Decisions analysis in industrial engineering

Academic Year: (2023 / 2024) **Review date: 04/05/2023 13:25:44**

Department assigned to the subject: Mechanical Engineering Department

Coordinating teacher: GARCIA GUTIERREZ, ISABEL

Type: Electives ECTS Credits : 6.0

Year : 4 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Required: "Diseño y simulación de sistemas productivos" (3rd year)

LEARNING OUTCOMES

CB1. Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study
CB2. Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.
CB3. Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements which include reflection on relevant social, scientific or ethical issues.
CB5. Students will have developed the learning skills necessary to undertake further study with a high degree of autonomy.
CG1. Ability to solve problems with initiative, decision-making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Industrial Engineering.
CG3. Ability to design a system, component or process in the field of Industrial Technologies to meet the required specifications
CG4. Knowledge and ability to apply current legislation as well as the specifications, regulations and mandatory standards in the field of Industrial Engineering.
CG5. Adequate knowledge of the concept of company, institutional and legal framework of the company. Organisation and management of companies.
CG6. Applied knowledge of company organisation.
CG8. Knowledge and ability to apply quality principles and methods.
CG9. Knowledge and ability to apply computational and experimental tools for the analysis and quantification of Industrial Engineering problems.
RA2. Engineering Analysis: To be able to identify engineering problems within the industrial field, recognise specifications, establish different resolution methods and select the most appropriate one for their solution
RA4. Research and Innovation: To be able to use appropriate methods to carry out research and make innovative contributions in the field of Industrial Engineering.
RA5. Engineering Applications: To be able to apply their knowledge and understanding to solve problems and design devices or processes in the field of industrial engineering in accordance with criteria of cost, quality, safety, efficiency and respect for the environment.

OBJECTIVES

- Knowledge of general techniques to support industrial engineering decision making in multi-organizational and multi-decision agent context.

- Identify situations where each technique apply.

- Understand the importance of possible deviations between the case study and the model applied.

- Being able to implement the techniques studied.

- Understand the role of the R+D+I in business competitiveness and its relationship to engineering, technological capital and entrepreneurship.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction to decision analysis. Quantitative models for decision-making in industrial engineering.
2. Decision tree analysis. Expected Monetary Value.
3. Search and use of additional information.
4. Certainty Monetary Equivalent. Utility functions.
5. Application of utility functions to decision tree analysis.
6. Introduction to analytical utility functions.
7. Attitudes towards risk. Types of analytical utility functions.
8. Constant proportionality risk aversion analytical utility functions.
9. Game theory. Introduction.
10. Two-person zero-sum games.
11. Two-person non-zero-sum games.
12. Introduction to multicriteria decision making.
13. Goal Programming. Problem formulation and resolution.
14. Environmental applicacions of MCDM techniques.
15. ELECTRE method. Problem formulation and resolution.
16. Application to HHRR selection problems.
17. Research, development and innovation. Technological capital and competitiveness.

LEARNING ACTIVITIES AND METHODOLOGY

Lectures, exercises, practical sessions, cases and assignments to be carried out by the students and discussed during the sessions, readings assigned by the instructor or identified by the students.

ASSESSMENT SYSTEM

% end-of-term-examination/test:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

60% Final written exam.
40 % Continuous evaluation. Partial exams will be held, approximately in the tentative weeks indicated in the schedule. Optionally, complementary evaluation system. May apply sampling based grading.
Minimimum grade required in the final exam: 4

BASIC BIBLIOGRAPHY

- DIXIT, AVINASH K., NALEBUFF, BARRY J. Pensar estratégicamente: un arma decisiva en los negocios, la política y la vida diaria, Antoni Bosch, D.L., 1992

- Garriga Garzón, F. Problemas resueltos de teoría de la decisión (ver adaptac para este curso), OmniaScience, 2013

- HILLIER, FREDERICK S.; LIEBERMAN, GERALD J. Introducción a la Investigación de Operaciones. Novena Edición., McGraw-Hill, 2010

- ROMERO, CARLOS. Teoría de la decisión multicriterio, conceptos, técnicas y aplicaciones., Alianza, D.L., 1993

- TAHA, HAMDY A. Investigación de operaciones. Novena edición. , Pearson, 2012

- Theory presentation and problems distributed through Aula Global, Área de Ingeniería de Organización.