

EASTERN MEDITERRANEAN UNIVERSITY COURSE OUTLINE TEMPLATE

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|---------------------------|---|---------------------|-------------------------|
| COURSE CODE | <i>IENG581</i> | COURSE LEVEL | <i>Spring / 2023-24</i> |
| COURSE TITLE | Design and Analysis of Experiments | | |
| COURSE TYPE | <i>Area Core</i> | | |
| LECTURER(S) | Assoc. Prof. Dr. ADHAM MACKIEH | | |
| CREDIT VALUE | 03 | ECTS VALUE | 06 |
| PREREQUISITES | ----- | | |
| COREQUISITES | ----- | | |
| DURATION OF COURSE | 14 weeks | | |
| WEB LINK | http://staff.emu.edu.tr/adhammackieh/en/teaching/ieng581 | | |

CATALOGUE DESCRIPTION

The way in which information is used in statistical inference making will be explored by covering the simple comparative experiments, experiments with a single factor, fixed effect and random effect models, model adequacy checking, choice of sample size, randomized blocks and Latin squares design, incomplete block design, factorial designs, rules for sums of squares and expected mean squares, fractional factorial designs and regression analysis. Moreover, the statistical package for system statistics (SPSS) will be introduced.

AIMS & OBJECTIVES

- To introduce the basic concepts of experimental design
- To introduce the basic techniques of experimental analysis
- To illustrate how the design and analysis of experiment can develop a process and improve its performance.

GENERAL LEARNING OUTCOMES (COMPETENCES)

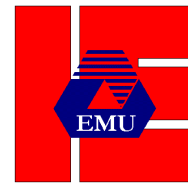
On successful completion of this course, students are expected to developed **knowledge** and **understanding** of:

- The importance of experimental designs to practicing engineers,
- The use of experimental design for process development or improvement,
- The importance of selecting appropriate statistical model in experimental researche,
- The value of statistical analysis in experimental scientific studies.

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

- Planning and designing a suitable model for comparative experiments,
- Choosing a suitable design.
- Analytic analysis of the design,
- Identifying relevant data from irrelevant,
- Choosing a computer software for analysis,
- Interpreting the results obtained,
- Developing improved & robust processes and products,
- Optimal response surfaces.

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



values and attitudes regarding the issues of:

- Need of a well-planned experimental design,
- Role of designs in studying comparative experiments,
- Sources of error and variability in experimental designs,
- Optimization in designs,
- Using related computer software effectively.

GRADING CRITERIA

All examinations will be based on lectures, assigned readings, and project study. The students need to study the materials well in order to understand all concepts, procedures and techniques covered in this course. Exam results will be announced in the student portal as soon as the exam papers have been evaluated. Descriptions of these examinations are as follows:

Home-works: There will be five Homeworks.

Project Work: There will be one project work that covers the applications of the techniques of the Design and Analysis of Experiments.

In Class Exams: There will be Two In Class Examinations.

Make-up Exam: Make-up examination will only be offered (at the end of the semester) to students who missed an exam and who can provide adequate documentation for the reason of their absence within five working days at the latest after the examination date. A student's illness will only be accepted as a valid excuse if it is supported by a written report of one physician of any State Hospital in Northern Cyprus.

Regarding the project study, unfortunately, a penalty for late submissions will be applied if the project report is not submitted on the due date.

RELATIONSHIP WITH OTHER COURSES

The course material will be useful in graduate courses and research work where it is required to design and analyze statistical data from comparative viewpoint and to draw statistical inferences.

LEARNING / TEACHING METHOD

Data show projectors, and Blackboards are used in class when necessary.

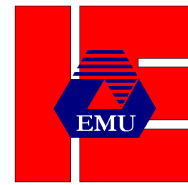
METHOD OF ASSESSMENT

The student's overall grade will be based on the general assessment of the instructor; the Grades-percentages (below) may give an idea about the relative importance of various assessment tools. The instructor or the SENATE of EMU reserves the right to modify these assessment tools and the Grade percentages if necessary:

| | |
|--------------------|------|
| Two In Class Exams | 50 % |
| Five Home-works | 25 % |
| Project | 25 % |

The letter grades distribution usually it is as follows:

| <u>Grades range</u> | <u>Letter Grades</u> | <u>Grades range</u> | <u>Letter Grades</u> |
|---------------------|----------------------|---------------------|----------------------|
| ≥85 To 100 | A | ≥55 To <60 | C |
| ≥80 To <85 | A- | ≥50 To <55 | C- |
| ≥75 To <80 | B+ | ≥45 To <50 | D+ |
| ≥70 To <75 | B | ≥40 To <45 | D |
| ≥65 To <70 | B- | ≥35 To <40 | D- |
| ≥60 To <65 | C+ | <35 | F |



Note: The instructor reserves the full right to modify the distribution of the letter grades.

ATTENDANCE

Regular attendance is necessary and it will be taken in every lecture hour. Less than 70% attendance may lead to NG (Nil-grade).

TEXTBOOK/S

DOUGLAS C. MONTGOMERY; Design and Analysis of Experiments, John Wiley and Sons, Inc., 9TH Edition.

INDICATIVE BASIC READING LIST

- George E.P. BOX, William G. HUNTER and J. Stuart HUNTER; Statistics for Experimenters, An Introduction to Design, Data Analysis, and Model Building, John Wiley and Sons, 1978.
- William W. HINES and Douglas C. MONTGOMERY; Probability and Statistics in Engineering and Management Science, John Wiley and Sons, 3rd Edition, 1990.
- R.H. MYERS and D.C. MONTGOMERY; Response Surface Methodology: Process and Product Optimization using Designed Experiments, Wiley, 1995.
- Richard I. Levin and David S. Rubin; Statistics for Management. Prentice Hall, 7TH Edition, 1998.

EXTENDED READING LIST

There are many books related with this course in the Library of Eastern Mediterranean University.

CONTENT & SCHEDULE: The weekly time schedule of this course is Monday 13:30-16:20.

The lecture topics within the semester are as shown in the following table:

| WEEK | TOPICS |
|------|---|
| 1 | Introduction and Overview. |
| 2 | Simple Comparative Experiments. |
| 3 | Review of Statistics and hypothesis testing. |
| 4 | Experiments with a Single Factor: The Analysis of Variance |
| 5 | Analysis of the Fixed Effect Models. Comparison of Individual Treatment means. SPSS & MINITAB sessions. |
| 6 | Analysis of Random Effect Models. Model Adequacy Checking. |
| 7 | Choice of sample size. The regression approach to ANOVA |
| 8 | Kruskal-Wallis Test. |
| 9 | Midterm Week. |
| 10 | Randomized Blocks. |
| 11 | Latin Squares. |
| 12 | Factorial Designs Fixed Effect Models. |
| 13 | Factorial Designs Random Effect Models. |
| 14 | The 2 ^k Factorial Designs. |
| 15 | Final Exam Week. |

PLAGIARISM

This is intentionally failing to give credit to sources used in writing regardless of whether they are published or unpublished. Plagiarism (which also includes any kind of cheating in exams) is a disciplinary offence and will be dealt with accordingly. Any act not suitable for a university student will not be tolerated and may lead to formal disciplinary action. Example of this are: getting someone else to take the examinations for you, misrepresentation of your own answer sheet as another's work, cheating, knowingly assisting other students to cheat, abusing the tolerance or breaking the discipline of the class.