240AU023 - Tyres

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering
Academic year: 2017
Degree: MASTER'S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2012). (Teaching unit Compulsory)
MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Teaching unit Optional)
ECTS credits: 3
Teaching languages: Spanish

Teaching staff

Coordinator: M. ANTONIA DE LOS SANTOS LOPEZ
Others: DAVID GALLEGOS DIEZ

Prior skills

Knowledge of Vehicle dynamics

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. Conceptualize engineering models, apply innovative methods in problem solving and applications suitable for the design, simulation, optimization and control of processes and systems
3. Develop ability to solve problems that are unfamiliar, incompletely defined, considering the possible methods of solution, including the most innovative, selecting the most appropriate, and correcting implementation, evaluating different design solutions.
4. Perform, present and defend an original exercise performed individually before a university tribunal, consisting of a comprehensive project of Automotive Engineering professional nature which synthesize the skills acquired in the teachings

General:
5. Ability to apply appropriate knowledge of mathematical aspects, analytical, scientific, instrumental, technological and management, the resolution of the problems of the automotive
6. Conceive, design, calculate and design processes, equipment, facilities and plants related to the design and manufacture of vehicles and their systems
7. Develop independent learning skills to maintain and enhance the powers of Automotive Engineering, to allow the continued development of the profession.

Teaching methodology

Lectures.
Scheduled autonomous learning.
Cooperative learning.

Learning objectives of the subject

General objectives:
- Provide a generic knowledge on tyres
Specific objectives:
- Know the influence of the tyre in the dynamic characteristics of the vehicle
240AU023 - Tyres

- Analyse the types of stress on the tyre
- Know the regulations which are actually applied on tyres

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group:</th>
<th>Hours medium group:</th>
<th>Hours small group:</th>
<th>Guided activities:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong></td>
<td>75h</td>
<td>0h</td>
<td>18h</td>
<td>9h</td>
<td>48h</td>
</tr>
<tr>
<td></td>
<td>0.00%</td>
<td>24.00%</td>
<td>12.00%</td>
<td>0.00%</td>
<td>64.00%</td>
</tr>
</tbody>
</table>
### General characteristics

| Description: | General characteristics of tyres.  
|             | Nomenclature used in the designation of tyres.  
|             | - Tourism vehicle tyres.  
|             | - Industrial vehicle tyres.  
| Related activities: | Interactive classes, resolution of problems and practical examples.  
| Specific objectives: | Know the general characteristics of tyres.  
|                   | Know the nomenclature used specifically on tyres. |

| Learning time: | 10h  
| Theory classes: | 4h  
| Practical classes: | 2h  
| Self study: | 4h |

### Longitudinal and transversal forces

| Description: | Static and dynamic radial stiffness.  
|             | Longitudinal stresses: traction and breaking.  
|             | Longitudinal drift.  
|             | Rolling resistance.  
|             | Acuaplaning.  
|             | Transverse stresses.  
|             | Transverse drift.  
|             | Self-aligning moment.  
| Related activities: | Interactive classes, resolution of exercises and practical examples.  
| Specific objectives: | Analyse the longitudinal and transverse stresses and its reactions of the tyre dynamic.  
|                   | Know the influence of the tyre on the vehicle's dynamic. |

| Learning time: | 35h  
| Theory classes: | 12h  
| Practical classes: | 8h  
| Self study: | 15h |
### Regulations applied to tyres

**Description:**
Load-speed test.
Bearing endurance, adhesion in damp surfaces and bearing noise.

**Related activities:**
Interactive classes, resolution of problems and practical examples.

**Specific objectives:**
- Know the official approval that is applied on tyres.
- Know the testing procedures as an evaluation tool and the comparison of the performance of the tyres.

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>30h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes:</td>
<td>10h</td>
</tr>
<tr>
<td>Practical classes:</td>
<td>6h</td>
</tr>
<tr>
<td>Self study:</td>
<td>14h</td>
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</table>
### Planning of activities

<table>
<thead>
<tr>
<th>INTERACTIVE CLASSES</th>
<th>Hours: 41h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 24h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study: 15h</td>
</tr>
</tbody>
</table>

**Description:**
Exposition by the Professor of the contents indicated in the section "contents", with the active participation of the students

**Support materials:**
- Notes of the subject
- Bibliographic references of the subject

**Specific objectives:**
The ones indicated in the section "contents"

<table>
<thead>
<tr>
<th>RESOLUTION OF PROBLEMS AND PRACTICAL EXAMPLES</th>
<th>Hours: 12h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Self study: 8h</td>
</tr>
</tbody>
</table>

**Description:**
Exercises to be solved by the students, at home and in class

**Support materials:**
- Notes of the subject
- Formulation of the problems

**Specific objectives:**
The ones indicated in the section "contents"

<table>
<thead>
<tr>
<th>MONOGRAPHIC WORK</th>
<th>Hours: 15h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Self study: 15h</td>
</tr>
</tbody>
</table>

**Description:**
Development of a monographic work from the topic proposed by the Professor of the course

**Support materials:**
- Notes of the subject
- Bibliographic references of the subject

**Specific objectives:**
The ones indicated in the section "contents"
EXAMS

Hours: 7h
Theory classes: 4h
Self study: 3h

**Description:**
Two written exams will take place, one in mid-semester and the other one by the end of the semester, so as to evaluate individually the comprehension level of the specific objectives of the course and the achieved knowledge in the lectures and the activities developed.

**Support materials:**
- Formulation of the exam

**Descriptions of the assignments due and their relation to the assessment:**
- Answer sheet of the exam

**Specific objectives:**
- Individual evaluation of the comprehension level and the achieved knowledge

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**Qualification system**

Written exams: 60%
Deliveries: 20%
Monographic work: 20%

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**Regulations for carrying out activities**

Exams: general theory and practical part. In the theory part, the use of any material is allowed, while the practical part will allow the use of a formulary.

The exercises will be delivered within 15 days from the date proposed.

To carry out the monographic work, different thematic options will be proposed by the tutor. It will be carried out in groups and a written report must be presented (no more than 25 pages and under the rules of the Department of Mechanical Engineering). Finally, the work will be defended in a 15-minute oral presentation.

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**Bibliography**

**Basic:**


**Complementary:**
