

# Course description

<b>Course abbreviation:</b>	KCH/SEMIP	<b>Page:</b>	1 / 3
<b>Course name:</b>	Light and Electron Microscopy		
<b>Academic Year:</b>	2016/2017	<b>Printed:</b>	25.09.2017 22:38

<b>Department/Unit /</b>	KCH / SEMIP	<b>Academic Year</b>	2016/2017
<b>Title</b>	Light and Electron Microscopy	<b>Type of completion</b>	Exam
<b>Accredited/Credits</b>	Yes, 4 Cred.	<b>Type of completion</b>	Oral
<b>Number of hours</b>	Přednáška 2 [Hours/Week]		
<b>Occ/max</b>	Status A      Status B      Status C	<b>Course credit prior to</b>	NO
<b>Summer semester</b>	0 / -      0 / -      0 / -	<b>Counted into average</b>	YES
<b>Winter semester</b>	64 / -      0 / -      0 / 2	<b>Min. (B+C) students</b>	not determined
<b>Timetable</b>	Yes	<b>Repeated registration</b>	NO
<b>Language of instruction</b>	Czech	<b>Semester taught</b>	Winter semester
<b>Substituted course</b>	KFY/SEMIP		
<b>Preclusive courses</b>	N/A		
<b>Prerequisite</b>	N/A		
<b>Informally recommended courses</b>	N/A		
<b>Courses depending on this Course</b>	KFY/MIMET, KFY/SEMIC, KFY/SEMIS, KFY/ZSEMC		

## Course objectives:

Methods of light and electron microscopy with emphasis on physical principles, display theory, imaging methods, basic knowledge of construction and preparation of chemicals. Use of microscopic techniques for analysis of surface characteristics of solids.

## 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

Methods of light and electron microscopy with emphasis on physical principles, display theory, imaging methods, basic knowledge of construction and preparation. Use of microscopic techniques for analysis of surface characteristics of solids.

Time schedule

### I. Light microscopy

1. Introduction. Fundamentals of physical optics. Converging and diverging lenses, lens defects.
2. Optical system of a microscope. Magnification, resolution, numerical aperture, depth of acuity.
3. Construction, types of microscopes. Objectives, eyepieces, illuminating system.
4. Imaging methods. Bright and dark field in transmittant and incident light. Phase contrast method. Polarization microscopy.
5. Measurement with a microscope. Measurement of lengths, depth and breadths. Structure calculation.
6. Aids for microscoping. Microscoping procedure. Classification of preparations.
7. Preparation of a microscopic preparation (fixation, cutting, colouring, fitting).

### II. Electron microscopy

8. Physical fundamentals. Interaction electron - solid.
9. Fundamentals of electron optics. Electrostatic and electromagnetic lenses. Lens defects. Resolution and depth of acuity.
10. Transmission electron microscope (TEM). Construction, operating modes, operation.
11. Scanning electron microscope (SEM). Construction, operating modes, operation.
12. Preparation of chemicals for TEM (fixation, cutting, contrasting).
13. Preparation of chemicals for REM (fixation, dewatering, metal coating).

## Prerequisites - other information about course preconditions

**Competences acquired**

The student knows methods of light and electron microscopy with stress on physical principles, display theory, imaging methods, basic knowledge of construction and preparation of chemicals.

**Studijní opory****Guarantors and lecturers**

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

**Literature**

- **Basic:** NAUŠ, J. *Experimentální metody biofyziky I. 1. vyd. 129 s.* Olomouc: UP Olomouc, 1985.
- **Basic:** KUBÍNEK, R. *Experimentální metody biofyziky. 1. vyd. 49 s.* Olomouc: UP Olomouc, 1989.
- **Basic:** High-Magnification Stereoscropy - [http://www.funsci.com/fun3\\_en/hmster/hmster\\_en.htm](http://www.funsci.com/fun3_en/hmster/hmster_en.htm) >
- **Basic:** <http://ceg.fsv.cvut.cz/CZ/ceg-vyzkum/mikroskopie.htm> - <http://ceg.fsv.cvut.cz/CZ/ceg-vyzkum/mikroskopie.htm> >
- **Basic:** <http://encyklopedie.seznam.cz/heslo/139109-mikroskopie-atomarnich-sil> - <http://encyklopedie.seznam.cz/heslo/139109-mikroskopie-atomarnich-sil> >
- **Basic:** [http://www.funsci.com/fun3\\_en/usph/usph.htm](http://www.funsci.com/fun3_en/usph/usph.htm) - [http://www.funsci.com/fun3\\_en/usph/usph.htm](http://www.funsci.com/fun3_en/usph/usph.htm) >
- **Basic:** [http://www.funsci.com/texts/index\\_en.htm](http://www.funsci.com/texts/index_en.htm) - [http://www.funsci.com/texts/index\\_en.htm](http://www.funsci.com/texts/index_en.htm) >
- **Basic:** <http://www.matexpm.com/lext.htm> - <http://www.matexpm.com/lext.htm> >
- **Basic:** <http://www.paru.cas.cz/lem/book/> - <http://www.paru.cas.cz/lem/book/> >
- **Basic:** [http://www.vscht.cz/sls/vyzkum/metody/polarizacni\\_mikroskopie.htm](http://www.vscht.cz/sls/vyzkum/metody/polarizacni_mikroskopie.htm) - [http://www.vscht.cz/sls/vyzkum/metody/polarizacni\\_mikroskopie.htm](http://www.vscht.cz/sls/vyzkum/metody/polarizacni_mikroskopie.htm) >
- **Extending:** SMĚKAL, P. *Experimentální metody biofyziky II. Světelná a elektronová mikroskopie. 1. vyd. 220 s.* Ostrava: Ostravská univerzita, 1995. ISBN 80-7042-723-X.
- **Recommended:** PROSSER, V. et al. *Experimentální metody biofyziky. 1. vyd. 716 s.* Praha: Academia, 1989. ISBN 80-200-0059-3.
- **Recommended:** MALÍNSKÝ, J. *Přehled histologické techniky. 1. vyd. 46 s.* Olomouc: UP Olomouc, 1985.

**Time requirements**

Activities	Time requirements for activity [h]
Being present in classes	26
Self-tutoring	26
Scientific text studying in a foreign language	13
Consultation of work with the teacher/tutor (incl. electronic)	5
Preparation for an exam	16
<b>Total:</b>	<b>86</b>

**assessment methods****professional knowledge**

Oral examination

**teaching methods****professional knowledge**

Demonstration

Monologic (explanation, lecture, briefing)

Working with text (coursebook, book)

**learning outcomes**

**professional knowledge**

The student knows methods of light and electron microscopy with stress on physical principles, display theory, imaging methods, basic knowledge of construction and preparation of chemicals.

**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	Bachelor	Full-time	Biophysics	1	2014	2016	Povinné předměty	A	2	ZS
Applied Physics	Bachelor	Full-time	Biophysics	1	2012	2016	Povinné předměty	A	2	ZS
Biology	Bachelor	Full-time	Experimental Biology	1	2	2016	Povinné předměty	A	2	ZS
Chemistry	Postgraduate Master	Full-time	Analytical Chemistry of Solid Phase	1	2013	2016	Povinné předměty	A	2	ZS
Specialization in Health Service	Bachelor	Full-time	Health Laboratory Assistant	1	1	2016	Povinné předměty	A	2	ZS
Biology	Postgraduate Master	Full-time	Systematic Biology and Ecology	1	2012	2016	Povinně volitelné předměty	B	1	ZS