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| Module name | **Microscopic techniques** |
| Module code | B-BC.BE.223 |
| ISCED code | 0511: Biology |
| Study cycle | IIo |
| Semester | summer semester |
| Responsible for this module  | Main teacher Bożena Pawlikowska-Pawlęga, bozka1996@o2.pl, +48 815375928 Jarek Pawelec, jarwpaw@interia.pl, +48 815375916 Jerzy Wydrych, jerzy\_wydrych@onet.eu |
| Language of instruction | English |
| Website | www.umcs.pl/en/list-of-courses,5022.htm |
| Prerequisites | basic knowledge of English, the passed courses from cell biology, chemistry and biochemistry; |
| ECTS | 3 |
| ECTS points hour equivalents | Contact hours (work with an academic teacher) 30 laboratory hours Total number of hours with an academic teacher45 Number of ECTS points with an academic teacher 1.5Non-contact hours (students' own work) 45 Total number of non-contact hours45 Number of ECTS points for non-contact hours1.5**Total number of ECTS points for the module 3** |
| Educational outcomes verification methods | Grades achieved by the students from two tests (minimum 60%); assessment of manual abilities of the student during particular lab classes by the teacher ( with help of teacher) which finishes with appropriate goal achievement for current activation of the student: e.g.: correct trimming of sample; correct interpretation of images from particular types of microscopes; correct preparation of slides on particular lab classes; |
| Description | The module covers the knowledge in the area of cell biology and cytochemistry. The exercises enable to earn theoretical and practical knowledge from different kind of light microscopy e.g. fluorescence, dark-field, light-field as well as confocal and electron: transmission and scanning. Main topics include: construction and operation of different types of microscopes; preparation of specimens for electron microscopy: trimming, cutting, contrasting of biological samples; grids observation in TEM; sample observation in SEM; observation of apoptosis and necrosis in cancer cells under fluorescent microscope; slides observation under light microscope; |
| Reading list | 1. Hayat M.A. 2000. Principles and techniques of electron micrioscopy. Biological applications. Cambridge University Press;
2. J.Litwin, M.Gajda.WUJ 2011. Podstawy Technik Mikroskopowych;
3. B.Wróbel and coauthors. WUMK 2005. Podstawy Mikroskopii Elektronowej;
4. Cieciura L. PWN 1989. Techniki stosowane w mikroskopii elektronowej.
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| Educational outcomes | **KNOWLEDGE*** Student characterizes selected microscopic techniques
* Student explains their principles;
* Student identifies particular cell organelle on microscopic slides

**SKILLS** * Student uses techniques of biological preparation in the range of microscopic techniques
* Student selects appropriate microscopic techniques dependently on the sort of observation and experiment

**ATTITUDES*** Student knows safe and ergonomic working in the laboratory;
* Student is aware of practical application of microscopic techniques
* Student is aware of the importance of microscopic research in biological and medical knowledge
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| Practice | 1. Slides observation and preparation for different types of microscopes
2. Trimming and grids preparation for electron microscopy
3. Grids’ contrasting
4. Ultra-cutting of biological samples
5. Positive and negative grids’ contrasting
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**Information about classes in the cycle**

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**SKILLS** * Student uses techniques of biological preparation in the range of microscopic techniques
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**ATTITUDES*** Student knows safe and ergonomic working in the laboratory;
* Student is aware of practical application of microscopic techniques

Student is aware of the importance of microscopic research in biological and medical knowledge |
| A list of topics | 1. Construction and functioning of electron microscope: transmission and scanning
2. Visit in electron microscopy lab of UMCS
3. Construction and operation of confocal microscope
4. Visit in confocal microscopy lab of UMCS
5. Test - electron microscopy: transmission, scanning and confocal microscopy.
6. Construction and operation of a light microscope (bright field, dark field, phase contrast and fluorescent)
7. Procedure for specimen preparation for electron microscopy
8. Trimming and grids preparation for electron microscopy.
9. Cutting of biological samples.
10. Positive grid’s contrasting
11. Test- Construction and operation on light microscope (bright field, dark field, phase contrast and fluorescence; samples preparation for electron microscopy - all stages of the procedure.
12. Slides observation with application of light microscope.
13. Recording images from grids cut by students in electron microscope.
14. Slides observation in fluorescence microscopy.
15. Final Assessment.
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| Teaching methods | Lecture; lab classes: observation; practical preparation of slides for observations; analysis and interpretation of electron micrographs; |
| Assessment methods | 1. Continuous assessment in a form of tests - two tests during the course on which final mark is based;
2. Presence on lab classes (2 classes can be omitted under the condition not dependent on the student e.g. disease, funeral etc.).

These both conditions are considered by the teacher when giving final grade |