

D – Charakteristika studijního předmětu/Subject Specification					
Název studijního předmětu / Subject title	Applied Mathematics				
Typ předmětu / Subject type	obligatory		dopor. ročník / semester/ recommended year / semester	1/1	
Rozsah studijního předmětu / Learning support time		hod. za týden / weekly load	3+3	Kreditů / Credits	6
Jiný způsob vyjádření rozsahu / Other expression of Support time	14 weeks, each 3 hours of lectures and 3 hours of seminary				
Způsob zakončení / Assessment	Examination		Forma výuky / Form of teaching	Lectures seminars	
Další požadavky na studenta / Next demands on the Student					
Vyučující / Teacher					
Prof. Dr. Ing. Jiří Maryška, CSc., doc. Ing. Jan Šembera, Ph.D.					
Stručná anotace předmětu / Short subject annotation					
The objective of the subject is to inform students on advanced mathematical methods of solution of ordinary and partial differential equations and optimization methods. The core subject topics are analytical solution of ordinary differential equations, numerical methods (Runge-Kutta methods, Adams methods, Finite Difference Method), basics of functional analysis, metric spaces, Hilbert and Banach spaces, spaces of smooth and integrable functions, Sobolev spaces, classification of partial differential equations, basics of optimization methods.					
Informace ke kombinované nebo distanční formě / Information about combined or distance form					
Rozsah konzultací (soustředění) / Consultation (assembly) range		hodin za týden / hours per week			
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process					
Studijní literatura a studijní pomůcky / Reading list and study utilities					
- Variational Methods in Mathematics, Science and Engineering / Karel Rektorys. -- 2. ed. -- Dordrecht : Reidel, 1980					

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title	Probability and Statistics			
Typ předmětu / Subject type	obligatory		dopor. ročník / semester/ recommended year / semester	1.1.20 10
Rozsah studijního předmětu / Learning support time		hod. za týden / weekly load	2+1	Kreditů / Credits
Jiný způsob vyjádření rozsahu / Other expression of Support time	14 weeks, each 2 hours of lectures and 1 hour of seminary			
Způsob zakončení / Assessment	Written test and its oral discussion		Forma výuky / Form of teaching	Lectures seminars
Další požadavky na studenta / Next demands on the Student				
Vyučující / Teacher	Mgr. Jan Březina, PhD.			
Stručná anotace předmětu / Short subject annotation	The objective of the subject is to review basics of probability and statistics and introduce students into advanced parts. The basic models and characteristics of probability distributions are recalled briefly. Selected methods of statistical data analysis and modelling are explained, including the maximum likelihood and Bayes principles, analysis of dependence and trend (correlation, regression), classification, basic models of random processes. The procedures are illustrated on the solution of simple studies with the aid of Matlab.			
Informace ke kombinované nebo distanční formě / Information about combined or distance form				
Rozsah konzultací (soustředění) / Consultation (assembly) range		hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process				
Studijní literatura a studijní pomůcky / Reading list and study utilities	Probability and Mathematical Statistics. 1,2: Jiří Kadeřábek, Jana Přívratská, VŠST 1993 Wikipedia and various web sources collected and completed by lecturer.			

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title	Electromagnetic Field and Optics			
Typ předmětu / Subject type	Obligatory		dopor. ročník / semester/ recommended year / semester	1/1
Rozsah studijního předmětu / Study load in hours and credits	2+2	hod. za týden / weekly load	4	Kreditů / Credits 6
Jiný způsob vyjádření rozsahu / Other expression of study load	14 (7+7) weeks, each 2 hours of lectures and 2 hours of seminary			
Způsob zakončení / Assessment	Examination		Forma výuky / Form of teaching	Lectures lab. seminars
Další požadavky na studenta / Other demands on students				
Vyučující / Lecturer	Aleš Richter Prof. M. Sc., Ph.D., Václav Kopecký, Prof., M. Sc., Ph.D.,			
Stručná anotace předmětu / Subject annotation	<p>Part 1 – Electromagnetics</p> <p>Lumped versus distributed electrical circuits. Electromagnetic Components. Maxwell’s equations. Static electric field. Steady electric currents. Static magnetic field. Time-varying fields and Maxwell’s equations. Transient response of transmission lines. Electromagnetic waves.</p> <p>Part 2 - Optics:</p> <p>Electromagnetic optics – electromagnetic theory of light, wave equation in homogeneous and inhomogeneous medium, monochromatic electromagnetic waves, plane, spherical a Gaussian electromagnetic waves.</p> <p>Wave optics – wave optics postulates, wave equation and Helmholtz equation, interference a multiple interference.</p> <p>Fourier optics – optical Fourier transformation, diffraction, holography.</p>			
Informace ke kombinované nebo distanční formě / Information for students in external form of study				
Rozsah konzultací (soustředění) / Consultations, study meetings	2	hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Individual student work – type, load, content and way of checking				
Type: theoretical and experimental work in laboratory				
Content: computation exercises and laboratory experiments				
Load: approx. 8 hours				
Checking: Progress checking and completion checking at the end of the course				
Studijní literatura a studijní pomůcky / Reading list and study utilities				
Umran, S. I., Avis S. I.: Engineering Electromagnetics, Addison Wesley Longman,1999, USA				
Edminister, J. A.: Electromagnetics, Crash course, McGraw-Hill, 2003,USA				
Pauli, W.: Pauli Lectures on Physics, Volume 1. Electrodynamics (41457-4),				
Volume 2. Optics and Theory of Electrons (41458-2), Dover Publications, INC, NY, USA, ISBN 0-486-41457-4				
Bahaa, E., A., Saleh, Malvin, C., T.: Fundamentals of Photonics, John Wiley & Sons, Inc., (ISBN: 978-0-471-83965-1) New York 1991				

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title	Electrical drives			
Typ předmětu / Subject type	Obligatory		dopor. ročník / semester/ recommended year / semester	1/1
Rozsah studijního předmětu / Study load in hours and credits	3/2	hod. za týden / weekly load	5	Kreditů / Credits 5
Jiný způsob vyjádření rozsahu / Other expression of study load	14 weeks, each 3 hours of lectures and 2 hours of seminary			
Způsob zakončení / Assessment	Exam, written und oral		Forma výuky / Form of teaching	P, L, lab.ex.
Další požadavky na studenta / Other demands on students				
Knowledges from mathematic, electrotechnics and electrics motors, powers semoconductors elements and converters, automatics control, modeling and simulation				
Vyučující / Lecturer				
Ing. Jiří Kubín, Ph.D.				
Stručná anotace předmětu / Subject annotation				
Subject of study: Kinematics of drives, its loading, losses, dimensioning and driving, block algebra in control algorithm, mathematics models of driving motors and power semiconductor converters, main types of direct and alternating drives and servomechanism, ordering of drives, control systems with microprocessors, project, modeling and simulating electric drives, utilization in the industry				
Informace ke kombinované nebo distanční formě / Information for students in external form of study				
Rozsah konzultací (soustředění) / Consultations, study meetings		hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Individual student work – type, load, content and way of checking				
14 hours autonomous working of students – electric drive project, calculation, dimensioning, wiring, ordering, simulation, well-tried. Inspection of the process in the laboratory diary continuously.				
Studijní literatura a studijní pomůcky / Reading list and study utilities				
Boldea Ion, Nasar S. A., Electric drives, ISBN - 9780849342202 Leonhard,W.: Control of Electrical Drives, Springer Verlag, Berlin 1997, Emadi,Ali: Handbook of Automotive Power electronics and Motor Drives (Electrical Engineering and Electronics), 5/2005 Hardcover, Boldea,I.,Nasar,S.A.: Electric Drives: CD – Rom Interactive, 11/1998, Hardcover, Hindmarsh,J.: Worked Examples in Electrical Machines and Drives (Applied Electricity and Electronics), 7/1985, Hardcover, Wildi,Theodore: Electrical Machines, Drives and Power Systems, 1/2005, Hardcover				

D – Charakteristika studijního předmětu/Subject Specification					
Název studijního předmětu / Subject title	Laboratories I				
Typ předmětu / Subject type	Obligatory		dopor. ročník / semester/ recommended year / semester	1/1	
Rozsah studijního předmětu / Learning support time	0+4	hod. za týden / weekly load	4	Kreditů / Credits	5
Jiný způsob vyjádření rozsahu / Other expression of Support time	four hours of lectures and experimental work per week				
Způsob zakončení / Assessment	credit (classified)		Forma výuky / Form of teaching	lectures, experimental work, excursions	
Další požadavky na studenta / Next demands on the Student	none				
Vyučující / Teacher	Ing. Petr Šidlof, Ph.D.				
Stručná anotace předmětu / Short subject annotation	<p>The course introduces the students into experimental methods in the mechanics of elastic bodies, namely strain gauge measurements and optical methods in deformation measurements. Through laboratory experiments, the students learn to apply these methods in practical cases of structures loaded by various stresses, to perform data acquisition, process the results and write a measurement report. Instead of using pre-built setups and data acquisition systems, the students realize a self-made measurement chain, beginning with transducer installation and ending by creating a simple measurement software. The laboratory experiments are supplemented by lectures from relevant parts of linear elasticity and excursions to research and development labs.</p> <ol style="list-style-type: none">1. Elementary concepts of the mechanics of elastic bodies.2. Strain gauge measurements. Connection of strain gauges into the quarter-bridge, half-bridge and full bridge.3. Data acquisition hardware and software. Excursion to the hydrodynamical lab of TUL.4. Plane bending of a beam.5. NI LabView fundamentals. Creating a simple measurement software using express functions.6. Densimeter – first experimental problem.7. Elementary concepts of the theory of undamped linear oscillation of lumped parameter systems.8. Damped vibration. Influence of mass and damping on vibration of a clamped beam – 2nd experimental problem.9. Multiaxial stress. Plane stress and plane strain. Stress states in a pressure vessel loaded by internal pressure.10. LabView programming. Creating a measurement software using the elementary LabView blocks. Measurement of deformation on a wall of a pressure vessel– third experimental problem.11. Torsion of a straight prismatic rod.12. Realization of a torque wrench based on measurement of torsion– fourth experimental problem.13. Optical method in deformation measurements. High-speed imaging.14. Evaluation of an impact test using high-speed camera – fifth experimental problem.				
Informace ke kombinované nebo distanční formě / Information about combined or distance form					
Rozsah konzultací (soustředění) / Consultation (assembly) range			hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process					
Five written reports from assigned experimental problems (densimeter, free undamped and damped vibration, deformation of a pressure vessel loaded by internal pressure, measurement of torque, high-speed imaging).					
Studijní literatura a studijní pomůcky / Reading list and study utilities					
Humen, VJ., Potěšil, A., Lufinka, A.: Experimental mechanics - Selected lessons. Supplementary material for LA1, FM TUL. Liberec 2006.					
Klaboch, L.: Experimental methods I. ČVUT, Praha, 1982.					
Manuals and web pages of manufacturers and suppliers of measure technology and units					

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title	Robotics			
Typ předmětu / Subject type	Obligatory	dopor. ročník / semester/ recommended year / semester	1/2	
Rozsah studijního předmětu / Learning support time	hod. za týden / 2/2 weekly load	Kreditů / Credits	5	
Jiný způsob vyjádření rozsahu / Other expression of Support time	14 weeks, each 2 hours of lectures and 2 hours of seminary			
Způsob zakončení / Assessment	Examination	Forma výuky / Form of teaching	Lecturers and labs	
Další požadavky na studenta / Next demands on the Student				
Vyučující / Teacher	Doc. Ing. Mgr. Václav Záda, CSc.			
Stručná anotace předmětu / Short subject annotation	<p>The aim of this subject is to deep knowledge of students about kinematics and dynamics of robots, solutions of direct and inverse kinematics problems with using analytical and special numerical methods. After kinematics there will be studied dynamics of robots, matrix differential equations of robot motion and alternative methods. Students will be informed about basic methods of robot control with using kinematics equations or dynamical equations respectively, robot motion control on defined trajectories and on defined surfaces, classical trajectory planning, numerical solutions of dynamics of robots and simulations of robot motion.</p>			
Informace ke kombinované nebo distanční formě / Information about combined or distance form				
Rozsah konzultací (soustředění) / Consultation (assembly) range	2	hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process				
Type: theoretical or practical work in laboratory of robotics				
Load: 14 hours in laboratory				
Content: six individual thematically oriented works – programming of robots, building of robots with kit using				
Checking: Progress checking via work reports, complex checking at the end of course				
Studijní literatura a studijní pomůcky / Reading list and study utilities				
Angeles, J.: Fundamentals of Robotics Mechanical Systems. Springer-Verlag, New York, 2003. Canudas de Win, C.- Sicilianny, B.-Bastin, G.: Theory of Robot Control. Springer-Verlag, 1996. Samson, C.-Le Borgne, M.-Espiau, B.: Robot Control. Clarendon Press, Oxford, 1991. Liu, D.-Wang, L.-Tan, Ch. K. : Design and Control of Intelligent Robotic Systems. Springer-Verlag Berlin, 2009. Schilling, R. J.: Fundamentals of Robotics. Analysis and Control. Prentice Hall, Englew. Cliffs, New Jersey, 1990. Kárník, L.-Novák Marcinčin J.: Biorobotická zařízení. Nakl. MÁRFY SLEZKO, 1999. Záda, V. Chatraie, A. – Lindr, D.: Learning control for robot manipulators. In: Engineering Mechanics 2009, Svratka, Czech Republic, pp. 1489-1495. Institute of Theoretical and Applied Mechanics, Academy of Science of the Czech Republic, Prague. ISBN 978-80-86246-35-2				

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title	Programmable Controllers			
Typ předmětu / Subject type	Obligatory subject		dopor. ročník / semester/ recommended year / semester	1st year 2nd term
Rozsah studijního předmětu / Learning support time	hod. za týden / weekly load	2+2	Kreditů / Credits	5
Jiný způsob vyjádření rozsahu / Other expression of Support time	14 weeks, each 2 hours of lectures and 2 hours of practical			
Způsob zakončení / Assessment	Written and oral exam		Forma výuky / Form of teaching	Lecturers and labs
Další požadavky na studenta / Next demands on the Student				
Vyučující / Teacher	Ing. Martin Diblík, Ph.D.			
Stručná anotace předmětu / Short subject annotation	The subject is an introduction into logic control with focus on industrially used devices. Students familiarised themselves with design methods of logic signals processing systems, the accent is put on PLC function understanding, programming and general rules of PLC use for machine and process control. The visualisation of controlled process is also important, mainly with the aid of standard industrial communication technologies. Lectures: 1. Logic control – terms definition (logic system, analog signals, digital signals, binary signals, logical variables, operators, functions...) 2. PLC – definition, demands, use 3. PLC – sorting, inputs/outputs, architecture, communication, programming possibilities 4. IEC 61131 programming 5. Market overview, producers, PLC types, SIMATIC S7 (200-, 300-, F-series). 6. – 9. guided examples 10. Communication, industrial bus classification, ASi, Profibus, Profinet. 11. Distributed peripherals I/O, human-machine interface (HMI, OPC) 12. PLC for General Motion Control			
Informace ke kombinované nebo distanční formě / Information about combined or distance form				
Rozsah konzultací (soustředění) / Consultation (assembly) range		hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process				
Practical task: Programming of PLC controllers according to the task description. Checking: passed – failed				
Studijní literatura a studijní pomůcky / Reading list and study utilities	John, K. H., Tiegelkamp, M.: IEC 61131-3: Programming Industrial Automation Systems, 2nd Edition., 2010, VI, 376 p. ISBN: 978-3-642-12014-5 Siemens AG: Simatic S7-300, Manuals and brochures.			

D – Charakteristika studijního předmětu/Subject Specification					
Název studijního předmětu / Subject title	Drives and Servomechanisms				
Typ předmětu / Subject type	Obligatory		dopor. ročník / semester/ recommended year / semester	1/2	
Rozsah studijního předmětu / Learning support time		hod. za týden / weekly load	2+2h	Kreditů / Credits	5
Jiný způsob vyjádření rozsahu / Other expression of Support time	14 weeks (one semester), each week 2 lessons of lectures and 2 lessons of seminary				
Způsob zakončení / Assessment	exam		Forma výuky / Form of teaching	Lecturers and labs	
Další požadavky na studenta / Next demands on the Student					
Basic electrotechnics and physics (electromagnetism) knowledge.					
Vyučující / Teacher					
Doc. Ing. Pavel Rydlo, CSc., Ing. Josef Černohorský, PhD.					
Stručná anotace předmětu / Short subject annotation					
This subject teaches students basic principles of electrical drives, basic knowledge of servomechanisms such as servodrives, drive and motion controllers and industrial communication networks. There were given information about drive mathematical modeling and control structures. <ul style="list-style-type: none">• Drive principles and construction (DC, ECDC, Stepper, Synchronous, Induction, linear and torque drives)• Characteristics of drives and usage of drive in industry• Control structure of servodrives (Torque, Speed, Position mode, Master Slave, Electronic gearbox, Electronic cams)• Pulse Width Modulation, Sensorless Speed Control, Direct Torque Control• Speed and position sensors• Industrial bus and communications systems, CANOpen, HEDABus• Controlling systems• Drive tuning• Programming of motion controllers via IEC 61131-3					
Informace ke kombinované nebo distanční formě / Information about combined or distance form					
Rozsah konzultací (soustředění) / Consultation (assembly) range	2× 3 h		hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process					
Mathematical model of DC drive in Matlab-Simuling Model of position and speed servodrive in Matlab-Simuling					
Studijní literatura a studijní pomůcky / Reading list and study utilities					
DORSEY, John. <i>Continuous and discrete control systems</i> , ISBN: 0-07-250023-9 H.Bulent Ertan and col. <i>Modern Electrical Drives</i> ,Kluwer Academic Publishers (Aug 2000),ISBN: 978-0792363767 Nasar S.A., Boldea,I. <i>Vector Cotrol of Ac Drives</i> .CRC Press Inc (Aug 1992),ISBN: 978-0849344084 Krishnan, R. <i>Electric Motor Drives: Modeling, Analysis, and Control</i> . Prentice Hall 2001, ISBN: 978-0130910141 http://www.irf.com/technical-info/guide/ (Application Training Guide) http://www.semikron.com/internet/index.jsp?sekId=13 (Application) http://www.st.com/stonline/products/support/motor/tutorial/tutorial.htm (Motor tutorial)					

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title	Control Systems in Mechatronics			
Typ předmětu / Subject type	Obligatory subject		dopor. ročník / semester/ recommended year / semester	1st year 2nd term
Rozsah studijního předmětu / Learning support time	hod. za týden / weekly load	2+2	Kreditů / Credits	5
Jiný způsob vyjádření rozsahu / Other expression of Support time	14 weeks, each 2 hours of lectures and 2 hours of seminary			
Způsob zakončení / Assessment	Written and oral exam		Forma výuky / Form of teaching	Lectures And labors
Další požadavky na studenta / Next demands on the Student				
Vyučující / Teacher	Doc. Ing. Osvald Modrlák, CSc., Ing. Lukáš Hubka, PhD.			
Stručná anotace předmětu / Short subject annotation	<p>This subject offers a comprehensive overview of control systems with accent on an appropriate balance between theoretical concepts and engineering practice in analysis, synthesis and identification of linear dynamic systems. The subject focuses on empirical identification, single loop control design method, problems of optimal PID control strategy and application of frequency domain methods.</p> <p>The important part consists of solving complicated control loops as feed forward, cascade, multiloop pairing and fundamental approach to state variable control. Theoretical and practical lessons involve utilization of MATLAB software tools. The implementation of the theory will be carried out on physical real models with industrial equipment in the Control laboratory. Extensive computer assisted laboratory exercises cover such tasks as rotation speed control of a system with DC-motor, tachometer and elastic clutch with a load, water temperature control of a circulation water boiler heater, level control, temperature control of air flow and others.</p> <p>The students will acquire good knowledge of practical parameter estimation for determined model structure, analysis and synthesis of dynamic systems, PID controller tuning, practical design of industrial control systems, review of Multi Input Multi Output systems and basic knowledge of state controller design. They will become familiar with implementation of control algorithms using modern software tools. Web based interactive modules assist student self study and help prepare practical experimentation.</p>			
Informace ke kombinované nebo distanční formě / Information about combined or distance form				
Rozsah konzultací (soustředění) / Consultation (assembly) range		hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process				
Elaborates: 1) Identification measuring and data acquisition 2) Parametric identification by chosen model structure 3) Synthesis of PID controller by chosen method 4) PID - Real time control 5) Multiloop-pairing control Checking: passed – failed				
Studijní literatura a studijní pomůcky / Reading list and study utilities				
Kuo, B.C.: Automatic control systems. John Wiley & Sons, Inc. New York, 1995. ISBN 0-471-36608-0 Mariin, T. E.: Process control. Designing processes and control systems for dynamic performance. Mc Graw Hill, 2 nd ed, 2000. ISBN 0-07-039362-1. Bolton, W.: Mechatronics. Electronic control systems in mechanical and electrical engineering. Pearson Education Limited, 3-rd ed. 2003. ISBN 10: 0-13-121633-3.				

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title	Digital Signal Processing I			
Typ předmětu / Subject type	Compulsory elective		dopor. ročník / semester/ recommended year / semester	1st year 2nd term
Rozsah studijního předmětu / Learning support time	hod. za týden / weekly load	2+2	Kreditů / Credits	5
Jiný způsob vyjádření rozsahu / Other expression of Support time	14 weeks, each 2 hours of lectures and 2 hours of seminary			
Způsob zakončení / Assessment	Written and oral exam		Forma výuky / Form of teaching	Lecturers and labs
Další požadavky na studenta / Next demands on the Student	Basic knowledge of mathematical analysis and linear algebra.			
Vyučující / Teacher	Ing. Zbyněk Koldovský, PhD.			
Stručná anotace předmětu / Short subject annotation	<p>The course is an introduction to digital signal processing comprising the sampling theorem, deterministic and stochastic models of signals, Fourier transforms, Z-transform, LTI systems, Fast Fourier transform, filter design theory and further topics. It provides an insight into major engineering applications of DSP, e.g., spectral analysis, digital filtering, noise reduction, and speech processing.</p>			
Informace ke kombinované nebo distanční formě / Information about combined or distance form				
Rozsah konzultací (soustředění) / Consultation (assembly) range		hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process				
Studijní literatura a studijní pomůcky / Reading list and study utilities				
B. Porat, A Course in Digital Signal Processing, John Wiley & Sons, New York, 1997. B. Porat, Digital Processing of Random Signals, Dover Publications, Mineola, 2008.				

D – Charakteristika studijního předmětu/Subject Specification					
Název studijního předmětu / Subject title	Design of electrotechnics systems				
Typ předmětu / Subject type	Compulsory elective		dopor. ročník / semester/ recommended year / semester	1/2	
Rozsah studijního předmětu / Learning support time		hod. za týden / weekly load	2+2h	Kreditů / Credits	5
Jiný způsob vyjádření rozsahu / Other expression of Support time	14 weeks, each 2 hours of lectures and 2 hours of seminary				
Způsob zakončení / Assessment	Exam		Forma výuky / Form of teaching	Lecturers and labs	
Další požadavky na studenta / Next demands on the Student					
Basic electrotechnics and physics (electromagnetism) knowledge					
Vyučující / Teacher					
Ing. Miroslav Novak, PhD.					
Stručná anotace předmětu / Short subject annotation					
<p>This subject teaches students necessary theory of electrotechnics needed for design of distribution boards and electrical equipment of machines and buildings. The aim is industrial applications from low voltage switchboards to manipulators and machinery ending with production lines of mass production. The main topics of lectures are:</p> <ul style="list-style-type: none">- CAD/CAE/CAM systems at electrotechnics- Electrotechnics legislative and standards- Conductor and cable design- Theory of protection devices, design, selectivity of protection- Over voltage protections- Switchboard parts, control parts, measuring devices, user friendliness- Switching devices- Power supplies, properties of low voltage power net- Switch board cooling, thermal behavior- Building installations <p>Students get basis of electrotechnics documentation generation at practical lessons. The teaching is based on CAD/CAE system ePLAN. Teacher leads collective project at first part of the course, than students work on individual projects.</p>					
Informace ke kombinované nebo distanční formě / Information about combined or distance form					
Rozsah konzultací (soustředění) / Consultation (assembly) range	2× 3 h		hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process					
Individual projects of electrotechnics system design in ePLAN system. Students have an access to university license of ePLAN system. Teacher on e-mail will check the final design.					
Studijní literatura a studijní pomůcky / Reading list and study utilities					
TKOTZ Klaus and col. Fachkunde Elektrotechnik. 23. ed. Europa-Lehrmittel; Auflage: 23 (2006), ISBN: 3808531576 ePLAN 20 manual, user's guide [CD-ROM]					
Access to standards at library, internet					

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title	Smart Sensors and Actuators			
Typ předmětu / Subject type	Compulsory elective		dopor. ročník / semester/ recommended year / semester	2 nd year 1 st term
Rozsah studijního předmětu / Study load in hours and credits		hod. za týden / weekly load	2 + 2	Kreditů / Credits 5
Jiný způsob vyjádření rozsahu / Other expression of study load	14 weeks, each 2 hours of lectures and 2 hours of seminary			
Způsob zakončení / Assessment	Written exam		Forma výuky / Form of teaching	Lectures and labs
Další požadavky na studenta / Other demands on students				
Vyučující / Lecturer	Prof. Ing. Jaroslav Nosek, CSc. / Doc.Ing. Pavel Mokřý, Ph.D.			
Stručná anotace předmětu / Subject annotation	<p>Short annotation of the course</p> <p>In this subject, there will be given the both theoretical overview and practical experience in the area of selected electric transducers of physical quantities. An accent will be put on the application of smart materials in such systems. Students will acquire the basic concepts of the application of piezoelectric, ferroelectric and piezoresistive materials in electrical transducers, including the practical experience from demonstrations of real experimental systems.</p> <p>Topics of the lectures</p> <ol style="list-style-type: none"> 1. Sensors and actuators of the advanced mechatronic system. 2. Smart materials and their use for actuators and sensors. 3. Piezoelectric materials. Elastic, piezoelectric and dielectric properties. Material constants. Linear state equations. 4. Applications of direct and inverse piezoelectric effects. 5. Piezoelectric sensors and their use measuring selected physical quantities (force, pressure, acceleration, vibrations, shocks). 6. Piezoelectric resonator. Basic modes of vibrations. Longitudinal, radial and thickness-shear vibrations. Simulation of the vibrations. 7. Electric equivalent circuit of the resonator. Design of the resonator. 8. Measurement of the resonance frequency. 9. Influences on the resonance frequency. 10. Non-linear effects and their consequences to the electric circuits. Resonator as a sensor of the physical, chemical and biological quantities. 11. Piezoresistive effect in the non-piezoelectric crystal. Piezoresistive sensors. 12. Intelligent semiconductor sensors. 13. Mikroelectromechanical systems (MEMS). Applications. 14. Piezoelectric thin films deposited on the Si-substrate. Measurements of the small mechanical displacements by laser interferometry. <p>Laboratory practices</p> <ol style="list-style-type: none"> 1. Direct and inverse piezoelectric effects. Methods of measurements. LVDT sensor and laser interferometry. 2. Measurement of the static mechanical stress. Piezoelectric module g. 3. Electric equivalent circuit. Measurement of the resonance frequency. 4. Determination of the parameters of electric equivalent circuit. Piezoelectric resonator as a bio-sensor. 5. Determination of the selected material constants of piezoelectric ceramics. Modal analysis. 6. Temperature dependence of the resonance frequency. 7. Piezoresistive sensor of mechanical strains. 8. Intelligent semiconductor sensors. 9. Optoelectronic devices and systems. 10. Measurement of selected mechanical quantities. 11. Measurement of the small mechanical displacements (by LVDT). 12. Measurement of the small mechanical displacements (by laser interferometry). 			

13. SW used in data processing.
14. Credits.

Informace ke kombinované nebo distanční formě / Information for students in external form of study		
Rozsah konzultací (soustředění) / Consultations, study meetings		hodin za týden / hours per week
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Individual student work – type, load, content and way of checking		
Studijní literatura a studijní pomůcky / Reading list and study utilities		
<p>[1] SETTER,N.: <i>Piezoelectric Materials in Devices</i>. Ceramics Laboratory, EPFL Lausanne, 2002. ISBN 2-9700346-0-3.</p> <p>[2] UCHINO,K.: <i>Ferroelectric Devices</i>. Marcel Dekker, Inc., New York, Basel 2000, ISBN 0-8247-8133-3.</p> <p>[3] ZELENKA,J.: <i>Piezoelectric Resonators and Their Applications</i>. Academia Praha, Elsevier Amsterdam, 1986.</p>		

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title	Renewable Energy Sources and its Control			
Typ předmětu / Subject type	Obligatory elective subject		dopor. ročník / semester/ recommended year / semester	1st year 2nd term
Rozsah studijního předmětu / Learning support time	hod. za týden / weekly load	2+2	Kreditů / Credits	5
Jiný způsob vyjádření rozsahu / Other expression of Support time	14 weeks, each 2 hours of lectures and 2 hours of seminary			
Způsob zakončení / Assessment	Written and oral exam		Forma výuky / Form of teaching	Lectures and labors
Další požadavky na studenta / Next demands on the Student				
Vyučující / Teacher	Ing.Lukáš Hubka, PhD., Doc. Ing. Osvald Modrlák,CSc			
Stručná anotace předmětu / Short subject annotation	<p>The growing importance of renewable energy sources, control methods and mechanisms, and system restoration has created a need for a new subject, providing an up-to-date introduction to modern electric power systems using renewable energy sources.This subject offers an overview of renewable energy sources and its control. The main forms of renewable energy will be described and discussed. The subject is focused on new generation of solar thermal panel and plants, photovoltaic sources, geothermal energy, water, wind and wave energy.</p> <p>The second part gives students an important introduction to the basic science and engineering behind fuel cell technology. Emphasizing the foundational scientific principles that apply to any fuel cell type or technology. Presentations provide descriptions of how fuel cells work, why they offer the potential for high efficiency, and how their unique advantages can best be used. Lab works are concentrated on hydrogen and fuel cells, hybrid fuel cell-battery for power supply and its control.</p> <p>The third important part consists of the intelligent management concept for decentralized power supply unit, energy optimizing management goals and concepts. The students will acquire good knowledge of renewable energy sources, design and condition for renewable energy commercialization. They will become familiar with scientific principles how fuel cell work and with control and optimization strategy and methods for decentralized power supply. Web based interactive modules for remote measure and control assist student self study and help prepare practical experimentation.</p>			
Informace ke kombinované nebo distanční formě / Information about combined or distance form				
Rozsah konzultací (soustředění) / Consultation (assembly) range		hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process				
Elaborates:1) Measuring and data acquisition on hydrogen and fuel cells or photovoltaic panel 2) Data processing of experimental results 3) Design of a decentralized power supply unit.				
Checking: passed – failed				
Studijní literatura a studijní pomůcky / Reading list and study utilities				
Freris, F., Infield, D.: Renewable Energy in Power Systems. John Wiley & Sons, Inc. New York, 2009, ISBN: 978-0-470-25843-9 O'Havre,R., Cha, S.-W., Colella, W., Prinz, F.: Fuel Cell Fundamentals, 2nd Edition. John Wiley & Sons, Inc. New York, 2009. ISBN: 978-0-470-25843-9.				

D – Charakteristika studijního předmětu/Subject Specification					
Název studijního předmětu / Subject title	Laboratory 2				
Typ předmětu / Subject type	Obligatory		dopor. ročník / semester/ recommended year / semester	1/2	
Rozsah studijního předmětu / Learning support time		hod. za týden / weekly load	4	Kreditů / Credits	5
Jiný způsob vyjádření rozsahu / Other expression of Support time	14 weeks, 4 hours of laboratory seminars				
Způsob zakončení / Assessment	credit		Forma výuky / Form of teaching	Lab. seminar	
Další požadavky na studenta / Next demands on the Student	Graduation of subject Measuring Technique I.; Measuring Technique II.; Electrical Engineering and Measuring				
Vyučující / Teacher					
Ing. Jan Koprnický, Ph.D.					
Stručná anotace předmětu / Short subject annotation					
The objective of the advanced course is to introduce laboratory technology planning used for characteristics identification and electromagnetic systems responses to students. Through suitably chosen laboratory topics the theory and practical solutions of a variety of experimental work and functional telemetry is introduced to students. The part of the presentations is the characteristics and demonstration of measuring chains used in experimental and developing units of industrial subjects and engineering companies.					
Informace ke kombinované nebo distanční formě / Information about combined or distance form					
Rozsah konzultací (soustředění) / Consultation (assembly) range		hodin za týden / hours per week			
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process					
1. – 4. Automobile electronics, CAN protocol, electrical measurement of car's actuators 5. Exact measurement and analysis of rotating velocity and acceleration of spinning units and machinery 6. Measurement and analysis of power inputs and loads of controlled servo 7. Optimization for reducing mechanism vibrations 8. Increasing of qualitative and efficiency parameters of processing machines 9. Experimental evaluation of designed crush elements, appraisal of constructions, experimental modal analysis 10. Construction and properties of measure analyzers					
Studijní literatura a studijní pomůcky / Reading list and study utilities					
Composite authors: Collection of examples and topics for experiments in industry profession. Learning script for LA 2 for consequential master degree studies at the FM TUL. Liberec 2007. Editor Potěšil, A.					
Manuals and web pages of manufacturers and suppliers of measure technology and units.					

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title		Automatic Control Theory		
Typ předmětu / Subject type		Obligatory	dopor. ročník / semester/ recommended year / semester	2/3
Rozsah studijního předmětu / Study load in hours and credits		hod. za týden / weekly load	2 + 2 h	Kreditů / Credits 5
Jiný způsob vyjádření rozsahu / Other expression of study load		14weeks (2 hours of lectures and 2 ours of seminar)		
Způsob zakončení / Assessment		Written exam	Forma výuky / Form of teaching	Lectures Seminars,labs
Další požadavky na studenta / Other demands on students				
Vyučující / Lecturer		Prof. Dr.-Ing.habil. Detlef Proske		
Stručná anotace předmětu / Subject annotation		Study of modern methods of Automatic Control Students will asquire Knowledge on multi loop control, digital control and state space control and about the practical use of these methods.		
Informace ke kombinované nebo distanční formě / Information for students in external form of study				
Rozsah konzultací (soustředění) / Consultations, study meetings		hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Individual student work – type, load, content and way of checking				
Assignment of tasks and check of solution in seminar.				
Studijní literatura a studijní pomůcky / Reading list and study utilities				
<ul style="list-style-type: none">Robert F. Stengel (1994). <i>Optimal Control and Estimation</i>. Dover Publications. ISBN 0-486-68200-5, ISBN-13: 978-0-486-68200-6.Franklin et al. (2002). <i>Feedback Control of Dynamic Systems</i>, 4, New Jersey: Prentice Hall. ISBN 0-13-032393-4.Joseph L. Hellerstein, Dawn M. Tilbury, and Sujay Parekh (2004). <i>Feedback Control of Computing Systems</i>. John Wiley and Sons. ISBN 0-47-126637-X, ISBN-13: 978-0-471-26637-2.Diederich Hinrichsen and Anthony J. Pritchard (2005). <i>Mathematical Systems Theory I - Modelling, State Space Analysis, Stability and Robustness</i>. Springer. ISBN 0-978-3-540-44125-0.Sontag, Eduardo (1998). <i>Mathematical Control Theory: Deterministic Finite Dimensional Systems. Second Edition</i>. Springer. ISBN 0-387-984895				

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title		Computational Intelligence / Artificial Neural Networks		
Typ předmětu / Subject type		Obligatory selectable	dopor. ročník / semester/ recommended year / semester	2/3
Rozsah studijního předmětu / Study load in hours and credits		hod. za týden / weekly load	2+3 h	Kreditů / Credits 5
Jiný způsob vyjádření rozsahu / Other expression of study load		15 weeks (2 hours of lectures, 2 hours of seminar - 1 hour of practical course on PC is included)		
Způsob zakončení / Assessment		Exam	Forma výuky / Form of teaching	Full-time course
Další požadavky na studenta / Other demands on students		Basic knowledge in natural science		
Vyučující / Lecturer		Wolfgang Kästner		
Stručná anotace předmětu / Subject annotation		<p>The aim is to impart basic as well as consolidated knowledge about computational intelligence especially artificial neural networks and their application for the modelling of complex processes.</p> <p>Main topics are:</p> <ul style="list-style-type: none">- Foundations of CI, ANN- Application of ANN in classification and modelling- Modelling of complex processes using Multilayer Perceptron (design, architecture, training, test, recall, example of demonstration, practical realisation, software tools)- verification and validation of model, analysis of sensitivity- requirements for application to model dynamic processes- application of developed algorithms <p>The students get basic informations about the foundations of artificial neural networks with the focus on the modelling of complex processes using Multilayer Perceptron. Seminar and practical training on PC consolidate the ability to develop and apply the algorithms.</p>		
Informace ke kombinované nebo distanční formě / Information for students in external form of study				
Rozsah konzultací (soustředění) / Consultations, study meetings		2 x 3 h	hodin za týden / hours per week	
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Individual student work – type, load, content and way of checking				
Assignment of tasks and check of solution in seminar.				
Studijní literatura a studijní pomůcky / Reading list and study utilities				
Anderson, J.A.; Rosenfeld, E.: Neurocomputing: Foundation of Research, The MIT Press, 1988 Fogelman, S. [Hrsg.] : Industrial applications of neural networks. Singapore, 1998 Hecht-Nielsen, R.: Neurocomputing, Addison-Wesley, 1990 Mujtaba, I. M. [Hrsg.]: Application of neural networks and other learning technologies in process e engineering. River Edge, NJ, 2001 Nørgaard, M.: Neural networks for modelling and control of dynamic systems - a practitioner's handbook. London ; Berlin ; Heidelberg, 2000 Patterson, D: Artificial neuronal networks, Prentice Hall, 1996				
Access to standards at library and internet.				

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title	Image Processing			
Typ předmětu / Subject type	Obligatory selectable		dopor. ročník / semester/ recommended year / semester	2/3
Rozsah studijního předmětu / Learning support time	hod. za týden / weekly load	2+2 h	Kreditů / Credits	
Jiný způsob vyjádření rozsahu / Other expression of Support time	15 weeks, each 2h of lectures and 2 hours of seminary			
Způsob zakončení / Assessment	Exam		Forma výuky / Form of teaching	Lectures seminars
Další požadavky na studenta / Next demands on the Student	Knowledge in software development with Microsoft Visual C++ 2008			
Vyučující / Teacher	Prof. Dr. rer. nat. Stefan Bischoff			
Stručná anotace předmětu / Short subject annotation				
<p>This course provides a general introduction to the fundamental techniques of computer vision and image processing and illustrates their practical application. The main topics are:</p> <ul style="list-style-type: none">- Image acquisition and representation- Preprocessing methods: transformations of pixel brightness and geometry, camera calibration, local operators- Video and audio compression- Image segmentation: thresholding, edge-based and region-based segmentation, Hough transformation, template matching, motion segmentation, optical flow- Feature extraction: color, texture and shape descriptors; Principal Component Analysis (PCA)- Classification: prototypes, cluster analysis, statistical methods, classifiers- Teachable image evaluation: supervised and non-supervised learning, neural networks, Support-Vector-Machines (SVM)- Multi-sensor technology: depth sensors, photogrammetry, 3D scene reconstruction <p>Overview of current practical application areas: visual quality inspection, robotics, medical diagnosis, video conference systems, biometry, security</p>				
Informace ke kombinované nebo distanční formě / Information about combined or distance form				
Rozsah konzultací (soustředění) / Consultation (assembly) range	2 x 3 h	hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process				
Studijní literatura a studijní pomůcky / Reading list and study utilities				
Bernd Jähne, Digital Image Processing, Springer, 5th edition (April 29, 2002), ISBN: 3540677542				
Gary Bradski, Adrian Kaehler, Learning OpenCV – Computer Vision with the OpenCV Library, O'Reilly Media, 2008, ISBN: 978-0-596-51613-0				

D – Charakteristika studijního předmětu/Subject Specification					
Název studijního předmětu / Subject title	Communication Engineering				
Typ předmětu / Subject type	Compulsory		dopor. ročník / semester/ recommended year / semester	1 st year 2 nd term	
Rozsah studijního předmětu / Learning support time		hod. za týden / weekly load	2 +2	Kreditů / Credits	5
Jiný způsob vyjádření rozsahu / Other expression of Support time	15 weeks, each 2 hours of lectures and 2 hours of seminary				
Způsob zakončení / Assessment	Written exam		Forma výuky / Form of teaching	Lecture and seminary	
Další požadavky na studenta / Next demands on the Student					
Vyučující / Teacher	Prof. Dr.-Ing. Reiner Thiele				
Stručná anotace předmětu / Short subject annotation	<p>This course provides a general introduction to the fundamental techniques of communication and illustrates their practical application. The main topics are:</p> <div><div>Part: Adaptive filters</div><div><ul style="list-style-type: none">- Mathematical basics- Mathematical modeling of the adaptive task- Linear prediction and lattice structure- Method of the steepest descent- Least mean squares algorithm- Adaptive gradient methods for lattice structures- Recursive least squares algorithm</div><div><div>Part: Information theory and coding</div><div><ul style="list-style-type: none">- Introduction- Discrete information sources- Discrete transfer channels- Entropy of continuous sources- Continuous channels- Optimal codes, source coding- Channel coding</div></div></div>				
Informace ke kombinované nebo distanční formě / Information about combined or distance form					
Rozsah konzultací (soustředění) / Consultation (assembly) range		hodin za týden / hours per week			
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process					
Studijní literatura a studijní pomůcky / Reading list and study utilities	Alexander, S.T.: Adaptive Signal Processing. Springer Verlag New York, Berlin, Heidelberg 1990 Haykin, S.: Adaptive Filter Theory. Prentice-Hall Inc. Englewood Cliffs, New Jersey 1991, ISBN 0-13-005513-1 Mansuripur, M.: Introduction to Information Theory. Prentice-Hall, Englewood Cliffs, 1987				

D – Charakteristika studijního předmětu/Subject Specification					
Název studijního předmětu / Subject title	Signal Processing				
Typ předmětu / Subject type	Compulsory		dopor. ročník / semester/ recommended year / semester	1 st year 2 nd term	
Rozsah studijního předmětu / Learning support time		hod. za týden / weekly load	2 +1+1	Kreditů / Credits	5
Jiný způsob vyjádření rozsahu / Other expression of Support time	15 weeks, each 2 hours of lectures, 1 hour of seminary and 1 hour of labs				
Způsob zakončení / Assessment	Written exam		Forma výuky / Form of teaching	Lectures, seminary and labs	
Další požadavky na studenta / Next demands on the Student					
Vyučující / Teacher	Prof. Dr.-Ing. Reiner Thiele				
Stručná anotace předmětu / Short subject annotation	<p>The basics of Signal processing are developed in this course. These are time-based signals and systems, a mathematical description of signals and systems in the time, frequency and screen domain, including totals and integral transformations. The main emphasis here is on the discrete and fast Fourier transform for signal and system analysis. Another subject of education is the design of recursive and non-recursive digital filters and also of wave digital filters. For this purpose both the impulse invariance and the bilinear method, the Fourier approximation and the wave description to the design of digital filters are dealt with.</p> <p>Topics of the lectures</p> <ul style="list-style-type: none">I. Time-continuous networks (Theoretical basics, active RC-filters, passive LC-filters, active filters in SC-technology)II. Digital Signal Processing (Introduction, conversion of signals, time-discrete signals and systems, DFT and FFT, filter structures, systems with multiple sampling rates)III. Time-discrete networks (Theoretical basics, design of recursive digital filters, design of non-recursive digital filters, design of wave digital filters) <p>Laboratories and seminars</p> <p>The topics covered in lectures are practised in seminary and laboratory using selected design methods for analogue and digital filters.</p>				
Informace ke kombinované nebo distanční formě / Information about combined or distance form					
Rozsah konzultací (soustředění) / Consultation (assembly) range		hodin za týden / hours per week			
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process					
Studijní literatura a studijní pomůcky / Reading list and study tilities	Cavicchi, T.J.: Digital Signal Processing. John Wiley & Sons, 2000 Bateman, A; Paterson-Stephens, I.: The DSP Handbook. Algorithms, Applications and Design Techniques. Prentice Hall, 2001 Blinchikoff, HI.; Izverev, A: Filtering in the Time and Frequency Domains. Noble Publishing, 2001				

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title	Magnetic Bearings			
Typ předmětu / Subject type	Compulsory voting		dopor. ročník / semester/ recommended year / semester	3
Rozsah studijního předmětu / Study load in hours and credits	2+2	hod. za týden / weekly load	4	Kreditů / Credits 5
Jiný způsob vyjádření rozsahu / Other expression of Support Time	every week, 2 hours of lectures			
Způsob zakončení / Assessment	Examination		Forma výuky / Form of teaching	Lectures, Seminars
Další požadavky na studenta / Other demands on students	Basic electrotechnics and physics (electromagnetism) knowledge			
Vyučující / Teacher	Fränk Worlitz			
Stručná anotace předmětu / short Subject annotation	<p>This subject teaches students design and application of magnetic bearings. The main topics of lectures are:</p> <ul style="list-style-type: none">- kinds of magnetic bearings- design and engineering- control theory- diagnosis possibilities- applications			
Informace ke kombinované nebo distanční formě / Information for students in external form of study				
Rozsah konzultací (soustředění) / Consultations, study meetings		hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Individual student work – type, load, content and way of checking				
Studijní literatura a studijní pomůcky / Reading list and study utilities				
Gerhard Schweitzer, Hannes Bleuler, Alfons Traxler, 1994. Active Magnetic Bearings, Basics, Properties and Applications of active Magnetic Bearings. 1994 vdf Hochschulverlag AG an der ETH Zürich. ISBN 3 7281 2132 0.				
Akira Chiba, Tadashi Fukao, Osamu Ichikawa: Magnetic Bearings and Bearingless Drives Verlag Newnes (an imprint of Butterworth-Heinemann Ltd) (Mai 2005)				

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title	Optional Module /Internat. Project W16 Hardware Programming			
Typ předmětu / Subject type	selectable obligatory subject		dopor. ročník / semester/ recommended year / semester	2nd year 1st term
Rozsah studijního předmětu / Learning support time	hod. za týden / weekly load	2	Kreditů / Credits	5
Jiný způsob vyjádření rozsahu / Other expression of Support time	15 weeks with 2h of lectures			
Způsob zakončení / Assessment	exam		Forma výuky / Form of teaching	Lecturers
Další požadavky na studenta / Next demands on the Student				
The subject Hardware Programming is selectable from a catalogue of optional modules. It is provided together with a international project work. The amount for both components, the selectable obligatory subject and the project work is 5 credits.				
Vyučující / Teacher	Professor Dr.-Ing. Stephan Kühne			
Stručná anotace předmětu / Short subject annotation	<ul style="list-style-type: none">- hardware of 8- or 16 Bit Microcontrollers (architecture, special function registers, bus-system, reset-logic, pin-layout, timers,- ANSI standard C language programming- interrupte-controlling, interrupt-priorities, mascable Interrupts- hardware description of the real time clock DS12887 (pin-layout, operation, signal-description, adress map, time-, calender- and alarm-locations, non-volatile RAM control-registers),- integration of hardware expansions- programm developpment in ANSI C with µVISION2 fraom the company KEIL-using of the printed board software EAGLEe from the german company CADSOFT- routing and board-design of printed-circuit boards- assembling and fitting of the printed board- soldering and commissioning of the printed board- test of the develloped board with with software routines.			
Informace ke kombinované nebo distanční formě / Information about combined or distance form				
Rozsah konzultací (soustředění) / Consultation (assembly) range			hodin za týden / hours per week	
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process				
Studijní literatura a studijní pomůcky / Reading list and study utilities				
DS80C320/DS80C323 High-Speed/Low-Power Micro, Date Sheet of the 8-Bit-Microcontroller from the company DALLAS SEMINCONDUCTOR (Download from http://www.maxim-ic.com/) High-Speed Microcontroller User Guide, Handbook from the company DALLAS SEMINCONDUCTOR (Download from http://www.maxim-ic.com/) DS12887 Real-Time Clock, Data sheet from the company DALLAS SEMINCONDUCTOR (Download from http://www.maxim-ic.com/) Brian W. Kernighan, Dennis M. Ritchie: C. Programming Language, publisher: Prentice Hall, 04.1988, ISBN-13: 9780131103627, language: english Gary J. Bronson: A First Book of ANSI C, Fourth Edition, publisher: Course Technology, 01.2006, ISBN-13: 9781418835569, language: english				

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title	Diploma seminar			
Typ předmětu / Subject type	Obligatory		dopor. ročník / semester/ recommended year / semester	2/2
Rozsah studijního předmětu / Study load in hours and credits	0+3	hod. za týden / weekly load	3	Kreditů / Credits 3
Jiný způsob vyjádření rozsahu / Other expression of study load				
Způsob zakončení / Assessment	Credited		Forma výuky / Form of teaching	Lectures seminars
Další požadavky na studenta / Other demands on students				
Diploma thesis must be assigned.				
Vyučující / Lecturer				
Aleš Richter, Prof., M. Sc., Ph.D.,				
Stručná anotace předmětu / Subject annotation				
Communication skills at diploma thesis work Preparation: six key points Objectives, Audience, Content, Organization, Visual information, Practice Giving talks and presentations: Presentation, Signposting language, Delivery				
Informace ke kombinované nebo distanční formě / Information for students in external form of study				
Rozsah konzultací (soustředění) / Consultations, study meetings	3	hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Individual student work – type, load, content and way of checking				
Individual student presentation The students act as an opponent (in a discussion).				
Studijní literatura a studijní pomůcky / Reading list and study utilities				
Bowling, P., Noordam, B.: Mastering Your PhD, Survival and Success in the Doctoral Years and Beyond, ISBN-10 3-540-33387-8, Springer Berlin, Heidelberg, New York, 2006 ISBN-13 978-3-540-33387-6, Springer, Berlin, Heidelberg, New York				

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title	Diploma thesis			
Typ předmětu / Subject type	Obligatory		dopor. ročník / semester/ recommended year / semester	2/2
Rozsah studijního předmětu / Study load in hours and credits	0+12	hod. za týden / weekly load	12	Kreditů / Credits 12
Jiný způsob vyjádření rozsahu / Other expression of study load				
Způsob zakončení / Assessment	Credited		Forma výuky / Form of teaching	consultations lab. seminars
Další požadavky na studenta / Other demands on students				
Diploma thesis must be assigned.				
Vyučující / Lecturer	Individual supervisor with the boards of Mechatronics			
Stručná anotace předmětu / Subject annotation				
Consultation and supervising at diploma thesis working Preparation: Key points, Objectives, Content, Organization, Practice Giving talks and presentations: Presentation, Signposting language, Delivery				
Informace ke kombinované nebo distanční formě / Information for students in external form of study				
Rozsah konzultací (soustředění) / Consultations, study meetings	3	hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Individual student work – type, load, content and way of checking				
Individual student consultations				
Studijní literatura a studijní pomůcky / Reading list and study utilities				
Bowling, P., Noordam, B.: Mastering Your PhD, Survival and Success in the Doctoral Years and Beyond, ISBN-10 3-540-33387-8, Springer Berlin, Heidelberg, New York, 2006 ISBN-13 978-3-540-33387-6, Springer, Berlin, Heidelberg, New York				

D – Charakteristika studijního předmětu/Subject Specification					
Název studijního předmětu / Subject title	Technical diagnostics				
Typ předmětu / Subject type	Obligatory elective		dopor. ročník / semester/ recommended year / semester	2nd year, 4 th semester	
Rozsah studijního předmětu / Learning support time		hod. za týden / weekly load	2+2	Kreditů / Credits	5
Jiný způsob vyjádření rozsahu / Other expression of Support time	10 weeks, each 2 hours of lectures and 2 hours of seminary				
Způsob zakončení / Assessment	examination		Forma výuky / Form of teaching	lectures, exams	
Další požadavky na studenta / Next demands on the Student					
Vyučující / Teacher	Doc. Ing. Ivan Jaksch, CSc.				
Stručná anotace předmětu / Short subject annotation					
<p>The subject deals with technical diagnostics methods including additional mathematics. Special mathematics methods of signal processing from mechanical systems, transfer functions and frequency responses of electro-mechanical systems, vibro-diagnostics, noise signal processing and diagnostics, diagnostics of electric machines, demodulation techniques for vibration and electric machines diagnostics, optoelectronics diagnostics methods, measurement and expert diagnostics systems are lectured.</p> <p>Applied diagnostic methods are illustrated in practical exercises and student will get an overall survey about diagnostics methods including practical projects.</p>					
Informace ke kombinované nebo distanční formě / Information about combined or distance form					
Rozsah konzultací (soustředění) / Consultation (assembly) range		hodin za týden / hours per week			
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process					
Students will work on individual projects. Apps. 3 project/semester					
Studijní literatura a studijní pomůcky / Reading list and study utilities					
All study utilities are in electronic form available for students. Books, Technical papers, Technical review, papers from international conferences, papers from seminars.					

D – Charakteristika studijního předmětu/Subject Specification			
Název studijního předmětu / Subject title	Intelligent Robots		
Typ předmětu / Subject type	Obligatory elective	dopor. ročník / semester/ recommended year / semester	2/4
Rozsah studijního předmětu / Learning support time	hod. za týden / 2/2 weekly load	Kreditů / Credits	5
Jiný způsob vyjádření rozsahu / Other expression of Support time	10 weeks, each 2 hours of lectures and 2 hours of seminary		
Způsob zakončení / Assessment	Examination	Forma výuky / Form of teaching	Lectures and labs
Další požadavky na studenta / Next demands on the Student			
Vyučující / Teacher	Doc. Ing. Mgr. Václav Záda, CSc.		
Stručná anotace předmětu / Short subject annotation	<p>The subject is focused to the using of method of artificial intelligence in the area of robotics. There will be used the first-order predicate logic for the describing of logical situation which must be solved in cooperation with modern method of computer vision and speaking recognition with using other sensors for control and intelligent decides of robots. This subject uses student knowledge of the subject Robotics, from the previous study, where were defined all necessary notions and which can be therefore omitted. One of main problems is the study of optimal control and problems of obstacle representing in working area and using in the trajectory planning. There will be studied problems of bio-robotics and humanoid robotics and social manners among mobile robots in this subject.</p>		
Informace ke kombinované nebo distanční formě / Information about combined or distance form			
Rozsah konzultací (soustředění) / Consultation (assembly) range	2	hodin za týden / hours per week	
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process			
Type: theoretical or practical works in laboratory of robotics Load: 14 hours in laboratory Content: six individual thematically oriented works – programming of robots, building of robots with kit using Checking: Progress checking via work reports, complex checking at the end of course			
Studijní literatura a studijní pomůcky / Reading list and study utilities			
Mařík, V. a kol.: Umělá inteligence, 1.-5. díl. Academia, Praha, 1993, 1997, 2000, 2003, 2007. La Valle, S. M.: Planning Algorithms. University of Illinois. Cambridge University Press, 2006. Liu, D.–Wang, L.–Tan, Ch. K. : Design and Control of Intelligent Robotic Systems. Springer-Verlag Berlin, 2009. Haralick, R. M.- Shapiro, L. G.: Computer and Robot Vision. Volume I.(II).Addison Wesley, Reading, Ma, 1992 (93). Ayache, N.: Artificial Vision for Mobile Robots. The MIT Press, Cambridge, Massachusetts, USA, 1991. Winston, P.: Artificial Intelligence, Addison-Wesley Publ. Co., Reading, Mass., second edition, 1992. Kárník, L.-Novák Marcinčin J.: Biorobotická zařízení. Nakl. MÁRFY SLEZKO, 1999. Švejdar, V.: Logika, neúplnost, složitost a nutnost. Academia, Praha 2002.			

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title	Řídicí systémy vozidel / Control Systems of the Vehicle			
Typ předmětu / Subject type	Compulsory elective		dopor. ročník / semester/ recommended year / semester	2/4
Rozsah studijního předmětu / Study load in hours and credits	hod. za týden / weekly load	2+ 2	Kreditů / Credits	5
Jiný způsob vyjádření rozsahu / Other expression of study load	10 weeks, each 2 hours of lectures and 2 hours of seminary			
Způsob zakončení / Assessment	Zkouška / Exam.		Forma výuky / Form of teaching	Lectures and Labs
Další požadavky na studenta / Other demands on students				
Vyučující / Lecturer				
Doc. Ing. Miroslav Malý, CSc. Ing. Pavel Brabec, Ph.D.				
Stručná anotace předmětu / Subject annotation				
The subject is focused to: fundamental properties of driving system elements, accessories and control systems, design of structurally-constrained control systems: e.g. output feedback electrohydraulic control systems, block diagrams and signal flow graphs of engine control, transmission control. Vehicle safety systems – vehicle stabilization systems: anti-lock brakes and other systems of vehicles.				
[1] Drivetrain, function, design, drivetrain elements.				
[2] Transmissions. Manually shifted and automatic transmission.				
[3] Hydrostatic transmission of mobile machines, energy transmission and transformation in hydraulic circuits (the velocity control of the wheels)				
[4] Steering – system requirements, hydraulic and electric power assisted steering. 4WS (four-wheel steering systém).				
[5] Braking systems, design and components of braking systems,				
[6] Vehicle stabilization systems, antilock braking systems, traction control system, electronic stability program,				
[7] Safety systems, information and communication.				
Informace ke kombinované nebo distanční formě / Information for students in external form of study				
Rozsah konzultací (soustředění) / Consultations, study meetings			hodin za týden / hours per week	
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Individual student work – type, load, content and way of checking				
Individ. project – 6 weeks – report and presentation				
Studijní literatura a studijní pomůcky / Reading list and study utilities				
[1] BAUER, H.: Diesel – Engine Management. 3rd. ed. Robert Bosch, D. 2004, ISBN 0-7680-1343-7				
[2] BUCKENDALE, L., R.: Truck Systéme Design Handbook. Vol. II. SAE. Danvers, MA. 2002. ISBN 0-7680-0887-5				
[3] DUDZINSKI, P.- HAWRYLAK, H.- HOHL, G.- KETTING, M.: Off-Road Machines and Vehicles in Tudory and Practuce. ISTVS, Technical University of Wroclaw. 1996. ISBN 83-906518-0-7.				
[4] JURGEN, R., K.: Electronic Bracking, Traction, and Stability Controls. SAE. Warendale, PA. 1999. ISBN 0-7680-1513-8...				
[5] NOACK, S.: Hydraulic in Mobile Equipment. OMEGON Fachliteratur, Ditzinger, Germany.2001. ISBN 3-933698-16-2, ISBN 0-7680-0885-5				
[6] BOSCH: Automotive Handbook. Robert Bosch, D. 2004. ISBN 0-7680-1513-8				

D – Charakteristika studijního předmětu/Subject Specification					
Název studijního předmětu / Subject title	Human-Computer Interaction				
Typ předmětu / Subject type	Compulsory elective subject		dopor. ročník / semester/ recommended year / semester	2	
Rozsah studijního předmětu / Study load in hours and credits		hod. za týden / weekly load	2 + 2	Kreditů / Credits	5
Jiný způsob vyjádření rozsahu / Other expression of study load	10 weeks, 2 hours of lectures and 2 hours of seminary				
Způsob zakončení / Assessment	Exam		Forma výuky / Form of teaching	Full-time course	
Další požadavky na studenta / Other demands on students					
Vyučující / Lecturer					
Ing. Jindra Drábková, Ph.D.					
Stručná anotace předmětu / Subject annotation					
<p>The subject <i>Human-Computer Interaction</i> offers the overview of design of virtual environments with interactive components. Virtual Reality Modeling Language (VRML) is a tool for building the virtual environments. The students familiarize with the environment of VRML editor and VRML browser. The aim of seminary is to practice building various 3D objects. During the term the students will elaborate several projects.</p> <p>The main topics of lectures are:</p> <ul style="list-style-type: none">• Introduction of VRML• Navigation• Shapes• Appearance• Special nodes• Variable types• Prototypes• Sensors• Animations• Scripts					
Informace ke kombinované nebo distanční formě / Information for students in external form of study					
Rozsah konzultací (soustředění) / Consultations, study meetings	2 × 2 h		hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Individual student work – type, load, content and way of checking					
Individual final project. Students will design the virtual environment with interactive components in VRML Pad. Teacher will check this final project.					
Studijní literatura a studijní pomůcky / Reading list and study utilities					
<p>[1] PREECE, J. ET AL. Human-Computer Interaction. Wokingham (UK), Addison-Wesley, 1998.</p> <p>[2] philliphansel.com/ – VRML tutorial</p> <p>[3] www.ia.hiof.no/~michaell/home/vr/vrhiof98/index.html – An Introduction to Virtual Reality</p> <p>[4] home.snafu.de/hg/ – examples, sound and picture samples</p> <p>[5] www.parallelgraphics.com/products/cortona/download/iexplore/ – Cortona (VRML browsers)</p> <p>[6] www.parallelgraphics.com/products/vrmlpad/ – VRMLPad 2.1 (VRML editor)</p>					

D – Charakteristika studijního předmětu/Subject Specification				
Název studijního předmětu / Subject title	Control methods in applications			
Typ předmětu / Subject type	Elective compulsory		dopor. ročník / semester/ recommended year / semester	2/4
Rozsah studijního předmětu / Learning support time		hod. za týden / weekly load	Kreditů / Credits	5
Jiný způsob vyjádření rozsahu / Other expression of Support time	2 hours of lectures and 2 hours of seminars or laboratory experiments per week			
Způsob zakončení / Assessment	Examination		Forma výuky / Form of teaching	Lectures, labs, seminars
Další požadavky na studenta / Next demands on the Student				
Vyučující / Teacher	Doc. Dr. Ing. Mgr. Jaroslav Hlava			
Stručná anotace předmětu / Short subject annotation	<p>This course is focused on practical applications of automatic control methods. Consequently, realistic case studies and not just illustrative examples of control design are presented. Particular emphasis is put on those features present in controlled plants and systems that complicate or even exclude the application of classical linear finite dimensional control theory. Such features include particularly time delays, non-linear behavior and interaction of continuous and logical controls. Thus the main topics of lectures cover control of time delay systems including systems with internal delays, application of simpler non-linear control approaches and hybrid control. An effort is made to explain all of the necessary theory and methods using examples of realistic control cases such as telemanipulation with time delay, communication delays in distributed control systems, overcoming strong non-linearity in pH control systems, hybrid control of combustion engines etc.</p>			
Informace ke kombinované nebo distanční formě / Information about combined or distance form				
Rozsah konzultací (soustředění) / Consultation (assembly) range		hodin za týden / hours per week		
Rozsah a obsahové zaměření individuálních prací studentů a způsob kontroly / Range and content sight of the individual student works and control process				
Studijní literatura a studijní pomůcky / Reading list and study utilities				
<p>Normey-Rico J.E. & Camacho E.F. (2007), Control of dead-time processes, Springer Verlag</p> <p>Johansson, R., & Rantzer, A. (2003), Nonlinear and Hybrid Systems in Automotive Control, Springer Verlag</p> <p>Levine W. S. (1999), Control system applications, CRC Press</p> <p>Mirkin L. & Palmor Z.J. (2005), Control Issues in Systems with Loop Delays, in Handbook of Networked and Embedded Control Systems, Birkhäuser Boston</p> <p>Silva, G., J., Datta, A., & Bhattacharyya, S., P. (2005), PID Controllers for Time-Delay Systems, Boston: Birkhäuser</p> <p>Luigi del Re et al. (2010), Automotive Model Predictive Control - Models, Methods and Applications, Springer Verlag, Lecture Notes in Control and Information Sciences, Vol. 402, 2010</p>				