The aim of this course is to help students understand and practice the techniques and tools that enable them to enhance and develop their creativity as well as the appreciation of creativity in other people. In this course, students will learn the techniques of problem solving in engineering and the knowledge and use of creative techniques for obtaining new or alternative solutions, to teamwork, to motivation, for improving performance of alternative solutions, as well as the concept of innovation in all areas of their future professional work. Following a methodology based on logic, scientific method, and statistical decision theory, the student will focus problems, to appreciate the importance of the environment and interaction with the systems, and the influence of their knowledge and perception in search for information. When students have successfully completed this course will be able to troubleshoot, optimize and design products and services, dissect arguments, distinguish between good and bad reasoning, fallacies discover and find and target the key elements of a discussion. There will also be encouraged critical thinking, enabling them to articulate and defend their own views and recognize and identify possible defects in their beliefs and reasoning.
## Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group:</th>
<th>39h</th>
<th>31.20%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>0h</td>
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</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities:</td>
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</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>86h</td>
<td>68.80%</td>
</tr>
</tbody>
</table>
## 1. Introduction. Some key concepts. Taxonomies.

**Description:**
- Ideas
- Creativity
- Engineering problem solving
- Effectiveness vs. Efficiency
- Identity Environment-System
- Innovation
- Types of Innovations
- The killer applications
- Keys for a innovative entrepreneurship
- Innovation cases
- Reflexions about Innovation
- Inventions
- Examples and Creativity cases
- Creativity performance
- Features of geniuses

**Learning time:** 9h  
**Theory classes:** 9h

## 3. Critical Thinking

**Description:**
- Data, information and knowledge
- Critical Thinking
- Famous engineers performances
- Development of knowledge
- Research and obtain information
- Perception
- Thinking and reasoning
- Conscious and subconscious Mind.
- Role of the Mind in Learning
- The Heuristics
- Reasoning
- Brain and Mind, role of the cerebral hemispheres

**Learning time:** 15h  
**Theory classes:** 15h
## 3. Problem Solving and Engineering Design

**Learning time:** 6h  
**Theory classes:** 6h

**Description:**  
- Finding creative solutions  
- Strategy to promote creativity.  
- Convergent and Divergent Problems  
- Procedures for obtaining solutions.  
- Team Leadership  
- Leadership and Executive Intelligence.

## 4. Creative Techniques

**Learning time:** 12h  
**Theory classes:** 12h

**Description:**  
- Pure Creative techniques.  
- Lateral Thinking  
- Reversal Techniques  
- Analogies Method  
- Forced Relationship Techniques  
- Strata  
- Da Vinci Technique  
- Automated Writing Technique  
- Pseudo Dream Technique  
- Creative Systematized Techniques  
- Logical Thinking  
- Tree of Ideas or Mind Maps  
- SWOT (Strengths, Weaknesses, Opportunities, and Threats)  
- "Six Hats" Method  
- Discretization, partition or division Techniques.  
- Morphological Matrix Method.  
- Key Questions Technique  
- Brainstorming  
- CPS (creative problem solving)  
- TRIZ (Theory of Inventive Problem Solving) method  
- Delphi Method
230637 - CTC - Critical Thinking and Creativity

5. Summary and Conclusions

<table>
<thead>
<tr>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Summary of all main subject concepts.</td>
</tr>
<tr>
<td>- Critical review of the subject and teacher.</td>
</tr>
<tr>
<td>- Proposed improvements.</td>
</tr>
</tbody>
</table>

Learning time: 3h
Theory classes: 3h

Qualification system

Ongoing evaluation of weekly assignments exercises and class contributions to the discussions proposed: 100%

Examinations consist to solve a creative problem by a students team

Bibliography

Basic:


Complementary: