**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 |

| Type of class *(use only the types mentioned below)* | Number of teaching hours | Semester | ECTS Points |
|---|---|---|---|
| lecture | 15 ( remote) | IV | 5 ( 1 remote) |
| 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 |

## II. Course Objectives

- Presenting the principles of gene manipulation and its associated techniques to enable students to understand them.
- Acquainting students with the methodologies of basic genetic engineering through their individual execution.
- Forming skills of observation, asking questions, designing experiments, discuss the results and make proposals
- Developing ability to use specific vocabulary and terms of genetic engineering

## III. Course learning outcomes with reference to programme learning outcomes

| Symbol | Description of course learning outcome | Reference to programme learning outcome |
|---|---|---|
| KNOWLEDGE | | |
| 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 *in vitro* and describes their practical use, in particular in biotechnology | K_W06 |
| W_04 | presents the principles of health, safety work and ergonomics, | K_W09 |
| SKILLS | | |
| 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 |
| SOCIAL COMPETENCIES | | |
| 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 an 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)* |
|---|---|---|---|
| KNOWLEDGE | | | |
| W_01,<br>W_02<br>W_03<br>W_04 | conventional lecture,<br>laboratory analysis, | Written exam,<br>test; | examination card;<br>rated test/exam,<br>protocol, |
| SKILLS | | | |
| U_01<br>U_02<br>U_03<br>U_04<br>U_05 | Laboratory classes | observation; test of practical skills, report | Report printout, rating card |
| SOCIAL COMPETENCIES | | | |
| K_01 | Laboratory classes | Test of practical skills,<br>Report | Report printout, rating card |

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

| **Mark** | **Evaluation criteria** | |
|---|---|---|
| **Very good (5)** | 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% |
| **overgood (4.5)** | 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 % |
| **Good (4)** | 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% |
| **Quite good(3.5)** | 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% |
| **sufficient (3)** | 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 ( 15 remote) |
| Number of hours of individual student work | 80 ( 10 preparation for remote hours) |

## 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 |