Politehnica University of Bucharest
Faculty of Electronics, Telecommunications and Information Technology

COURSE DESCRIPTION

1. Program identification information

1.1 Higher education institution	Politehnica University of Bucharest
1.2 Faculty	Electronics, Telecommunications and Information Technology
1.3 Department	Applied Electronics and Information Engineering
1.4 Domain of studies	Electronic Engineering, Telecommunications and Informational Technologies
1.5 Cycle of studies	License
1.6 Program of studies/Qualification	Technologies and Systems of Telecommunications (TSTeng)

2. Course identification information

2.1 Name of the course				Automatic Control in Electronics and Telecommunications			
2.2 Lecturer				Prof. Dr. Dan Alexandru Stoichescu			
2.3 Instructor for practical activities				Lect. Dr. Bogdan Cristian Florea			
2.4 Year of studies	III	2.5 Semester	V	2.6 Evaluation type	Verification	2.7 Course choice type	Optional

3. Total estimated time (hours per semester for academic activities)

3.1 Number of hours per week, out of which	3	3.2 course	2	3.3 practical activities	1
3.4 Total hours in the curricula, out of which	42	3.5 course	28	3.6 practical activities	14

Distribution of time	hours
Study according to the manual, course support, bibliography and hand notes	24
Supplemental documentation (library, electronic access resources, in the field, etc)	3
Preparation for practical activities, homework, essays, portfolios, etc.	5
Tutoring	0
Examinations	4
Other activities	0

3.7 Total hours of individual study	36
3.9 Total hours per semester	78
3. 10 Number of ECTS credit points	3

4. Prerequisites (if applicable)

4.1 curricular	Mathematical Analysis 1 and 2; Physics 1 and 2; Electrotechnics 1 and 2; Electronic Devices; Fundamental electronic Circuits; Analog Integrated Circuits
4.2 competence-based	C1. Using the fundamental elements of electronic devices, circuits, systems, instruments and technology.

5. Requisites (if applicable)

5.1 for running the course	None
5.2 for running of the applications	Compulsory presence at the practical applications according to the bachelor studies regulations of PUB.

6. Specific competences

Professional competences	Selection, installation and operation of fixed and mobile telecommunications equipment and network design to ensure a common telecommunications site.
Transversal competences	-

7. Course objectives (as implied by the grid of specific competences)

7.1 General objective of the course	Comprehensive analysis and synthesis of linear analogical control systems.
4.2 Specific objectives	Control systems and their constituent parts analysis by means of transfer functions and state variables. Knowledge of control system performance in time and frequency. Familiarizing students with simple control system design. Description of basic control system constituents: transducers, signal conditioners, controllers.

8. Content

8.1 Lectures	Teaching techniques	Remarks
1.Introduction. 1.1. Definitions, control system block diagram. 1.2. Open control systems and feedback control systems. 1.3. Classification of control systems.	The blackboard and the video projector, when necessary, are mostly used in classroom. For oral communication, the exposure, concept understanding by solving problems and conversation methods are used. For learning, the students have, at their disposal, note courses and the recommended books.	2 hours
2. Analysis of linear continuous control systems (LCCS) by means of transfer functions. 2.1. Analysis of LCCS by means of differential equations. 2.2. Transfer functions of monovariables and plurivariables LCCS and of their blocks. 2.3. Analysis of LCCS in frequency domain.		4 hours
3. Analysis of LCCS by means of state variables.		6 hours

3.1. State variables; state and output equations of LCCS; examples. 3.2. Relations between state variables model and transfer functions of a LCCS; examples. 3.3. Electrical, mechanical and termic systems analysis by means of state variables; examples.		
4. LCCS performances. 4.1. LCCS performances in time domain; answer of a LCCS to unit pulse. 4.2. LCCS performances in frequency domain: definitions. 4.3. LCCS stability; Routh-Hurwitz and Nyquist criteria; examples.		4 hours
5. LCCS synthesis. 5.1.Transfer functions of electronic controllers 5.2. LCCS design with standard controllers and specific circuits; examples. 5.3. Control system with 2 poles. 5.4. LCCS design by means of poe- zeros procedure.		6 hours
6. Principal component blocks of a control system. 6.1. Transducers: definitions, classification, performances; examples. 6.2. Signal conditioners: definitions, examples. 6.2. Controllers: structure, examples.		6 hours

Bibliography

1. Jacob, Michael: "*Industrial Control Electronics-Applications and Design",* Prentice-Hall International, 1989.
2. Dumitrache, I., Călin,S., Boţan,C., Niţu,C., : "*Automatizări şi Echipamente Electronice",* Ed. Didactică şi Pedagogică, Bucureşti, 1992.
3. Van de Vegte,J : "*Feedback Control Systems"*, Prentice Hall, Englewood Cliffs, New Jersey, 1994.
4. Ogata, K. : "*System Dynamics"*, Prentice Hall, Saddle River, New Jersey, 1998.
5. Stoichescu D.A,. Vasile,D. :*Sisteme Automate – Culegere de Probleme"*,PUB, Bucharest,1998
6. Stoichescu,D.A. : *"Echipamente electronice de reglaj automat",* Printech, Bucure;ti, 2014.

8.2 Practical applications	Teaching techniques	Remarks
Temperature Control	Explanations, demonstrations and laboratory experiment method are used; 3 and 4 students in a team is the ordinary arrangement. For laboratory experiments the modules MCM-12/EV, MCM-12A/EV, MCM-12B/EV and MCM-12C/EV manufactured by Electronica Veneta are used.	2 hours
Light Control		2 hours
Level Control		2 hours
Flow Control		2 hours
Pressure Control		2 hours
Speed and Position Control		2 hours
Final Practical Examination		2 hours

Bibliography
1. Jacob, Michael: "*Industrial Control Electronics-Applications and Design",* Prentice-Hall International, 1989.
2. Dumitrache,I., Călin,S., Boţan,C., Niţu,C., : "*Automatizări şi Echipamente Electronice",* Ed. Didactică şi Pedagogică, Bucureşti, 1992.
3. Van de Vegte,J : "*Feedback Control Systems"*, Prentice Hall, Englewood Cliffs, New Jersey, 1994.
4. Stoichescu D.A,. Vasile,D. :*Sisteme Automate – Culegere de Probleme"*,PUB, Bucharest,1998
5. Stoichescu,D.A. : *"Sisteme electronice de reglaj automat",* Printech, Bucure;ti, 1999.
6. Elettronica Veneta: "*TEACHER/STUDENT hanbooks of modules MCM-12/EV, MCM-12A/EV, MCM-12B/EV, MCM-12C/EV.*

9. Bridging the course content with the expectations of the epistemic community representatives, professional associations and employers representatives for the domain of the program

The early aim of the control systems, realized mostly with electronic circuits, has been the improvement of the industrial equipment work, but they are used now in very different fields: the same procedures and, sometimes, the same circuits are encountered in motor command and blood pressure monitoring. In medicine, telecommunications, transport, robotics, radar the automatic control is omnipresent and no practical application in these fields can be achieved without the knowledge of the knowledge of the basic notions and principles.
The discipline curriculum fits very well to this demand: in the first part of the course, the ground notions are rigorously defined and explained; a lot of examples are given for a total understanding of the analysis methods of the physical systems belonging to the control loops and of the control systems in totality; in the second part of the course, the control systems performances are defined and the basic design methods are developed; at the end, the role, typical structure and characteristics of the principal blocks of a control system are presented.
The course and laboratory activities are conceived in a way to make the students able to solve medium complexity problems in the field of the automatic control.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final mark
10.4 Lectures	-knowledge of control system analysis by means of transfer functions and state variables; -knowledge of basic methods in contol system synthesis and ability to use these methods for medium complexity circuit design; -familiarization with the role,structure and	- two tests during the semester sustained in days announced at the beginning of the semester; the subjects cover the course and consist in theoretic questions and and requiring a thorough knowledge and understanding of the course.	70%

	operation of basic components of a control system: transducers, signal conditioners, controllers.		
10.5 Practical applications	-knowledge of the theory concerning the experiments performed in the laboratory; -familiarizing with experimental modules structure and understanding of their operation; -ability to perform laboratory experiments.		30%
10.6 Minimal performance standard			
-Modeling of physical systems by means of transfer functions and state variables. -Calculating the answer of a control system to standard input signals. -Ability to evaluate control system stability by means of stability criteria. -Design, by compensation and pole-and zeroes methods of a control system.			

Date	Lecturer	Instructor for practical activities
07.09.2017	Prof. PhD Eng. Dan A. Stoichescu. Lect.	PhD Eng. Bogdan Cristian Florea

Date of department approval
25.09.2017

Director of Department,
Prof. PhD Eng. Sever Pașca