

**Course Syllabus****I. General Information**

Course name	Genetic engineering
Programme	BSc
Level of studies (BA, BSc, MA, MSc, long-cycle MA)	part-time
Form of studies (full-time, part-time)	Biological sciences
Discipline	English
Language of instruction	BSc

Course coordinator/person responsible	Dr Elżbieta Kochanowicz
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Type of class ( <i>use only the types mentioned below</i> )	Number of teaching hours	Semester	ECTS Points
lecture	15	IV	5
tutorial			
classes	30	IV	
laboratory classes			
workshops			
seminar			
introductory seminar			
foreign language classes			
practical placement			
field work			
diploma laboratory			
translation classes			
study visit			

Course pre-requisites	Knowledge of biochemistry and genetics. Ability of laboratory work
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**II. Course Objectives**

<ul style="list-style-type: none"> <li>• Presenting the principles of gene manipulation and its associated techniques to enable students to understand them.</li> <li>• Acquainting students with the methodologies of basic genetic engineering through their individual execution.</li> <li>• Forming skills of observation, asking questions, designing experiments, discuss the results and make proposals</li> <li>• Developing ability to use specific vocabulary and terms of genetic engineering</li> </ul>
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### III. Course learning outcomes with reference to programme learning outcomes

Symbol	Description of course learning outcome	Reference to programme learning outcome
<b>KNOWLEDGE</b>		
W_01	presents terminology used in genetic engineering,	K_W01
W_02	presents knowledge in the field of laboratory techniques and research tools used in genetic engineering	K_W05
W_03	presents knowledge in the field of genetics and molecular techniques of DNA recombination <i>in vitro</i> and describes their practical use, in particular in biotechnology	K_W06
W_04	presents the principles of health, safety work and ergonomics,	K_W09
<b>SKILLS</b>		
U_01	applies techniques and research tools in the field of genetic engineering	K_U01
U_02	carries out observations and performs parameter measurements during DNA analysis using simple laboratory equipment	K_U02
U_03	prepares a written study on issues related to genetic engineering using the scientific language	K_U13
U_04	designs and performs research tasks or expertise in the field of genetic engineering	K_U15
U_05	learns independently in a targeted manner in the field of genetic engineering, updates his knowledge and skills, applies new research techniques and plans his professional development	K_U17
<b>SOCIAL COMPETENCIES</b>		
K_01	shows appropriate habits necessary to work in a research laboratory, in particular under aseptic conditions and work with genetic material	K_K04

### IV. Course Content

#### Lecture:

Genomes, transkryptomes and proteomes. Different gene cloning strategies. Cloning vectors and their applications. Enzymes for DNA manipulation. Cutting and joining of DNA molecules. Polymerase chain reaction - principles, varieties, examples of applications. Methods for DNA sequencing. Assembles of adjacent sequences. Human genome sequencing project. Library of clones and their application, screening of the libraries by different methods. Labeling of DNA. Genetic and physical mapping of genomes. Determination of gene function. Changing genes: site-directed mutagenesis. Different methods for RNA analysis. Genetic engineering techniques of II and III generation. The use of genetic engineering in practice - genetically modified organisms. qPCR

#### Classes:

Methods of DNA isolation. Purification of plasmid DNA by alkaline lysis and chromatography. Comparing the purity of isolated DNA preparations obtained by different methods. Determining the efficiency of applied methods. Restriction enzymes. Digestion of isolated plasmid vectors to obtain a linear form. Construction of restriction maps. DNA agarose gel electrophoresis. DNA visualization and analysis Polymerase chain reaction. Implementation of PCR in temperature gradient. Site-

directed mutagenesis by PCR. Primers designing for PCR. Cloning of gene in the plasmid vector. Prepare the ends of the DNA for cloning. Ligation. Preparation of competent E.coli cells. Transformation of bacteria. Analysis of obtained transformants.

#### V. Didactic methods used and forms of assessment of learning outcomes

Symbol	Didactic methods (choose from the list)	Forms of assessment (choose from the list)	Documentation type (choose from the list)
<b>KNOWLEDGE</b>			
W_01, W_02 W_03 W_04	conventional lecture, laboratory analysis,	Written exam, test;	examination card; rated test/exam, protocol,
<b>SKILLS</b>			
U_01 U_02 U_03 U_04 U_05	Laboratory classes	observation; test of practical skills, report	Report printout, rating card
<b>SOCIAL COMPETENCIES</b>			
K_01	Laboratory classes	Test of practical skills, Report	Report printout, rating card

#### VI. Grading criteria, weighting factors.....

Mark	Evaluation criteria	
<b>Very good (5)</b>	the student realizes the assumed learning outcomes at a very good level	the student demonstrates knowledge of the education content at the level of 91-100%
<b>overgood (4.5)</b>	the student accomplishes the assumed learning outcomes an over good level	the student demonstrates knowledge of the education content at the level of 86-90 %
<b>Good (4)</b>	the student accomplishes the assumed learning outcomes at a good level	the student demonstrates knowledge of the education content at the level of 71-85%
<b>Quite good(3.5)</b>	the student accomplishes the assumed learning outcomes at a quite good level	the student demonstrates knowledge of the education content at the level of 66-70%
<b>sufficient (3)</b>	the student accomplishes the assumed learning outcomes at a sufficient level	the student demonstrates knowledge of the education content at the level of 51-64%

**VII. Student workload**

Form of activity	Number of hours
Number of contact hours (with the teacher)	45
Number of hours of individual student work	80

**VIII. Literature**

Basic literature
Brown, T.A. Genomes, PWN 2009
Additional literature
Primrose S.B./ Twyman R.M. Principles of gene manipulation and genomics, Blackwell Publishing