

Experimental methods

The course information

Experimental methods

Annotation:

The course is focused on knowledge improvement in the area of industrial products testing and experimental work.

- Experiment methodology
- Basic elements of the experimental device and their significance
- Experiment setup
- Properties and parameters of measuring devices
- Measurement device calibration and measurement errors
- Sensors of basic physical quantities

Lesson

▪ Lectures

- theory of experiment and measurement of physical quantities

▪ Practical exercise

- experiments in the laboratory, data processing

Teachers

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Study materials

- **E-learning TUL**
 - <https://elearning.tul.cz>

What you need:

- **PC, notebook, etc.**
 - MS Office Excel or Open Office Calc
 - Dewesoft software (free version)
for data processing
 - MS Office Word or Open Office Writer
for creating test reports
- Some camera or camcorder (mobile phone, tablet)
for experiment documentation – only if you want

List of lectures

1. Basic input information

2. lesson 1: Experiment in technical practice
3. lesson 2: Exciters
4. lesson 3: Measuring and recording device
5. lesson 4: Measurement device and electromagnetic interference
6. lesson 5: Properties of a measurement device - analog part
7. lesson 6: Properties of a measurement device - digital part
8. lesson 7: Sensors for measuring of distance or displacement
9. lesson 8: Measurement of deformation - strain gauges
10. lesson 9: Force sensors, pressure sensors, torque sensors, accelerometers
11. lesson 10: Temperature sensors
- 12., 13., 14. Students' work presentation, final test from the theoretical part, credit, exam

List of practical lessons

1. work safety prescription, excursion to the lab
2. Task 1: Measurement of a rubber part stiffness
3. Task 2: Tensile testing of a steel specimen
4. Task 3: Measurement of a liquid damper characteristics
5. Task 4: Vibration Frequency Analysis
6. Task 5: Measurement of amplitude frequency transmission characteristic
7. Task 6: Measurement of the resonance frequency using the Dirac pulse method
8. Task 7: The measurement device settings, measurement of the calibration curve
9. Task 8: Measurement of a part mechanical stress during operation
10. Task 9: Measurement of the scooter's beam deflection during riding
11. Task 10: Crash test
- 12., 13., 14. Students' work presentation, final test from the theoretical part, credit, exam

Practical lesson organization

In the lab

- New experiment description
- Experiment realization and data measurement
- Instructions for data processing

E-learning work

- Basic data processing = simple graph from measured data
- The resulting graph will be saved in pdf, jpg, etc. format and uploaded to the e-learning

Conditions for passing the EXM

- Credit
 - simple data processing from experiments
 - continuously during the semester
 - students continuously upload processed results of experiments to e-learning
 - to get credit, you need to upload at least 9 out of ten tasks

Conditions for passing the EXM

- Exam
- written part
 - the test from the theoretical part
 - 10 questions
 - one randomly selected question from each theoretical lesson
 - a list of questions will always be given at the end of each lesson
- oral part
 - two short presentations of two selected experiments
 - you can choose 2 arbitrary tasks and make two presentations
 - 5 – 10 minutes for one