr/faramarz.khosravi/en/teaching/ieng385-mane385			

COURSE DESCRIPTION

The purpose of the course is to introduce and train students in the application of statistical tools and techniques in industries and other areas. An array of statistical tools in presenting and interpreting statistical data will be introduced to students. After a brief review of probability distributions, estimation procedures of statistical parameters will be presented. These will include parametric, nonparametric and interval estimation procedures. Testing of statistical hypotheses under various assumptions will be presented. Finally, correlation and regression analysis of bivariate data will be introduced.

AIMS & OBJECTIVES

The basic purpose of presenting the materials of this course is to:

1- Develop basic principles of statistics
2- Teach students how to use different statistics method in practical application
3- Introduce the students to actual testing and estimating procedures of statistical parameters arising in Industries.

GENERAL LEARNING OUTCOMES

On successful completion of this course, students are expected to develop **knowledge** and **understanding** of:

1. Using Data Descriptions (Inferential statistics, Samples, Populations, Mean, Mode, Median, Symmetry and Skewness) (Contributing Student Outcomes 1, 2, 6)
2. Application of the Graphical Methods (Line Graph, Bar Graph, Pie Chart and Histogram) (Contributing Student Outcomes 1, 2, 6)
3. Probability Properties, Conditional Probabilities, Multiplication Rule, Bayes Theorem (Contributing Student Outcomes 1)
4. Using Properties of Expected Value and Variance (Contributing Student Outcomes 1)
5. Application of Discrete Random Variables (Bernoulli, Binomial, Geometric, Hypergeometric and Poisson Distributions) (Contributing Student Outcomes 1)
6. Application of Continuous Random Variables (Uniform, Normal, Exponential, Gamma and Chi-squared Distributions) (Contributing Student Outcomes 1)
7. Application of the Central Limit Theorem and Approximation Methods (Contributing Student Outcomes 1)
8. Application of Sampling distributions (Standard Normal, t-distribution, Chi-squared and F-distribution) (Contributing Student Outcomes 1)
9. Application of Estimation (Biased and Unbiased Estimator, Estimating the Mean, Estimating the Variance, etc.) (Contributing Student Outcomes 1)
10. Using the Maximum Likelihood Estimation Method (Contributing Student Outcomes 1)
11. Application of the Hypothesis tests (Mean Tests, Variance Tests, ANOVA, Goodness-of-Fit Test and Test for Independence) (Contributing Student Outcomes 1, 2, 6)
12. Using p-Values for Decision Making in Testing Hypotheses (Contributing Student Outcomes 1, 2, 6)
13. Application of the Simple Linear Regression (Contributing Student Outcomes 1, 2, 6)
14. Using a Solver Program (SPSS) in Statistics (Contributing Student Outcomes 1, 2, 6)
15. Working effectively in multidisciplinary teams, making an independent research in real life environment, and writing a technical report on the results (Contributing Student Outcomes 1, 3, 4, 5, 6)

On successful completion of this course, students are expected to develop **their skills in**:

- Applying several statistical procedures regarding parameters of Industrial Processes (CO: 2,3)
- Interpretations of statistical tests and suggestions for improvement (CO: 1,3)
- Using Statistical software on a regular basis (CO: 3)

On successful completion of this course, students are expected to develop their **appreciation** of, and respect for **values and attitudes** to:

- Importance of Statistics as a tool to verify, suggest and develop industrial production (CO: 1,2,3)
- Importance of modern statistical software (CO: 2, 3)
- Relevance of using Statistics in using available data to forecast and analyse production in Industrial Processes (CO: 2,3)

The course helps to achieve the following program *educational objectives*:

- initiate and manage change in organizations and processes
- enable enterprises to make optimal decisions under conditions of uncertainty

The course makes significant contributions to the following program *outcomes*:

- an ability to apply knowledge of mathematics, science, and engineering
- an ability to design and conduct experiments, as well as to analyze and interpret data
- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical health and safety, manufacturability, and sustainability
- an ability to identify, formulate, and solve engineering problems
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

LEARNING TEACHING METHODS

The function of teaching is to enable students to learn. Therefore students are required to read the chapters of the textbook before coming to class and solve the related end of chapter questions after each lecture. The instructor will lecture in class by writing on the board and some lectures will be given in the lablatory to tach student statistical package softwares. Also, this course introduces to the engineering students various statistical methods and their applications to engineering science.

ASSIGNMENTS

Any form of document concerning work that is to be used by the instructor as the basis of grading will be shown to the student upon request, **within a week following the announcement of the grade**. The objection to any grade must be made to the course assistants within that period. If, after an exam has been graded, you think an error was made in grading or you have questions about the grading of the material, please examine the exam solutions first, and then write your questions or comments on a separate sheet of paper and turn this paper to the assistants.

METHOD OF ASSESSMENT

All examinations, quizzes and assignments will be based on the lectures, tutorials and labs. Assignments will be to hone the problem skills of the students. Students will be encouraged to go through their answer scripts and clarify their omissions and mistakes, if any. Descriptions of the examinations are as follows:

Project: Students should form groups of 5 students (exactly, otherwise you should submit a valid excuse in written form). The data is provided by the instructor and each group must work according to the project guide, if the project report is not submitted on time, a late submission penalty will be applied.
Quizzes: There will be four quizzes during the semester and the best three marks will be selected.
Midterm Exam: There will be one midterm exam.
Final Exam: The final exam will cover the last three chapters (Topics of after Midterm).
Laboratory: This course contains 8 hours LABs. During these LAB sessions students will learn how to use SPSS software to solve their problem in the field of Statistics.
Makeup Exam: There will be **only one makeup exam** after final exam for those students who missed midterm or final exam. This makeup exam will be considered only for one of the mentioned exams. This makeup exam will cover the whole course material. There will be no makeup exam for LAB and quizzes.
Resit Exam: The resit examination will cover all the material studied throughout the semester and has the same structure as in the midterm and final examinations. This exam will be scheduled for a day in the designated resit exams week.

Note 1: The students need a calculator so they should bring their calculators to all lecture/tutorial/lab/exam hours.
Note 2: The voluntary presentation of statistical engineering applications has (5%) bonus. Topics will be chosen by student.

Grading Policy:

Quizzes	15%
Project	20%
Midterm Exam	25%
Laboratory	10%
Final Exam	30%

Note that the instructor reserves the right to modify these percentages in case it is found necessary. You will be informed from the changes, if any.

ATTENDANCE

Attendance will be taken every lecture hour. Note that university regulations allow instructors to give a grade of **NG** (Nil Grade) to a student whose absenteeism is more than 30% of the lecture/lab hours and/or who do not complete sufficient work that are included in the assessment of the course

TEXTBOOK/S

- Notes for every chapter prepared by ınstructor and uploaded. These notes ıncluеds summary of Walpole's book
- R.E. Walpole, R.H. Myers, S.L. Myers, and K. Ye, "Probability & Statistics for Engineers and Scientists", 9th ed., Prentice Hall, (2011).
- Sh. Ross, "A First Course In Probability" 8th ed., Prentice Hall, (2010).

COURSE CONTENT	
Week	**Topics**
1 -2	Collection and Presentation of data; descriptive measures.
2 - 4	Review of probability and statistical distributions.
4 - 6	Parametric estimation, interval estimation and properties of good estimators.
7	Maximum Likelihood Estimator and Nonparametric Estimations
8 – 9	Midterm Exams
11 - 13	Testing of Hypothesis & Fitness tests
14	Regression Analysis and ANOVA
15 - 16	Final Exams

Contribution of the Course to meeting the requirements of Criterion 5

Mathematics and Basic Sciences : 4
Engineering Topics : 1
General Education : 0

RELATIONSHIP OF THE COURSE TO STUDENT OUTCOMES

	Level of Contribution		
Student Outcomes	**No**	**Moderate**	**High**
(1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	☐	☐	☑
(2) 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	☑	☐	☐
(3) an ability to communicate effectively with a range of audiences	☐	☐	☑
(4) 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	☑	☐	☐
(5) 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	☐	☐	☑
(6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	☐	☐	☑
(7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	☑	☐	☐

ACADEMIC HONESTY - PLAGIARISM

Cheating is copying from others or providing information, written or oral, to others. Plagiarism is copying without acknowledgement from other people's work. According to university by laws cheating and plagiarism are serious offences punishable with disciplinary action ranging from simple failure from the exam or project, to more serious action (letter of official warning suspension from the University for up to One Semester). Disciplinary action is written in student records and may appear in student transcripts.

PLEASE KEEP THIS COURSE OUTLINE FOR FUTURE REFERENCE AS IT CONTAINS IMPORTANT INFORMATION