

Course description

Course abbreviation:	KCH/PRFYZ	Page:	1 / 3
Course name:	Equipment Physics		
Academic Year:	2016/2017	Printed:	20.09.2017 18:26

Department/Unit /	KCH / PRFYZ	Academic Year	2016/2017
Title	Equipment Physics	Type of completion	Exam
Accredited/Credits	Yes, 4 Cred.	Type of completion	Combined
Number of hours	Přednáška 2 [Hours/Week] Seminář 1 [Hours/Week]		
Occ/max	Status A Status B Status C	Course credit prior to	NO
Summer semester	0 / 0 2 / - 0 / 0	Counted into average	YES
Winter semester	0 / - 0 / - 0 / -	Min. (B+C) students	not determined
Timetable	Yes	Repeated registration	NO
Language of instruction	Czech	Semester taught	Summer semester
Substituted course	KFY/PRFYZ		
Preclusive courses	N/A		
Prerequisite	N/A		
Informally recommended courses	N/A		
Courses depending on this Course	N/A		

Course objectives:

Measuring sequence and its structure, sensors and scanners - features and parameters, physical phenomena used in sensors, sensors for electrical and magnetic quantities, sensors for mechanical quantities - passive and active, sensors for heat quantities - contact and remote, optical fiber sensors, processing of electrical signals - A/A, A/D, D/A converters, digital measuring instruments - multimeters, R-L-C-f instruments, oscilloscopes, amplitude and spectral analyzers, PC measurement systems, virtual measurement systems.

Requirements on student

Evaluation of the subject as well as the exam grading is made according to the articles No 31 - 33 in the Regulations on Study and Examinations University of Ostrava

Content

KFY/PRFYZ

Measuring sequence and its structure, sensors and scanners - features and parameters, physical phenomena used in sensors, sensors for electrical and magnetic quantities, sensors for mechanical quantities - passive and active, sensors for heat quantities - contact and remote, optical fiber sensors, processing of electrical signals - A/A, A/D, D/A converters, digital measuring instruments - multimeters, R-L-C-f instruments, oscilloscopes, amplitude and spectral analyzers, PC measurement systems, virtual measurement systems.

In the seminars students will be closely acquainted with equipment used not only for study of photosynthesis (spectrophotometers, infra-red gas analyzers, HPLC, luminescence spectrophotometer, fluorimeters, spectroradiometer, pH meters, quantum sensors etc.).

Time schedule:

1. Basic definitions. Basic measurement techniques, types and features of measured signals, classification of signals, typical time courses of signals, measuring sequence and its structure, paths of transfer.
2. Sensors and scanners. Classification of sensors and scanners, features and parameters of sensors and scanners, physical phenomena used in sensors.
3. Principle of sensors. Resistance sensors, capacitive sensors, inductance sensors, piezoelectrical sensors, photoelectrical sensors, optical sensors, fiber sensors, optoelectrical sensors.
4. Amplifiers and transducers. Operational amplifiers, OZ application, nonlinear amplifiers, measuring amplifiers.
5. A-D a D-A converters. Basic principles of analog-digital conversion, types of A-D converters.
6. A-D a D-A converters. Feedback A-D converter with constant increments, feedback A-D converter with variable increments, integrating A-D converter with single-slope integration, integrating A-D converter with double-slope integration, comparative A-

D converter, A-D converter with delta modulation, D-A converters.

7. Digital meters. Principles of digital multimeters, types of disturbances of digital multimeters, principles of R, L, C, f, T digital meters.

8. Digital meters. Z-U converter, Y-U converter, capacity-time converter, resistance ratio converter, frequencies filters, EMC.

9. Stabilizers. Principles and features of stabilizers and their classification, stabilizer of voltage with Zener diode, stabilizer of voltage with transistor, alternating stabilizers.

10. Stabilizers. Feedback stabilizers, sources of U, I with rectangular VA characteristic, noncontinuous stabilizer, transducers.

11. Oscilloscopes and recorders. Analog oscilloscopes, digital oscilloscopes, principles and features of recorders.

12. Analyzers. Analog analyzers, frequency analyzers with tunable filter, heterogenous frequency analyzer, parallel type spectral analyzer, digital analyzers, spectral analyzers with digital filters, FFT analyzers, LTA-LSA type logical analyzers.

13. Measuring computers and virtual devices. Measuring computers, types of plug-in computer modules, virtual machines, software measuring devices.

Prerequisites - other information about course preconditions

none

Competences acquired

The student:

- is familiar with definitions of: measuring sequence and its structure, sensors and scanners - features and parameters, physical phenomena used in sensors, sensors for electrical and magnetic quantities, sensors for mechanical quantities - passive and active, sensors for heat quantities - contact and remote, optical fiber sensors.

- acquires processing of electrical signals - A/A, A/D, D/A converters, digital measuring instruments - multimeters, R-L-C-f instruments, oscilloscopes, amplitude and spectral analyzers, PC measurement systems, virtual measurement systems.

Studijní opory

Guarantors and lecturers

- **Guarantors:** doc. RNDr. Jiří Kalina, Ph.D.
- **Lecturer:** doc. RNDr. Jiří Kalina, Ph.D.
- **Seminar lecturer:** doc. RNDr. Jiří Kalina, Ph.D.

Literature

- **Recommended:** VEDRAL,J.-FISER,I. *Elektronické obvody pro měřicí techniku*. Praha, 1999. ISBN 80-01-01950-0.
- **Recommended:** DADO,S.-KREIDEL,M. *Senzory a měřicí obvody*. Praha CVUT, 1996. ISBN 80-01-01500-9.

Time requirements

Activities	Time requirements for activity [h]
Being present in classes	39
Scientific text studying in the Czech language	10
Preparation for an exam	25
Consultation of work with the teacher/tutor (incl. electronic)	5
Scientific text studying in a foreign language	10
Preparation for test	20
Total:	109

assessment methods

professional knowledge

Oral examination

Written examination

prerequisite

professional knowledge

none

teaching methods**professional knowledge**

Demonstration

Dialogic (discussion, dialogue, brainstorming)

Monologic (explanation, lecture, briefing)

Working with text (coursebook, book)

learning outcomes**professional knowledge**

The student:

- is familiar with definitions of: measuring sequence and its structure, sensors and scanners - features and parameters, physical phenomena used in sensors, sensors for electrical and magnetic quantities, sensors for mechanical quantities - passive and active, sensors for heat quantities - contact and remote, optical fiber sensors.

- acquires processing of electrical signals - A/A, A/D, D/A converters, digital measuring instruments - multimeters, R-L-C-f instruments, oscilloscopes, amplitude and spectral analyzers, PC measurement systems, virtual measurement systems.

Course is included in study programmes:

Study Programme	Type of	Form of	Branch	Stage	St. plan v.	Year	Block	Status	R.year	R.
Applied Physics	Postgraduate Master	Full-time	Biophysics	1	2014	2016	Povinně volitelné předměty	B	1	LS
Chemistry	Postgraduate Master	Full-time	Analytical Chemistry of Solid Phase	1	2013	2016	Povinně volitelné předměty	B	1	LS
Chemistry	Postgraduate Master	Full-time	Teaching for Secondary Schools - Single-Specialization Chemistry	1	2015	2016	Povinně volitelné předměty	B		LS