

# STABILITY STUDIES AND CHATTER

## CONTROL TECHNIQUES IN MACHINING

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### Overview

In today's highly competitive machining industries, assessment of quality, cost, sustainability and productivity is made on the bases of surface integrity, tool wear, cutting power, chatter control, dimensional integrity and many other factors. The objective of maintenance department is to monitor the machining conditions and suggest some control measures to achieve the better quality and productive outcomes. However, experimental examinations sometimes involve time and cost factors. At present, modeling tools are dominating in several engineering sectors. Perhaps the machine dynamics is a coupled model of tool and workpiece, which is highly nonlinear and the overall process stability depends on several operating parameters and conditions. The cutting instability sometimes called chatter is very important objective to be controlled in achieving better quality products. During the modeling process, often second-order delay differential equations in the time domain are to be solved. Time domain, frequency domain and direct simulation techniques are available for solving the infinite dimensional delay differential equations. The so-called stability diagrams are to be generated for identifying the boundaries of stability which delineate the machining parameter space into stable and unstable cutting conditions. The stable cutting conditions, which can now be chosen systematically, guarantee smooth product, ergonomic work environment and prolonged life of cutting tools and machine tools.

Machining of thin-walled workpiece is of vital importance today. Especially, the design of milling process with flexible workpiece has been a topic of interest in aircraft components and other parts. With moderate depths of cut and high speeds, often the instability can be avoided. A knowledge of stability assessment and instability cross-over conditions helps in deciding the correct operating states of machine tools. Use of expert systems, intelligent methods in active or semi-active controls is therefore needed. Academic and industrial experts must update with the present scenario of stability assessment methodologies.

### Objectives

The primary objectives of the course are as follows:

- I. Exposing participants to the fundamentals of tool dynamics.
- II. Building confidence amongst the participants in the application of stability assessment procedures.
- III. Providing exposure to the practical problems and their solutions, through case studies and live projects in machine tool dynamics.
- IV. Enhancing the capability of the participants to identify and control the chatter instability in machining operations with the aim of optimizing productivity.
- V. Utilize the various software tool in stability assessment.

<b>Modules</b>	<ul style="list-style-type: none"> <li>• Duration: 26<sup>th</sup> – 30<sup>th</sup> September, 2022</li> <li>• All lectures and tutorials will be held online.</li> </ul>
<b>Who can attend?</b>	<ul style="list-style-type: none"> <li>• Any enthusiast of knowledge-based, optimized and sustainable manufacturing.</li> <li>• Executives, engineers and researchers from manufacturing, service and government organizations, including R&amp;D laboratories.</li> <li>• Student at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions.</li> </ul>
<b>Fees</b>	<p>The participation fees for taking the course is as follows:</p> <ul style="list-style-type: none"> <li>• Participants from abroad: US \$50 (including tax)</li> <li>• Industry/ Research Organizations: INR 1180 (including tax)</li> <li>• Academic Institutions: INR 1180 (including tax)</li> </ul>

## The Faculty

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### Course Co-ordinator:

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