Course Code:	OG4EV	**Level of Course:**	Undergraduate	**ECTS**	**5**	Semester:	8
Course Title:	Electrical Vehicles			Year of Study:			4
Objective of the course:	Review construction and characteristics of electric vehicles. Describe basic concepts of electric propulsion systems. Explain the role of traction power converters and traction motors. Kinematics and dynamics of electric vehicles. Analyze drag, friction and reactive forces. Investigate traction effort and power flow in acceleration, deceleration, cruising, breaking, and coasting. Distinguish overhead lines and typical vehicle supply systems. Review autonomous vehicles and batteries. Provide students with the ability to analyze electric vehicles, to model and specify traction power converters and drives.						
Course Contents:	Transportation systems and vehicles which use electric propulsion. Characteristics of railways, urban trains, trams, trolley buses and road vehicles. Brief history of railways and train supply systems. Kinematics and dynamics of electric vehicles. Derivation of traction force and torque. Assessment of steady and intermittent motion resistance. Dynamic and regenerative braking. Receptivity of overhead lines. Adhesion limit, the impact of mechanical and electrical factors on adhesion limits. Maximum trust per axle. Active and passive anti skid measures. Typical speed-time, torque-time and current-time diagrams. Energy-optimal and cost-optimal diagrams. The overview of electric traction drives. Force and torque control, starting characteristics. Electrical and regenerative braking capability. Rheostat control of a series DC motor. Non-dissipative force control; traction choppers. Diode locomotive with multiple tap transformer. Thyristor locomotive and the recuperation capability. AC traction drives. Power converter topologies for AC traction motors. Basic torque control structures for AC traction drives. Basic hardware and software prerequisites for controlling the AC traction motors and power converters.						
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 semester, and approximately 30 hours of preparation during exam term).						
Literature:	1. B. Radojković "Električna vuča" 2. S.N. Vukosavić: "Digital Control of Electrical Drives" 3. S.N. Vukosavić et.al. "Zbirka zadataka iz električne vuče"						
Assessment methods:	**Exam** - Three-hour examination. Two problems to be solved, related to traction force estimation, DC and AC traction drives (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:			