

**UNIVERSITY OF CRAIOVA**  
**DEPARTMENT: AUTOMATION, ELECTRONICS AND**  
**MECHATRONICS**  
**MASTER: COMPLEX SYSTEMS AUTOMATION**

**1-ST YEAR**

1. Nonlinear automation fundamentals
2. Complex systems modeling
3. Robust systems
4. Adaptive systems
5. Research and design management
6. Software structures for real time applications
7. Intelligent control of processes
8. Electric processes control
9. Electric processes control- project
10. Optimization techniques software
11. Communication systems and networks
12. Communication systems and networks - project

**2-ND YEAR**

1. Networked control systems
2. Networked control systems - project
3. Advanced robot operating
4. Flexible manufacturing systems
5. Bioengineering
6. Strategies of complex systems control
7. Scientific research activity
8. Dissertation paper internship

## 1-ST YEAR

### **SUBJECT : NONLINEAR AUTOMATION FUNDAMENTALS**

**NUMBER OF CREDIT POINTS:** 6

**SEMESTER:** I

**COURSE TYPE:** core course

**COURSE OBJECTIVES:** It is one of the subject matters which extend theoretical competence and practical abilities in the domain of the calculus of advanced automatic systems, which are all non-linear, using analytical methods and the appropriate MATLAB software package. The acquired knowledge can be used in the other subject matters of the domain.

**COURSE CONTENT:** A motivating introduction: applications of non-linear systems; elementary non-linear systems; phase plan and limit cycles; the basics of A. M. Liapunov's theory. Liapunov's advanced theory (non-autonomous systems, the existence of Liapunov functions, specific applications; positive and passive systems, applications; the method of the description function and oscillation parametres calculus; Linearization by reverse reaction; discontinuous command applications; relay- type systems; variable structure systems; sliding regimes; adaptive systems – elementary aspects; nonlinear multivariable systems.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** written examination

**BIBLIOGRAPHY:**

- Belea, C. - Automatica neliniară, Editura Tehnică, București, 1983.
- Răsvan, VI. - Teoria stabilității (Cap. 2), Editura științifică și enciclopedică, București, 1987.
- Răsvan, VI., Popescu, D. - Aplicații ale sistemelor dinamice, Sitech, Craiova, 2004.
- Răsvan, VI. - Systemes nonlineaires, Printech, București, 2004.
- Pervozvanski, A.A. , - Curs de Teoria Sistemelor (I. rusă), Nauka, Leningrad, 1986.

### **SUBJECT : COMPLEX SYSTEMS MODELING**

**NUMBER OF CREDIT POINTS:** 6

**SEMESTER:** I

**COURSE TYPE:** core course

**COURSE OBJECTIVES:** The course contributes to the improvement of automation engineers knowledge, especially of those specialising in process control and technical informatics. The course includes teaching methods and techniques by which various proceses and installations are modelled (mathematically represented) using calculus systems. Advanced concepts and methods for systems modeling and simulation are to be presented.

**COURSE CONTENT:** The modeling of complex dynamic systems. General considerations; the synthesis of mathematical models for complex systems; The reduction of mathematical models order of complex systems. Physical systems modeling by using the Bond – graph method.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** written examination

**BIBLIOGRAPHY:**

- G. Hall, J.M. Watt - Modern Numerical Methods for Ordinary Differential Equations, Clarendon Press Oxford, 1976.
- K. Dekker, J. G. Verwer - Stabilitz of Runge Kutta methods for stiff nonlinear differential Equations, North Holland, 1984.

N. Racoveanu, Gh. Dodescu, I. Mincu - Metode numerice pentru ecuatii cu derivate parțiale de tip hiperbolic, Ed. Tehnica, Buc. 1976

Nicolae D., Vîțătoru M., Caușil I. - Tehnici de modelare și identificare , curs - Reprografia Universității din Craiova, 1981

N. Racoveanu, Gh. Dodescu, I. - Mincu, Metode numerice pentru ecuatii cu derivate parțiale de tip parabolic, Edit. Tehnică, Buc. 1977.

### **SUBJECT : ROBUST SYSTEMS**

**NUMBER OF CREDIT POINTS:** 6

**SEMESTER:** I

**COURSE TYPE:** core course

**COURSE OBJECTIVES:** The course aims at introducing the basic notions concerning the analysis and design of modern control systems, taking into account structured and unstructured uncertainties.

**COURSE CONTENT:** Basic mathematical aspects; robust synthesis issues; robust regulators design (the monovariable case); parametric robustness analysis; modern methods of synthesis.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** written examination

**BIBLIOGRAPHY:**

- Popescu D.- Analiza și sinteza sistemelor robuste, Ed. Universitaria, Craiova, 2002
- Zhou K., Doyle J.C., Glover K. - Robust and Optimal Control, Prentice-Hall, 1996
- Marin C., Popescu D. - Teoria Sistemelor și reglare automată, Ed. Sitech, 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.

### **SUBJECT : ADAPTIVE SYSTEMS**

**NUMBER OF CREDIT POINTS:** 6

**SEMESTER:** I

**COURSE TYPE:** core course

**COURSE OBJECTIVES:** The course aims at training the future automation engineers who specialize in process control, ensuring 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.

**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 și flexibilă a proceselor industriale, Ed. Tehnică, București, 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., Sisteme automate neliniare - Aplicații în biotehnologie, Ed. Universitaria, Craiova, 2002.

Holzner S. - Borland C++ Programming , Brady Books, New York, 1992.

**SUBJECT : RESEARCH AND DESIGN MANAGEMENT**

**NUMBER OF CREDIT POINTS: 6**

**SEMESTER: I**

**COURSE TYPE:** complementary

**COURSE OBJECTIVES:** The course aims at presenting the main facets of scientific research management, starting from the idea that education and scientific research are determinant factors of progress and development, of economic, social and cultural modernization. Research and design management is a strategic element of durable development and aims at orienting the young graduates to scientific research training them as future researchers who are to work in EU. Their knowledge is to be adequate to orient them in the top domains of scientific research.

**COURSE CONTENT:** Introduction: Defining the basic notions; Technical creativity and innovation, competition and research-development; Elements of research-development-innovation management; The concept of creativity and creativity methods; Technological prognosis and R-D planning; R-D activity planning and organisation; Innovation management; Research and design management in a company; Project management; Technological information protection; Strategic management; Scientific research policy in Romania; Legislation and research-development-innovation process.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** written examination

**BIBLIOGRAPHY:**

- Vînătoru M. - Managementul proiectelor, 2008, Ed. Universitaria Craiova.  
I. Chein - The field of Action Research, 2005, Sage Publications, California.  
O.Plesa, F.Ciote - Inovarea si sfidările schimbării, Editura Multimedia, 1996.  
Legea nr.324/8 iulie privind Cercetarea științifică și dezvoltarea tehnologiei.  
HG nr.328/28 aprilie 2005 privind Cercetarea de Excelență..

**SUBJECT : SOFTWARE STRUCTURES FOR REAL-TIME APPLICATIONS**

**NUMBER OF CREDIT POINTS: 6**

**SEMESTER: II**

**COURSE TYPE:** specialty

**COURSE OBJECTIVES:** This course studies the basic notions concerning the problems of real time process control. The study covers: methods and possibilities of making and implementing a real time executive; the design and implementation of numeric process control algorithms, designing control applications using a real time operating system.

**COURSE CONTENT:** Real-time calculus systems; basic concepts in real-time programming; real-time primitives in resource management; continuous systems discretization; numeric adjustment algorithms; the programming of real-time applications using a real-time executive.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** written examination

**BIBLIOGRAPHY:**

- Auslander D.,Tham C. - Real-time software for control: program examinationples in C, Prentice Hall, 1990.  
Bennet, S. - Real-time Computer Control, Prentice Hall, 1988.  
Buhr R., Bailey D. - An Introduction to Real Time Systems from Design to Networking with C++, Prentice Hall Inc., 1998.  
Călin S., Dumitrache I. - Reglarea numerică a proceselor tehnologice, Ed. Tehnică, București, 1984.

**SUBJECT : INTELLIGENT CONTROL OF PROCESSES**

**NUMBER OF CREDIT POINTS: 6**

**SEMESTER: II**

**COURSE TYPE:** specialty

**COURSE OBJECTIVES:** The course aims at introducing: the basic concepts of intelligent systems theory, the theory of intelligent systems integration and its practical aspects of implementation; the study of design algorithms and of intelligent control methods; the use of computer aided design programs for the analysis and synthesis of intelligent control systems; the analysis of the various algorithms for intelligent control by means of simulation and experimental performance.

**COURSE CONTENT:** Introduction to intelligent control systems and calculus (soft computing); System fundamentals from the perspective of fuzzy logic; fuzzy logic control; neural networks bases; main classes of neural networks; dynamic neural networks and applications for chaos control and prediction. Neuro-fuzzy systems. Evolutionist calculus. Intelligent calculus for intelligent machines design (soft computing). Intelligent calculus instruments in real world applications.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** written examination

**BIBLIOGRAPHY:**

- Albus J. S., Meystel A. M. - Intelligent Systems: Architecture, Design, Control , John Willey, 2001.  
Buiu C. - Introduction to cognitive science, Sapientia Publisher, Bucharest, 2000.  
Buiu C. , Albu M. - Intelligent software agents, ICPE Publisher, Bucharest, 2000.  
Buiu C., Pop V. - Cognitive engineering, ICPE Publisher, Bucharest, Romania, 2001.  
Cichocki A, Unbehauen R. - Neural Networks for Optimization and Signal Processing, John Wiley, 1993.

**SUBJECT : ELECTRIC PROCESSES CONTROL**

**NUMBER OF CREDIT POINTS: 5**

**SEMESTER: II**

**COURSE TYPE:** specialty

**COURSE OBJECTIVES:** The course aims at developing the knowledge of future automation engineers, specialised in process control, ensuring their competence in the field of industrial processes control. There are approached some basic concepts and methods used in electrical processes control.

**COURSE CONTENT:** Introduction. General considerations. Execution elements used in electrically operated systems. Automatic adjustment of direct current operated systems. Systems of automatic adjustment of asynchronous machines operating. Systems of automatic adjustment of synchronous machines applying intelligent calculus to the real world.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** written examination

**BIBLIOGRAPHY:**

- A. Kelemen. - Acționări electrice, Ed. Didactica si Pedagogica, Buc. 1979.  
A. Kelemen, M. Imecs. - Sisteme de reglare cu orientare după câmp ale mașinilor de c.a., Edit. Academiei, Buc. 1989.  
R. Magureanu. - Mașini electrice speciale pentru sisteme automate, Edit. Tehnica Buc. 1980.

- G. Weinrich, E. Varzaru. - Sisteme de reglare unificate pentru procese rapide. Edit Tehnica Buc. 1970.  
 A. Barzam. - Automation in electrical power systemes, MIR Publishers, Moscow, 1981.

Bellman R. - Dynamic Programming, Univ. Press Princetown, 1957.

**SUBJECT : ELECTRIC PROCESSES CONTROL - PROJECT**

**NUMBER OF CREDIT POINTS: 1**

**SEMESTER: II**

**COURSE TYPE:** specialty

**OBIECTIVELE PROIECT:** The course aims at developing the knowledge of future automation engineers, specialised in process control, ensuring their competence in the field of industrial processes control. There are approached some basic concepts and methods used in electrical processes control.

**COURSE CONTENT:** The design of adjustment system for an asynchronous engine turn when  $U/f$  is constant. The design and simulation of the converter system (redressor + inverter) specific to an asynchronous engine. Direct methods of field-oriented adjusting of an asynchronous machine. Indirect methods of field-oriented adjusting of an asynchronous machine. Synchronous machine adjustment according to the field-orientation principle. Nonlinear algorithms in adjusting electrical machines.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** project

**BIBLIOGRAPHY:**

- A. Kelemen. - Acționări electrice, Ed. Didactica si Pedagogica, Buc. 1979.  
 A. Kelemen, M. Imecs. - Sisteme de reglare cu orientare după câmp ale mașinilor de c.a., Edit. Academiei, Buc. 1989.  
 R. Magureanu. - Mașini electrice speciale pentru sisteme automate, Edit. Tehnica Buc. 1980.  
 G. Weinrich, E. Varzaru. - Sisteme de reglare unificate pentru procese rapide. Edit Tehnica Buc. 1970.  
 A. Barzam. - Automation in electrical power systemes, MIR Publishers, Moscow, 1981.

**SUBJECT : OPTIMIZATION TECHNIQUES SOFTWARE**

**NUMBER OF CREDIT POINTS: 6**

**SEMESTER: II**

**COURSE TYPE:** specialty

**COURSE OBJECTIVES:** The course presents the necessary theoretical and practical competences necessary for computer-assisted solving of optimization issues. Comparative studies between various optimization algorithms are made, pointing out their advantages and disadvantages.

**COURSE CONTENT:** Introduction. General considerations. Algorithms of solving the optimization problems without restrictions. Algorithms of solving the optimization problems with linear restrictions. Algorithms of solving the optimization problems with nonlinear restrictions. Algorithms of solving large-dimensioned optimization problems. Optimization algorithms applications.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** written examination

**BIBLIOGRAPHY:**

- Ionescu VI., Popeea C. - Optimizarea sistemelor, E.D.P., București, 1981.  
 Călin S., Belea C. - Sisteme automate adaptive și optime, E.T. București, 1971.  
 Călin S., Tertisco M., s.a. - Optimizări în automatizări industriale, E.T. București, 1979.

**SUBJECT : COMMUNICATION SYSTEMS AND NETWORKS**

**NUMBER OF CREDIT POINTS: 5**

**SEMESTER: II**

**COURSE TYPE:** specialty

**COURSE OBJECTIVES:** The course is meant to get the student acquainted with the technologies specific to data transmission, to make him acquire technical knowledge in fixed and mobile data transmission, communication network, the evaluation of the performances of a communication system applying the theoretical knowledge and practical skills.

**COURSE CONTENT:** Local industrial networks. Introductory notions. Network security. Wide band radio transmission systems. Wireless networks. Advanced communication systems.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** written examination

**BIBLIOGRAPHY:**

- Bănică I. - Rețele de comunicații între calculatoare, Editura Teora, București, 1998.  
 Carbon M. - Exercices résolus de mathématiques du signal, Ed. Dunod Paris 1992.  
 Dobrescu R. - Transmiterea datelor, Editura Academiei Române, Bucuresti, 2005.  
 Duvant P. - Traitement du signal, Ed. Hermes – 1990.  
 Feher K. - Comunicatii digitale avansate, vol. I, Ed. Tehnica Bucuresti 1993.

**SUBJECT : COMMUNICATION SYSTEMS AND NETWORKS - PROJECT**

**NUMBER OF CREDIT POINTS: 1**

**SEMESTER: II**

**COURSE TYPE:** specialty

**OBIECTIVELE PROIECT:** The course is meant to get the student acquainted with the technologies specific to data transmission, to make him acquire technical knowledge in fixed and mobile data transmission, communication network, the evaluation of the performances of a communication system applying the theoretical knowledge and practical skills.

**COURSE CONTENT:** Modulated signals use in data transmission (MA, MF, MP, MDP). Using delta modulation in data transmission. Data acquisition in industrial processes. Serial transmission. Using process mains. Data protection. Error detecting and correcting codes. Basic band transmission. Impulse modulation. Line equalizer design. Making programmes for data compression.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** project

**BIBLIOGRAPHY:**

- Bănică I. - Rețele de comunicații între calculatoare, Editura Teora, București, 1998.  
 Carbon M. - Exercices résolus de mathématiques du signal, Ed. Dunod Paris 1992.  
 Dobrescu R. - Transmiterea datelor, Editura Academiei Române, Bucuresti, 2005.

## 2-ND YEAR

### SUBJECT : NETWORKED CONTROL SYSTEMS

**NUMBER OF CREDIT POINTS:** 5

**SEMESTER:** I

**COURSE TYPE:** specialty

**COURSE OBJECTIVES:** The course aims at introducing the basic concepts regarding the implementation of control systems distributed within the network; the general presentation of industrial networks, delays introduced in controlling networks, the simultaneous design of task and controller planner.

**COURSE CONTENT:** Design paradigms and methods of network control systems; Multitasking; communication resources division; industrial networks; calculus and communication resources division. Network distributed control.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** written examination

**BIBLIOGRAPHY:**

Documentație Matlab/Simulink/RTW si xPC.

Documentație Quanser.

Documentație TrueTime.

Documentație rețele CAN, LIN.

### SUBJECT : NETWORKED CONTROL SYSTEMS - PROJECT

**NUMBER OF CREDIT POINTS:** 1

**SEMESTER:** I

**COURSE TYPE:** specialty

**PROJECT OBJECTIVES:** The project applies the concepts presented at the course by means of modelation, simulation or applications.

**COURSE CONTENT:** Real time operating system implementation xPC sub Matlab/Simulink/RTW. Testing the real time operating system implementation xPC Implementarea sistemului de operare de timp real. (UDP) sub xPC network communication testing. Remote control for a MCC sub xPC. Remote control for 2 MCC distributed in different network nodes sub xPC.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** project

**BIBLIOGRAPHY:**

Matlab/Simulink/RTW and xPC documentation

Quanser documentation

TrueTime documentation.

CAN, LIN networks documentation

### SUBJECT : ADVANCED ROBOT OPERATING

**NUMBER OF CREDIT POINTS:** 6

**SEMESTER:** I

**COURSE TYPE:** core course

**COURSE OBJECTIVES:** The course aims at presenting the complex systems for robot operating, the basic principles of operating systems, the dynamic models of conventional and unconventional industrial robots, the structure of control systems using the most modern technologies and procedures.

**COURSE CONTENT:** Conventional and unconventional robot cinematics. Speed kinematics and statics. Robot dynamics. Advanced sensory systems. Unconventional operating systems. Control systems; 3D virtual modeling of robots. Artificial sight control.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** written examination

### BIBLIOGRAPHY:

Ivanescu, M. - Roboți industriali, Editura Universitaria, Craiova, 1998.

Ivănescu, M. - Sisteme avansate de conducere în robotică, Editura Scrisul Românesc, Craiova, 2002.

Borangi, Th., Ionescu, F. - Robot modelling and simulation, Editura Agir, Editura Academiei Române, București, 2002.

### SUBJECT : FLEXIBLE MANUFACTURING SYSTEMS

**NUMBER OF CREDIT POINTS:** 6

**SEMESTER:** I

**COURSE TYPE:** specialty

**COURSE OBJECTIVES:** The course offers the students the necessary knowledge in the domain of design, building, functional analysis and exploitation of flexible manufacturing systems.

**COURSE CONTENT:** Introduction. Definitions. Classifications. Concepts concerning production organization and mathematical models. Economic aspects of FMS design, investment and exploitation. Automatic production systems. Automatic production system analysis. Assembly systems and production process division. Methods of automatic marking and identification. FMS functioning representation by using the Grafcet method.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** written examination

**BIBLIOGRAPHY:**

Groover, M. - Automation, Production systems and Computer Integrated Manufacturing, Ed. Prentice-Hall, 1987.

Mair, M. G. - Industrial robotics, Ed. Prentice Hall International Inc., 1988.

Nof, Y. S. - Handbook of industrial robotics, Ed. Krieger Publishing Company, 1992.

Warnock, I. - Programmable controllers, operation and application, Ed. Prentice Hall International Inc., 1988.

Sandler, B. - Robotics, designing the mechanisms for automated machinery, Ed. Prentice Hall, 1991.

### SUBJECT : BIOENGINEERING

**NUMBER OF CREDIT POINTS:** 6

**SEMESTER:** I

**COURSE TYPE:** core course

**COURSE OBJECTIVES:** The course contributes to the training of the future engineers in the domain of process control, ensuring their knowledge regarding biosystems and bioprocesses control. Some of the basic concepts presented are: biological systems modeling, bioreactors processes modeling, biosystems stability, estimates of the bioprocesses state and parametres, techniques of adaptive control of bioreactors.

modelarea unor sisteme biologice, a proceselor desfășurate în bioreactoare, stabilitatea biosistemelor, estimarea stării și parametrilor bioprocetelor, tehnici de conducere adaptivă a bioreactoarelor.

**COURSE CONTENT:** Mathematical modeling of biotechnological processes. Bioprocesses stability analysis. General dynamic model extension in the case of complex bioreactors or bioreactors with distributed parametres. Considerations on kinetic modeling, estimation and control of bioreactors. Bioprocesses state and parametres estimation. The adaptive control of bioprocesses.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** written examination

**BIBLIOGRAPHY:**

Petre E. - Conducerea automată a proceselor biotehnologice - curs, Reprografia Universității din Craiova, 1997.

Petre E. - Conducerea adaptivă a sistemelor biotehnologice, Editura Avrămeanca, Craiova, 1997.  
Bastin G., Dochain, D. - On-line Estimation and Adaptive Control of Bioreactors, Elsevier, Amsterdam, 1990.  
Isidori A. - Nonlinear Control Systems, Springer Verlag, 1989.  
Khalil K.H. - Nonlinear Systems, Macmillan Publishing Company, New York, 1992.

**SUBJECT : STRATEGIES OF COMPLEX SYSTEMS CONTROL - PROJECT**

**NUMBER OF CREDIT POINTS: 6**

**SEMESTER: I**

**COURSE TYPE:** specialty

**COURSE OBJECTIVES:** The project classes are meant to practically implement advanced control algorithms on experimental installations and also to approach some design techniques concerning automate adjustment systems based on the knowledge acquired at previous courses.

**COURSE CONTENT:** Mathematical modeling of some experimental Quanser, FESTO, LabVolt installations; The estimate of some fluidic system parametres. The estimate of an electric system parametres. The estimate of a mechanic system parametres. The design of adjustment systems for systems with dead time. The design of waterfall adjustment systems. The design of combined adjustment systems. The design of the systems with intelligent neuro-fuzzy control. The design of multivariable adjustment systems. The design of adjustment systems with state-reaction. The design of adjustment systems for nonlinear systems.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** written examination

**BIBLIOGRAPHY:**

Călin S. - Regulatele automate, E.D.P., București, 1976.  
Kuo B.C. - Automatic Control Systems, Prentice Hall, 1991.  
Marin C., Petre E., Popescu D., Selisteanu D., Ionete C. - Sisteme de reglare automată. Lucrări practice., Ed. Sitech, Craiova, 1997.  
Marin C. - Regulatele automate. Indrumar de proiectare., Reprografia Universității din Craiova, 1983.  
Ogata K. - Discrete time control systems, Prentice Hall, 1987.

**SUBJECT : SCIENTIFIC RESEARCH ACTIVITY**

**NUMBER OF CREDIT POINTS: 15**

**SEMESTER: II**

**COURSE TYPE:** specialty

**COURSE OBJECTIVES:** as applicable.

**COURSE CONTENT:** as applicable.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** written test

**BIBLIOGRAPHY:** as applicable.

**SUBJECT : INTERNSHIP - DISSERTATION PAPER**

**NUMBER OF CREDIT POINTS: 15**

**SEMESTER: II**

**COURSE TYPE:** specialty

**COURSE OBJECTIVES:** as applicable.

**COURSE CONTENT:** as applicable.

**TEACHING LANGUAGE:** Romanian

**EVALUATION:** written test

**BIBLIOGRAPHY:** as applicable.

Dean,

Professor Eugen BOBAȘU, PhD