SYLLABUS

Topic of the course	Molecular Biology: RNA and DNA - data source and place for improvements.
Institution where the course will take place	Institute of Bioorganic Chemistry Polish Academy of Sciences,
Language	English
Learning objectives	Ph.D. student: 1. will gain the knowledge regarding “RNA world” hypothesis 2. will acquire knowledge about specific features which distinguish DNA and RNA 3. will know which particular RNA features are responsible for RNA activity and why RNA undergoes different molecular processes 4. will get to know about DNA replication and RNA synthesis and maturation. 5. will get to know how to use DNA as a source of sequence data and how to use ddPCR (droplet digital PCR) to select a proper therapy for patients with advanced non-small-cell lung cancer (NSCLC). 6. will get to know about the molecular background of genetic diseases: Huntington disease, *Retinitis pigmentosa* (RP). 7. will get to know how to use modern NGS tools to analyse RNA expression on transcriptomic, post-transcriptional and degradome levels. 8. will get to know how to use CRISPR/Cas9 tool in the case of allopolyploid species. 9. by the end of the course the student should be able to (i) show differences between DNA and RNA (ii) explain RNA processing steps (iii) use ddPCR to find mutation and analyse gene expression (iv) perform DNA sequencing, carry-out transcriptome, small RNA and degradome libraries (v) perform PAREsnip2 analysis.
Type of the course	Obligatory lecture
Semester/Year	Summer semester 2021/2022
Name of the lecturer	Andrzej Pacak
Name of the examiner	Andrzej Pacak
Teaching methods	Lectures/Seminars with audio-visual techniques
Admission requirements	Knowledge about nucleic acids, computer skills and some knowledge about Ubuntu software. Student should be able to use English language at university level.

Number of ECTS points	4 ECTS
Number of lectures	30 h
Didactic methods	Lectures and discussions.
Methods of verification and assessment of learning outcomes	Written exam and individual discussion of the examination work.
Conditions of a positive evaluation	A passing grade of the exam.
Course content	This course contains information about molecular nature of DNA and RNA. Will show why nucleic acids undergo molecular processes. Will show how to us DNA to acquire information about sequence and potentially dangerous mutation. The course will provide detail information about preparation NGS (Next-Generation Sequencing) libraries and provide information how to use bioinformatical tools to show RNA-RNA interactions.
Literature and the course materials	1. Elliott, D., and Ladomery, M. (2017). Molecular biology of RNA. Oxford University Press. 2. RNA Control and Regulation, (Cold Spring Harbor Symposia on Quantitative Biology LXXXIV) (2019). 3. Berg, J.M., Stryer, L., Tymoczko, J.L., Gatto, G.J. (2018) Biochemia, PWN. 4. Bal, J. (2017) Genetyka medyczna i molekularna, PWN.