

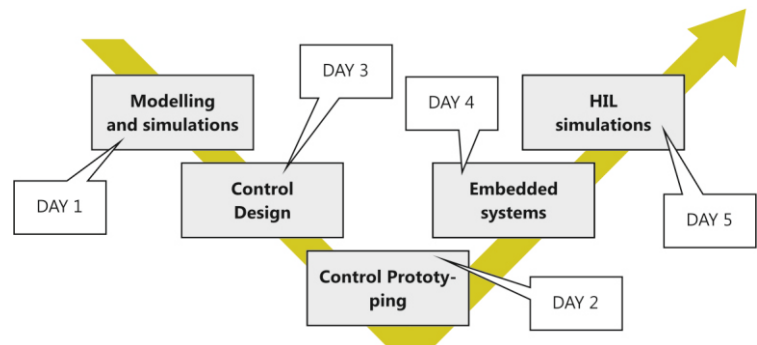
International Mechatronics Summer School 2020 in Brno, Czech Republic

„We firmly believe, that practical experience in a lab with real systems is much more valuable than reading of a hundred books, watching thousands of videos and surfing a milion web pages.“



→ Key information:

- Dates: **7. - 12. September 2020**
- Duration: **5 teaching days (40 hours)**
1 day of social event
(visit of Cesky Krumlov)
- Language: English
- Fee: **€ 690** (€ 550 early bird registration)



→ Programme:

- Modelling of Mechatronics Systems: Current Trends and New Adventures.
- Rapid Control Prototyping: How to Effectively Design a Controller on a Real System.
- Model Based Control – designing advanced nonlinear controllers.
- Modern Real-Time Hardware for measurement, control and Hardware-In-the-Loop (HIL).
- All these topics are explained on particular real systems (such as an automotive actuators), demonstrated on real-world examples and solutions and trained using laboratory HANDS-ONS.

→ Why to join us?

- Do you want to improve your MATLAB/Simulink skills?
- Do you want to get some HANDS-ON experience with programming real-time embedded systems?
- Do you want to learn more about modelling, system identification, testing and control in mechatronics and AUTOMOTIVE?
- You can learn from people with experience from real projects for companies like ŠKODA Auto, Honeywell, BOSCH and others.

www.imss.cz



Preliminary program:

- Students will receive the course materials before the start of the summer school.
- Most of the teaching time will be spent by individual work in a computer lab with continual support of lecturer.

→ Day 1: Modelling of mechatronics systems: current trends and new adventures

- Overview of the course
- Students will work in two groups: beginners and advanced.
- Beginners group: Introduction to MATLAB and Simulink (basics, vectorization, advanced features such as solvers, algebraic loops, zero crossing detection). The knowledge acquired will be sufficient to successfully continue and enjoy next days.
- Advanced group: Special topics in MATLAB (new language features, optimization of memory usage and other topics) and Simulink (S-functions, Code generation and others). Acquired knowledge will significantly deepen the understanding and user proficiency with MATLAB and Simulink and other similar tools.
- HANDS-ON – both groups will do exercises in the computer lab.

→ Day 2: Rapid Control Prototyping (RCP) = How to Effectively Design a Controller on a Real System

- Real-Time systems for measurement and control – lecture
- Theory and HANDS-ON: Controller development - control of a mechatronic actuator using RCP tools (MF 624 I/O card, Real-Time toolbox) – labs
- Theory and HANDS-ON: Deployment of a controller to an embedded system – how to adjust Simulink model to run at a microcontroller (Microchip dsPIC) - labs
- HANDS-ON - Team project: building and programming of LEGO Mindstorms robots using Simulink, team competition.

→ Day 3: Model based control – how to design advanced controllers

- Why is model useful for control, how to design nonlinear controllers using a model of a system (plant) - lecture
- How to acquire system model – Introduction and selected advanced techniques in System Identification – lecture
- HANDS-ON - Individual project: modelling, identification and control of selected laboratory model or real system (e.g. an nonlinear automotive actuator).

→ Day 4: Modern Real-Time Hardware for measurement and control - FPGAs

- Structure of Real-Time hardware - lecture
- Introduction to programming of FPGAs – lecture, demonstrations, labs
- Programming of FPGA using automatically generated code – demonstration.
- HANDS-ON – individual project: Programming of a Xilinx FPGA.

→ Day 5: Hardware-In-the-Loop technique (HIL) – modern way to develop and test a mechatronic product

- Introduction to HIL, principles, HW, SW, overview and features of common and special peripherals
- Success stories – We will share with you the results of our industrial projects.
- Case study: Modular platform for RCP and HIL on the National Instruments PXI (technical details, demonstration)
- Case study: Modular platform for RCP and HIL dSPACE (technical details, demonstration)
- HANDS-ON – team project – HIL on a dSPACE system.