

2019 Nagaoka Summer School for Young Engineers (NASSYE)

List of Research Topics

Mechanical Engineering

Department website: <http://mcweb.nagaokaut.ac.jp/j/>

Research Topic	Practical experience of measurement and observation regarding the mechanical properties and deformation characteristics of corrugated paperboards and thick laminated boards
Instructor	NAGASAWA, Shigeru
Assistant Instructor	
Contents	<p>1) Introductory lecture, the physical properties of paper fibers, the usage of paperboard, corrugated board, several mechanical processing methods such as wedge cutting, crease bending, in-plane/out-of-plane compressing test and in-plane tensile testing will be learned using e-learning materials and discussion with instructors.</p> <p>2) Practices, preparation (making in rectangle shape) of specimens such as several paperboards and corrugated paperboards, in-plane tensile/compressive test with 0/90/45 degree of grain direction, out-of-plane compressive of corrugated board (flat-crush test), observation of non-linear deformation of paperboard and corrugated paperboard using a high speed digital camera.</p> <p>3) Discussion, the difference between two dimensional punch/die shearing and wedge cutting.</p>
Required skills/ Remarks	<p>Recommended preparation and background knowledge of participants, since the mechanical processing of soft composite materials is the primary topic, the participants ought to review and be familiar with the strength of solid materials.</p> <p>Keywords: a laminated fibrous board, the tensile strength, the compressive test, the shearing and the bending of a simple beam or a plate, the stress and the strain.</p> <p>Several mathematical knowledge are necessary for understanding the experimental principle: Vector analysis, Numerical integration and differentiation, the Least-square method. As an introductory training of necessary technical knowledge is considered in this duration, there is not any strict limitation to choose this course.</p>

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Research Topic	Ultra precision measurement and control with sub-nanometer resolution
Instructor	AKETAGAWA, Masato
Assistant Instructor	
Contents	The nanometer is 10^{-9} m meters, which corresponds approximately to the size of four carbon atoms. Some of the latest flash memory circuit widths are already below 10 nanometers. In the manufacture of a flash memory, it is necessary to position and control a driving stage for a silicon wafer with an accuracy of 1/20 of the circuit width. In our laboratory we try to control the driving stage by detecting the movement of the driving stage with sub-nanometer resolution.
Required skills/ Remarks	

Research Topic	Fabrication and Evaluation of the MAX phase Ceramics
Instructor	NANKO, Makoto
Assistant Instructor	
Contents	The MAX phase ceramics, such as Ti_2AlC and Ti_2SiC , are synthesized and consolidated by using spark plasma sintering. Mechanical properties and machinability of the MAX phase ceramics are evaluated.
Required skills/ Remarks	