UCLouvain

lmapr2020

2020

Materials Selection

Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

5 credits	30.0 h + 22.5 h	Q2

Teacher(s)	Bollen Pierre (compensates Nysten Bernard) ;Nysten Bernard ;Pardoen Thomas ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	1. The design process 2. Material properties charts 3. The basics of materials selection 4. Over constrained and multiple objectives problems 5. Influence of shape on material selection 6. Design of hybrid materials 7. Process selection 8. Ecoselection
Aims	**Contribution of the course to the program objectives** Having regard to the LO of the programme KIMA, this activity contributes to the development and acquisition of the following LO: • LO 1.1, 1.2 • LO 2.1, 2.2, 2.3, 2.4, 2.5 • LO 4.1, 4.2, 4.4 • LO 5.1, 5.2, 5.3, 5.4, 5.6 **Specific learning outcomes of the course** At the end of this course, the student will be able to 1 • LO1.1. Explain the basic concepts of the materials selection procedure established by Prof M.F. Ashby: property charts, the formulation of selection problems in terms of - function, objectives, constraints, free variable - using performance indices, multiple and/or conflicting objectives, shape and hybrid solutions, eco-design; • LO1.1. Describe modern material solutions which more and more consist of multimaterials systems, comprising composites, multilayers, coatings, assemblies, functionalized surfaces. • LO1.2 Use the material selector software EDUPACK edited by Granta design; • LO2.1 to 2.5. Apply the material selection procedure to real problems (case studies) which involve the analysis of the problem (i.e. define the list of requirement by decomposition into the elementary functions in order to define the working conditions and function, main solicitations, objectives and constraints), the derivation of performance indices, the selection of the best solution, the justification of the simplification, the critical assessment of the solution and the formulation of better solution compared to existing solution ' all these steps will require mobilizing all their scientific and technical knowledge gained in earlier training regarding physical phenomena and all the classes of materials. • LO4. Organize the analysis of the last case study as a team project effort • LO5. Communicate and defend the results of the case study analysis - - - - *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** The students will be individually graded based on the objectives indicated above. More precisely, the evaluation involves the grading of • the presentation of two case studies already solved in the supporting book by group of two; • the presentation of a new material selection problem by group of two; • a written exam based on a short list of synthetic questions prepared by the teachers and given during the year The evaluations will be carried out under presential format except if the covid crisis forces a remote format; and this case, the evaluation will be preferentially carried out via TEAMS.

Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** This course is very much based on personal learning. The method proposed by M.F. Ashby in his book "Materials Selection in Mechanical Design" is followed with a few additional or more in depth information such as for instance about hybrid materials. About 9 lectures are proposed to cover the main aspects of the procedure, mixed with exercise sessions and case study analyses. Lots of room is left for discussion. The students will receive a license to use material selector software by Granta design. Additional resources are provided on Moodle. The lectures will be taught in presential mode; a co-modal format will be used if needed due to covid crisis.
Content	1. The design process 2. Material properties charts 3. The basics of materials selection 4. Over constrained and multiple objectives problems 5. Influence of shape on material selection 6. Design of hybrid materials 7. Process selection 8. Ecoselection
Inline resources	Moodle website : https://moodleucl.uclouvain.be/course/view.php?id=11067
Bibliography	Le livre « Materials Selection in Mechanical Design » par M. Ashby (4eme édition, Elsevier) est un support obligatoire du cours
Other infos	This course requires only basic knowledge of materials science in particular regarding the mechanical properties (elasticity, plasticity, fracture, basic structural mechanics) and functional properties (electrical, thermal, optical, magnetic).
Faculty or entity in charge	FYKI

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Physical Engineering	FYAP2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Chemical and Materials Engineering	KIMA2M	5		
Master [120] in Electro-mechanical Engineering	ELME2M	5		
Master [120] in Mechanical Engineering	MECA2M	5		