

Course	Material Selection and Manufacturability Aspects of Energy Technology Applications, 3 ECTS credits
Year and period	M.Sc. 1-2; 6-10.8.2018
Teacher(s)	Docent, D.Sc. (Tech.) Harri Eskelinen, LUT Lecturer D.Sc. (Tech.) Kimmo Kerkkänen, LUT
Person(s) in Charge	Professor D.Sc. (Tech.) Juha Varis, LUT
Aims	<p>After having passed this course the student is able to:</p> <ul style="list-style-type: none"> - understand the basic process of systematic material selection approaches for solving cross-technological material selection tasks especially in energy technology applications - recognize the key properties, the main strengths, the critical weaknesses and the typical application areas of the main groups of constructional materials for different types of energy technology applications - is able to take into account both the functionality and the manufacturability aspects in addition to the total costs and environmental aspects of the product in solving the material selection tasks related to energy technology applications - recognize the most important aspects for easy assembly of typical constructions and components used in energy technology applications.
Content	<p>During the course the student will become familiar with the properties and application areas of different constructional materials.</p> <ul style="list-style-type: none"> - Aspects of selecting and comparing different materials for energy technology applications are discussed from the viewpoints of functionality, manufacturing aspects, costs and environmental aspects of the product. - Future trends in materials science are discussed. - Following material groups will be discussed: metals and their alloys, polymers, ceramics, composites, adaptive (smart) materials and nanomaterials. - Some environmental aspects of material selection from the viewpoints of LCC and LCA and the basics of MIPS calculations are explained. - Principles to solve the materials solution tasks based on systematic approaches starting from the product's requirement list will be discussed.

	<ul style="list-style-type: none"> - Basic rules to improve the DFMA-properties (design for manufacturability and assembly) of a product are presented and applied to typical energy technology applications. <p>The course is also suitable for doctoral studies.</p>
Modes of Study	<ul style="list-style-type: none"> - Introductory lectures and exercises 16 h - Team work and a limited project work 32 h - Presentations of the results of the team work/ project work 10 h - Independent work is needed 20 h <p>Total workload 78 h</p>
Evaluation	<p>Final grade 0-5. Evaluation:</p> <ul style="list-style-type: none"> - project work 70 % - presentation 30 %
Study Materials	<ul style="list-style-type: none"> - Mangohon, P., The Principles of Materials Selection for Engineering Design. - Strong, A. B., Plastics, Materials and Processing. - Kalpakjan, S. & Schmid, S., Manufacturing Engineering and Technology.
Prerequisites	<p>Previous studies in engineering science are recommended.</p>