Universidad Zaragoza

28950 - Agri-food industry: design and optimisation

Información del Plan Docente

Academic Year	2016/17
Academic center	201 - Escuela Politécnica Superior
Degree	437 - Degree in Rural and Agri-Food Engineering
ECTS	6.0
Course	4
Period	First semester
Subject Type	Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

This subject is offered in the English Friendly form

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The learning process is based on:

1) The **participatory lecture technique** (PLT) will be applied during the course of the theoretical sessions. Students will be encouraged to actively participate in the lectures by asking/answering questions and/or solve short exercises.

2) **Group work and collaborative learning** will be used during the course of the practical sessions, which will be focused on solving a number of problems and case studies.

3) Several **collaborative projects,** integrating concepts and techniques and based on the case studies analysed during the practical sessions, will be performed by the students (in groups of 2 or 3 members; the same groups as those established during the practical sessions).

5.2.Learning activities
- Theoretical sessions in the classroom (20 h).
- Practical sessions in the computer classroom (40 h).
- Cooperative learning: during the practical sessions (in class) and the collaborative projects (out of class).
- Autonomous learning (out of class): students will be encouraged to resolve several exercises and questionnaires related to the subjects covered in the classroom. They will post the solution on the Moodle site and interact with each other.
- Individual or small-group tutoring, which can be face-to-face (in the desk of lecturers) or virtual (using the Moodle platform).

5.3.Program

Theory programme

Thematic block I: Designing production systems.

Topic 1 : PRODUCTION CAPACITY. Planning and programming the production. Cost analysis. Predicting demand using time series models. Systems with delays (queuing theory). Feasibility study of investments affecting production capacity.

Topic 2 : LOCATION AND LAYOUT OF THE PLANT. Qualitative and quantitative analysis to decide the location of one or several facilities. Layout of the plant: Types, factors to consider and SLP (*Systematic Layout Planning*).

Thematic block II: Modelling and Optimisation.

Topic 3 : OPTIMISING FUNTIONS. Cases without restrictions and with one restriction. Lagrange multipliers.

Topic 4 : GRAPH THEORY. Optimal route. Transport networks: Optimal flow.

Topic 5 : LINEAR PROGRAMMING. Fundamentals. Simplex algorithm. Duality and sensitivity analysis.
Thematic block III: Process Simulation.
Topic 6 : Introduction to the Aspen HYSYS software. Compounds data bases. Thermodynamic packages. Simulation environment. Optimisation tools.
Practical programme

Practical session resolving case studies

Case study 1 . Predicting demand using time series models.

Case study 2 . Analysing systems with delays (Jackson's networks).

Case study 3 . Variation of the production capacity in the long term: Comparing different investment alternatives.

Case study 4 . Food processing industry location.

Case study 5 . Establishing the optimal online purchasing policy of a company in the food-processing sector: Application of Lagrange multipliers.

Case study 6 . Analysis of a transport network. Optimal route and flow.

Case study 7 . Linear programming: Establishing the optimal production plan.

Case study 8 . Linear programming: Establishing the optimal product range.

Case study 9 . Linear programming: Establishing the optimal production programme and optimal purchasing plan.

Case study 10 . Simulation using Aspen HYSYS of an evaporation process.

5.4.Planning and scheduling

Schedule

Workload

Activity	Classroom or laboratory hours	Factor	Out of class hours
Theoretical sessions	22	1,5	33
Practical sessions	30	1,3	39
Collaborative work	-	-	26
Total	52		98
Total workload	150 h		

5.5.Bibliography and recomended resources

Basic Texbooks

- Hillier, Frederick S. Introduction to Operations Research. McGraw-Hill Science/Engineering/Math, 9th Ed. 2009.

Complementary Textbooks

- López-Gómez, A., Barbosa-Cánovas, G.V. Flood plant design. Boca Raton: CRC Press, 2005.
- Taha, Hamdy A. Operations Research: An Introduction. Pearson, 9th Ed., 2010.