Module name	**Genetics - an extensive course**
Module code	B-B.018E
ISCED code	0511: Biology
Study cycle	I^{o}
Semester	summer
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	8.0
ECTS points hour equivalents	Contact hours (work with an academic teacher) Lectures – 30 hours; Laboratory – 60 hours Conversations and personal consultation with academic teachers - 20 hours Total number of hours with an academic teacher 110 Number of ECTS points with an academic teacher 4 Non-contact hours (students' own work) 110 preparation for laboratory classes and examination - 95 hours studying of literature - 15 hours Total number of non-contact hours 110 Number of ECTS points for non-contact hours 4 Total number of ECTS points for the module = 8
Learning outcomes verification methods	lecture -written exam laboratory classes - written tests
Course full description	The module covers the knowledge in the area of fundamental genetic definitions, structure, topology and replication of DNA, organization of prokaryotic and eukaryotic genomes, analysis and interpretation of inheritance results of linked and non-linked genes, inheritance of dominant and recessive autosomal and sex-linked diseases (Mendelian genetics), genetic control of transcription (function of promoters in initiation of transcription, transcription termination), organization and expression of prokaryotic genes and eukaryotic genes, mutations and mutagens, transposons, DNA repair systems, genetic

	recombination. Genetic terms and processes analysed include: 1.Structure, organization and function of prokaryotic and eukaryotic genomes. 2.Genetic polymorphism. 3.Mechanisms of replication and transcription and regulation of these processes. 4.Gene expression and regulation on transcriptional and postranscriptional levels. 5.Sex determination. Heredity of sex-linked and unlinked traits. 6.Mechanisms of horizontal gene transfer; bacterial plasmids, conjugation, transduction, and transformation. 7.Mutations and mutagenesis. 8. Mobilizable elements and their role in genome instability; DNA repair systems; techniques of molecular diagnostics. Lecture includes the following issues: 1. genetic terms (dominance, codominance, incomplete dominance, pleiotropy, gene, open reading frame, multiple alleles, lethal alleles, genotype, phenotype, cumulative traits, epistasis); 2. structure, organization and function of prokaryotic and eukaryotic genomes; division of genetic material in prokaryotic and eukaryotic cells; genetic polymorphism; 3. chromosomes - a structure and function in cells; heredity of sex-linked and unlinked traits; sex determination in various organisms; 4. pedigree analysis; trait inheritance in humans; genetic syndromes in humans; construction of chromosomal maps; 5. physicochemical properties and topology of DNA; genetic and physical mapping; 6. replication of DNA; replication origin and terminus; primosome, replisome and other associate proteins involved in replication; 7. functional organization of prokaryotic and eukaryotic genes; genetic code; transcription and translation; gene expression and regulation of these procrsses on transcriptional and postranscriptional levels; structure and function of promoters and terminators; 8. mutations and mutagenesis; mobile DNA; genetic polymorphism; techniques of molecular diagnosis 9. mechanisms of horizontal gene transfer; bacterial plasmids, conjugation, transduction, and transformation; restriction and modification and CRiSP systems. 10. mobilizable elements and their role in genome

	instability; DNA repair systems; techniques of molecular diagnostics. Laboratory classes include the following issues: 1. Mendelian genetics and probability; 2. Non-Mendelian genetics; 3. DNA structure, function and replication; 4. Division of genetic materials in prokaryotic and eukaryotic cells; meiosis, ploidy and gamete formation; 5. Sex determination; heredity of sex-linked and unlinked traits; 6. Organization of genomes in Prokaryota and Eukaryota; elements of cytogenetics; 7. Chromosomes –structure and function, karyotypes and mitosis; cell division disturbances; linkage, crossing over and gene mapping; 8. Human pedigree analysis; chromosomal mutations; chromosomal syndromes; 9. Mechanisms of horizontal gene transfer; bacterial plasmids; 10. Conjugation and transformation; application of plasmids in genetic studies; 11. Barriers of horizontal gene transfer; restriction and modification systems and CRISPR; 12. Mutations and mutagenesis, analysis of mutants in the context of gene function; genetic polymorphism; 13. Techniques of molecular diagnosis with the use of PCR reactions and PCR-RFLP; 14. Molecular mechanisms of regulation of bacterial gene expression on the basis of lactose tryptophan operons; catabolite repression; atenuation.
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 4. Bacterial disease mechanisms. An introduction to cellular microbiology. M. Wilson, R. McNab, B. Henderson. Cambridge University Press, Cambridge, 2002
Learning outcomes	**KNOWLEDGE** W1. Understanding of basic processes occurring in organisms on both molecular and cellular levels (K_W01) W2. Understanding of rules of bacterial and eukariotic cell heredity and functioning (K_W01) W3. Know possibility of practical use of genetic achievements in medicine and animal and plant cultivation (K_W07) W4. Use basic genetic techniques in studies of cellular

	processes in organisms and identification and characterization of genes (K_W11) **SKILLS** U1. Operate basic laboratory apparatus and equipment used in genetic studies (K_U01) U2. Perform basic laboratory experiments for analysis of genetic material of Procaryotes and Eucaryotes (K_U02, K_U04) U3. Draw correct conclusions from conducted experiments and observations (K_U07) U4. Use biological and genetic terminology in scientific discussions (K_U13) **SOCIAL COMPETENCES** K1. Applying the obtained knowledge to solving various genetic problems by utilizing critical thinking, and data analyzing (K_K01) K2. Having knowledge of practical use of genetics achievements in diagnosis of human disorders (K_K01) K3. Having knowledge of ethical problems related with manipulation of genetic material (K_K01) K4. Having knowledge of needs of systematic enlargement of scientiic achivement (K_K01, K_K02) K5. Having knowledge of phenotypic effects of genome variability and instability (K_K01, K_K02)
Practice	…….
Teaching methods	Lecture: multimedia presentation, lecture Laboratory classes: conducting of experiments and assays, tasks, observation, multimedia presentation