

Module name	Genetics - a basic course
Module code	B-BT.015E
ISCED code	0511: Biology
Study cycle	I ^o
Semester	winter
Responsible for this module	Prof. dr hab. Monika Janczarek Department of Genetics and Microbiology e-mail: mon.jan@poczta.umcs.lublin.pl
Language of instruction	English
Website	
Prerequisites	Microbiology course
ECTS	6.5
ECTS points hour equivalents	<p>Contact hours (work with an academic teacher) – 75 h</p> <ul style="list-style-type: none"> - lectures: 30 h - labs: 45 h - conversations with academic teachers: 20 h <p>Total number of hours with an academic teacher 95</p> <p>Number of ECTS points with an academic teacher 3.5</p> <p>Non-contact hours (students' own work) - 90 h</p> <ul style="list-style-type: none"> - preparation for the exam: 40 h - preparation for labs: 35 h - literature study: 15 h <p>Total number of ECTS points for the module – 6.5</p>
Learning outcomes verification methods	<p>lecture -written exam</p> <p>laboratory classes - written tests</p>
Course full description	<p>The module covers the knowledge of the basic principles of genetics in prokaryotes and eukaryotes at the level of molecules, cells, and multicellular organisms. Topics include Mendelian and non-Mendelian inheritance, structure and function of DNA, chromosomes, and genomes; DNA replication, recombination and repair; gene expression; mutations and mutagenesis.</p> <p>Lecture includes the following issues:</p> <ol style="list-style-type: none"> 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

	<p>determination in various organisms;</p> <ol style="list-style-type: none"> pedigree analysis; trait inheritance in humans; genetic syndromes in humans; construction of chromosomal maps; physicochemical properties and topology of DNA; genetic and physical mapping; replication of DNA; replication origin and terminus; primosome, replisome and other associated proteins involved in replication; functional organization of prokaryotic and eukaryotic genes; genetic code; transcription and translation, regulation of gene expression; structure and function of promoters in transcription; mutations and mutagenesis; mobile DNA; genetic polymorphism; techniques of molecular diagnosis horizontal gene transfer; bacterial plasmids; conjugation, transformation, and transduction; restriction and modification systems. <p>Laboratory classes include the following issues:</p> <ol style="list-style-type: none"> Mendelian genetics and probability; Non-Mendelian genetics; DNA structure, function and replication; Division of genetic materials in prokaryotic and eukaryotic cells; meiosis, ploidy and gamete formation; Organization of genomes in Prokaryota and Eukaryota; elements of cytogenetics; Chromosomes –structure and function, karyotypes and mitosis; cell division disturbances; Human pedigree analysis; chromosomal mutations; chromosomal syndromes; Linkage, crossing over and gene mapping; Mechanisms of horizontal gene transfer; bacterial plasmids; Conjugation and transformation; application of plasmids in genetic studies; Barriers of horizontal gene transfer; restriction and modification systems and CRISPR; Mutations and mutagenesis, analysis of mutants in the context of gene function; genetic polymorphism; Techniques of molecular diagnosis with the use of PCR reactions and PCR-RFLP; Molecular mechanisms of regulation of bacterial
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	gene expression on the basis of lactose tryptophan operons.
Bibliography	<ol style="list-style-type: none"> 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	<p>KNOWLEDGE</p> <p>W1. Understanding of basic processes occurring in organisms on both molecular and cellular levels (K_W01)</p> <p>W2. Know possibility of practical use of genetic achievements in medicine and animal and plant cultivation (K_W07)</p> <p>W3. Use basic genetic techniques in studies of cellular processes in organisms and identification and characterization of genes (K_W11)</p> <p>SKILLS</p> <p>U1. Operate basic laboratory apparatus and equipment used in genetic studies (K_U01)</p> <p>U2. Perform basic laboratory experiments for analysis of genetic material of Procaryotes and Eucaryotes (K_U02, K_U04)</p> <p>U3. Draw correct conclusions from conducted experiments and observations (K_U07)</p> <p>U4. Use biological and genetic terminology in scientific discussions (K_U13)</p> <p>SOCIAL COMPETENCES</p> <p>K1. Applying the obtained knowledge to solving various genetic problems by utilizing critical thinking, and data analyzing (K_K01)</p> <p>K2. Having knowledge of practical use of genetics achievements in diagnosis of human disorders (K_K01)</p> <p>K3. Having knowledge of ethical problems related with manipulation of genetic material (K_K01)</p> <p>K4. Having knowledge of needs of systematic enlargement of scientific achievement (K_K01, K_K02)</p>
Practice
Teaching methods	<p>Lecture: multimedia presentation, lecture</p> <p>Laboratory classes: conducting of experiments and assays, tasks, observation, multimedia presentation</p>