

SYLLABUS

1. Course title:

Optimal Control

2. Code:

AR303

3. Cycle of study:

1

4. ECTS credits:

6

5. Type of course: Mandatory Elective**6. Prerequisites:**

[AR201] Linear Automatic Control Systems II, [AR204] Nonlinear System Control

7. Class restrictions:

Students of the Electrical Engineering and Computer Science Study Program

8. Duration / semester:

1

7

9. Weekly contact hours:

9.1. Lectures:

3

9.2. Seminars:

1

9.3. Laboratory/Practice classes:

1

10. Faculty:

Faculty of Electrical Engineering

11. Department/study program:

Electrical Engineering and Computer Science

12. Lecturer:

Ph.D Amila Dubravić, assistant professor

13. Lecturer's e-mail:

amila.dubravic@untz.ba, amila.dubravic@fet.tuzla.ba

14. Web site:

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15. Course aims:

The objective of the course is introduction of the optimal control system theory and principles, as well as software packages for problem solutions.

16. Learning outcomes:

Student training for:

- control optimization (understanding the theory, principles and techniques of optimal system control and use of software packages to address this problem)

17. Course content:

Optimization and control. Formulation of optimal control problems. Mathematical programming. Unconstrained function optimization, optimality conditions, iterative gradient algorithms (Newton type). Constrained function optimization, optimality conditions. Lagrange multipliers and Khun-Tucker theorem. Iterative constrained optimization algorithms, linear programming (LP), quadratic programming (QP), sequential quadratic programming (SQP). Variational calculus and Euler-Lagrange equations, Pontryagin minimum principle, dynamic programming and Hamilton-Jacobi-Bellman equation. Optimal linear quadratic regulator (LQR) and Riccati equation. Numerical solutions of the open loop optimal control problem. Formulation of closed loop optimal controllers, parametric optimization. Formulation and solution of model predictive controllers (MPC).

18. Learning methods:

Lectures - Train students with the skills taught in the course. A Power Point presentation is displayed, for additional explanations blackboard and chalk are used, typical examples are presented and computer simulations are activated.

Auditory Exercises - Solving problems that are the subject of course study.

Laboratory Exercises - Solving problems and performing computer simulations.

19. Assessment methods:

The exam is written and verbal. Written exam is a combination of theoretical questions and computational examples made in lectures and at auditory exercises. The final exam is written and oral exam consisting of discussion of seminar work and theoretical questions.

20. Assessment components:

Test 1 = 25 points,
Test 2 = 25 points,
Seminar work = 20 points.
Final exam = 30 points.

21. Required reading list:

"N. Prljača, Z. Sehić, Automatsko Upravljanje – Analiza i Dizajn, Mikroštampa , Tuzla, 2008S. R. Fletcher, Practical Methods of Optimization, John Wiley and Sons, 2001R. D. Kirk, Optimal Control Theory, Dover Publications, Inc., 1998M. Glavić, N. Prljača, Teorija optimalnog upravljanja i elektroenergetski sistem, Univerzitet u Tuzli, 1999"

22. Web sources:**23. Applicable starting from the academic year:**

2016/2017

24. Adopted in the Faculty/Academy session:

04.04.2016