Year : 2018/19

28950 - Agri-food industry: design and optimisation

Syllabus Information

Academic Year:	2018/19
Subject:	28950 - Agri-food industry: design and optimisation
Faculty / School:	201 -
Degree:	437 - Degree in Rural and Agri-Food Engineering
ECTS:	6.0
Year:	4
Semester:	First semester
Subject Type:	Compulsory
Module:	---

General information

Aims of the course

Context and importance of this course in the degree

Recommendations to take this course

This subject is offered in the English Friendly form

Learning goals

Competences

Learning goals

Importance of learning goals

Assessment (1st and 2nd call)

Assessment tasks (description of tasks, marking system and assessment criteria)

Methodology, learning tasks, syllabus and resources

Methodological overview

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).

Learning tasks

- 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).

Syllabus

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.

Course planning and calendar

Schedule

Workload

Activity	Classroom or laboratory hours	Factor	Out of class hours
Theoretical sessions	20	1,5	30
Practical sessions	40	1	40
Collaborative work	-	-	17
Evaluation	3		
Total	63		87
Total workload	150 h		

Bibliography and recommended resources

BB	Hillier, Frederick S.. Introducción a la investigación de operaciones / Frederick S. Hillier, Gerald J. Lieberman ; revisión

técnica, Guillermo Martínez del Campo V., Ernesto A. Pacheco . 9a. ed. México [etc.] : McGraw-Hill, cop. 2010

BC Lopez-Gómez, A., Barbosa-Canovas, G.V. (2005). Flood plant design. Boca Raton: CRC Press

BC Taha, Hamdy A.. Investigación de operaciones / Hamdy A. Taha; traducción Virgilio González Porro . 7ª ed. México [etc.] : Pearson Educación, 2004

The updated recommended bibliography can be consulted in:
http://psfunizar7.unizar.es/br13/egAsignaturas.php?id=8111