Course	**Material Selection and Manufacturability Aspects of Energy Technology Applications, 3 ECTS credits**
Year and period	M.Sc. 1−2; 5−9 August 2019
Teacher(s)	Harri Eskelinen, Professor, LUT University Kimmo Kerkkänen, Lecturer, LUT University
Person(s) in Charge	Harri Eskelinen, Professor, LUT University
Aims	After having passed this course the student is able to: - Understand the basic process of systematic material selection approaches for solving cross-technological material selection tasks especially in energy technology applications. - Recognise 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. - 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. - Recognise the most important aspects for easy assembly of typical constructions and components used in energy technology applications.
Content	During the course the student will become familiar with the properties and application areas of different constructional materials. - 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 staring from the product's requirement list will be discussed.

	- Basic rules to improve the DFMA-properties (design for manufacturability and assembly) of a product are presented and applied to typical energy technology applications. The course is also suitable for doctoral studies.
Modes of Study	- 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 Total workload 78 h
Evaluation	Final grade 0-5. Evaluation: - project work 70 % - presentation 30 %
Study Materials	- 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	Previous studies in engineering science are recommended.