Name of the Faculty	School of Medicine in English UJ CM
Name of the unit responsible for training	Department of Molecular Biology and Clinical Genetics UJ CM
Name of module	Genetics with elements of Molecular Biology
Module code	
Language of training	English
Training effects for the module	The aim of the module is to introduce the basics of genetics and molecular biology in the dimension necessary to learn about a subject according to current standards of basic content group for the study of medical direction in the following **areas:** - Biological and molecular basis of inheritance, the ability of testing and modifying genetically determined characteristics, and available tools for this purpose, the basic concepts of medical genetics, genetic diagnosis, patterns of inheritance and the relationship between genetic and phenotypic traits - Students identify the sources and the need to systematically amend and update the knowledge in this field, - Development of students' critical approach to new concepts in the field of genetics and molecular medicine, to develop the student's ability to formulate their own opinions based on independent analysis of the literature data After completing the course the student In term of the knowledge: - Knows the concepts of cell cycle and regulation of gene expression - Have a basic understanding of stem cells and their use in medicine - Knows the basic concepts of genetics - Describes the phenomenon of feedback and interaction of genes - Knows what the normal human karyotype is, and the most common chromosomal disorders - Describes the molecular mechanisms of mutagenesis - Knows the rules of inheritance of quantitative and qualitative traits, independent inheritance of traits and inheritance of extra nucleus genetic information - Know the factors affecting the primary and secondary balance of population genetic - Knows the basics of diagnosis and chromosomal gene mutations responsible for inherited and acquired diseases, including cancer - Outlines the benefits and risks of the presence in the ecosystem of genetically modified organisms (GMOs) - Know the genetic mechanisms for the acquisition of drug resistance by microorganisms and cancer cells in the terms of skills is able to: - provide a family inheritance of traits in a lineage - identify patterns of inheritance - calculate the theoretical risk characteristics occur based on patterns of inheritance and genetic crosses - interpret the genetics' association factors, the odds ratio and relative risk - interpret the result of targeted research in the direction of mutation and molecular studies based on genetic linkage in the terms of social competence: - Is familiar with the general IT resources in the field of molecular biology and genetics - Acting in the group is able to find information, plan, and then perform an action related to the diagnosis of genetic - Is aware of the knowledge and the need for continuous updates on

	the basics of genetics and molecular biology
Type of module (mandatory/facultative)	mandatory
Year of studies	1-6
Semester	2
Name of the person leading the module	Prof. Marek Sanak,
Name of the person examining or person granting the credit	
Realization	Activities requiring direct participation of academic and student teacher
Prerequisites and additional needs	
Type and number of hours of classes that require direct participation of the academic teacher and students when such activities are provided for such module	Lectures – 18 h Seminaries – 9 h Lab exercises – 3 h
Number of ECTS	2
Balance of ECTS	Participation in classes – 30 hours - self-refer to the prescribed IT resources in molecular biology and genetics - 5 h - self-preparation conceptual of selected molecular diagnostic techniques for mutation - 10 h - a review of published original research in the field covered by the subject matter of practical exercises - 10 h **Total 55 hours of students' work**
Didactic methods applied	Lecture begins with an introduction of the terms used in genetics, such as genes, gene, genotype, phenotype; is explaining the functional structure of the human genome, flow organization of genetic information. These topics are based on the teaching of design and nucleic acid metabolism in the Framework of biochemistry. Seminars discussing complex (from molecular techniques to clinically relevant phenotypes) four groups of subjects (analysis of cell cycle gene expression, phenotype-genotype correlation, lineage and population analyses). At the seminars are discussed topics related to phenotypic and genotypic diagnosis of the most common human diseases, congenital diseases prevention and control of the cell cycle in the context of cell differentiation and carcinogenesis. Subjects of genetic engineering are related to genetically modified food and biological therapy using recombinant molecules. Classes are conducted in the Department of Molecular Biology and Clinical Genetics and include handwritten performed by students procedures related to the determination of the genotype.
Methods for testing and evaluation criteria of learning outcomes achieved by students	Students will be assessed on the basis of participation and activity in the classroom, preparing individual tasks and team tasks. Additional criteria for evaluation is to adapt to requirements of their execution, as defined by the teacher. Individual task: Each student will develop individually chosen by them positions of the original literature on the diagnosis of monogenic diseases. In the study, will be crucial for the discussion of the task team, the study used molecular techniques. Team task: Student teams will develop on the basis of previously presented web resources issue of molecular diagnostics of the selected monogenic diseases. This will require the preparation of a concept for the selection of the molecular techniques. Assessment the performance of individual and team tasks will be made during the exercise by the teacher, and forms the basis for discussion in seminars.
The form and the conditions for completion of the module, including the rules of admission to the exam, and the form and conditions for completion of the various activities within the scope of the module	To be allowed to pass is the presence and active participation in all exercises and seminars. Assesment test 50 single-choice questions (10% of the questions require mathematical calculations). A positive rating after receiving 60% of correct answers. Assesment in the second term in an oral form.

Training module content	1.The organization of the genome of eukaryotic organisms. The structure of the human genome, chromosome structure and techniques of the study. The most common chromosomal mutations and their clinical implications. 2. Techniques for the study of nucleic acid sequences and its volatility, sequencing and the polymerase chain reaction in real time, restriction enzymes and hybridization techniques, genetic maps. Genetic probes. 3.Mitochondrial genome and its variations. Population genetic variation and methods of its research. Segregation of genetic markers. Genetic equilibrium. 4. Basic models of inheritance and their typical characteristics. Reasons of recessiveness or dominance genetic characteristics. The correlation of genotype-phenotype for example of cystic fibrosis and osteogenesis imperfecta. 5.Symbols used in lineage. Inactivation of the X chromosome and genetic stigmatization. 6. Methods for the analysis of gene expression. Investigation of mRNA. Mutations in somatic cells. Loss of heterozygosity of tumor suppressor genes. Experimental models of gene expression studies. 7. Model threshold of multifactorial inheritance. Primary and intermediate phenotypes. Screening and preventive interventions for increased genetic susceptibility. 8. Basic math calculation in genetics. Testing a genetic equilibrium, genetic linkage and association. The methods of calculation. 9. Examples of the analysis from molecular techniques to clinically relevant phenotypes: the cell cycle, gene expression, phenotype-genotype correlation, pedigree analysis and population.
Basic and supplementary bibliography to complete the module	see booklist
Amount of hours, principles and form of apprenticeship, when the training program provides practice	