

# Machining Process Modeling, Machine Tap Testing and Chatter Vibrations Avoidance - ShopPro/CutPro

## DERS PROGRAMI

### Week 1: Material testing for machining process modeling

<i>Date</i>	<i>Period</i>	<i>Content</i>	<i>Activity</i>
Jan 23, 2023, 19.00 – 19.30	Lecture I	Orthogonal cutting model: shear stress - shear angle-friction/lubrication; cutting constants	Prof. Altintas
Jan 24, 2023, 19.00 – 20.00	Tutorial I	Material data base design from cutting tests (Manual calculations)	Mal Inc. Engineer
Jan 25, 2023, 19.00 – 19.30	Lecture II	Oblique cutting model: turning, drilling, milling. Cutter design with CutPro	Prof. Altintas
Jan 26, 2023, 19.00 – 20.00	Tutorial II	CUTPRO: Implementation of turning, milling, drilling simulations	Mal Inc. Engineer
Jan 27, 2023, 19.00 – 19.30	Lecture III	Practical fundamentals of tool/workpiece vibrations; frequency measurement of tool/workpiece; engineering interpretation of tap test measurements	Prof. Altintas

### Week 2: Machine tool testing

<i>Date</i>	<i>Period</i>	<i>Content</i>	<i>Activity</i>
Jan 30, 2023, 19.00 – 19.30	Tutorial III	Manual calculations, CutPro/Modal Analysis)	Prof. Altintas and MAL Inc engineer
Jan 31, 2023, 19.00 – 20.00	Lecture IV	Hammer tests to measure FRF (frequency response function) of the machine tool (Manual calculations, MalTF/Modal Analysis)	Prof. Altintas
Feb 01, 2023, 19.00 – 19.30	Tutorial IV	Modal analysis, hands on training and the engineering interpretation of mode shapes for troubleshooting machine and fixture setups	Prof. Altintas and MAL Inc engineer
Feb 02, 2023, 19.00 – 20.00	Lecture V	Construction of Chatter Stability Lobes using simple theory	Prof. Altintas
Feb 03, 2023, 19.00 – 19.30	Tutorial V	Manual construction of Chatter Stability Lobes for turning operations	Prof. Altintas and MAL Inc engineer

### Week 3: Chatter stability lobes and chatter avoidance in machining & Project Week

<i>Date</i>	<i>Period</i>	<i>Content</i>	<i>Activity</i>
Feb 06, 2023, 19.00 – 19.30	Lecture VI	Advanced Chatter stability for milling, boring heads and drilling	Prof. Altintas
Feb 07, 2023, 19.00 – 20.00	Tutorial VI	Chatter stability for milling, boring heads, and drilling	Prof. Altintas and MAL Inc engineer
Feb 08, 2023, 19.00 – 19.30	Lecture VII	Analyze actual cutting, discussion of results and the influence of tool geometry, material properties and machine tool dynamic stiffness on chatter (Manual calculations)	Prof. Altintas
Feb 09, 2023, 19.00 – 20.00	Tutorial VII	Practice design of milling operation, conduct virtual tests, analyze the results	Prof. Altintas and MAL Inc engineer
Feb 10, 2023, 19.00 – 19.30	Lecture VIII	Variable pitch cutter design; effect of run-out, serrated cutter, frequency and time domain-based stability, process damping	Prof. Altintas

## Week 4: Machining diagnostics and virtual machining

<i>Date</i>	<i>Period</i>	<i>Content</i>	<i>Activity</i>
Feb 13, 2023, 19.00 – 19.30	Tutorial VIII	Practice with advanced features of CUTPRO	MAL Inc. Engineer
Feb 14, 2023, 19.00 – 20.00	Lecture IX	Introduction of CAM Based Part Machining Simulation and Optimizatoin: MACHPRO, NPRO (NX) and DELPRO (CATIA)	Prof. Altintas and MAL Inc. Engineer
Feb 15, 2023, 19.00 – 19.30	Tutorial IX	Hands on training of MACHPRO	MAL Inc. Engineer
Feb 16, 2023, 19.00 – 20.00	Lecture X	Virtual CNC and Current research and developments at UBC Manufacturing Automation Laboratory.	Prof. Altintas
Feb 17, 2023, 19.00 – 19.30	Tutorial X	Hands on training: NPRO, MACHPRO and CATIAL DELPRO	Lab Assistants/ Prof. Altintas