INVESTIGATION OF THE SURFACE ROUGHNESS IN THE CASE OF DIFFERENT CUTTING PROCESSES

1st Semester Report

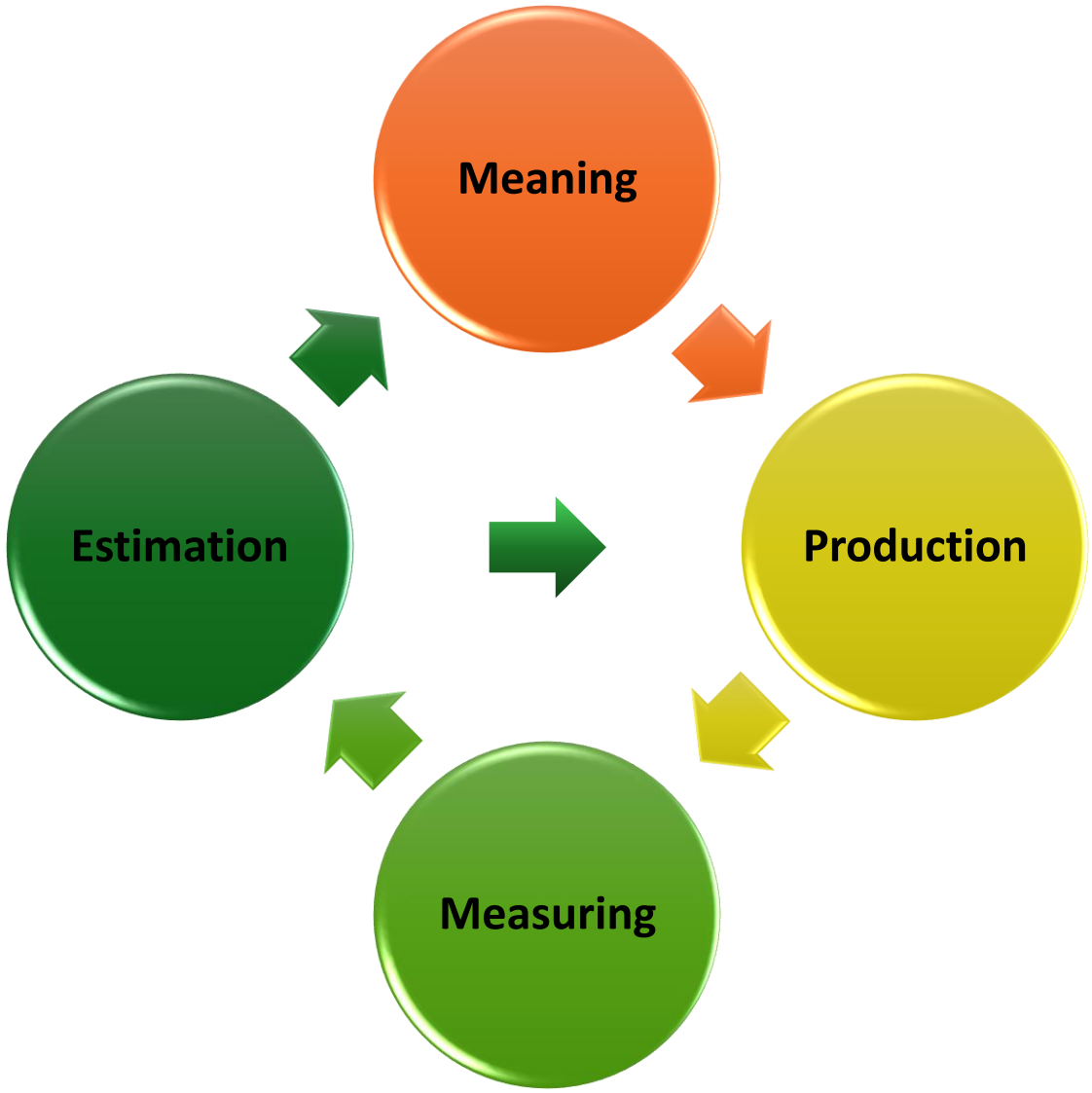
2024/25. 1.

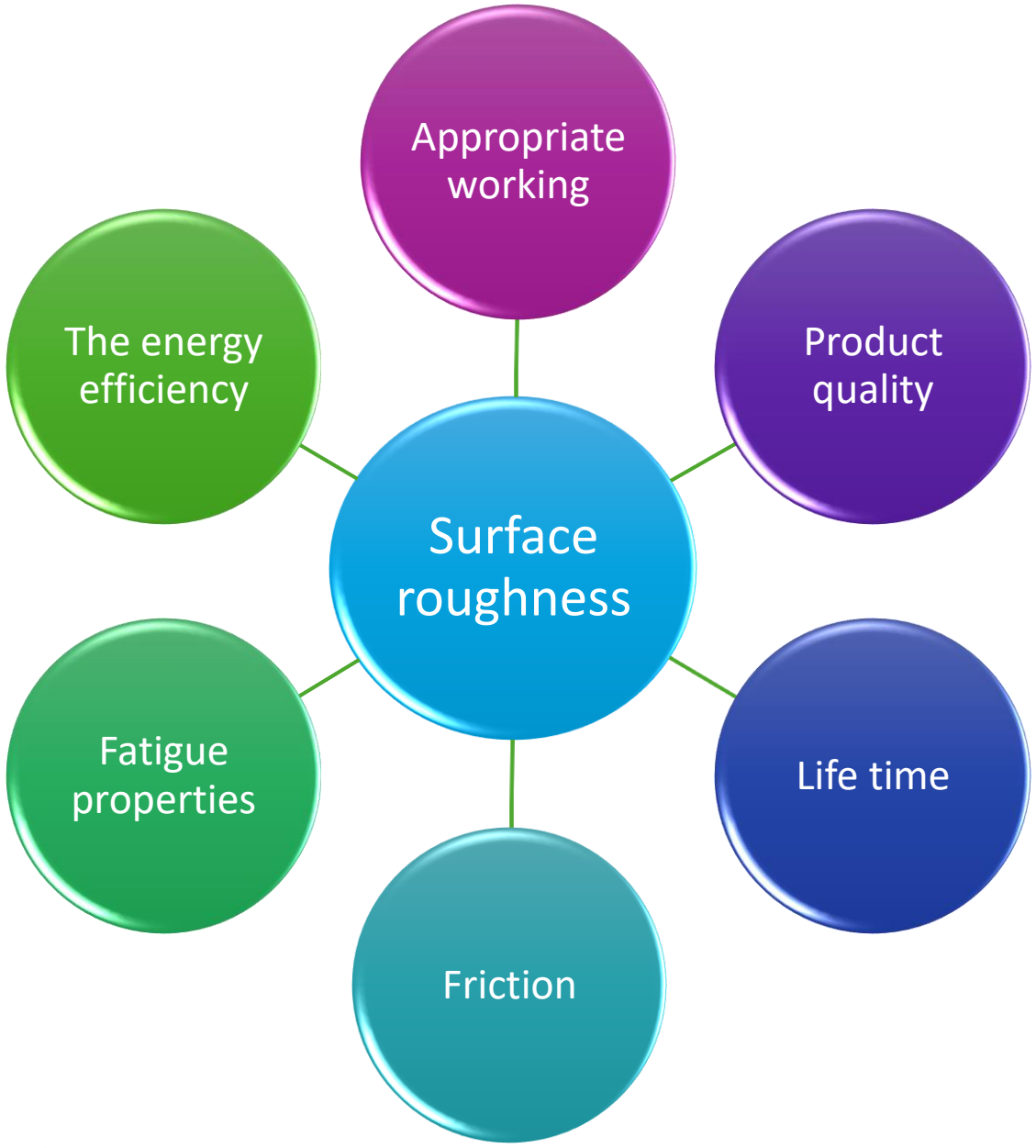
Suratjon Nuriddinov PhD student

Supervisor Dr.habil Balázs Mikó

ÓBUDAI EGYETEM
BÁNKI DONÁT GÉPÉSZ ÉS BIZTONSÁGTECHNIKAI MÉRNÖKI KAR

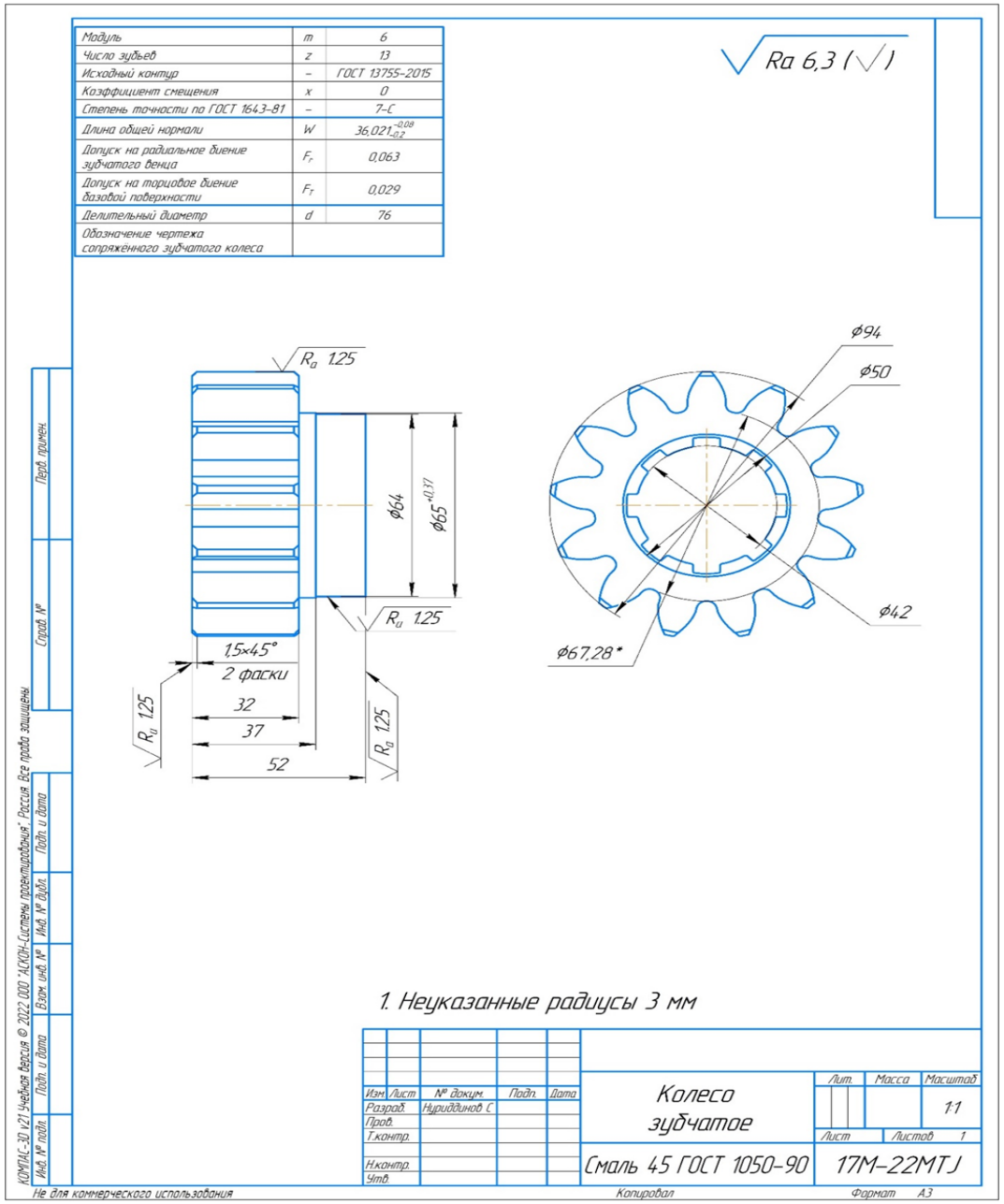
Introduction





Example

Measurement of surface roughness in grinding process using TIME 3221 digital profilometer (A typical portable instrument)



Research process / topics

Literature overview

Define the research topics

Manufacturing method specific topography parameters

Image processing in evaluation of surface roughness and machining method

Develop the Equivalent Replacement Profile method

ÓBUDAI EGYETEM
BÁNKI DONÁT GÉPÉSZ ÉS BIZTONSÁGTECHNIKAI MÉRNÖKI KAR

Literature overview

Process

- Keywords
- Search
- Analyse
- Classify
- Summarise

Keywords

- Surface roughness
- Standards
- Measuring methods
- Estimation
- Cutting methods

Estimation of surface roughness

- Approaches that are based on machining theory to develop analytical models and computer algorithms to represent the machined surface
- Approaches that examine the effects of various factors through the execution of experiments and the analysis of the results
- Approaches that use designed experiments
- Artificial intelligence (AI) approaches
- Surface roughness characterization by using image processing

Comparative Analysis of Surface Roughness

Production Technology	Surface Roughness Characteristics	Measurement Methods	Factors Affecting Roughness
Turning	Moderate roughness, visible tool marks	Stylus profilometer, laser scanning	Cutting speed, feed rate, tool wear
Milling	Rougher than turning, tool marks in cutting direction	Stylus profilometer, optical profiler	Cutter type, feed rate, tool wear, machining method
Grinding	Very smooth finish, precise control over surface roughness	Profilometer, optical measurement	Wheel type, grit size, feed rate, speed
Additive Manufacturing	Rough finish, layer lines visible, requires post-processing	Stylus profilometer, 3D scanning	Layer height, print speed, material choice, resolution

Plane for the next semester

- Literature survey in turning, different milling processes, grinding, EDM, measurement, production and application
- the relationship between 2D and 3D surface roughness parameters

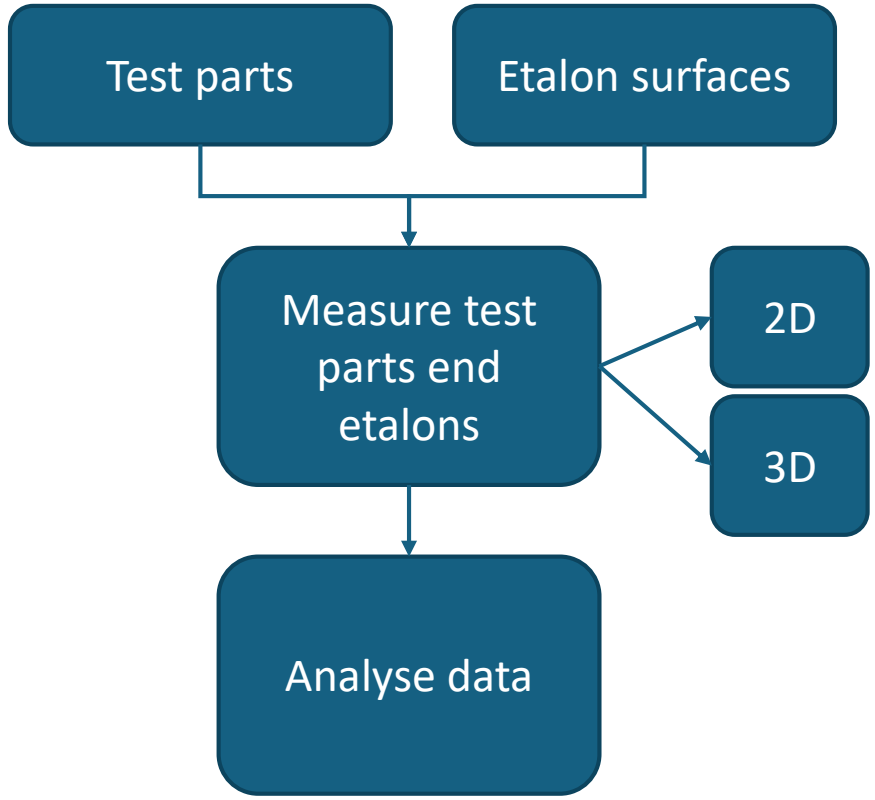
ÓBUDAI EGYETEM
BÁNKI DONÁT GÉPÉSZ ÉS BIZTONSÁGTECHNIKAI MÉRNÖKI KAR

Manufacturing method specific topography parameters

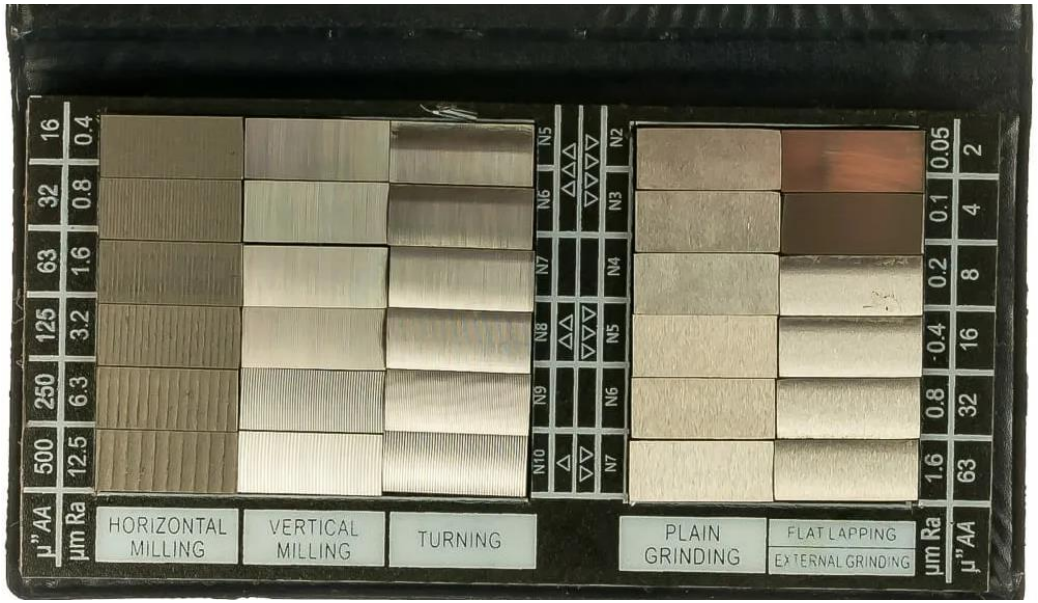
- Investigation of the specific parameters combination

- Identifying the combination of the surface roughness or topography parameters and other properties of the 2D or 3D measured geometric data

- Data analyzing via using statistical, regression and AI methods



Measuring and analysing etalon parts with different production technologies and (turning, milling, grinding, additive manufacturing)



+ picture
I take a picture there (MB)

Subjects in the 2024/25. 1. semester

- Investigation of surface microgeometry and microtopography

Lecturer: Dr. Gabriella Farkas

Measured and analysed etalon parts in Mitutoyo SJ-301 and Mahr stylus instrument

- Writing scientific works

Lecturer: Dr. Anna Tünde Kovács

- Wrote article: Analysis of surface roughness by machining large module gears with a new tool
- Attended conference

Publication activity

- Nuriddinov, S. (2024). Research of the process of machining of large modular gear wheels on CNC machines. ISJ Theoretical & Applied Science, 05 (133), 31-34.
- “Improvement of The Design and Substantiation of The Parameters of The Working Bodies and Drive Mechanisms of The Bitter Separator Machine” Of IJARSET, Volume 8, Issue 12, December 2021.
- “Selection of Rational Form of Working Bodies of Digging Machines” Of IJARSET, Volume 8, Issue 5, May 2021.
- Suratjon Nuriddinov, & Bakhtiyor Mardonov. (2024). APPLICATION OF GRINDING PROCESS OF LARGE MODULE GEAR WHEELS WITH FINGER ABRASIVES STONE. World Scientific Research Journal, 28(1), 113–119.

ÓBUDAI EGYETEM
BÁNKI DONÁT GÉPÉSZ ÉS BIZTONSÁGTECHNIKAI MÉRNÖKI KAR

Thank you for your attention

Suratjon Nuriddinov