UNIVERSITY OF CRAIOVA
DEPARTMENT: AUTOMATION, ELECTRONICS AND MECHATRONICS
MASTER: CONTROL SYSTEMS IN ROBOTICS

1-ST YEAR

1. Architecture and systems in mechatronics and robotics
2. Power electronics and operating systems
3. Mechanics complements
4. Mechatronic systems modeling
5. Robust control of robots
6. Production and modern technologies
7. Microcontrollers and integrated systems
8. Parallel calculus algorithms and structures
9. The adaptive control of robotic structures
10. Virtual Instrumentation

2-ND YEAR

1. SCADA applications
2. Architecture and systems in mechatronics and robotics (II)
3. Computer-aided engineering
4. Advanced systems for robot controlling
5. Intelligent materials, micro- and nanotechnologies
6. Dissertation paper elaboration

1-ST YEAR

SUBJECT: ARCHITECTURE AND SYSTEMS IN ROBOTICS AND MECHATRONICS

NUMBER OF CREDIT POINTS: 6
SEMESTER: I
COURSE TYPE: specialty
COURSE OBJECTIVES: Introduction to the main types of robots and present-day development of robotics at national and international level. Introduction to the the main types of robotic structures considering various criteria, such as: kinematic chain structure, the type of operating structure used, the functioning of the final element of the robot, etc. Several types of robots are studied, making their kinematic modeling, using Denavit – Hartenberg procedure. Starting from the kinematic model, the dynamic model corresponding to those robots is implemented by using classical modeling methods. Special attention is paid to a particular type of robot, the hyperredundant (tentacular) robot, whose dynamic model is based on energentic relations, using the Lagrange procedure for infinite-dimensional models.
COURSE CONTENT: The place and role of robots and robotics. Classification. Kinematic models of industrial robots. Dynamic modeling of industrial robots. Tentacular systems. The kinematic and dynamic model of a tentacular robot.
TEACHING LANGUAGE: Romanian
EVALUATION: written examination
BIBLIOGRAPHY:

Ispas, V., Pop, I., Bocu, M., Roboţi industriali, Editura Dacia, Cluj-Napoca, 1985.

Schilling, R.J., Fundamental of Robotics: Analysis and Control, Englewood Cliffs, NJ: Prentice Hall, 1990

Ivanescu,M., From Classical to Modern Mechanical Engineering-Fundamentals, Editura Academiei Romane, Bucuresti , 2007

SUBJECT: POWER ELECTRONICS AND OPERATING

NUMBER OF CREDIT POINTS: 6
SEMESTER: I
COURSE TYPE: specialty
COURSE OBJECTIVES: Introduction of notions referring to: the control methods of continuous tension variators for robotics applications, the functioning and control methods of invertors, the principles and basic schemata of the convertors through zero commutation, the control elements of operating with a direct current engine and a continuous tension variator, the control elements of operating with a step by step engine, the control elements of operating with a synchronouns engine with permanent magnets, the control elements when operating with an asynchronous engine.
CONTINUT: Continuous tension variators for applications in mechatronics**.** Invertors; Zero commutation convectors. Operating systems with m.c.c and continuous tension variators. Operating systems with an asynchronous engine; Operating systems with a synchronouns engine with permanent magnets. Operating by using step-by-step engines.
TEACHING LANGUAGE: Romanian
EVALUATION: written examination
BIBLIOGRAPHY:

S. Ivanov, Reglarea vectorială a sistemelor de acţionare electrică, Tipografia Universităţii din Craiova, 2000;

G. Seguier, R. Bausiere, F. Labrique, Electronique de puissance. Structures, fonctions de base, principales applications. Dunod, Paris, 2004;

G. Seguier, R. Bausiere, F. Labrique, Les convertisseurs de l'électronique de puissance. Vol. 4 La convertion continu-alternatif. Lavoisier, Paris, 1995;

F. Labrique, H. Buyse, G. Seguier, R. Bausiere – Les convertisseurs de l'électronique de puissance. Vol 5 Commande et comportement dynamique. Lavoisier, Paris, 1998;

B. Hansruedi - Convertisseurs Statiques, Presses Polytechniques et Universitaires Romandes, Lousane, 1991;

R. Măgureanu, N. Vasile – Servomotoare fără perii de tip sincron. Editura Tehnică, Bucureşti, 1990;

P. Vas – Sensorless Vector and Direct Torque Control, Clarendon Press, Oxford, 1998.

SUBJECT: MECHANICS COMPLEMENTS

NUMBER OF CREDIT POINTS: 6
SEMESTER: I
COURSE TYPE: specialty
OBIECTIVE: Develop the basic knowledge about the methods of designing the mathematical models of the movements of mechanical systems as part of mechatronic products, and also aspects of these systems design.
COURSE CONTENT: Elements of algebra and vector and tensor analysis. Notions of the geometry of masses. Kinematics – methods of study, systems of coordinates. The study of rigid body kinematics and of rigid body systems. Kinematic chains. Mechanisms – kinematic analysis. Methods of study: the contour method, closed form equations, the method of transfer functions. The kinematic analysis of spatial kinematic chains. The structure and kinematics of robotic mechanical systems. Mechanical systems dynamics. Lagrange's algorithm applied to the dynamic study of guidance devices. The space of phases. Hamilton's canonical equations. Principles and algorithms of mechanical systems design. Specific issues in designing the mechanical systems of mechatronic products, models of the elastic deformations of constructive elements. The modeling of operating fluid media. Amortization modeling. The modeling of the force transmitted through the force of friction, the modeling of the systems of constructive elements subjected to elastic deformation.
TEACHING LANGUAGE: Romanian
EVALUATION: oral examination
BIBLIOGRAPHY:

Bagnaru, D., Cataneanu, A., Mecanica-Mecanisme, Editura Sitech, Craiova, 1997;

Bagnaru, D., Cataneanu, A., Dinamica cu aplicatii in inginerie, Editura Universitaria, Craiova, 2009;

Bagnaru, D., Cataneanu, A., Mecanică aplicată în ştiinţele inginereşti, Editura Universitaria, Craiova, 2012;

Buculei, M., Mecanica, vol. I, II, Reprografia Universitatii din Craiova, 1980;

Cataneanu, A., Mecanica, vol. I,II, Editura Universitaria, Craiova, 2000, 2001;

Cataneanu, A., Mecanica – Culegere de probleme Editura Universitaria, Craiova, 2002;

Ceausu, V, Enescu, N., Ceausu, F., Culegere de probleme, Mecanica, vol. I. Statica si cinematica, Editura Printech, Bucuresti, 1997:

Darabont, A., Vaiteanu, D., Munteanu, M., Mecanica tehnica. Culegere de probleme, Editura Scrisul Romanesc, Craiova, 1983;

Ispas, V., Aplicatiile cinematicii in constructia manipulatoarelor si robotilor industriali, Editura Academiei Romane, Bucuresti 1990;

Mangeron, D., Irimiciuc, N., Mecanica rigidelor cu aplicatii in inginerie, Vol. I, II, III, Editura Tehnica, Bucuresti, 1978, 1980, 1981;
Merches, I., Burlacu, L., Applied Analytical Mechanics,The Voice of Bucovina Press, Iasi, 1995;
Mogan, Gh, Proiectarea constructive a sistemelor mecanice ale produselor mecatronice, Universitatea Transilvania, Braşov, 2003;
Neagoe, M., Cinematicaroboţilorindustriali. Precizia roboţil or, Universitatea Transilvania braşov, 2002
Staicu, St., s.a, Probleme de mecanica teoretica. Mecanica analitica, Universitatea Politehnica Bucuresti, 1996;
Voinea, R., Voiculescu, D., Simion, F. P., Introducere in mecanica solidului rigid cu aplicatii in inginerie, Editura Academiei, Bucureşti,1989.

SUBJECT: MECHATRONICS SYSTEMS MODELING

NUMBER OF CREDIT POINTS: 6
SEMESTER: I
COURSE TYPE: specialty
COURSE OBJECTIVES: Introduction of notions referring to: systems and models, analogies among various physical domains, the classical modeling of electrical, mechanical, electro-mechanical systems and bond graph techniques of modeling the same systems. To raise awareness of basic and advanced concepts of modeling physical-technical systems both through classical methods and through bond graph methodology.
COURSE CONTENT: Systems and models. Model construction and control. The classification of mathematical models. Physical laws and types of signals. Model types. Block diagram type models. Models unde rthe form of differential equations. Models in the space of states. Examples. Review of some fundamental relations in physics. Electrical circuits. Mechanical systems in translation movement. Mechanical systems in rotation movement. A comparative study of the specific measures to different physical domains. Analogies among various domains of physics. Systems made up of Se, R, C elements connected by J1. Systems made up of Se, R, I connected by J1. Bond Graph methodology; connections. Energetic and coenergetic variables. The Bond Graph model construction. Bond Graph standard elements. Multiport elements. Pseudo Bond Graph elements. Bond Graph causality; The construction of mathematical models and block diagrams. Examples; Behavioural analogies. Systems made up of Sf, R, C and I connected by J0 and J1 junctions; The Bond Graph modeling of electrical systems. The Bond Graph modeling of mechanical systems. The Bond Graph modeling of electro-mechanical systems. The Bond Graph modeling of Quanser rotational mechatronic systems.
TEACHING LANGUAGE: Romanian
EVALUATION: written examination
BIBLIOGRAPHY:

Bobaşu E., Modelare şi Simulare. Teorie şi Aplicaţii, Universitaria, Craiova, 2000.
Damic V., Montgomery J., Mechatronics by Bond Graphs: An Object Oriented Approach to Modelling and Simulation. Springer Verlag, 2003.
Dauphin-Tanguy G., Les bond graphs. Hermes, Paris, France, 2000.
Karnopp D., Rosenberg R., System Dynamics: A Unified Approach. John Wiley, New York, 1974.
Păstrăvanu O., Ibănescu, R., Limbajul Bond-graph în modelarea şi simularea sistemelor fizico-tehnice. Gh. Asachi, Iasi, 2001.
Rosenberg R. C, Karnopp D. C., Introduction to Physical System Dynamics. Series in mechanical engineering, Marc Graw Hill, 1983.
Thoma J., Introduction to Bond Graphs and their Applications. Pergamon Press, Oxford, 1975.
Thoma J., Simulation by bond-graphs. Introduction to a Graphical Method. Springer Verlag, New York, 1990.

SUBJECT: ROBUST CONTROL OF ROBOTS

NUMBER OF CREDIT POINTS: 6
SEMESTER: I
COURSE TYPE: specialty
COURSE OBJECTIVES: Introduction of basic concepts concerning the analysis and design of modern robot-controlled systems in case of structured and unstructured uncertainties and getting the student acquainted with the use of the assisted design programmes for robust systems.
COURSE CONTENT: Uncertainties modeling. Norms for signals and systems. Spaces of functions. Robust stability. Additional performances. Degrees of importance. Robust regulators design. Moderate sensitivity issue. The "loop shaping" method. Parametric robustness analysis. Kharitonov's theorem. The margin theorem. The parametrization of stabilizing compensators. Hinf synthesis within the space of states; Stability degree ensurance. Regulators with two degrees of freedom. Synthesis examples.
TEACHING LANGUAGE: Romanian
EVALUATION: written examination
BIBLIOGRAPHY :

Popescu D., Analiza si sinteza sistemelor robuste, EdituraUniversitaria, Craiova, 2002;
Zhou K., Doyle J.C., Glover K., Robust and Optimal Control, Prentice-Hall, 1996;
Marin C., Popescu D., Teoria sistemelor si reglare automata, EdituraSitech, Craiova, 2007;
Barmish B.R., New Tools for Robustness of Linear Systems, Macmillan Publishing Company, New York, 1994;
Hinrichsen D., Pritchard A.J., Mathematical Systems Theory I. Modelling, State Space Analysis, Stability and Robustness, Springer-Verlag, Berlin, 2005;
Răsvan V., Popescu D., Sisteme dinamice aplicate – Oscilaţii. Robusteţe. Întârzieri de timp, EdituraSitech, Craiova, 2004;
Borangiu T., Ionescu F., Robot Modelling and Simulation, Editura Academiei Române, Bucureşti, 2002;
Borangiu T., Advanced Robot Motion Control, Editura Academiei Române, Bucureşti, 2003;
* * * Matlab/Simulink Software.

SUBJECT: PRODUCTICS AND MODERN TECHNOLOGIES

NUMĂR DE CREDITE: 6
SEMESTER: II
COURSE TYPE: specialty
COURSE OBJECTIVES: Acquisition of basic theoretical knowledge and practical skills in the field and their use in developing complex applications.
COURSE CONTENT: Fundamental concepts in production system management. Production structures with hierarchical and distributed organization patterns. Methods of modeling production systems. The management of a flexible manufacturing workshop, fundamental notions. The production planning in a flexible workshop, fundamental notions. Division and precedence issues in assembly

systems. Methods of evaluating functional performances. The functional simulation of production systems.
TEACHING LANGUAGE: Romanian
EVALUATION: written examination
BIBLIOGRAPHY:

M. Widmer, Modèles mathématiques pour une gestion efficace des ateliers flexibles, Editura Presses Polytechnique et Universitaires Romandes, Colection META – Elveţia, 1995, ISBN: 2-88074-206-4
P. Pujo, J.P. Kieffer, Fondaments du pilotage des systèmes de production, Editura Hermes-Lavoisier, Franţa, 2002, ISBN: 2-7462-0513-0
C. Chu, J.M. Proth, l'ordonnancement et ses applications, Editura Masson, Seria Sciences de l'Ingenieur, Franţa, 1996, ISBN: 2-225-85193-X
***, ABB Studio Lite Documentation, ABB
***, CATIA, SMARTEAM, ENOVIA Documentation, Dassault Systemes

SUBJECT: MICROCONTROLLERS AND INTEGRATED SYSTEMS

NUMBER OF CREDIT POINTS: 5
SEMESTER: II
COURSE TYPE: core course
COURSE OBJECTIVES: Understanding the development of an integrated system (IS) from requirements and design to implementation. Connecting previous knowledge in adjustment engineering to programming and microcontroller systems. Knowledge of the techniques for the implementation of some control applications through an integrated system as part of a both theoretical and practical approach.
COURSE CONTENT: Introductory notions. Microcontrollers and competition implementation. Real time operating systems: general aspects; communication and synchronization. The design and modeling of an IS. Distributed systems. Distributed systems and CAN main channel.
TEACHING LANGUAGE: Romanian
EVALUATION: written examination
BIBLIOGRAPHY:

Nicola, S. Microcontrolere. Aplicaţii in mecatronica, EdituraUniversitaria Craiova, 2005;
Popa, M. Microprocesoare si microcontrolere, Editura Politehnica Timişoara, 2000;
Ball,S. Embedded Microprocessor Systems: Real World Design, 3rd ed., Newness Elsevier Science, 2002;
Janka, R. S., Specification and Design Methodology for Real-time Embedded Systems, Springer, 2002;
Marwedel,P. Embedded System Design, Springer, 2003.

SUBJECT: PARALLEL CALCULUS ALGORITHMS AND STRUCTURES

NUMBER OF CREDIT POINTS: 6
SEMESTER: II
COURSE TYPE: specialty
COURSE OBJECTIVES: The study of parallel calculus structures, based on cell automata principles, the study of parallel calculus algorithms and manners of implementing them on the cell automata structures which are able to be electronically made.
COURSE CONTENT: Cell automata. The spreading of information within the cell space. Cell automata analysis and synthesis. Cell automata controlability. Function performance on cell automata**.** Robot control by cell automata. Algorithm implementation on cell automata. Cell automata for robot operating.
TEACHING LANGUAGE: Romanian
EVALUATION: written examination
BIBLIOGRAPHY:

Ilie Diaconu – Automate celulare pentru conducerea roboţilor, Editura Universitaria, Craiova,2002
Mircea Ivănescu – Roboţi industriali, Editura Universitaria, Craiova,1994

SUBJECT: ADAPTIVE CONTROL OF ROBOTIC STRUCTURES

NUMBER OF CREDIT POINTS: 6
SEMESTER: II
COURSE TYPE: specialty
COURSE OBJECTIVES: The course aims at training the future automation, mechatronics and robotics engineers who specialize in robotic process and structure control, providing the fundamental notions about the analysis and design of modern control systems, when process models are incompletely known or their parametres vary in time.
COURSE CONTENT: Adaptive control; deterministic continuous adaptive systems; discrete adaptive systems; self-adjusting adaptive systems; the linearizing adaptive control of non-linear systems; applications to robotic structures; applications of adaptive control to robotic structures.
TEACHING LANGUAGE: Romanian
EVALUATION: written examination
BIBLIOGRAPHY:

Astrom, K.J., Wittenmark, B. - Adaptive Control, Addison-Wesley Pub. Comp. Inc., 1995.
Călin, S., Popescu, Th., Jora, B., Sima, V. - Conducerea adaptivă şi flexibilă a proceselor industriale, EdituraTehnică, Bucureşti, 1988.
Ioannou, P., Sun, J. - Robust Adaptive Control, PTR Prentice Hall, 1996.
Marino, R., Tomei, P. - Nonlinear Control Design: Geometric, Adaptive, Robust, Prentice Hall Int., 1995.
Petre, E., Selişteanu, D. - Modelarea şi identificarea bioproceselor de depoluare, EdituraUniversitaria, Craiova, 2005.
Selişteanu D., Petre E. - Metode de conducere a bioproceselor de depoluare, Editura Universitaria, Craiova, 2006.
Sastry, S., Bodson, M. - Adaptive Control: Stability, Convergence and Robustness. Englewood Cliffs, NJ: Prentice-Hall, 1989.
Sastry, S. - Nonlinear Systems - Analysis, Stability and Control, Springer, 1999.
Watanabe, K. - Adaptive Estimation and Control, Prentice Hall Int., 1992.
* * * MATLAB - "Nonlinear Control Design Toolbox".

SUBJECT: VIRTUAL INSTRUMENTATION

NUMBER OF CREDIT POINTS: 6
SEMESTER: II
COURSE TYPE: specialty
COURSE OBJECTIVES: This course studies the basic notions concerning the acquisition of knowledge and the training of students in the area of virtual instrumentation. The study covers: the design of virtual instruments for signal analysis and synthesis, filters, control algorithms. The course involves laboratory work: virtual instrumentation platforms - NI ELVIS (National Instruments), the LabVIEW software package**.**

COURSE CONTENT: the design of virtual instruments for signal analysis and synthesis, filters, control algorithms.
TEACHING LANGUAGE: Romanian
EVALUATION: written examination
BIBLIOGRAPHY:

1. Oppenheim, A.V. & R.W. Schafer, 1999, "*Discrete-Time Signal Processing*", Second Edition, Prentice Hall International.
2. Selişteanu, D., Ionete, C., Petre, E., Popescu, D., Şendrescu, D., 2003, *"LabVIEW Programming Guide. Applications for signal processing"*, (in Romanian), Univ. of Craiova Publ. House.
3. ***, 2001, "*LabVIEW Data Acquisition Course Manual*", National Instruments, USA.
4. ***, 2007, "*NI Elvis User Manual*", National Instruments, USA.

2-ND YEAR

SUBJECT: SCADA APPLICATIONS

NUMBER OF CREDIT POINTS: 5
SEMESTER: I
COURSE TYPE: specialty
COURSE OBJECTIVES: Knowledge about data aquisition process, process control, technological installations, mechatronic systems, robots and their understanding; the understanding of the concept of SCADA system and the manner of a SCADA application operating; the use of programmable automata within SCADA applications; SCADA applications implementation; the use of a SCADA software.
COURSE CONTENT: the concept of SCADA system the components of a SCADA system; data aquisition; man-machine interfaces; control systems; programmable automata; the communication system; the security of SCADA systems; SCADA software; making a SCADA application; examples.
TEACHING LANGUAGE: Romanian
EVALUATION: written examination
BIBLIOGRAPHY:

Gordon Clarke, Deon Reynders, Practical Modern SCADA Protocols: DNP3, 60870.5 and Related Systems, EdituraNewnes, 2004.
Jeff Weigant, Creating HMI/SCADA Industrial Applications Using Microsoft Access, EdituraPlctrng Consultants, 1999.
David Bailey, Edwin Wright, Practical SCADA for Industry, EdituraNewnes, 2003.
Michael Wiebe, A Guide to Utility Automation: Amr, Scada, and It Systems for Electric Power, EdituraPennwell Books, 2000.
Stuart A. Boyer, SCADA: Supervisory Control and Data Acquisition, EdituraISA-The Instrumentation, Systems, and Automation Society, 2004.
Ronald L. Krutz, Securing SCADA Systems, EdituraWiley, 2005.
William Shaw, Cybersecurity for SCADA Systems, EdituraPennwell Corp., 2006.
Steve Mackay, Edwin Wright, Deon Reynders, John Park, Practical Industrial Data Networks: Design, Installation and Troubleshooting, EdituraNewnes, 2003.
Jonas Berge, Software for Automation: Architecture, Integration, and Security, EdituraISA-The Instrumentation, Systems, and Automation Society, 2005.
Popescu D., Programmable logic controllers, EdituraUniversitaria Craiova, 2010.
Hackworth J.R., Hackworth F.D. Jr., Programmable logic controllers, EdituraPearson Education, 2004.
Alciatore D., Histand M., Introduction to Mechatronics and Measurement Systems, EdituraMcgraw-Hill, 2007.
Clarence W. De Silva, Mechatronics – An Integrated Approach, CRC Press, 2005.
***, CX-Supervisor (software SCADA) – OMRON.

SUBJECT: ARCHITECTURE AND SYSTEMS IN ROBOTICS AND MECHATRONICS (II)

NUMBER OF CREDIT POINTS: 5
SEMESTER: I
COURSE TYPE: specialty
COURSE OBJECTIVES: Study of the main classes of mechatronic and robotic physical structures, identification of some special examples, use of some methods of modeling them, study of conventional and unconventional algorithms and control systems to monitor their evolution.
COURSE CONTENT: Classes of mechatronic and robotic physical structures (hyper-redundant robots, telemanipulators, exoscheletons, modular and reconfigurable robots, cooperant robots, pendular robots, biped robots, quadruped robots, hexapod and miriapod robots, other structures inspired from the living world, micro- and nanorobots, unconventional operating systems, intelligent premises. The modeling of special mechatronic and robotic structures (direct and reversed kinematic modeling, dynamic modeling through various methods). Conventional and unconventional control systems of mechatronic and robotic structures (the fuzzy methodology, the method of artificial potential field, the sliding mode, the method of programming through training). Case studies. Applications.
TEACHING LANGUAGE: Romanian
EVALUATION: written examination
BIBLIOGRAPHY:

Bishop, R.H., (Editor-in-Chief), The Mechatronics Handbook, CRC Press, Washington, D.C., 2008, ISBN: 978-0-8493-9260-3;
Burdick, J.W., Chirikjian, G.S.,"An Obstacle Avoidance Algorithm for Hyper-Redundant Manipulators", Proceedings of the 1990 IEEE Int. Conf. On Rob. And Autom., Cincinnati, May 14-17, 1990, vol.1, pp. 625-631;
Burdick, J.W., Chirikjian, G. S., "A Modal Approach to Hyper-Redundant Manipulator Kinematics", IEEE Transsaction on Robotics and Automation., vol.10, No. 3, June, 1994, pp. 343-353;
Chirikjian, G.S., Burdick, J.W., "Theory and Applications of Hyper-Redundant Robotic Mechanisms", Eighth World Congress on the Theory of Machines and Mechanisms, Prague, Czechoslovakia, August 26-31, 1991, vol. 1, pp. 429-432;
Hirose, S., "Biologically Inspired Robots Snake-Like Locomotors and Manipulators", Oxford University Press, 1993;
Ivanescu, M., "From Classical to Modern Mechanical Engineering-Fundamentals", EdituraAcademia Romana, Bucharest, 2007, ISBN: 978-973-27-1561-1;
Ivanescu, M., "Sisteme Avansate de Conducere in Robotica", EdituraScrisul Romanesc, Craiova, 2003, ISBN: 973-38-0389-8

Jazar, R.N., “Theory of Applied Robotics: Kinematics, Dynamics, and Control”, Springer Science, LLC, New York, NY 10013, USA, 2007, ISBN: 978-0-387-32475-3;
Kawamura Sadao, Svinin Mikhail (Eds.), Advances in Robot Control, Ed.: Springer, New York, USA, 2006, ISBN: 978-3-540-37346-9;
Kozlowski, K., (Ed.), “Robot Motion and Control”, Series: Lecture Notes in Control and Information Sciences, Vol. 335, 2006, ISBN: 978-1-84628-404-5;
Schilling, J.R.,"Fundamentals of Robotics: Analysis and Control", Prentice Hall, 1990;
Sciavicco, L., Siciliano, B., “Modelling and Control of Robot Manipulators (Advanced Textbooks in Control and Signal Processing), Ed.: Springer, 2nd edition, 2000, ISBN: 978-1852332211;
Sponghttp://www.amazon.com/Robot-Modeling-Control-Mark-Spong/dp/0471649902/ref=pd_bxgy_b_text_c - # , M.W., Hutchinson, S., Vidyasagar, M.,” Robot Modeling and Control”, Ed.: Wiley, New York, USA, 2005, ISBN: 978-0471649908;
Stoian, V.,” Roboţi industriali. Aplicaţii”, EdituraUniversitaria, Craiova, 2003, ISBN: 973-8043-158-8.

SUBJECT: COMPUTER-AIDED ENGINEERING

NUMBER OF CREDIT POINTS: 5
SEMESTER: I
COURSE TYPE: specialty
COURSE OBJECTIVES: Understanding of the manner of functioning of a computer-assisted engineering environment, beyond software and peripherics use. The course develops the knowledge acquired in the Computer-aided design course.
COURSE CONTENT: Developing applications in autocad Electrical.
TEACHING LANGUAGE: Romanian
EVALUATION: written examination
BIBLIOGRAPHY:

Proiectare asistată - curs, Dorian Cojocaru, Cristian Vladu;
Proiectare asisatată de calculator, Dorian Cojocaru, Cristian Vladu – îndrumar de laborator;
Documentaţie de firmă autodesk, autocad (Inventor, Electrical).

SUBJECT: ADVANCED SYSTEMS OF ROBOT CONTROLLING

NUMBER OF CREDIT POINTS: 6
SEMESTER: I
COURSE TYPE: specialty
COURSE OBJECTIVES: Introduction of the concepts regarding: advanced systems in robot control (structure, operating systems, sensory systems, movement transmission elements), kinematic and dynamic modeling, operating space analysis, mobile robots.
COURSE CONTENT: Introduction to control systems issues. Control through state variables. Systems with cabled logic controllers. Systems with flexible logic controllers. Control systems with programmable automata. Microprocessor control systems. Robot control through programmable logical controllers. Fuzzy control systems.
TEACHING LANGUAGE: Romanian
EVALUATION: written examination
BIBLIOGRAPHY:

Allen, J., Kautz, H., Pelavin R., Tenenberg, J. (1991). Reasoning about Plans, Morgan Kaufmann Publish., San Mateo;
Camacho E.F., Bordons C. (1999). Model Predictive Control, Springer-Verlag, London;.
Dumur D., Boucher P. (1994). Predictive Control Application in the Machine Tool Field. In Clarke D. (Ed.) Advances in Model-Based Predictive Control, Oxford University Press, pp. 471-482;
Engelberger, J. (1980). Robotics in Practice, AMA, New York.;
Fu K.S., Gonzales R.C., Lee C.S.C. (1993). Robotics - Control, Sensing, Vision and Intelligence, Mc. Graw Hill, New York;
Jennings, N. R. (1994). Cooperation in industrial multi-agent systems, World Scientific, Singapore.;
Lazăr C. (1999). Conducerea predictivă a proceselor cu model cunoscut, Editura Matrix Rom, Bucureşti;
Pănescu D. (1992). On Planning Use In Robot Control, Buletinul Institutului Politehnic Iaşi, Tomul XXXVIII (XLII), Fasc. 1-4, Secţia IV, Automatică şi Calculatoare, pg. 95 – 101;
Pănescu D. (1994). Contribuţii la modelarea şi conducerea roboţilor industriali, Teză de doctorat, Universitatea Tehnică “Gh. Asachi” Iaşi;
Pănescu D. (1995). An Artificial Intelligence And Automatic Control Approach Toward Reactive Robotic Systems, Proceedings of the Fourth Turkish Symposium on Artificial Intelligence and Neural Networks, Marmara Research Center, Gebze, Turcia, pg. 305 – 315;
Pănescu, D., Huţanu, C., Pricop, A., Postolache M. (1997). On Expert System Use In Computer Integrated Manufacturing, Buletinul Institutului Politehnic Iaşi, Tomul XLIII (XLVII), Fasc. 1-4, Secţia IV, Automatică şi Calculatoare, pg. 47 – 55;
Pănescu, D., Voicu, M., Dumbravă, Şt., Ifrim, S., Brăescu, C., Ninu, A. (2000). A Vision based Robot Control Module Integrated in a Training CIM System, Proceedings of the 3rd Working Conference on Engineering Education For The 21st Century, Sheffield, Anglia, pg. 199 – 204, ISBN 0 86339 905 3;
Rahmani F., Boucher P., Dumur D. (1990). Generalized Predictive Control with Multiple Reference Model for self-synchronous motors, Proc. IMACS TC'90, vol.1, pp.9-14;
Russell, S., and Norvig, P. (1995). Artificial Intelligence: a Modern Approach, Prentice Hall, New Jersey;
Soeterboek R. (1992). Predictive Control. A unified approach, Pretince-Hall;
Song Y., De Keyser R.M.C. (1993). Microcomputer - Based Decentralized Control of Robotic Manipulators. In Tsafestas M. (Ed.)Applied Control, M. Dekker Inc., pp.663-707;
Voicu, M., Pănescu, D., Păstrăvanu, O., Dumbravă, Şt., Ifrim, S., Resmeriţă, Şt. (1998). CIM systems: a new trend in control engineering education, Proceedings of the Global Congress on Engineering Education, Cracovia, Polonia, pg. 337 – 341, ISBN 0 7326 1903 3 – UICEE.

SUBJECT: INTELLIGENT MATERIALS, MICRO- AND NANOTECHNOLOGIES

NUMBER OF CREDIT POINTS: 6
SEMESTER: I
COURSE TYPE: core course
COURSE OBJECTIVES: The complex approach of intelligent materials and of the functional intelligent structures based on them, exploitation of the applicability of these

systems focusing on the domain of robotics and mechatronics.
COURSE CONTENT: Intelligent materials and nanostructured materials**.** Micro and nanotechnologies. Biosubstances and biomaterials. Elements regarding the control of the systems based on intelligent materials, micro- and nanotechnologies. Computational techniques, hardware architectures, microsystems and elements of micro-robotics developed on biological principles.
TEACHING LANGUAGE: Romanian
EVALUATION: oral examination
BIBLIOGRAPHY:

Smart Material Systems and MEMS: Design and Development Methodologies - Vijay Varadan, K. J. Vinoy S. Gopalakrishnan , Wiley , 2006, ISBN-10: 0470093617 ; ISBN-13: 978-0470093610
Handbook of Smart Systems and Materials - Vijay Varadan , Institute of Physics Publishing, 2006, ISBN-10: 0750304820 , ISBN-13: 978-0750304825
Materiale si structuri inteligente, N. Bizdoaca, E. Bizdoaca, Universitaria, 2006, ISBN: 973-742-369-0; 978-973-742-369-6
Using Microsoft Project, Tim Pyron, 2002.

SUBJECT: DISSERTATION PAPER ELABORATION

NUMBER OF CREDIT POINTS: 15
SEMESTER: II
COURSE TYPE: core course
COURSE OBJECTIVES: as applicable
COURSE CONTENT: as applicable
TEACHING LANGUAGE: Romanian
EVALUATION: oral examination
BIBLIOGRAPHY: as applicable

Dean,
Professor Eugen BOBAŞU, PhD