

**KARTA PRZEDMIOTU****I. Dane podstawowe**

|  |  |
|--|--|
| Nazwa przedmiotu                               | Biologia molekularna   |
| Nazwa przedmiotu w języku angielskim           | Molecular biology  |
| Kierunek studiów                               | Biotechnologia   |
| Poziom studiów (I, II, jednolite magisterskie) | I  |
| Forma studiów (stacjonarne, niestacjonarne)    | stacjonarne  |
| Dyscyplina                                     | biologia   |
| Język wykładowy                                | Grupy w języku polskim – język polski<br>Grupy w języku angielskim – język angielski |

|   |                               |
|---|-------------------------------|
| Koordinator przedmiotu/osoba odpowiedzialna | Prof. dr hab. Ryszard Szyszka |
|---|-------------------------------|

| Forma zajęć ( <i>katalog zamknięty ze słownika</i> ) | Liczba godzin | Semestr | Punkty ECTS |
|--|---------------|---------|-------------|
| wykład   | 30            | IV      | 7           |
| konwersatorium                                       |               |         |             |
| ćwiczenia  | 45            | IV      |             |
| laboratorium   |               |         |             |
| warsztaty  |               |         |             |
| seminarium   |               |         |             |
| proseminarium  |               |         |             |
| lektorat   |               |         |             |
| praktyki   |               |         |             |
| zajęcia terenowe                                     |               |         |             |
| pracownia dyplomowa                                  |               |         |             |
| translatorium  |               |         |             |
| wizyta studyjna                                      |               |         |             |

|                   |   |
|-------------------|---|
| Wymagania wstępne | Laboratory techniques, biochemistry, microbiology |
|-------------------|---|

**II. Cele kształcenia dla przedmiotu**

|  |
|--|
| C1 - Theoretical acquaint students with selected techniques of modern molecular biology  |
| C2 - Practical implementation of selected techniques of molecular biology  |
| C3 - Development of skills in experiment designing, observation, asking questions and discussing the results.                            |
| C4 - The acquisition of skills in specific vocabulary of molecular biology   |
| C5 – To acquaint students with the most important processes in All living organisms (from viruses to vertebrates) at the molecular level |

### III. Efekty kształcenia dla przedmiotu wraz z odniesieniem do efektów kierunkowych

| Symbol                       | Opis efektu przedmiotowego   | Odniesienie do efektu kierunkowego |
|------------------------------|--|------------------------------------|
| <b>WIEDZA</b>                |  |                                    |
| W_01                         | The student knows and is able to present the stages of the processes of transcription and translation  | K_W01                              |
| W_02                         | The student can name and describe the basic techniques of molecular biology  | K_W06                              |
| W_03                         | Proposes the use of a suitable technique to achieve a particular result<br>Compare the different techniques that can be used to achieve one goal   | K_W07                              |
| W_04                         | presents the principles of health, safety work and ergonomics  | K_W09                              |
| <b>UMIEJĘTNOŚCI</b>          |  |                                    |
| U_01                         | The student can independently carry out basic experiments in molecular biology   | K_U01                              |
| U_02                         | The student is able to carry out gene expression in bacterial cells with the calculation of its performance<br>The student knows how to plan and execute an efficient purification of the expressed gene product | K_U05                              |
| U_03                         | learns independently in a targeted manner in the field of molecular biology<br>Student can check the activity of selected enzymes using radiometric techniques   | K_U07                              |
| <b>KOMPETENCJE SPOŁECZNE</b> |  |                                    |
| K_01                         | Openness to modern technologies used in biotechnology  | K_K01                              |
| K_02                         | Ability making their own arguments in relation to molecular techniques   | K_K02                              |
| K_03                         | possesses appropriate habits required to the work in scientific laboratories using molecular biology techniques, proceeds according to work safety regulations, knows about behavior in danger                   | K_K03                              |

### IV. Opis przedmiotu/ treści programowe

Lecture: DNA as genetic material. Definition of gene, structure of eukaryotic and prokaryotic genes. Organization of genetic material in pro- and eukaryotic cells. Changes in genome (transposition, conversion, rearrangement). DNA replication. Different mechanisms of genetic material amplification. Mutagenesis and DNA repair processes. Mechanisms of DNA recombination. Transcription. Structure and function of pro- and eukaryotic RNA polymerases, mechanisms of initiation, elongation and termination of transcription. Control of gene expression in eukaryotic and prokaryotic cells. Posttranscriptional modifications of RNA and their regulation. Translation. Genetic code, mechanisms of initiation, elongation and termination of translation as well as regulation of the processes. Protein transport in the cell. Transport mechanisms of proteins to specific localizations. Structure and function of heat shock protein (HSP). Proteolysis. External signal transmission at eukaryotic and prokaryotic organisms. Structure and functional basics of membrane and internal receptors. Proteins as molecular switch in signal cascades: G proteins and Ras protein, MAP kinase, protein p53, caspases. Molecular mechanisms in cell cycle.

Classes: Practical application of reporter genes. The properties, characteristics, and visualization of

selected genes. Cloning of the gene encoding the protein kinase. Overexpression of a kinase in a selected expression systems. Cell lysis and the purification of the gene product by liquid chromatography. Calculation of the efficiency of expression and purification. Checking the activity of a protein kinase using radiometric method. Determination of kinetic constants. Regulation of the enzyme activity by using selective inhibitors.

#### V. Metody realizacji i weryfikacji efektów kształcenia

| Symbol efektu                | Metody dydaktyczne<br>(lista wyboru) | Metody weryfikacji<br>(lista wyboru) | Sposoby dokumentacji<br>(lista wyboru)                       |
|------------------------------|--------------------------------------|--------------------------------------|--|
| <b>WIEDZA</b>                |                                      |                                      |  |
| W_01                         | Conventional lecture<br>Analysis     | exam<br>observation                  | Evaluated test,<br>Observation report                        |
| W_02                         | Conventional lecture<br>Analysis     | exam<br>observation                  | Evaluated test,<br>Observation report                        |
| W_03                         | Conventional lecture<br>Analysis     | exam<br>observation                  | Evaluated test,<br>Observation report                        |
| W_04                         | Analysis                             | observation                          | Observation report   |
| <b>UMIEJĘTNOŚCI</b>          |                                      |                                      |  |
| U_01                         | Classes                              | Presentation, written test           | presentation rating card/<br>file, Evaluated written<br>test |
| U_02                         | Classes                              | Presentation, written test           | presentation rating card/<br>file, Evaluated written<br>test |
| U_03                         | Classes                              | Presentation, written test           | presentation rating card/<br>file, Evaluated written<br>test |
| <b>KOMPETENCJE SPOŁECZNE</b> |                                      |                                      |  |
| K_01                         | Classes                              | Presentation, written test           | presentation rating card/<br>file, Evaluated written<br>test |

#### VI. Kryteria oceny, wagi

| 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 95-100% |
| <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 85-94 % |
| <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 75-84%  |

|                        |  |  |
|------------------------|--|--|
| <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 65-74% |
| <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. Obciążenie pracą studenta

|  |               |
|--|---------------|
| Forma aktywności studenta                  | Liczba godzin |
| Liczba godzin kontaktowych z nauczycielem  | 75            |
| Liczba godzin indywidualnej pracy studenta | 100           |

### VIII. Literatura

Grupy w języku polskim

|  |
|--|
| Literatura podstawowa  |
| Węgleński, P. Molecular genetics, PWN 2007   |
| Brown, T.A. Genomes, PWN 2009  |
| Biochemistry Eighth edition by Berg, Jeremy M., Tymoczko, John L., Gatto, Gregory J., Stryer (2015)  |
| Literatura uzupełniająca   |
| Alberts B., Johnson A., Lewis J., Raff M., Roberts K., Walter P., Molecular Biology of the Cell, New York: Garland Science 2008                        |
| Lodish H., Berk A., Kaiser C.A., Krieger M., Scott M.P., Bretscher A., Ploegh H., Matsudaira P., Molecular Cell Biology, W.H. Freeman Publishers, 2012 |

Grupy w języku angielskim

|   |
|---|
| Literatura podstawowa   |
| Allison, L.A. Podstawy biologii molekularnej, Wydawnictwo Uniwersytetu Warszawskiego 2009                                       |
| Berg, J.M., Tymoczko, J.L., Stryer, L.: Biochemia, PWN, 2009  |
| Turner P.C., McLennan A.G., Bates A.D., White M.R.H., Biologia Molekularna – krótkie wykłady, PWN, 2011                         |
| Literatura uzupełniająca  |
| Alberts B., Johnson A., Lewis J., Raff M., Roberts K., Walter P., Molecular Biology of the Cell, New York: Garland Science 2008 |