Course description

Department/Unit /	SLO / OS			**Academic Year**	2015/2016
Title	Optical Sensors			**Type of completion**	Colloquium
Accredited/Credits	Yes, 3 Cred.			**Type of completion**	
Number of hours	Přednáška 2 [Hours/Week]				
Occ/max	Status A	Status B	Status C	**Course credit prior to**	NO
Summer semester	0 / -	0 / -	0 / -	**Counted into average**	NO
Winter semester	0 / -	0 / -	0 / -	**Min. (B+C) students**	not determined
Timetable	Yes			**Repeated registration**	NO
Language of instruction	Czech			**Semester taught**	Winter semester
Optional course	Yes			**Internship duration**	0
Evaluation scale	S|N				
No. of hours of on-premise					
Auto acc. of credit	No				
Periodicity	K				
Substituted course	None				
Preclusive courses	N/A				
Prerequisite courses	N/A				
Informally recommended courses	N/A				
Courses depending on this Course	N/A				

Course objectives:

The aim is to give students information about selected optical sensors based on different optical principles (triangulation, intereference, time and spatial coherence, speckle and holography).

Requirements on student

Class attendance
Knowledge of the course topics, ability to discuss about the course topics in wider contexts

Content

1. Basic definitions - definition of optically smooth and optically rough surface, definition of the problem of the measurement, explanation of the coherent speckle, explanation of the meaning of characteristic quantities
2. Classification of optical sensors according to the principle - triangulation (laser triangulation, triangulation with measurement of phase, deflectometry with measurement of phase, autofocusing), interferometry in white light (interferometry in white light in time domain, interferometry in white light with spectral splitting (in frequency domains, optical coherent tomography (OCT)), classical interferometry
3. Interferometric methods with synthesis of coherent function, interferometry using spatial coherence
4. Holographic interferometry
5. Interferometry based on coherent speckle, photography based on coherent speckle, correlation interferometry, electronic correlation interferometry (ESPI)
6. Method using correlation properties of fields of coherent speckle - measurement of component of small deformation tensor of the object and the quantities derived from these components

Prerequisites - other information about course preconditions

Prior knowledge of the undergraduate physics.
At least 3 participating students.

Competences acquired

Comprehension
Recognize optical sensors according to the principle, explain principle of selected optical sensors (based on interference, holography, and speckle) and state examples of their applications.

Fields of study

Guarantors and lecturers

- **Guarantors:** prof. RNDr. Miroslav Hrabovský, DrSc. (100%)
- **Lecturer:** RNDr. Pavel Horváth, Ph.D. (100%), doc. RNDr. Pavel Pavlíček, Ph.D. (100%), RNDr. Petr Šmíd, Ph.D. (100%)

Literature

- **Recommended:** Miler M. *Holografie*. SNTL Praha, 1974.
- **Recommended:** Jones R., Wykes C. *Holographic and Speckle Interferometry*. Cambridge University Press, Cambridge, 1989.
- **Recommended:** Hrabovský M., Bača Z., Horváth P. *Koherenční zrnitost v optice*. UP Olomouc, 2001.
- **Recommended:** Dorsch R., Häusler G., Herrmann J. *Laser triangulation: Fundamental uncertainty of measurement, App. Opt. 33, 1306 - 1314*. 1994.
- **Recommended:** Gruber M., Häusler G. *Simple, robust and accurate phase-measuring triangulation, Optik 89, 118 - 122*. 1992.
- **Recommended:** Goodman J.W. *Speckle phenomena in optics: theory and applications*. Roberts and Company Publishers, Greenwood Village, 2007.
- **Recommended:** Dresel T., Häusler G., Venzke H. *Three-dimensional sensing of rough surfaces by coherence radar, Appl. Opt. 31, 919 - 925*. 1992.

Time requirements

All forms of study

Activities	Time requirements for activity [h]
Homework for Teaching	20
Preparation for the Course Credit	44
Attendace	26
Total:	**90**

Teaching methods

Monologic Lecture(Interpretation, Training)

Assessment methods

Mark

Course is included in study programmes:

Study Programme	Type of	Form of	Branch	Stage	St. plan v.	Year	Block	Status	R.year	R.
Physics	Postgraduate Master	Full-time	Applied Physics	1	1	2015	Volitelné předměty	C	2	ZS