Óbuda University ***Donát Bánki Faculty of Mechanical and Safety Engineering***	Institute of Mechatronics and Vehicle Engineering Department of Mechatronics

Subject name and Neptun-code: Automatic Control Systems (BGRIR14NEC, BGRIR14ENND, BGRCE1KTNC)
Credit points: *4*

Fall Semester of the Academic year of 2016/17. Full time training.

The course is available at: BSc in Mechatronics.

Supervised by:	Prof. Dr. SZABOLCSI, Róbert	Lectured by:	Prof. Dr. SZABOLCSI, Róbert
Requirements of the course: (Neptun Codes)	—		

Lessons per week:	Theory: **2**	Practice (in Auditorium): **0**	Lab: **2**	Consultation: **0**
Level of exam (s,v,f):	**V (Exam)**			

The Syllabus

Aim: Give an overview about modern control systems, systems' analysis and preliminary design.

Topics: Basics of automatic control theory. Modern control theory. Mathematical models of dynamical systems. Laplace-transformation used in control theory. State-space representation of dynamical systems. Block diagrams, signal flow charts. Basic terms and theirs analysis. Time domain responses. Frequency domain responses. Open loop system analysis. Closed loop system analysis. Reference signal tracking problems. Disturbance rejection and sensor noise attenuation problems, and theirs solution in control engineering. Stability problems of the closed loop control systems. Main elements of the control engineering, and theirs dynamical description. Dynamic performances used in control engineering. Control system preliminary design: pole placement, LQ-based design methods. Solution of control problems of control engineering using MATLAB.

Requirements

Weeks	
1.	Registration for the course.
2.	Basics of automatic control theory. Modern control theory. Mathematical models of dynamical systems. Basics in MATLAB Programming.
3. – 4.	Laplace-transformation used in control theory. State-space representation of dynamical systems. Block diagrams, signal flow charts. Basic terms and theirs analysis. Time domain responses. Frequency domain responses. Open loop system analysis. Solution of control problems using MATLAB.
5.	Test paper No 1.
6.-7.	Closed loop system analysis. Reference signal tracking problems. Disturbance rejection and sensor noise attenuation problems, and theirs solution in control engineering. Stability problems of the closed loop control systems. Main elements of the control engineering, and theirs dynamical description. Solution of control problems of mechatronics using MATLAB.
8.	Test paper No 2.
9.–13.	Dynamic performances used in control engineering. Control system preliminary design: pole placement, LQ-based design methods. Solution of control problems of control engineering using MATLAB. Analogue and digital devices used in control engineering. Solution of control problems of mechatronics using MATLAB.
14.	Test paper No 3.
15.	Closing the Course. Test papers. Signature gaining.

All main areas of the course are evaluated by test papers. The course is to be considered successfully executed if and only if all the 3 test papers are marked with grades higher than 2 (satisfactory). If there is any test paper evaluated by grade of "Unsatisfactory (Grade 1)" of those all 3 written test papers, the teacher's signature is denied. If there is a single test paper not written one, the student must be cancelled from the course.

To improve: If there is any unsatisfactory evaluated test paper, the student must be provided 2 occasions to improve including the 15th lecture.

Participation: The participation is not obligatory at all lectures with the exemption of the test paper lectures.

Grade: The teacher's signature is provided and student can apply for the exam if and only if the average grade of three test papers is higher than 2.

MATLAB scripts: are evaluated individually at 15th lecture. Correct scripts are necessary and sufficient conditions for gaining signature at the end of the course.

References:

1. Burns, R. S. *Advanced Control Engineering*, Butterworth-Heinemann, Oxford-Auckland-Boston-Johannesburg-Melbourne-New Delhi, 2001.
2. Franklin, G. F. – Powell, J. D. – Emami-Naeini, A. *Feedback Control of Dynamic Systems*, Prentice-Hall, Pearson Education International, 2002
3. Stefani, R. T. – Shahian, B. – Savant Jr., C. J. – Hostetter, G. H. *Design of Feedback Control Systems*, Oxford University Press, New York-Oxford, 2002
4. Lantos, B. *Control System Engineering, Part I-II, Modern Control Engineering*, (in Hungarian), Academic Press, ISBN 963-05-7922-7, Budapest, Hungary (2003).
5. Nise, N. S. *Control Systems Engineering*, John Wiley & Sons, Inc., 2004.
6. Dr. Szabolcsi Róbert: A MATLAB programozása, Zrínyi Miklós Nemzetvédelmi Egyetem, 2004.
7. Prof. Dr. Szabolcsi Róbert: *Korszerű szabályozási rendszerek számítógépes tervezése*, egyetemi tankönyv, Zrínyi Miklós Nemzetvédelmi Egyetem, ISBN 978-615-5057-26-7, 415 oldal, 2011.
8. Dorf, R.C. – Bishop, R.H. *Modern Control Systems*, Prentice-Hall International Inc., 2001.

Quality Assurance: using feedback provided by the students for improving content and methods of teaching of the subject.

Budapest, 6 September 2016.

Prof. Dr. Róbert SZABOLCSI
Course Leader