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| **Design of mechatronics systems** |

**Code:**

**ECTS Credit Points: 4**

**Evaluation:** mid-term grade

Year, Semester: spring

Number of teaching hours/week:

Lecture: **2**

Practice: **1**

**Prerequisites:**

**Topics**:

This course deals with the integration of the mechanical and electrical engineering disciplines within a unified framework. The topics are: Mechatronic systems classification, A mechatronic system in architecture, Modelling and simulations of mechatronic systems, actuators of a Mechatronic system. Electrical machines for mechatronic applications. Power electronic converters design and development for mechatronic systems. Current source and voltage source PWM converters design. Sensors interfacing to mechatronic systems. Data acquisition systems design and implementation for mechatronic systems. Mechatronics systems programming. Driver and interface programs development for mechatronic systems. Dynamic performances evaluation of mechatronic systems. Mechatronic systems industrial applications. Significant laboratory-based design experiences. Topics covered in the course include: Low-level interfacing of software with hardware; use of high-level graphical programming tools to implement real-time computation tasks; digital logic; analog interfacing and power amplifiers; measurement and sensing; electromagnetic and optical transducers; control of mechatronic systems.

**Literature:**

[1] K. Janschek – Mechatronics systems (Methods, Models, Concepts), Springer Verlag, 2012, ISBN: 978-3-642-17531-2.

[2] D. Shetty, R. Kolk – Mechatronicssystems design, SecondEdition, ISBN-10: 143906198x, 2010.

[3] D. Karnop, D. Margolis, R. Rosenberg – System dynamics: Modeling, simulation, and control of mechatronicsystems, John Wiley and sons. 2012, ISBN-10: 047088908x.

[4] Szász Csaba. – Stepping motor controlsystems, U.T. PRES, Cluj, 2004, ISBN 973-662-104-9.

[5] Szász Csaba.. – Digital controlsystems-Applications U.T. PRES, Cluj, 2006, ISBN (10) 973-662-274-6.

**Schedule**

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| **1st week:****Lecture:** Mechatronic systems classification. Mechatronic system architectures.**Practice:** Scheduled lab sessions, but students mostly work on a self-scheduled basis. | **2nd week:** **Lecture:** Modeling and simulation of mechatronic systems. Mechatronic system’s actuators**.****Practice:** Scheduled lab sessions, but you will mostly work in the lab on a self-scheduled basis. |
| **3rd week:****Lecture:** Electrical machines for mechatronic applications. Power electronic converters design and development for mechatronic systems.**Practice:** Scheduled lab sessions, but students mostly work on a self-scheduled basis in the lab. | **4th week:****Lecture:** Current source and voltage source, PWM converters design.**Practice:** Scheduled lab sessions, but students mostly work on a self-scheduled basis in the lab. |
| **5th week:****Lecture:** Sensors interfacing to mechatronic systems. Design of data acquisition systems and implementation of mechatronic systems.**Practice:** Scheduled lab sessions, but students mostly work on a self-scheduled basis in the lab. | **6th week:****Lecture:** Mechatronics systems programming. Drivers and interface programs development for mechatronic systems.**Practice:** Scheduled lab sessions, but students mostly work on a self-scheduled basis in the lab. |
| **7th week:****Lecture:** Driver and interface programs development for mechatronic systems. Dynamic performances evaluation of mechatronic systems.**Practice:**Scheduled lab sessions, but you will mostly work in the lab on a self-scheduled basis. | **8th week:****Mid-term test****Lecture:** **Practice:** Scheduled lab sessions, but students mostly work on a self-scheduled basis in the lab. |
| **9th week:****Lecture:** Mechatronic systems industrial applications. Significant laboratory-based design experiences**.****Practice:** Scheduled lab sessions, but students mostly work on a self-scheduled basis in the lab. | **10th week:****Lecture:** Topics covered in the course include: Low-level interfacing of software with hardware; use of high-level graphical programming tools to implement real-time computation tasks I.**Practice:** Scheduled lab sessions, but students mostly work on a self-scheduled basis in the lab. |
| **11th week:****Lecture:** Topics covered in the course include: Low-level interfacing of software with hardware; use of high-level graphical programming tools to implement real-time computation tasks II.**Practice:** Scheduled lab sessions, but students mostly work on a self-scheduled basis in the lab. | **12th week:****Lecture:** Digital logic; analog interfacing and power amplifiers. **Practice**:Scheduled lab sessions, but you will mostly work in the lab on a self-scheduled basis. |
| **13th week:****Lecture:** Measurement and sensing; electromagnetic and optical transducers.**Practice:** Scheduled lab sessions, but students mostly work on a self-scheduled basis in the lab. | **14th week:****Lecture:** Control of mechatronic systems.**Practice:** Scheduled lab sessions, but students mostly work on a self-scheduled basis in the lab. |
| **15th week:****End-term test** |  |

**Requirements**

**A, for a signature:**

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice** is compulsory. Students must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can’t make up a practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date, being discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments to the course with them to each practice class. Active participation is evaluated by the teacher in every class. If a student’s behavior or conduct doesn’t meet the requirements of active participation, the teacher may evaluate his/her participation as an absence because of the lack of active participation in class.

During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week. Students have to sit for the tests.

**B, for a grade:**

The course ends in a **mid-semester grade (AW5)**based on the test results.

The minimum requirement for both mid-term and end-term tests is 50%. Based on the score of the tests separately, the grade for the tests is given according to the following table:

Score Grade

0-39 fail (1)

40-52 pass (2)

52-63 satisfactory (3)

64-71 good (4)

72-80 excellent (5)

If the score of the sum of the two tests is below 40, the student once can take a retake test ofthewholesemestermaterial.