

E – Charakteristika studijního předmětu				
Název studijního předmětu	Real Time Systems			
Typ předmětu	povinně volitelný		dopor. ročník / semestr	3/ZS
Rozsah studijního předmětu	2+2	hod. za týden	4	kreditů 10
Jiný způsob vyjádření rozsahu				
Způsob zakončení	zkouška		Forma výuky	přednášky, cvičení
Další požadavky na studenta				
Vyučující	Doc. Dr. Mgr. Ing. Jaroslav Hlava			
Stručná anotace předmětu	<p>Short annotation of the course</p> <p>This course is designed to provide the students with a good understanding of the basics of real time systems design. The course includes basic principles of real time programming: processes, synchronisation, communication and scheduling in real time systems and functions of real time operating systems. Since real time control represents one of the most important areas where the real time systems are applied, the course includes also an introduction into digital control, computer implementation of control algorithms and distributed control systems.</p> <p>Topics of the lectures</p> <p>Real-Time Systems, definitions, hard versus soft real time systems, real time control systems, application examples. Commonly used approaches to real-time scheduling, scheduling of periodic tasks, priority driven scheduling, resource access control.</p> <p>Inter-process communication synchronisation, deadlock, semaphores, queues</p> <p>Real Time operating systems.</p> <p>Sampling of continuous systems, discrete models of continuous systems, state space and transfer function models, Z transform.</p> <p>Design of digital controllers, digital approximation of continuous PID controllers, digital controllers with optimised structure..</p> <p>Implementation of digital control algorithms, selection of sampling period, aliasing, effect of finite word length, fixed point and floating point computation, quantisation effects, effect of the computational time delay.</p> <p>Distributed control systems, communication channel delays and their effect on control performance.</p> <p>Architecture and programming of industrial control systems, connection of logical and digital control in modern PLC systems.</p> <p>Laboratories and seminars</p> <p>The topics covered in lectures are practised in computer laboratory using selected real time operating systems and industrial control systems Rockwell Automation. The basics of digital control are practised using Matlab and relevant toolboxes.</p>			
Studijní literatura a studijní pomůcky	<p>Liu, J. W. (2000), <i>Real Time Systems</i>, Prentice Hall, Upper Saddle River, N.J.</p> <p>Landau, Ioan D., Zito, Gianluca (2006), <i>Digital Control Systems Design, Identification and Implementation</i>, Springer Verlag</p> <p>Wittenmark, B., Åström, K. J., Årzén K. E. (2002), <i>Computer Control: An Overview</i>, IFAC Professional Briefs, freely available from http://www.ifac-control.org/</p>			