

Syllabus 2020/2021

Description of the course

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|-------------------------|--|-------------------------------------|---|
| Module/Course | MOLECULAR BIOLOGY | Group of detailed education results | |
| | | Group code | Group name |
| | | B | The scientific basis of medicine |
| | | C | Preclinical sciences |
| Faculty | Medicine | | |
| Major | medicine | | |
| Specialties | Not applicable | | |
| Level of studies | Uniform magister studies X * 1 st degree studies <input type="checkbox"/> 2 nd degree studies <input type="checkbox"/> 3 rd degree studies <input type="checkbox"/> postgraduate studies <input type="checkbox"/> | | |
| Form of studies | X full-time <input type="checkbox"/> part-time | | |
| Year of studies | I | Semester | X Winter <input type="checkbox"/> Summer |
| Type of course | X obligatory <input type="checkbox"/> limited choice <input type="checkbox"/> free choice/elective | | |
| Course | <input type="checkbox"/> major X basic | | |
| Language of instruction | <input type="checkbox"/> Polish X English <input type="checkbox"/> other | | |

* mark with an X

Number of hours

Form of education

| Unit teaching the course | Lectures (L) | Seminars (SE) | Auditorium classes (AC) | Major Classes – not clinical (MC) | Clinical Classes (CC) | Laboratory Classes (LC) | Classes in Simulated Conditions (CSC) | Practical Classes with Patient (PCP) | Specialist Classes – magister studies (SCM) | Foreign language Course (FLC) | Physical Education obligatory (PE) | Vocational Practice (VP) | Self-Study (Student's own work) | E-learning (EL) |
|--|--------------|---------------|-------------------------|-----------------------------------|-----------------------|-------------------------|---------------------------------------|--------------------------------------|---|-------------------------------|------------------------------------|--------------------------|---------------------------------|-----------------|
| Winter Semester | | | | | | | | | | | | | | |
| Department of Biology and Medical Parasitology | 25 | 25 | - | 15 | - | - | - | - | - | - | - | - | - | - |
| Summer Semester | | | | | | | | | | | | | | |
| | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TOTAL per year: 65 | | | | | | | | | | | | | | |



| Educational objectives (max. 6 items) | | | | |
|--|----------------------------------|---|---|---|
| C1. Providing students with knowledge of the basics of modern genetics and its experimental methods and preparing them for the clinical genetics course. | | | | |
| C2. Students receive knowledge about the mechanisms responsible for the integrity of the individual organism gene pool and for the transfer of genes between the subsequent generations in Prokaryota as well as in Eukaryota. | | | | |
| C3. Students gain information about the influence of environmental pollution by mutagenic and carcinogenic substances on the human organism. | | | | |
| C4. Students get knowledge about the methods of molecular biology and their application in genetic studies. | | | | |
| C5 Education of students in the basics of medical parasitology, epidemiology and prevention of parasitic diseases. | | | | |
| C6. Students receive information about the structure and life cycles of human parasites and learn how to recognize the symptoms of parasitic infection | | | | |
| Education result matrix for module/course in relation to verification methods of the intended education result and the type of class | | | | |
| Number of course education result | Number of major education result | A student who completes the module/course knows/can/is able to | Methods of verification of intended education results (forming and summarising) | Form of didactic class <i>**enter the abbreviation</i> |
| K01 | B.W10. | - knows the structure of simple organic compounds included in macromolecules present in cells, extracellular matrix and body fluids | test, colloquium, written exam | S, L |
| K02 | B.W13. | - describes nucleotide functions in the cell, primary and secondary structures of DNA and RNA, and the structure of chromatin | test, colloquium, written exam | S, L |
| K03 | B.W14. | - knows genome, transcriptome and human proteome functions and basic methods used in their study; describes the processes of DNA replication, repair and recombination, transcription and translation, and the degradation of DNA, RNA and proteins; knows the concepts of gene expression regulation | test, written exam | S, L |
| K04 | B.W18. | - presents and describes processes: cell cycle, proliferation, cell differentiation and aging, apoptosis and necrosis and their importance for the functioning of the organism | test, colloquium, written exam | S, L |
| K05 | C.W1. | - defines the basic concepts of genetics | test, colloquium, written exam | S, L |
| K06 | C.W2. | - describes the gene linkage and interactions | test, colloquium, written exam | S |



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|-----|--------|---|--------------------------------|------|
| K07 | C.W3. | - describes normal human karyotype and different types of sex determination | test, colloquium, written exam | S, L |
| K08 | C.W4. | - describes chromosome structures and knows the molecular background of mutagenesis | test, colloquium, written exam | S, L |
| K09 | C.W5. | - knows principles of inheritance of different number of traits, quantitative traits, independent inheritance of traits and cytoplasmic inheritance | test, colloquium, written exam | S, L |
| K10 | C.W6. | - knows the genetic determination of blood groups | test, colloquium, written exam | S, L |
| K11 | C.W7. | - lists and describes autosomal and heterosomal aberrations leading to genetic diseases | test, colloquium, written exam | S, L |
| K12 | C.W8. | - knows factors affecting primary and secondary genetic equilibrium of population | test, colloquium, written exam | L |
| K13 | C.W10. | - knows the benefits and threats resulting from the presence of genetically modified organisms (GMOs) in the ecosystem; | written exam | L |
| K14 | C.W12. | - lists and describes microorganisms, including pathogens and those present in the physiological flora | test, colloquium | MC |
| K15 | C.W13. | - knows epidemiology of parasitic infections including geographical localization | test, colloquium | MC |
| K16 | C.W15. | - knows consequences of exposure of the human body to various chemical and biological agents, and principles of prevention | test, colloquium | MC |
| K17 | C.W16. | - describes invasive forms or development stages of chosen parasitic protozoa, helminths, and arthropods, including their geographical localization | test, colloquium | MC |
| K18 | C.W17. | - describes the host-parasite relations and the basic symptoms of parasitic infection | test, colloquium | MC |
| K19 | C.W18. | - defines symptoms of iatrogenic infections, their pathways and pathogens causing changes in specific organs | test, colloquium | MC |



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| K20 | C.W19. | - knows basic principles of microbiological and parasitological diagnostics | test, colloquium | MC |
| S 01 | C.U1. | - analyzes genetic crosses and pedigrees of human traits and diseases, as well as assess the risk of having a baby with chromosome aberrations | presentation of individually searched information in the group forum during classes; solving genetic crosses and explaining issues during classes | S |
| S 02 | C.U4. | - performs morphometric measurements, analyze the morphogram and record the karyotypes of diseases | presentation of individually searched information in the group forum during classes; work during classes - solving tasks prepared by the teacher or other students; Oral answer | S |
| S03 | C.U5. | - estimates the risk of manifestation of certain genetic disease basing on predispositions of the patient's family | microscopic observation and drawing pictures during classes; written test | S |
| S04 | C.U7. | - recognizes the most common parasites knowing their life cycles, structure, and symptoms of infection | microscopic observation and self-made drawings during classes | MC |
| S05 | C.U9. | - observes different parasites under microscope | microscopic observation and self-made drawings during classes | MC |

** L - lecture; SE - seminar; AC – auditorium classes; MC – major classes (non-clinical); CC – clinical classes; LC – laboratory classes; SCM – specialist classes (magister studies); CSC – classes in simulated conditions; FLC – foreign language course; PCP practical classes with patient; PE – physical education (obligatory); VP – vocational practice; SS – self-study, EL – E-learning .

Please mark on scale 1-5 how the above effects place your classes in the following categories:

communication of knowledge, skills or forming attitudes:

Knowledge: 5

Skills: 3

Student's amount of work (balance of ECTS points)

Student's workload

Student Workload (h)



| | |
|--|-----|
| (class participation, activity, preparation, etc.) | |
| 1. Contact hours: | 65 |
| 2. Student's own work (self-study): | 93 |
| Total student's workload | 158 |
| ECTS points for module/course | 7.5 |
| Comments | |
| The content of classes (please enter topic words of specific classes divided into their didactic form and remember how it is translated to intended educational effects) | |
| Lectures (Total - 25 hours: 11 x 2 h and 1 x 1 h – the last lecture) Lecture 1. DNA, RNA, chromatin, chromosomes, karyotype. (2h) Lecture 2. The organization of human genome; mitochondrial genome. (2h) Lecture 3. Replication of DNA. Transcription and translation. (2h) Lecture 4. Regulation of gene expression with particular reference to eukaryotic organisms. (2 h) Lecture 5. The cell cycle and its regulation. Genetic determinants of the immune system functioning. (2 h) Lecture 6. DNA diversity, DNA mutations, DNA repair mechanisms, mutagens, the influence of medicines, chemicals, physical factors, and environmental pollution. (2 h) Lecture 7. Mechanisms of DNA repair. (2 h) Lecture 8. Selected human genetic diseases, particularly X-linked diseases (2 h) Lecture 9. Population genetics (2 h) Lecture 10. Basic methods of molecular biology and their applications (2h) Lecture 11. Fundamentals of genetic engineering and biotechnology; genetically modified organisms (GMOs) (2 h) Lecture 12. Basics of pharmacogenetics (1 h) | |
| Seminars (25 hours: 8 x 3 h and 1 x 1 h – the last seminar) • Seminar 1. (week 1 or 6) ATTENTION! Groups starting the semester with parasitology write the colloquium – worms in the 6 th week (seminar 1). Transmission Genetics. Organization of classes. Health and safety rules. Internal regulations and syllabus. Basic concepts and definitions of genetics. Mendelian genetics. Mendel's Laws of inheritance (monohybrid, dihybrid crosses); test cross. Incomplete dominance, codominance, multiple alleles, lethal genes, gene interactions, pleiotropy. • Seminar 2. (week 2 or 7) Transmission Genetics. Extrachromosomal inheritance. Cell life cycle, mitosis, and meiosis. Human gametogenesis (oogenesis and spermatogenesis). • Seminar 3. (week 3 or 7) Transmission Genetics. Morgan's chromosome theory of heredity. Complete and incomplete linkage of genes. X-linked genes. Sex determination. Lyon hypothesis and Barr body – definition, mechanism of X chromosome inactivation. • Seminar 4. (week 4 or 9) Colloquium – transmission genetics. Molecular Genetics. Nucleic acids – types and functions. Structure of the eukaryotic genome – the levels of chromatin condensation. Replication of DNA. • Seminar 5. (week 5 or 10) Molecular Genetics. The genetic code (features and examples of exceptions). Gene expression in prokaryotes and eukaryotes: Transcription and enzymes participating in the steps of the process. • Seminar 6. (week 6 or 11) | |



Molecular Genetics. Gene expression in prokaryotes and eukaryotes: Translation and enzymes participating in the steps of the process. The control of gene expression in prokaryotes. Operon Theory (lactose operon, glucose catabolite repression; tryptophan operon, attenuation).

• **Seminar 7.** (week 7 or 12)

Colloquium – molecular genetics. **Human genetics.** Mutations – definition, types of mutations (point mutations, structural aberrations, numerical aberrations). Consequences of point mutations. Inheritance of diseases caused by point mutations: single-gene disorders – dominant (Huntington's chorea, Alzheimer's syndrome, achondroplasia, polydactyly, syndactyly, brachydactyly, camptodactyly, Recklinghausen disease, Marfan's syndrome, Ehlers-Danlos syndrome) and recessive (phenylketonuria, alkaptonuria, albinism, cystic fibrosis, galactosemia, mucopolysaccharidosis, lipidosis, glycogenosis, hemoglobinopathies).

• **Seminar 8.** (week 8 or 13)

Human genetics. Diseases caused by chromosomal numerical mutations (Down syndrome, Edwards syndrome, Patau syndrome, Klinefelter's syndrome, Turner syndrome) and chromosomal structural mutations (Wolf-Hirschhorn syndrome, Cri-du-chat syndrome, Prader-Willi syndrome, Angelman syndrome, Philadelphia chromosome).

• **Seminar 9.** (week 14)

Colloquium - human genetics (for groups ending the semester with a genetics) or **Colloquium** - worms (for groups ending the semester with parasitology). **Completion of the course.**

Practical classes (15 hours: 5 x 3 h)

Parasitology course content: life cycles, geographical distribution, diagnosis and diagnostic features of the parasites' developmental forms, symptoms of diseases caused by the parasites, pathogenicity, epidemiology, prevention of human parasites infection.

• **Practical 1.** (week 1 or 9)

ATTENTION! groups starting the semester with genetics write in the 9th week (practical 1) the colloquium - human genetics)

Parasitic protozoa – Flagellates: *Trichomonas vaginalis*, *Giardia intestinalis*, *Trypanosoma brucei gambiense*, *Leishmania infantum*, *L. donovani*, *L. tropica*

• **Practical 2.** (week 2 or 10)

Parasitic protozoa – Amoebae: *Entamoeba histolytica/dispar*, *Acanthamoeba castellanii*, *Naegleria fowleri*;
Apicomplexans: *Plasmodium spp.*, *Toxoplasma gondii*, *Cryptosporidium parvum*

• **Practical 3.** (week 3 or 11)

Parasitic worms – Trematoda: *Fasciola hepatica*, *Dicrocoelium dendriticum*, *Schistosoma spp.*, *Paragonimus westermani*, *Clonorchis sinensis*

• **Practical 4.** (week 4 or 12)

Parasitic worms – Cestoda: *Diphyllobothrium latum*, *Taenia saginata*, *Taenia solium*, *Echinococcus granulosus*, *Echinococcus multilocularis*, *Hymenolepis nana*

• **Practical 5.** (week 5 or 13)

Parasitic worms – Nematoda: *Ascaris lumbricoides hominis*, *Enterobius vermicularis*, *Trichuris trichiura*, *Trichinella spiralis*, *Toxocara canis*, *Loa loa*, *Strongyloides stercoralis*

ATTENTION! Groups ending the semester with parasitological part write in the 14th week the colloquium - worms)

Other ---

Literatura podstawowa: (wymienić wg istotności, nie więcej niż 3 pozycje)

1. Cisowska A., Hendrich A., Kicia M., Leszczyński P., Szydłowiec M., Tichaczek-Goska D., Wesółowska M., Wojnicz D. "Medical Biology for students of Medicine and Dentistry English Division", Wrocław Medical



University, Wrocław, 2019

2. Bogitsch B.J., Carter C., Oeltmann T „Human parasitology“ 5th edition, Academic Press 2018
3. Klug WS, Cummings MR, Spencer ChA, Palladino, Killian D “Concepts of genetics”, 12th edition, Pearson, 2019.

Literatura uzupełniająca i inne pomoce: (nie więcej niż 3 pozycje)

1. McLennan A.G., Bates A.D., Turner P.C., White M.R.H.: BIOS Instant notes: Molecular Biology. Garland Science, NY & London, 2013
2. Tobias E.S, Connor M., Ferguson-Smith M. “Essential medical genetics” 6th edition, Wiley-Blackwell, 2011
3. Campbell NA, Reece JB, Cain ML et al. Biology. A global approach. Pearson, 2016 (11th edition)

Didactic resources requirements (e.g. laboratory, multimedia projector, other...)

Classroom equipped with multimedia, microscopes. Lecture hall equipped with multimedia.

Preliminary conditions (minimum requirements to be met by the student before starting the module/course)

Knowledge of genetics and parasitology at the high school level.

Conditions to receive credit for the course (specify the form and conditions of receiving credit for classes included in the module/course, admission terms to final theoretical or practical examination, its form and requirements to be met by the student to pass it and criteria for specific grades)

Passing 5 partial tests (transmission genetics, molecular genetics, human genetics, protozoa, helminths) allows for getting credit and enter the final exam. **The attendance at all classes in accordance with the study regulations.** The percentage criteria for passing partial tests are identical to the examination criteria. **A student can be exempted from the final exam with a very good grade (5.0) in two cases:** 1) when obtains an average of at least 4.75 from all (5) partial tests; or 2) when a student fails the colloquium once but receives a very good grade (5.0) from the re-take of this colloquium and very good grades (5.0) from each of the other four colloquiums.

In the absence of a student resulting e.g. the disease, because of another important reason (justified by the sick leave, or other official document), the student is obliged to make up abandoned classes preparing a presentation or essay in electronic form on a topic given by the teacher covering abandoned classes, or participating in the classes of another group - if possible, and after obtaining the teacher's permission. In case of cancellation of classes for reasons beyond the control of students, e.g. Rector's Day, Dean's hours, etc., at the students' request, the classes will be conducted at another time agreed with the person conducting the classes.

The exam takes the form of a test (single choice) in the field of genetics (lectures and seminars). **The final mark of the subject** is the sum of points obtained during the exam (max. 80) and points obtained after converting grades from tests in parasitology during the semester (max. 20).

| Grade: | Criteria for course |
|-------------------------|---------------------|
| Very Good (5.0) | 92-100% |
| Good Plus (4.5) | 84-91% |
| Good (4.0) | 76-83% |
| Satisfactory Plus (3.5) | 68-75% |
| Satisfactory (3.0) | 60-67% |
| Grade: | Criteria for exam |
| Very Good (5.0) | 92-100% |



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|-------------------------|--------|
| Good Plus (4.5) | 84-91% |
| Good (4.0) | 76-83% |
| Satisfactory Plus (3.5) | 68-75% |
| Satisfactory (3.0) | 60-67% |

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|--------------------------------------|--|
| Name of unit teaching course: | Department of Biology and Medical Parasitology |
| Address | Mikulicza-Radeckiego 9, 50-345 Wrocław |
| Phone | 71 784 15 12 (secretariat) |
| E-mail | malgorzata.pekalska-cisek@umed.wroc.pl |

| | |
|---------------------------------------|--|
| Person responsible for course: | Prof. dr hab. Andrzej Hendrich |
| Phone | 71 784 15 12 (secretariat); 71 784 15 11 |
| E-mail | andrzej.hendrich@umed.wroc.pl |

| <i>List of persons conducting specific classes:</i> | <i>degree/scientific or professional title</i> | <i>Discipline</i> | <i>Performer profession</i> | <i>Form of classes</i> |
|---|--|-------------------|-----------------------------|------------------------|
| Andrzej Hendrich | prof. dr hab. | medical sciences | academic teacher | L |
| Dorota Wojnicz | dr hab. | medical sciences | academic teacher | S |
| Agnieszka Cisowska | dr | medical sciences | academic teacher | S, MC |
| Maria Wesolowska | dr | medical sciences | academic teacher | MC |
| Dorota Tichaczek-Goska | dr | medical sciences | academic teacher | S |
| Magdalena Szydłowicz | dr | medical sciences | academic teacher | S |
| Przemysław Leszczyński | mgr | medical sciences | academic teacher | S |

Date of Syllabus development

27.05.2020

Syllabus developed by

Dr Dorota Tichaczek-Goska

Signature of Faculty Dean


prof. Beata Sobieszczak

Signature of Head of teaching unit

Uniwersytet Medyczny we Wrocławiu
KATEDRA ANATOMII I BIOLOGII
I PARazyTOLOGII LECZNICZEJ
Kierownik

prof. dr hab. Andrzej Hendrich