Education:

The Department of MOMEI delivers courses in mechatronics, mechanical and power engineering as well as in industrial product design at both BSc and MSc programs of the Faculty of Mechanical Engineering. In the Mechatronics engineering MSc program the department offers specialization in adaptive mechatronic structures, Optomechatronics Biomechatronics, while in the BSc program in Mechatronics equipment, Optomechatronics and Biomechatronics. In mechanical engineering MSc program our department administered specialization in precision mechanics-optics.

The department conducts courses of informatics, measurement technology and system and control technology for full years. At the mechatronics engineering BSc and MSc programs our department delivers courses for full years of mechatronics, optics, automation, signal processing, computer control, application of microcontrollers, sensors and actuartors, modelling and simulation in biomechatronics and precision mechanics.

Students' Mechatronics Section is based in the MOMEI department and gets support for students' projects. Great results have been achieved in international Pneumobil competitions with the pneumatic vehicles developed by

students. Our students also participated in international mobile robot contest (RoboCup) and won III. prize in Graz and II. prize in Istanbul. In th summer of 2015 MOMEI, first in Europe, was the host of the Half-size MicroMouse contest in line with the announcement of the All Japan MicroMouse.

Furthermore referencies:

Development of measurement equipment for horizontal plane i n a nuclear reactor -

- Paksi Atomerőmű Zrt.

Development of a crane control system -

- Paksi Atomerőmű Zrt.

Analysis of a mechatronic throttle valve system

- Audi Hungária Motor Kft.

Development of a flexible manufacturing system -

- ROVITECH Kft

Shape design of coach windscreen -

- NABI

Development of measurement method and equipment for resistance measurement of conducting layers on car windows -

- Salgglas Kft.

Metrological revision of car window production-

- Salgglas Kft.

Alternative vision diagnostics using internet -

- Távkapcsolat Kft.

Optimization procedure of computational color blending for colored lenses -

- HOYA Magyarország Kft.

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Department of Mechatronics, Optics and Mechanical Engineering Informatics

## Main R&D&I areas of the department

Mechatronics,
Control Technology,
Robotics, Optics
Applied Informatics
Measurement and Instrumentation
Technology, Biomimetics, Biomechatronics
Optomechatronics, Precision Engineering

The department - with its 50 staff members - is the second biggest department of he Faculty of Mechanical Engineering. Beside a significant number of educational and research activities, we are engaged in several industrial and development projects. Our industrial R & D & I potential is ensured by our highly qualified and experienced staff of mechanical, electrical, civil, medical- and mechatronics engineers, biologists, IT experts and engineering mathematician.

Budapest University of Technology and Economics
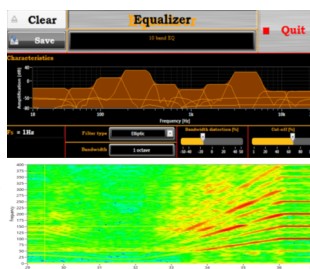**Faculty of Mechanical Engineering**

Research Guidelines
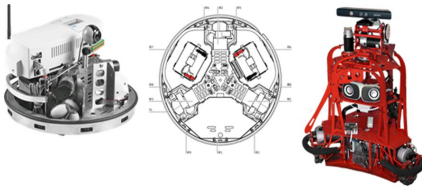
Motion control of mobile robots in real-time hardware and software environment. The aim is the development of a model-based robot control system for omnidirectional mobile robots. The results of this research project can be utilized in the field of industrial automation and intralogistics for automated assistant units working in factories or warehouses where fast and accurate material handling is necessary.

Vibration measurement and signal processing of internal-combustion engines are addressed in research subjects. These are intended for post-processing or real-time evaluation of automotive knock sensor signals in order to obtain information about operational conditions. For this a modular, general signal processing software is under development. With the system signals processing in time-, frequency- and order-domain or even with wavelet and coupled-domain methods can be executed. The post-processing system features a plug-in structure - algorithms developed independently from each other can be imported easily in addition to the hundreds of self-developed methods. In order to create a complete software bundle, a customizable, fully-scalable measurement and data acquisition software was developed.

One of the main trends of our applied informatics solutions is online image processing. Based on the purpose of the investigation we can create simulation and virtual spaces.

## Details of project works and presentation of competencies

Investigations based on precision techniques: Our department delivers investigation system solutions in the field of precision techniques. As an example we implemented a shape control system for carglasses. The measurement points of the system can be configured according to the specification of the customer. In the measurement points the curve and the circumference can also be measured. The same computer takes care of the control of the pneumatic actuators, data acquisition, data processing and the generation fo the protocol.
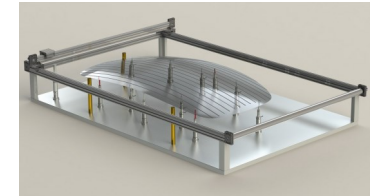
Optical investigations: One of our most remarkable projects in the field of optical investigations is the measurement of transmission and reflection characteristics of carglasses according to ISO or manufacturer specification. Our solution makes it possible to measure visible, UV and NIR rays next to the acquisition of reflection and filter data. Our competencies also include the color theoretical measurement of the chassis or other interior elements, displays in spectral domain extended with aesthetical investigations according to industrial standards.

Training for industrial partners: Our department organizes trainings for the industrial partners. The main fields of the trainings are mechatronics, optics, measurement technology, sensor and actuator technology. Our trainings give an overall view of the theoretical background and the practical applications as well. Special thematics are also possible on demand.

E-Meisterbock: The design and development of a complex analysis system to test motor control units for high power Diesel and Otto V-engines. The system is suitable to test 20 different types of ECUs. The main purpose of the system is to analyse real ECU control signals while the test bench is equipped with the real actuators. The sensors can be real or emulated which emulation can be performed with self-developed electical circuit cards.
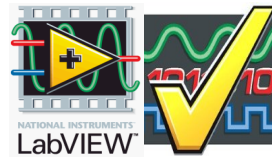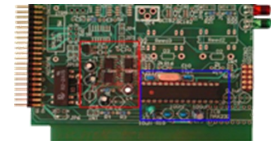
NI LabVIEW software development and system integration:
Investigation of measurement technological problems, hardware and software development and system integration. Our competencies include the measurement of sensor characteristics and data acquisition integrated to industrial measurement equipment. As a result of our research activities a highly configurable measurement system is realized, capable of measuring almost any kind of physical quantities based on the requirements. We also deliver task-specific professional systems (eg. vibration analysis), HIL testers, EoL functional testers, automated quality control systems. As an example we implemented the overall supervision system of a passive house with hardware and software development including energetic calculations. Besides production line integration of robots and quality control machine vision is also a part of our profile.
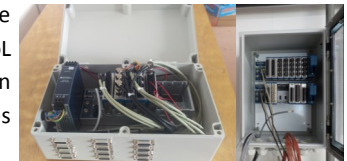
The purpose of our Department is to utilize the cutting-edge technology in our solutions with high quality. As a university we have the oppurtunity to apply novel results of our research activities into out implementations.