T-738-CONT ROBUST AND ADAPTIVE CONTROL, WITH AEROSPACE APPLICATIONS 8 ECTS

Year of study:	3rd or 4th year (final year BSc or first year MSc)
Semester:	Spring.
Level of course:	3. First cycle, advanced / 4. Second cycle, introductory.
Type of course:	Elective. *Recommended elective for Mechatronics Engineering.*
Prerequisites:	Feedback Control Systems (T-501-REGL).
Schedule:	Runs for 12 weeks – 6 teaching hours a week. Detailed schedule to be announced.
Supervising teacher:	Elias August.
Teacher:	Elias August.

Learning outcome:
Having completed this course, you should be familiar with the equations of motion describing aircraft flight dynamics, be able to explain them using your own word, and be able to simplify them in order to make them suitable for control design. Moreover, you should be able to identify whether a system is suitable for the application of the presented control methods and to apply them. They are

- command tracking using linear quadratic regulators (LQR),
- projective control,
- linear quadratic Gaussian control with loop transfer recovery (LQG/LTR),
- and MRAC.

Finally, you should be able to explain and apply Lyapunov stability theory to the analysis of nonlinear systems.

Content:
This course covers theoretical development and practical applications of formal methods in robust and optimal linear control, robust stability analysis, Lyapunov stability theory, and model reference adaptive control (MRAC). Throughout the course, case studies are presented to illustrate key design steps and the benefits of applying robust and adaptive control methodologies to aircraft design. Initially, general aviation background is also discussed.

Reading material: Lavretsky & Wise, *Robust and Adaptive Control with Aerospace Applications*, Springer 2013.
Teaching and learning activities: To be announced.
Assessment methods: To be announced.
Language of instruction: English.