General Information:

Name of Course: # INTELLIGENT CONTROL SYSTEMS

Course Code: IVM194ANMI
Semester: 1st
Number of Credits: 6
Allotment of Hours per Week: 2 lectures, 2 practices
Evaluation: Exam (with grade)
Prerequisites: -

Instructors: **Dr Ildikó JANCSKÁRNÉ ANWEILER, associate professor**
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Introduction, Learning Outcomes

This course presents some fundamental knowledge of classic and modern control systems, focusing on intelligent control algorithms.
Upon completion of this course the student should be :

- able to understand basic knowledge of control systems
- able to apply basic knowledge of fuzzy information representation and processing
- able to apply basic fuzzy inference and approximate reasoning
- able to understand the basic notion of fuzzy rule base
- able to apply basic fuzzy PID control systems.

General Course Description and Main Content:
Introduction to control engineering. PLC programing with SFC. Basics of classical control theory, PID control. Control performance testing examples. Introduction to fuzzy sets: The uncertain and inexact nature of the real world: ideas and examples; fuzzy membership functions. Introduction to fuzzy logic: Basic concept and properties of fuzzy logic versus classical two-valued logic. Introduction to fuzzy inference: Fuzzy inference principles; fuzzy decision making; approximate reasoning. Introduction to fuzzy rule base: If-Then rules; general format of fuzzy rule base; establishment of fuzzy rule base. Introduction to fuzzy control systems: Basic fuzzy control principle: example of set-point tracking; open-loop and closed-loop fuzzy control systems; fuzzy PID controllers design methods..

Methodology:
Lecturing using NI ELVIS QUANSER models. Practice in LabVIEW with fuzzy control development module.

Intelligent control systems **Course Syllabus**

Course Code: IVM194ANMI Time: L Wednesday 14:45-16:15

Semester: Autumn 2018/2019 1. P Wednesday 16:30-18:00

Location: PTE MIK,L A-119, P A119

Schedule:

Study period in 15 weeks: sept.3 - dec.14. (2018)

1. -
2. Introduction, control principles, P&ID diagrams, control examples. Drawing P&ID diagrams and block diagrams. Analog signals, filtering, closed loop control.
3. Control performance. Process models. On/off controller.
4. PID controller and tuning
5. Cascade control and feed forward - feedback control
6. fuzzy sets and fuzzy logic
7. fuzzy control
8. fuzzy control
9. *Autumn break*
10. Fuzzy controller design and test.
11. Project work 1.
12. PLC programing fundamentals
13. SFC programing
14. Project work 2.
15. Final project presentations

Each student is expected to do quizzes, homework assignments and submit the final project with a written report on the topic as agreed upon by the student and the instructor.

Projects and homework

1. Paper Review: A journal paper dealing with fuzzy systems will be assigned by the instructor. The student will write a detailed report on the paper, showing his/her mastery and understanding of the contents of the paper. All relevant mathematical derivations and computer simulations (if any) will be included in the report.
2. Design a fuzzy controller for a model system. Students will prepare a written report on their project, explaining in detail the theoretical development, experimental work, and analysis of the results obtained.
3. Create and test SFC program.

Attendance:

Attending is required all classes. Unexcused absences will adversely affect the grade, and in case of absence from more than 30% of the total number of lesson will be grounds for failing the class. To be in class at the beginning time and stay until the scheduled end of the lesson is required, tardiness of more than 20 minutes will be counted as an absence. In the case of an illness or family emergency, the student must present a valid excuse, such as a doctor's note.

Evaluation + Grading

Grading will follow the course structure with the following weight:

1. Homeworks 10 %.
2. Tests 80 %
3. Offered exam grade: over 65 % during the study and correction period.
4. Written exam in the exam period. A minimum of 50% is required to pass the exam.

Grading scale

Numeric Grade:	5	4	3	2	1
Evaluation in points:	85%-100%	75%-84%	65%-74%	50%-64%	0-49%

Students with special needs:

Students with special physical needs and requiring special assistance must first register with the Dean of the Students Office. All reasonable requests to provide an equal learning environment for all students is to be assured.

Required Reading and other Materials will be equivalent to:

- L. A. Bryan, E. A. Bryan, *PROGRAMMABLE CONTROLLERS, THEORY AND IMPLEMENTATION*, An Industrial Text Company Publication, Atlanta • Georgia • USA, 1997, ISBN 0-944107-32-X
- PC WORX 6 IEC 61131-Programming
- E.A. Parr, *Programmable Controllers, An engineer's guide*, Newnes, 2003, ISBN 0 7506 5757 X
- Kevin M. Passino and Stephen Yurkovich, *Fuzzy Control*, Addison Wesley Longman, Menlo Park, CA, 1998 (later published by Prentice-Hall). http://eewww.eng.ohio-state.edu/~passino/FCbook.pdf

Additional papers for reading will be uploaded into Neptun by the instructor.