



Final exam questions

Subject group name: **Advanced manufacturing**

Neptun code: ZVEGEGTNWAM

Credit points: 5

Subject in this subject group:

- **Advanced manufacturing** (BMEGEGTNWAM)

Program: Mechanical Engineering Modelling, MSc (2N-MW0)

Specialization: Design and Technology

Responsible person:

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You can check the current subject forms at the Educational Portal of the Faculty of Mechanical Engineering.

<https://oktatas.gpk.bme.hu/>

Always check the for updates at edu.gpk.bme.hu before preparing for the exam, especially if the subject group contains at least one subject from your final semester!

Valid from 01 September 2021

Dr. Márton Takács

associate professor

Advanced manufacturing (BMEGEGTNWAM)

1. Basics of material removal
Comparison of subtractive and additive manufacturing processes. Hybrid machining. Cutting tool geometry. Kinematic angles. Cutting inserts. Tool materials. Cutting process parameters and their effects. Roughing and finishing. Chip formation. Chip types. Built-up edge.
2. Characteristics of chip removal processes. Cutting methods.
Cutting forces. Cutting temperature. Cutting fluids. Tool wear and tool life. Turning. Milling. Drilling. Machine tools.
3. Reverse engineering
Principle of the reverse engineering processes, digitalization methods and equipment. Reverse engineering applications in the medical industry.
4. Rapid prototyping
Product cycle life. The role of the Rapid prototyping, Rapid tooling and Direct manufacturing in the product life cycle. Rapid prototyping and Rapid tooling process steps and applications in the tool production.
5. Layered manufacturing
Characterize and describe the layered manufacturing methods (mechanisms, strategies of geometry building, restrictions, applicable materials).
6. Feature-based machining
Characterize the "feature" based parametrical solid modelling systems. Describe the feature application in the tool path planning and NC programming. NC program creation (post-processing), program testing and machining simulation in CAM systems.
7. Tool path generation
Steps of tool path generation in CAM systems. Tool path strategies and solutions in CAM. Outline a mould cavity and core machining strategies (roughing and finishing) and the tool path generation process using CAM system.
8. Strategies of material removal
Characterize the metal removing strategies in CAM systems. Roughing (layered), rest roughing (layered), pre-finishing (Z-finish), finishing (Z-finish, parallel), rest finishing.
9. Laser beam machining
Characteristics of Laser beam. Lasing process. Laser types. Laser safety classes before and after 2002. Workability of materials by laser beam. Processes and methods (cutting, welding, drilling, marking, cleaning). Mechanism of machining by laser beam. Keyhole effect. Hybrid machining.
10. Fine surface finishing I.
Machining with fixed abrasive grains (honing, flex-hone, superfinishing). Methods, kinematics, types of machined part geometries, typical constructions of tool and machine tool. Typical applications.

11. Fine surface finishing II.
Machining with loose abrasive grains (lapping, polishing / buffing, sand polishing). Methods, kinematics, types of machined part geometries, typical constructions of tool and machine tool. Typical applications.
12. Electrical discharge machining
Processes and methods (wire, sinking, milling). Machinability of different workpiece materials. Mechanism of material removal by electrical sparks. Electrode materials.
13. Hard cutting
Fundamentals of hard cutting. Mechanism of chip removal. Cutting parameters (typical ranges of cutting speed, feed rate, depth of cut) and process parameters (cutting force components, cutting temperature). Cutting tools for hard cutting (geometry, materials).
14. Material Requirements Planning
Basic assumptions, concepts and the method of Material Requirements Planning (MRP). Illustration of MRP through a simple example.
15. Economic Order Quantity
The problem of lot-sizing, alternative lot-sizing methods, the determination of the Economic Order Quantity (EOQ) formula.
16. Basic aggregated production and capacity planning
Definition of a basic aggregated production and capacity planning problem in terms of linear program. Illustration of the solution method through a simple example.
17. Blow moulding processes I.
Extrusion and stretch blow moulding processes, solutions. Blow moulding tool design aspects. Mould manufacturing process alternatives.
18. Blow moulding processes II.
Main characters of the injection moulding process. Determination of the parting line (curve) and surface. Designing rules for 3-plates mould tools.