

Course Syllabi

1. MAES-00086 EXPERIMENTAL DESIGN

2. 144 credits hours.

3. Bibliography

- Análisis y diseño de experimentos, Pulido, H.G., de la Vara Salazar, R., Castellanos, 2012
- Análisis y Diseño de Experimentos., Gutiérrez, H., De la Vara, R. , 2008
- An Introduction to Statistical Learning: with Applications in R, James, G., Witten, D., Hastie, T., Tibshirani, R., 2021
- Diseño y Análisis de Experimentos, Montgomery, D, 2004

4. Specific Course Information

- a. Experimental Designs establish procedures or techniques to intentionally modify a process under study. This seeks to increase the probability of identifying significant changes in such processes. Studies carried out in experimental design can be exploratory where it is a question of knowing if a factor has influence on a variable of interest. In industry, these examples are evidenced when unknown as: is the productivity of a machine influenced by the type of operator or brand of the machine? the duration of an activity can infer the time in which it is performed or the gender of the person performing the activity? Among others. The objective of the design of experiments is to study when using a particular treatment occurs an improvement in the process or not. Then, experimental design studies how to vary the usual conditions of carrying out an empirical process to increase the probability of detecting significant changes in the process. This course will help students to develop skills to identify and solve problems related to Industrial Engineering. By stimulating their capacity for analysis, synthesis and critical thinking, ABET learning contents and results of this subject contribute to: RA2. Design. It applies engineering design to produce solutions that meet specific needs. RA3. Communication. Communicates professional topics to a range of effective audiences. RA5. Teamwork. Work in a team whose members together provide leadership, create a collaborative and inclusive environment, set goals, work plans and achieve goals with effectiveness.
- b. Prerequisites:
- INDU-00007 QUALITY MANAGEMENT
 - INDU-00021 PRODUCTION CONTROL SYSTEMS

5. Learning Objectives of the Course

- a. Identify sources of variation, randomization and modelling necessary to propose an experimental design, using effectively the different models and tests always based on objective evidence.
- Identify the variables involved in an experimental design and how they relate.
 - Recognize the components of variance and how they affect an experimental design, as well as how variance is distributed under it in an experiment.
 - Detect the main effects and interact them. in one or more experimental responses.
 - Identify the different models for an experimental design and choose the right ones for each case.
- b. Learning Outcomes
- Ra2. identify sources of variation in an experimental model in a way that produces solutions taking into account global factors of stakeholders.
 - Ra1. proposes, identifies and controls experiments applied to the field of industrial engineering.
 - Ra2. learn about experimental engineering designs to produce solutions that meet specific needs

- Ra5. works in a team to propose statistical models applied to industry considering goals, work plans and achieve objectives effectively
- Ra2. learn about experimental engineering designs to produce solutions that meet specific needs
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6. Course Topics

- Unit 1: introduction
- Unity 2: first designs with variability: models and estimation
- Unit 3: block designs
- Unit 4: factorial designs
- Unity 5: models that use variance analysis.