

Course Title:	Advanced industrial process control
Lecturer:	Assoc. Prof. Nenad Bolf, Ph.D.
Course Type:	Compulsory
ECTS:	6
Total Hours:	30 hours
Content of the Course:	Design and application of basic and advanced control methods to improve the effect of the process and optimum operation of the plant. Review of practical application in modern industrial control systems. The course covers the key areas of application of automatic control along with examples from practice. The emphasis is placed on the skills and understanding of design and application of automatic control systems.
Competences:	Students will acquire knowledge of the importance of process control and its practical application. They will be able to understand key elements concerning the operation, design and application of basic and advanced control methods. They will be able to analyse the dynamic characteristics of the process and to use them to improve the process operation. They will become familiar with the ways of applying various control algorithms.
Teaching Methodology:	Lectures, seminar, demonstration exercises
Course Units:	Review of basic control methods and the possibility of their upgrade. <u>Feedforward and multivariable control:</u> Feedforward control, an example of feedforward control, stationary and dynamic feedforward control, linking the feedforward and feedback control, multivariable control, application of multivariable control. <u>Special purpose control:</u> Calculating blocks, proportional regulation, application of proportional regulation, override regulation, selective regulation, duplex (split) regulation, auto-selector or cutback regulation. <u>Regulation of processes with dead time:</u> The phenomenon of dead time, Smith's predictor, application of Smith predictor, Moore analytical predictor, Dahlin's algorithm. <u>Compensation of nonlinearity and adaptive control:</u> Nonlinearity, valve characteristics, process characteristics, adaptive control, adaptive gain, 3-mode on-line adjustment of the regulator. <u>Architecture of modern control systems:</u> Basic organisation and components of the system, digital control systems, supervisory control systems, distributed control systems (DCS), structure with one or more circles, sequential and batch control. Application of artificial intelligence methods in control. Soft sensors and analysers. Fuzzy logic-based control, neural networks and expert systems. Development and application of soft analysers in the plant. <u>New guidelines for process control:</u> Process control and the management, special characteristics of process control, the possibility of statistical process control and statistical quality control, tools of the statistical process control, statistical process optimisation.
Examination Method:	Seminar, oral exam
References:	1. N. Bolf, Automatsko vodenje procesa, internal course material, FCET, 2010. 2. D.E. Seborg, T.F. Edgar and D.A. Mellichamp, Process Dynamics and Control, 2 nd ed., John Wiley & Sons; New York, 2010. 3. B.W. Bequette, Process Control: Modelling, Design, and Simulation, Prentice Hall, 2003. 4. T.E. Marlin, Process Control, Design Processes and Control System for Dynamic Performance, 2 nd ed., McGraw-Hill, 2000. 5. C.L. Smith, Advanced Process Control, Wiley-AIChE, 2010.
Course in English:	Yes
Quality Monitoring Method:	Course quality and performance monitoring in accordance with the quality management system of the University of Zagreb. Self-evaluation of lecturers and student poll.