

D – Charakteristika studijního předmětu					
Název studijního předmětu	Real Time Systems				
Typ předmětu	Povinně volitelný		doporučený ročník / semestr	3/ZS	
Rozsah studijního předmětu	2+2	hod. za týden	4	kreditů	5
Jiný způsob vyjádření rozsahu					
Způsob zakončení	Zkouška		Forma výuky	Přednášky, cvičení	
Další požadavky na studenta					
Předmět je vyučován v anglickém jazyce, nezbytná je proto jeho velmi dobrá znalost.					
Vyučující					
Doc. Dr. Mgr. Ing. Jaroslav Hlava.					
Stručná anotace předmětu					
<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>					
Topics of the lectures					
1. Real-Time Systems, definitions, hard versus soft real time systems, real time control systems, application examples.					
2. Commonly used approaches to real-time scheduling					
3. Clock driven (off-line) scheduling					
4. Priority driven scheduling of periodic tasks					
5. Schedulability tests based on maximum schedulable utilization and on critical instants and time demand analysis					
6. Scheduling of aperiodic and sporadic tasks					
7. Resource access control.					
8. Inter-process communication synchronisation, deadlock, semaphores, queues					
9-10 Real Time operating systems.					
11. Sampling of continuous systems, discrete models of continuous systems, state space and transfer function models, Z transform.					
12. Design of digital controllers, digital approximation of continuous PID controllers.					
13. 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.					
14. Architecture and programming of industrial control systems, connection of logical and digital control in modern PLC systems.					
Laboratories and seminars					
The topics covered in lectures are practised in computer laboratory using selected real time operating systems and in a limited extent also industrial control systems. The basics of digital control are practised using Matlab and relevant toolboxes.					
Informace ke kombinované nebo distanční formě					
Rozsah konzultací (soustředění)		hodin za týden			
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly					
Studijní literatura a studijní pomůcky					
Liu, J. W. (2000), Real Time Systems, Prentice Hall, Upper Saddle River, N.J.					
Landau, Ioan D., Zito, Gianluca (2006), Digital Control Systems Design, Identification and Implementation, Springer Verlag					
Wittenmark, B., Åström, K. J., Årzén K. E. (2002), Computer Control: An Overview, vydáno v řadě IFAC Professional Briefs, dostupné zdarma na http://www.ifac-control.org/					