

(faculty stamp)

COURSE DESCRIPTION

Z1-PU7

WYDANIE N1

Strona 1 z 3

| 1. Course title: APPLIED MOLECULAR BIOLOGY | | 2. Course code | | |
|--|---|-----------------------------|------------------|----------------------------------|
| 3. Validity of course description: 2012/2013 | | | | |
| 4. Level of studies: 1st cycle of higher education | | | | |
| 5. Mode of studies: intramural studies | | | | |
| 6. Field of study: BIOTECHNOLOGY | | (FACULTY SYMBOL) RAU | | |
| 7. Profile of studies: general | | | | |
| 8. Programme: | | | | |
| 9. Semester: 4 | | | | |
| 10. Faculty teaching the course: | | | | |
| 11. Course instructor: | | | | |
| 12. Course classification: | | | | |
| 13. Course status: compulsory | | | | |
| 14. Language of instruction: English | | | | |
| 15. Pre-requisite qualifications: Before the course, students should know the differences between the biology of Prokaryotes and Eucaryotes, especially at the molecular cell biology and physiology levels. The structure of DNA and RNA in different groups of organisms, and basic processes such as transcription and translation, are necessary to apply for the course. Students should be familiar with basic cell biology, genetics, and engineering courses, with particular knowledge of gene and genome structures. | | | | |
| 16. Course objectives: The main aim of this course is to introduce students to modern and advanced techniques used for whole cell genome and proteome research. Based on the basic knowledge of prokaryotic and eukaryotic genome structures and functions, the applications of molecular biology and genetic engineering in the fields of diagnostic medicine, molecular cloning, and cancer cell biology will be taught. The new strategies of genome, transcriptome and proteome studies of different organisms, with computational analysis of global changes in gene expression and the use of nucleotide sequence analysis in medicinal diagnostics will be shown. The most important topics of this course are microarray methods and deep genome sequencing analysis for clinical applications. | | | | |
| 17. Description of learning outcomes: | | | | |
| Nr | Learning outcomes description | Method of assessment | Teaching methods | Learning outcomes reference code |
| 1. | knows how to analyze structures within the genome; knows how to retrieve sequence of a selected gene from the database and knows how to perform further, higher-order analysis | OS | WT, WM | K_W06 |
| 2. | knows how to perform a comparative analysis of the genome between various organisms | OS | WT, WM | K_W08, K_W09 |
| 3. | is familiar with the construction of various structures and cell components, their organization and functions, knows the techniques used for isolation of various cell components | OS | WT, WM | K_W08, K_W25 |
| 4. | has a basic knowledge of research methods based on DNA or RNA microarrays and sequencing of nucleic acids, including their applications in medical diagnostics | OS | WT, WM | K_W13, K_W15 |

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|----|---|----|--------|---------------------------|
| 5. | is able to design an experiment based on the Real-time PCR technology, in order to determine the level of gene expression | OS | WT, WM | K_U01, K_U10 |
| 6. | uses literature in a foreign language, online databases and bioinformatics tools in order to analyze gene sequences | OS | WT, WM | K_U04 |
| 7. | is able to find and analyze nucleotide sequences and associate them with molecular process also those concerning diseases | OS | WT, WM | K_U02, K_U03, K_U12 |
| 8. | acts independently and creatively | OS | WT, WM | K_K07 |
| 9 | is able to collaborate in a group on the use of known molecular techniques utilized in the medicine | OS | WT, WM | K_K02 |

18. Teaching modes and hours

Lecture / BA /MA Seminar / Class / Project / Laboratory

15

19. Syllabus description:

Semester :

Lectures outline:

Lecture 1: Examples of molecular biotechnology centers; most important expertise, methods and equipment of research laboratories. This section introduces modern strategies in an interdisciplinary scientific environment, based on the life sciences.

Lecture 2: Methods for biological data acquisition, storage and screening – improvement of informatics databases, websites, programmers, and tools. Development of bioinformatics sciences with the example of the Human and other Genome Projects (genome structure discovery).

Lecture 3: Gene structure of different organisms and transcription. In the second part of this lecture, the main advanced techniques for studying DNA/RNA structure and synthesis will be discussed.

Lecture 4 Transcription and translation processes; routine reactions in the lab environment will be introduced (RT-PCR reactions).

Lecture 5: DNA sequencing methods for molecular biology and genomics applications. The Human Genome Project as an example of methods with applications in the genomics industry, and a new strategy for modern research (gene sequencing).

Lecture 6: Gene expression using microarray assays. new methods for exploring functional aspects of information transfer.

20. Examination: semester ...

21. Primary sources:

. B.Alberts, A.Johnson, J.Lewis, M.Raff, K.Roberts, P.Walter: Molecular biology of the cell. (IV edition) Garland Science, 2002

DNA microarrays. Ed.D.Bowtell, J.Sambrook, CSHL Press, Cold Spring Harbor, 2003

R.J.Reece: Analysis of genes and genomes. John Wiley&Sons Ltd.

J. M. Berg, L. Stryer, J. L. Tymoczko: Biochemia , PWN, 2009

D.S.T. Nicholl: An introduction to genetic engineering, Cambridge University Press , 2008

22. Secondary sources:

P.C. Turner, A.G. McLennan, A.D. Bates, M.R.H. White: *Biologia molekularna. . Krótkie wykłady* (wyd. II), PWN, 2009

P.C. Winter, G.I. Hickey, H.L. Fletcher: *Genetyka. Krótkie wykłady* (wyd. II), PWN 2008

D. B. Hames, N. M. Hooper: *Biochemia. Krótkie wykłady* (wyd. II), PWN , 2009

M.L. DePamphilis, S.D. Bell: *Genome duplication* Garland Science, 2011

C. Howe: *Gene Cloning and Manipulation*. Cambridge University Press , 2007

23. Total workload required to achieve learning outcomes

| Lp. | Teaching mode : | Contact hours / Student workload hours |
|-----|-----------------------|--|
| 1 | Lecture | 15/15 |
| 2 | Classes | 0/0 |
| 3 | Laboratory | 0/0 |
| 4 | Project | 0/0 |
| 5 | BA/ MA Seminar | 0/0 |
| 6 | Other | 15/0 |
| | Total number of hours | 30/15 |

24. Total hours:45

25. Number of ECTS credits: 1

26. Number of ECTS credits allocated for contact hours: 1

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects):0

26. Comments:

Approved:

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(date, Instructor's signature)

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(date , the Director of the Faculty Unit signature)