

220136 - Innovation and Creativity: Tools for Engineering

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
 Teaching unit: 758 - EPC - Department of Project and Construction Engineering
 Academic year: 2019
 Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
 BACHELOR'S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
 BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Teaching unit Optional)
 ECTS credits: 3 Teaching languages: English

Teaching staff

Coordinator: Miguel Angel Saiz Segarra

Teaching methodology

The methodology will be: Theoretical exposition and working in groups some exercises for practicing and improving the students creativity.

Learning objectives of the subject

Study load

Total learning time: 75h	Hours large group:	30h	40.00%
	Hours medium group:	0h	0.00%
	Hours small group:	0h	0.00%
	Guided activities:	0h	0.00%
	Self study:	45h	60.00%

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Content

<p>Module 1: Introduction to creativity. Is there Creativity in engineering?</p>	<p>Learning time: 12h Theory classes: 5h Self study : 7h</p>
<p>Description: In this module we try answer the next questions: It is engineering creative? Has sense the creativity in engineering? It is useful waste time thinking in improving my creativity? Have creative people similar traits? Am I a creative person? I will never be creative. What are the main factors that influence in creativity? What are the obstacles to creative thinking and how to overcome them? Can I improve my creative traits? Where do ideas come from?</p> <p>Related activities: Theoretical explanations. Self-reflections about the theoretical explanations working in groups. Examples and exercises.</p>	
<p>Module 2: Diving into Creativity.</p>	<p>Learning time: 13h Theory classes: 5h Self study : 8h</p>
<p>Description: In this module we discuss about some topics as: Do we really have two sides in my brain? Are they really different? Left side: reasoning. Right side: imagination. Engineering needs them both. Do I really want to use them? Advantages & Disadvantages of creativity. Creativity is a process, not just to have a good idea. Success, failure and the drive to keep creating. Creativity needs ideas and actions. How to support the failure. The four roles of creativity: Explorer, artist, judge, warrior. Where am I? Inside the life of some scientists and inventors.</p> <p>Related activities: Theoretical explanations. Self-reflections about the theoretical explanations working in groups. Examples and exercises.</p>	
<p>Module 3: Let's play with the creativity. Applied Creativity.</p>	<p>Learning time: 12h Theory classes: 5h Self study : 7h</p>
<p>Description: In this module we are going to apply the creativity, basically using some of the most known creativity techniques and learning to create new ones. WE discuss also about these topics: How improve the creativity in engineering. How obtain ideas from people. Different techniques of creativity. Theory and applications. Six thinking hats. Brainstorming. Sleep writing. TRIZ. Only genius can innovate? How can we help to anyone in having ideas? How to perform a technique of creativity in group. Different examples.</p> <p>Related activities: Theoretical explanations. Self-reflections about the theoretical explanations working in groups. Examples and exercises.</p>	

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<p>Module 4: Engineering the creativity: Applied Personal Creativity</p>	<p>Learning time: 13h Theory classes: 5h Self study : 8h</p>
<p>Description: In this module we are going to work in the next topics: How apply the creativity in the engineering problems. Theory of invention. Theory of Inventive Problem Solving. TRIZ in more detail. How use TRIZ in invention processes. Methods for inventing and innovating. How combine Convergent and divergent thinking. Innovators versus adaptors: main traits.</p> <p>Related activities: Theoretical explanations. Self-reflections about the theoretical explanations working in groups. Examples and exercises.</p>	
<p>Module 5: Innovation: Applied Collective Creativity.</p>	<p>Learning time: 12h Theory classes: 5h Self study : 7h</p>
<p>Description: In this module we integrate the creativity in the enterprise. The next topics are going to be worked: How enterprises innovate? How obtain ideas and transform in innovation. Innovation is not invention. The ten faces of innovation. The innovation groups. Incremental, Differential, Radical, and Breakthrough Innovation Projects.</p> <p>Related activities: Theoretical explanations. Self-reflections about the theoretical explanations working in groups. Examples and exercises.</p>	
<p>Module 6: Creativity, innovation and enterprises</p>	<p>Learning time: 13h Theory classes: 5h Self study : 8h</p>
<p>Description: In this module we continue diving in the applied innovation inside enterprises. The topics will be the next ones: How managing and transform individual creativity inside enterprises for obtaining innovation as a product of collective creativity. Innovation groups in the enterprises. Examples of applications.</p> <p>Related activities: Theoretical explanations. Self-reflections about the theoretical explanations working in groups. Examples and exercises.</p>	

Qualification system

The assessment will be a combination between the works inside the class and the homework activities.

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Bibliography

Basic:

Altshuller, G.; Shulyak, L.; Fedoseev, U. 40 principles TRIZ keys to technical innovation. Worcester, MA: Technical Innovation Center, 1998. ISBN 0964074036.

Savransky, Semyon D. Engineering of creativity: introduction to TRIZ methodology of inventive problem solving. Boca Raton, Fla. [etc.]: CRC Press, cop. 2000. ISBN 0849322553.

Kelley, Tom. The ten faces of innovation: IDEO's strategies for beating the devil's advocate & driving creativity throughout your organization. New York: Currency/Doubleday, 2005. ISBN 9780385512077.

Altshuller G. S.; Shapiro R. V. "About a technology of creativity". Questions of psychology. 1956, núm. 6, p. 37-49.

Complementary:

Csikszentmihalyi, Mihaly. Flow: the psychology of optimal experience. New York: Harper Perennial, 2008. ISBN 9780061339202.

Others resources:

- Saiz, M. A. (2011) Curso de creatividad aplicado a la empresa, presentada y publicada en el XV Congreso de Ingeniería de Proyectos. Huesca, 6, 7 y 8 de julio 2011.
- Saiz M. A. (2006) La importancia del grupo de innovación, presentada y publicada en el X CONGRESO DE INGENIERIA DE PROYECTOS. Valencia. 13, 14 y 15 de septiembre de 2006.
- Saiz M. A. (2006) La generación de ideas en entornos profesionales de alto nivel tecnológico: Una aplicación en SEAT ? Centro Técnico. X CONGRESO DE INGENIERIA DE PROYECTOS. Valencia. 13, 14 y 15 de septiembre de 2006.
- Saiz, M. A. (2005), Como potenciar la generación de ideas en la fase creativa de los procesos de innovación tecnológica en aplicaciones de la ingeniería industrial , Tesis Doctoral, UPC, Barcelona.
http://www.tdx.cesca.es/TDX-0629105-133644/index_an
- Saiz M. A. (2004) Técnica de innovación tecnológica aplicada al diseño de un componente en la industria del automóvil , VIII CONGRESO DE INGENIERIA DE PROYECTOS. Bilbao. 6, 7 y 8 de Octubre de 2004