UNIVERSITY OF PANNONIA

COURSE DATASHEET

Semester:	2016/17/1
Course:	Problem Solving on Advanced Manufactoring Processes
Code:	VEMKFKB121M
Responsible department:	Department of Physical Chemistry
Department code:	MKFK
Responsible instructor:	dr. András Dallos

Course objectives:

To make proficiency in knowledge in advanced manufacturing processes by problem solving practices, experiments and process design

Course content:

1 Water jet machining. Hydraulic and hydrodynamic calculations. Jet speed and energy planning. Technological characterization of water jet cutting. 2. Abrasive manufacturing. Problem solving in abrasive cutting processes (flow, pressure, particle characteristics, nozzle pressure and distance). 3. Ultrasonic energy. Ultrasound, intensity, power. Sonic power plant. Distance measurement. 4. Ultrasonic machining. Tool diameter and feed motion. Ultrasonic downstroke and machining time. Ultrasonic energy input and material removal. Abrasive ultrasonic manufacturing. Particle size and surface quality. 5. Electron gun. Acceleration, energy and velocity of electrons. Work function. Calculation of the electron beam penetration depth into the target material. 6. Electron beam machining. Energy demand of material removal by EBM. Relationships between cutting speed, cutting gap and electron gun power. Accuracy of electron beam drilling. 7. Plasma machining. Relationships between plasma cutting speed and quality and thickness of target material. Comparison of plasma and laser cuttings. Selection methods for high energy nontraditional manufacturing based on target material thickness and quality. 8. Relationships between cutting gap of laser cutting and the thickness of the target materials. Cutting speed of laser cutting, energy demand, thickness and quality of the target materials. Time and power needs of laser drilling of nonmetallic materials. 9. Electric discharge machining. Pruductivity and economical calculations. Determination of technological planning parameters. Specific shrinkage of electrode materials. Determination of optimal spark gap, condensator potential, load current intensity and working point. Th effect of load current on specific shrinkage of electrode materials and on material removal rate. 10. Chemical machining. The dependence of the rate of chemical etching on the quality and concentration of chemicals used. 11. Thermally assisted layer deposition. Calculation of vapor pressures and heat of evaporation of compounds. Calculation of mean free path and velocities of atoms and molecules. 12. Electrochemical depositions and machining. Calculation of electrode potentials. Calculation of electrolytical processes and charges. Material removal, current intensity. Calculation of specific conductance. Realationships between feed motion and current intensity and voltage. The effect of electrolyte pressure and current intensity on accuracy. Study of temperature dependence of electrolyte resistance. 13. Abrasive electrochemical grinding. The dependence of the gap on the pressure between workpiece and disc. Optimal disk shrinkage. 14. Electric discharge machining and water jet cutting in metal works (practice in industrial manufacturing plants) 15. Laser and plasma beam cutting in metal works (practice in industrial manufacturing plants)

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Requirements, evaluation and grading:

During the term the student is expected to write a comprehensive written exam

Required and recommended readings:

1. J. Brown: Advanced Machining Technology Handbook, McGraw-Hill Professional; 1998. 2. Kodácsy János , Szabó András: Finomfelületi és különleges megmunkálások (Kecskemét, 2004).