Course Code:	OG4DPP	**Level of Course:**	Undergraduate	**ECTS**	**5**	Semester	8
Course Title:	Digital control of electrical drives			Year of Study:			4
Objective of the course:	Introduce basic digital control concepts in power electronics and drives. Review the position, speed and current control requirements in electrical drives and motion control systems. Explain the analog and digital signal processing within DSP-controlled systems. Describe implementation steps and techniques. Overview numerical capability of fixed and floating point DSP controllers. Analyze resolution aspects and throughput of peripheral A/D units. Compare peripherals for PWM generation and quadrature encoder pulse detection. Provide students with the ability to analyze the drive and motion control issues, to formulate the structure of discrete time controllers, to set the feedback parameters, specify the hardware and perform the software implementation.						
Course Contents:	Numerical capabilities and peripheral units of motion control digital signal processors. The application of DSP technologies in motion control systems, power conversion, electric drives and power engineering. Fixed and floating point architectures. Real time DSP programming in C and assembly language. Digital implementation of PWM, control of 3-phase inverter bridges, space vector modulation. Discrete time current controller. Torque and flux control of servo motors applied as torque actuators in motion control systems. Inner and outer loop, cascade controllers. Digital implementation of field oriented control, IMC and DTC concepts. Discrete time speed and position control. The problem of compliance and mechanical resonance. Reconstruction of inaccessible feedback signals, implementation aspects and known issues. Sample processing of motor terminal quantities, shaft speed and position estimation. DSP-based monitoring and diagnostics. Early fault detection systems. Implementation aspects of algorithms for on-line system identification. Practical approaches to spectrum real time calculation and parameter estimation. Sensors, design of anti-aliasing filters and the sampling circuits. Quantization noise and remedies.						
Teaching Methods:	45 hours of lectures + 30 hours of supervised problem classes and midterm tests. Approximately 75 hours of personal study and exercise (3 hours per week during the semester, and approximately 30 hours of preparation during exam term).						
Literature:	4. S.N. Vukosavić: “Digital Control of Electrical Drives” 5. Texas Instruments: “Digital Signal Processing in VLSI” 6. W. Leonhard: "Control of Elected AC Drives", Springer						
Assessment methods:	**Exam** - Three-hour examination. Two problems to be solved, related to analyses, modeling and implementation of discrete time controllers (25% each), plus 5 out of 6 multiple-choice questions to be answered (10% each). Minimum score of 55% required to pass the test. **Midterm Test** - replaces 50% of the exam.						
Language of instruction:	Serbian	Date:		Signature:			