240AU034 - Quality Management

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 715 - EIO - Department of Statistics and Operations Research
Academic year: 2017
Degree: MASTER'S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2012). (Teaching unit Compulsory)
MASTER'S DEGREE IN STATISTICS AND OPERATIONS RESEARCH (Syllabus 2013). (Teaching unit Optional)
ECTS credits: 4,5
Teaching languages: Catalan

Teaching staff
Coordinator: JAVIER TORT-MARTORELL LLABRES

Degree competences to which the subject contributes

Specific:
1. Apply knowledge of mathematics, physics and technology obtained through study, experience and practice, using critical reasoning to establish economically viable solutions to technical problems in the automotive sector
2. Plan, monitor and control the development of new products, applying knowledge of marketing, technology and concurrent engineering

Generic:
3. Integrate knowledge and handle complexity, making judgments and decisions, from incomplete or limited information, including reflections on the social and ethical responsibilities of professional practice

Teaching methodology

Three methodologies will be used:
- Lectures and participatory classes
- Cooperative Learning
- Problem-based learning

Learning objectives of the subject

It is expected that the student is able to apply (design and implement) both technical and organizational aspects of quality management, quality control and quality improvement. Specifically, at the end of the course students will be able to:
- Understand the main quality standards related to the sector
- Design a quality procedure
- Understand the importance of quality improvement systems and design and organize Six Sigma or Lean systems applying the relevant techniques
- Making capability studies to characterize the variability of a process. Use control charts (SPC)
- Use simple factorial designs
- Work together to agree on decisions and solve problems
# Study load

<table>
<thead>
<tr>
<th>Total learning time: 112h 30m</th>
<th>Hours large group:</th>
<th>0h</th>
<th>0.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>27h</td>
<td>24.00%</td>
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<tr>
<td></td>
<td>Hours small group:</td>
<td>13h 30m</td>
<td>12.00%</td>
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<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>72h</td>
<td>64.00%</td>
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# Content

## Quality management and improvement

**Description:**

**Specific objectives:**
Understand and be able to argue and convince of the need to improve systems. Be able to apply the DMAIC (Six Sigma) methodology to simple projects. Know how to identify wastes according to the Lean methodology and identify appropriate tools to remove them.

<table>
<thead>
<tr>
<th>Learning time: 14h</th>
<th>Theory classes: 10h</th>
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<tbody>
<tr>
<td></td>
<td>Practical classes: 4h</td>
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</table>

## Statistical quality tools

**Description:**

What is sampling inspection? What is a sampling plan? Buyer and seller's risks. Calculation of risks. Characteristic of a sampling plan. Design of sampling plans. MIL-STD 105 D

Basic techniques of Design of Experiments, full factorial designs: Calculation and analysis of the significance of effects. Interpretation of results. Introduction to fractional factorial designs and robust product design (G. Taguchi contributions)

**Specific objectives:**
Be able to identify the appropriate control chart to each situation and to use them to identify assignable causes. Be able to design, conduct and analyze full factorial experiments. Know how to critically evaluate sampling inspection systems and use the concepts of the buyer's and seller's risks.

<table>
<thead>
<tr>
<th>Learning time: 21h</th>
<th>Theory classes: 14h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Practical classes: 7h</td>
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</tbody>
</table>

## Introduction to Total Quality.

Historical Background. The quality gurus. Juran’s trilogy.


Quality standards in the automotive sector: ISO / TS 16949


What is sampling inspection? What is a sampling plan? Buyer and seller's risks. Calculation of risks. Characteristic of a sampling plan. Design of sampling plans. MIL-STD 105 D

Basic techniques of Design of Experiments, full factorial designs: Calculation and analysis of the significance of effects. Interpretation of results. Introduction to fractional factorial designs and robust product design (G. Taguchi contributions)

Be able to identify the appropriate control chart to each situation and to use them to identify assignable causes. Be able to design, conduct and analyze full factorial experiments. Know how to critically evaluate sampling inspection systems and use the concepts of the buyer's and seller's risks.
### Other tools for quality

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>10h</th>
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<tbody>
<tr>
<td>Theory classes:</td>
<td>6h</td>
</tr>
<tr>
<td>Practical classes:</td>
<td>4h</td>
</tr>
</tbody>
</table>

#### Description:
Ishikawa's seven basic tools: templates, histograms, Pareto charts, cause-effect diagrams, scatterplots, stratification, control charts. Skills: team work


#### Specific objectives:
Be able to identify the right tool to different situations and to use them in specific cases
# 240AU034 - Quality Management

## Planning of activities

| RESOLUTION OF EXERCISES AND PROBLEMS | Hours: 12h  
Practical classes: 4h  
Self study: 8h |
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<thead>
<tr>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>The students will have exercises and problems to solve. These assignments will be carried out individually or in groups, as indicated by the teacher. Some of these activities will be valued by the teacher, self-valued or jointly valued.</td>
</tr>
<tr>
<td><strong>Support materials:</strong></td>
<td>Each unit will have a collection of exercises available at least on the intranet (probably also as printed material).</td>
</tr>
<tr>
<td><strong>Descriptions of the assignments due and their relation to the assessment:</strong></td>
<td>The exercises done by each student will be used to value this activity.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>The students practice the achieved concepts and to provide information to the Professor about the level of assimilation and understanding of the concepts by the student.</td>
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| RESOLUTION OF CASE STUDIES | Hours: 28h  
Practical classes: 6h  
Self study: 22h |
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<tr>
<td><strong>Description:</strong></td>
<td>The students must solve case studies based on real industrial problems. They will have to use the database provided, they will have to decide the most appropriate statistical tools to answer to the questions set, using the statistical software (Minitab).</td>
</tr>
<tr>
<td><strong>Support materials:</strong></td>
<td>Students will have the formulation of cases and databases on the intranet. The students will also have available videos explaining the use of the statistical software (Minitab), needed to solve cases.</td>
</tr>
<tr>
<td><strong>Descriptions of the assignments due and their relation to the assessment:</strong></td>
<td>The evaluation will be based on questionnaires about the case studies, class discussion and, eventually, in delivering reports.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>Acquire skills in identifying the most appropriate methodologies and tools in every situation and in using them to answer specific questions.</td>
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<thead>
<tr>
<th>PARTIAL EXAM</th>
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<tr>
<td><strong>Description:</strong></td>
<td>Evaluation of the achieved knowledge.</td>
</tr>
<tr>
<td><strong>Descriptions of the assignments due and their relation to the assessment:</strong></td>
<td>Solved exam.</td>
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<thead>
<tr>
<th>FINAL EXAM</th>
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Description:
Evaluation of the achieved knowledge.

Descriptions of the assignments due and their relation to the assessment:
Solved exam.

Qualification system

\[ NF = 0.30\times N\times NAC + 0.25\times NEP + 0.45\times NEF \]

NF: final mark
NAC: mark of the continuous evaluation
NEP: mark of the partial exam
NEF: mark of the final exam

Regulations for carrying out activities

The ones applying at UPC and ETSEIB

Bibliography