Materials Selection in Engineering Design

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Overview

This course is about Mechanical and general Engineering Design as much as it is about Materials Selection. The main goal is to learn how to select materials, using the Materials Indices method, as an integral part of the engineering design process. Traditional methods of Materials Selection rely on extensive use of tables of material properties and past experience, and therefore are largely empirical. In contradistinction, the Material Indices method is a rational approach which identifies the combination of material properties that maximises the mechanical (or thermal, environmental, corrosion, optical…) performance in a given structural (or any other) application. For example, the material which minimises the mass (or the cost, environmental impact, etc.) of a tie rod of given stiffness (or strength), loaded in tension, is the one with maximum elastic modulus/density ratio (or strength/density ratio). This ratio is called the Material Index for the tie rod. The method also allows selecting materials incorporating shape, as well as material substitutions while meeting multiple and/or conflicting constraints. Emphasis will be put onto structural applications of materials, but several examples involving physical properties, such as optical and thermal properties, will be considered as well. The material selection is done based on mathematical criteria, and therefore it is unambiguous.

The primary objective of the course is to introduce the participants to the methods applied in the identification and derivation of the different mathematical criteria, i.e., Materials Indices, Shape Factors, Exchange Constants and Penalty Functions etc., required for any particular selection, and the subsequent identification of the set of best possible materials.

The course consists of 10 lectures to introduce the Materials Indices method, and 5 question sets solved during the Tutorial Sessions. Part of the Tutorial Exercises are solved with the help of a dedicated software package, CES Edupack, (Cambridge Engineering Selector).

Dates for the course	**Monday 12th December, 2016 to Friday 23rd December, 2016.**
Host Institute	NIT, Rourkela
No. of Credits	2
Max. No. of Participants	75
You Should Attend If…	▪ You are an engineering student (UG, PG and PhD) interested in clear understanding of the fundamentals of the designing of materials for any application ▪ You are an academician teaching/ interested in teaching the designing of materials ▪ You are a mechanical or materials engineer/ scientist from industry or R&D institutions involved in the designing and analysis of materials performance.
Participation Fees	The participation fees for taking the course is as follows: **Students: INR 3000** **Academic Institutions: INR 5000** **Industry/ R&D Organizations: INR 10000** **Participants from abroad: USD 300.** The above fee includes teaching materials only and participants are advised to bring their laptops for the tutorials and assignments. The participants will be provided sharing accommodation at the institute guest house, based on the availability, on payment basis.

Course Faculty

Prof. Carlos H Caceres is a Reader in Casting Technology at the School of Materials Engineering of the University of Queensland, Brisbane, Australia. His research mainly focuses on the micromechanics of deformation and fracture of aluminium and magnesium casting alloys, and on environmental issues regarding light alloy applications in transportation.

Dr. Nagarajan is an Assistant Professor at National Institute of Technology, Rourkela. His research interests are sheet and bulk metal forming processes, light alloys development for aerospace and automotive applications.

Course Coordinator

Dr. D. Nagarajan
Phone: 0661-246 2576
E-mail: nagarajand@nitrkl.ac.in