

# APPLICATION OF ROUGH MACHINING WITH BALL END MILL CUTTER IN 3 AXIS FREE FORM SURFACE MANUFACTURING

Goran Mladenovic<sup>1\*</sup>, Jagos Stojanovic<sup>1</sup>, Radovan Puzovic<sup>1</sup>, Mihajlo Popovic<sup>1</sup>, Milos Pjevic<sup>1</sup>,

<sup>1</sup>University of Belgrade, Faculty of Mechanical Engineering, Department of Production Engineering, 11000  
Belgrade, Serbia

\*Corresponding author e-mail: [gmladenovic@mas.bg.ac.rs](mailto:gmladenovic@mas.bg.ac.rs)

## Abstract

*The ball end cutter is a commonly used tool for rough machining free-form surfaces. This paper presents a procedure for rough machining parts with free-form surfaces on 3-axis machines. To achieve this, a model for predicting cutting forces is developed and implemented in a software solution for automatic technology design. This software solution has been previously tested and described. The procedure enables the optimal utilization of the tool while considering the maximum allowed cutting force for the selected tool diameter. The tool diameter is automatically determined based on the analysis of the surface geometry and is chosen to be smaller or equal to the minimum surface radius. The software solution includes an input of the part CAD model in STL file format and a tool database specific to the machine used. After upgrading the software with new strategies for rough machining, the generated NC code was tested on a CNC machine, and manufacturing was performed within the specified tolerances and surface roughness. The research was conducted at the Department of Production Engineering at the Faculty of Mechanical Engineering in Belgrade, where this topic has been actively studied for many years and is still under development. The described software solution is beneficial as it allows users to operate with minimal knowledge of CAM systems.*

## Keywords

CAD/CAM systems, ball end mill cutter, free form surface milling.

## Acknowledgement

The research work is funded by the Ministry of Science, Technological Development and Innovation of Republic of Serbia. Project Contract 451-03-47/2023-01/200105.