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

Subject name and Neptun-code: Control Engineering (BGRCE1KTNC) **Credit points of the Subject: *2***
Full time training. 1st Semester of the Academic year of 2015/16.

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: **0**	Consultation: **0**
Level of exam (s,v,f):	**F (Practice Mark)**			

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.

Requirements

Weeks	
2.	Basics of automatic control theory. Modern control theory. Mathematical models of dynamical systems.
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.
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.
8.	Test paper No 2.
9.–13.	Dynamic performances used in control engineering. Control system preliminary design: pole placement, LQ-based design methods. Analogue and digital devices used in control engineering.
14.	Test paper No 3.
15.	Closing the Course. Subject grades.

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 refused. If there is a single test paper not written one, the student must be cleared from the course.

To improve: If there is an unsatisfactory evaluated test paper, the student must be provided 2 occasions to improve. The 15th lecture also among those of available for improving.

Participation: The participation is not necessary at all lectures with the exception of the test paper lectures.

Practice Mark: average of the grades given for test papers. Teacher's signature and the practice mark is provided if and only if the average grade of three test papers is higher than 2.

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. Prof. Dr. Szabolcsi Róbert: *Korszerű szabályozási rendszerek számítógépes tervezése*, egyetemi tankönyv, Zrínyi Miklós Nemzetvédelmi Egyetem, ISBN 978-615-5057-26-7, 415 oldal, 2011.
7. 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, 25 June 2015.

Prof. Dr. Róbert SZABOLCSI
lecturer