Module name	**Genetics with elements of human genetics**
Module code	**B-BM.068Eng**
ISCED code	0511: Biology
Study cycle	*I°*
Semester	winter
Responsible for this module	Monika Janczarek Department of Industrial and Environmental Microbiology email: mon.jan@poczta.umcs.lublin.pl
Language of instruction	English
Website	
Prerequisites	Microbiology -basic course
ECTS	5
ECTS points hour equivalents	Contact hours (work with an academic teacher) – 60 - lectures: …30 - labs: ……30 Non-contact hours (students' own work) – 65 - preparation for the exam: 25 - preparation for labs: ……25….. - literature study: ……15 **Total number of ECTS points for the module - 5**
Learning outcomes verification methods	lecture -written exam laboratory classes - written tests
Course full description	Course description: The module covers the knowledge of principles of genetics in prokaryotes and eukaryotes, including humans, at the level of molecules, cells, and multicellular organisms. Topics include Mendelian and non-Mendelian inheritance; mechanisms involved in genetic inheritance; human genetic syndromes; structure and function of DNA, chromosomes, and genomes; organization of prokaryotic and eukaryotic genomes; DNA replication, recombination and repair; transcription and regulation of gene expression; mutations and mutagenesis and their effects on gene expression. Upon completion of the course, the student should: know rules of Mendelian genetics; the terminology and knowledge related to organization of prokaryotic and eukaryotic genomes and molecular processes engaged in inheritance; define basic genetic concepts and assign them to specified biological processes; describe the most important mechanisms involved in genetic inheritance and gene expression with the use of basic terminology; use the acquired knowledge of genetics to discuss the phenomena of inheritance and variability of organisms; know basic genetic techniques for

	analyzing genomes of various organisms, including human; understand significance of genetics and possibility of using these data in medicine and human diagnostics. Lecture includes the following issues: 1. the most important genetic terms (dominance, codominance, incomplete dominance, pleiotropy, gene, open reading frame, multiple alleles, lethal alleles, genotype, phenotype, cumulative traits, epistasis); 2. organization of prokaryotic and eukaryotic genomes; division of genetic material in prokaryotic and eukaryotic cells; 3. structure of chromosomes; inheritance of genes related and not related with sex; sex determination in various organisms; 4. human genome structure; 5.pedigree analysis; trait inheritance in humans; genetic syndromes; construction of chromosomal maps; 6. physicochemical properties and topology of DNA; genetic and physical mapping; 7. molecular mechanisms of DNA replication,; replication models and proteins engaged in this process; 8. functional organization of prokaryotic and eukaryotic genes; genetic code; transcription and translation, regulation of gene expression; structure and function of promoters in transcription; 9. Changeability of organisms and their genomes; spontaneous mutations and mutagenesis; mobile DNA; genetic polymorphism; kancerogenic physical and chemical factors; molecular techniques of human syndrome diagnosis 10. horizontal gene transfer; bacterial plasmids; conjugation, transformation, and transduction; restriction and modification systems. Laboratory classes include the following issues: 1. Mendelian and non-Mendelian genetics; 2. DNA structure, replication and biological function; 3. Organization of Prokaryota and Eukaryota genomes; elements of cytogenetics; division of genetic materials in prokaryotic and eukaryotic cells; meiosis, ploidy and gamete formation;

	4. Chromosomes –structure and function, karyotypes and mitosis; cell division disturbances; linkage, crossing over and gene mapping; structure of human genome; 5. Human pedigree analysis; chromosomal syndromes; 6. Mechanisms of horizontal gene transfer; bacterial plasmids; conjugation and transformation; application of plasmids in genetic studies; 7. Mutations and mutagenesis, analysis of mutants in the context of gene function; genetic polymorphism; 8. Molecular mechanisms of regulation of bacterial gene expression; analysis of bacterial genome: plasmid and chromosomal DNA isolation and gel electrophoresis 9. Restriction and modification systems: DNA digestion using restrictases, SNP genotyping using PCR-RFLP technique 10. Techniques of molecular diagnosis with the use of PCR reactions.
Bibliography	1. T.A. Brown, Genomes 2, 2002 2. J.E. Krebs, E.S. Goldstein, S.T. Kilpatrick, Lewin. Genes XI, 2014 3. Hartwell, Hood, Goldberg, Reynolds, Silver, Veres. Genetics: From Genes to Genomes, 2012
Learning outcomes	KNOWLEDGE: W1. Recognises basic genetic processes occurring in living organisms at the molecular, cellular, and organism level W2.Describes the relationships between organisms and the environment, and the influence of the environment on genomes of various organisms W3. Knows basic notions and terminology used in genetics W4. Understands the possibilities of practical applications of genetic knowledge W5 Describes genetic experiments explaining processes occurring in living organisms SKILLS: U1. Uses basic laboratory apparatus and equipment applied in genetic studies U2. Performs simple laboratory experiments for

	genetic analyses of Procaryotic and Eucaryotic genomes U3.Applies information techniques for description and interpretation of biological processes U4. Draws correct conclusions from conducted experiments and observations U5. Uses biological and genetic terminology in scientific discussions SOCIAL COMPETENCE: K1. Apples the obtained knowledge to solving various genetic problems by utilizing critical thinking, and data analyzing K2. Improve his/her knowledge of practical use of genetics achievements in diagnosis of human disorders K3. Improve his/her knowledge of ethical problems related with manipulation of genetic material K4. Understands the need for systematic enlargement of scientific achivement K5. Adopts an active attitude towards acquisition, extension, and updating biological knowledge K6. Acknowledges responsibility for own and others safety and safety of the environment during experimental work with apparatus, chemicals, and biological material
Practice	…-….
Teaching methods	Multimedia presentations, experiments, description, data analysis and discussion