

"Machining Process Modeling, Machine Tap Testing and Chatter Vibrations Avoidance – ShopPro/CutPro"

Date: June 07-09, 2010

Instructor: Prof. Y. Altintas, University of British Columbia

Place: The University of British Columbia, Vancouver, Canada

Objective: UBC Manufacturing Automation Laboratory has developed advanced, easy-to-use machining process simulation and measurement software which is used by a number of companies around the world. ShopPro is an integrated, easy to use tap-testing, chatter stability lobe, torque, power prediction as well as giving expert advice to solve machining problems. CUTPRO is advanced software with milling, turning, boring, drilling, spindle, CNC, tap testing, modal analysis and data acquisition modules.

Machining process simulation modules predict forces, torque, power, bending moment on spindle bearings, dimensional surface finish, vibrations and chatter-free depths-of-cut and spindle speeds. Machine tool and cutting tool designers can optimize their design choices, while process planners can significantly reduce the machining time while maintaining the accuracy and quality of the parts. The course gives balanced training of basic machining principles and their hands on application on machine tools.

Course Schedule:

DAY 1: MATERIAL TESTING FOR MACHINING PROCESS MODELING		
Period	Content	Activity
8:30-10:00	Orthogonal cutting model: shear stress-shear angle friction/lubrication; cutting constants	Lecture by Prof. Altintas
10:00-10:30	Coffee break	
10:30-12:00	Oblique cutting model: turning, drilling, milling. Cutter design with CutPro	Lecture by Prof. Altintas
12:00-13:00	Lunch at UBC	Lunch will be provided
13:00-16:00	Prediction of cutting forces, torque, power for milling cutters	Lab assistants
16:00-17:30	Material data base design from cutting tests	Lab assistants

DAY 2: MACHINE TOOL TESTING		
Period	Content	Activity
8:30-10:00	Practical fundamentals of tool/work piece vibrations; frequency measurement of tool/ work piece; engineering interpretation of tap test measurements (CutPro/Modal Analysis).	Lecture by Prof. Altintas
10:00-10:30	Coffee break	
10:30-12:00	Hammer tests to measure FRF (frequency response function) of the machine tool (MaITF/Modal Analysis)	Prof. Altintas and Lab Assistants
12:00-13:00	Lunch at UBC	Lunch will be provided
13:00-14:30	Modal analysis of a machine – hands on training	Prof. Altintas
14:30-15:00	Coffee break & discussions	
16:00-17:30	Forced vibrations, use of FRFs and mode shapes (CutPro/Milling)	Prof. Altintas

DAY 3: CHATTER STABILITY LOBES AND CHATTER AVOIDANCE IN MACHINING		
Period	Content	Activity
8:30-10:00	Construction of Chatter Stability Lobes using simple theory	Lecture by Prof. Altintas
10:00-10:30	Coffee break	
10:30-12:00	Chatter stability for milling, boring heads and drilling	Lecture by Prof. Altintas
12:00-13:00	Lunch at UBC	Lunch will be provided
13:00-14:30	Obtain chatter stability lobes with CutPro, select cutting conditions for testing	Prof. Altintas and Lab Assistants
14:30-15:00	Coffee break & discussions	
16:00-17:30	Cutting tests on the machine, discussion of results and the influence of tool geometry, material properties and machine tool dynamic stiffness on chatter. Closure.	