DESCRIPTION OF TRAINING PROGRAMME

FOT THE DOCTORAL SCHOOL AT THE KAZIMIERZ WIELKI UNIVERSITY

INFORMATION ON COURSE	
Course	**Current research issues**
Type of classes	specialist classes
Academic year	**2021/2022**
Field of science	natural sciences
Discipline of science	**biological sciences**
Class instructor	prof. dr hab. Joanna Moraczewska
Number of hours	**30**
Forme of classes	**lecture**
Pass rules	**examination**
Language of lecture	**English**
Framework learning outcomes (8 PRK)	• knows and understands the main trends in the development of the scientific or artistic disciplines covered in the curricula • knows and understands to such an extent that is possible to revise existing paradigms – world heritage, including theoretical foundations, general issues and selected specific issues – specific to a scientific or artistic discipline • is able to critically analyse and evaluate the results of scientific research, expertise and other creative work and their contribution to knowledge development • is ready for recognising the importance of knowledge in solving cognitive and practical problems

DETAILED DESCRIPTION OF CLASSES	
Particular learning outcomes	**Methods of verifications of learning outcomes**
• knows and understands the main trends in studies on actin and myosin molecular motors • knows and understands therapeutical applications of the basic knowledge on the mechanisms of contraction • knows and understands common motifs and differences of actin cytoskeleton structure and function in human, animal, plant and bacteria • knows and understands to such an extent that is possible to revise existing paradigms in the field of actin cytoskeleton biochemistry and structural biology • is able to critically analyse and evaluate the results of scientific research, expertise and other creative work and their contribution to development of knowledge in the field of actin cytoskeleton in health and disease • is ready for recognising the importance of knowledge on actin cytoskeleton in deciphering the mechanisms of physiological and disease process and in developing therapies.	• discussion of the lecture topics • discussion of the specific scientific problems that still need to be solved • solving quizzes by the student after completing thematic blocks • passing oral exam

<table>
<tr><th colspan="2">PROGRAM CONTENT IMPLEMENTED DURNING CLASSES</th></tr>
<tr><td colspan="2">

Current view of thin filament structure at near atomic level
New developments in the understanding of the structure of actin-myosin complex
Regulation of actin dynamics by actin-binding proteins
Biological role of posttranslational modifications of actin
The myosin family of mechanoenzymes – structure and functions of conventional and unconventional myosins
Mutations in sarcomeric proteins causing myopathies and cardiomyopathies
Myosin and tropomyosin as targets for therapeutical small molecules
Role of actin and myosin in the nucleus
Actin analogues in bacteria
Actin cytoskeleton in plants

</td></tr>
<tr><td>Didactic methods and eduactional techniques</td><td>Lecture with discussion, PowerPoint presentations.</td></tr>
<tr><td>Evaluation criteria</td><td>Minimum required to pass – 60%
60-67% - 3.0
68-75% - 3.5
76-83 % - 4.0
84-91% - 4.5
above 91% - 5.0</td></tr>
<tr><td>The form and conditions of passing (the form of verification of learning outcomes)</td><td>Oral exam. The student discusses 3 out of 5 topics selected by the examiner. Basic knowledge of 3 topics selected by the student is required.</td></tr>
<tr><td>Literature</td><td>

1. Das, S.; Ge, P.; Oztug Durer, Z.A.; Grintsevich, E.E.; Zhou, Z.H.; Reisler, E. D-loop Dynamics and Near-Atomic-Resolution Cryo-EM Structure of Phalloidin-Bound F-Actin. Structure 2020, 28, 586-593 e583, doi:10.1016/j.str.2020.04.004.
2. Grintsevich, E.E.; Ge, P.; Sawaya, M.R.; Yesilyurt, H.G.; Terman, J.R.; Zhou, Z.H.; Reisler, E. Catastrophic disassembly of actin filaments via Mical-mediated oxidation. Nat Commun 2017, 8, 2183, doi:10.1038/s41467-017-02357-8.
3. Bray, D. Chaotic actin. Genome Biol 2000, 1, REVIEWS108, doi:10.1186/gb-2000-1-1-reviews108.
4. Gayathri, P. Bacterial Actins and Their Interactors. Curr Top Microbiol Immunol 2017, 399, 221-242, doi:10.1007/82_2016_31.
5. Izore, T.; van den Ent, F. Bacterial Actins. Subcell Biochem 2017, 84, 245-266, doi:10.1007/978-3-319-53047-5_8.
6. Zang, J.; Kriechbaumer, V.; Wang, P. Plant cytoskeletons and the endoplasmic reticulum network organization. J Plant Physiol 2021, 264, 153473, doi:10.1016/j.jplph.2021.153473.
7. MacTaggart, B.; Kashina, A. Posttranslational modifications of the cytoskeleton. Cytoskeleton 2021, 78, 142-173, doi:10.1002/cm.21679.
8. Fili, N.; Toseland, C.P. Unconventional Myosins: How Regulation Meets Function. Int J Mol Sci 2019, 21, doi:10.3390/ijms21010067.
9. Houdusse, A. Biological nanomotors, driving forces of life. C R Biol 2021, 343, 53-78, doi:10.5802/crbiol.45.
10. Schmid, M.; Toepfer, C.N. Cardiac myosin super relaxation (SRX): a perspective on fundamental biology, human disease and therapeutics. Biol Open 2021, 10, doi:10.1242/bio.057646.
11. Tower-Rader, A.; Ramchand, J.; Nissen, S.E.; Desai, M.Y. Mavacamten: a novel small molecule modulator of beta-cardiac myosin for treatment of hypertrophic cardiomyopathy.

</td></tr>
</table>

Expert Opin Investig Drugs **2020**, *29*, 1171-1178, doi:10.1080/13543784.2020.1821361.
12. Trivedi, D.V.; Nag, S.; Spudich, A.; Ruppel, K.M.; Spudich, J.A. The Myosin Family of Mechanoenzymes: From Mechanisms to Therapeutic Approaches. *Annu Rev Biochem* **2020**, *89*, 667-693, doi:10.1146/annurev-biochem-011520-105234.
13. Manstein, D.J.; Preller, M. Small Molecule Effectors of Myosin Function. *Advances in experimental medicine and biology* **2020**, *1239*, 61-84, doi:10.1007/978-3-030-38062-5_5.
14. Doran, M.H.; Pavadai, E.; Rynkiewicz, M.J.; Walklate, J.; Bullitt, E.; Moore, J.R.; Regnier, M.; Geeves, M.A.; Lehman, W. Cryo-EM and Molecular Docking Shows Myosin Loop 4 Contacts Actin and Tropomyosin on Thin Filaments. *Biophys. J.* **2020**, *119*, 821-830, doi:10.1016/j.bpj.2020.07.006.
15. Risi, C.M.; Pepper, I.; Belknap, B.; Landim-Vieira, M.; White, H.D.; Dryden, K.; Pinto, J.R.; Chase, P.B.; Galkin, V.E. The structure of the native cardiac thin filament at systolic Ca(2+) levels. *Proceedings of the National Academy of Sciences of the United States of America* **2021**, *118*, doi:10.1073/pnas.2024288118.
16. Risi, C.; Schafer, L.U.; Belknap, B.; Pepper, I.; White, H.D.; Schroder, G.F.; Galkin, V.E. High-Resolution Cryo-EM Structure of the Cardiac Actomyosin Complex. *Structure* **2021**, *29*, 50-60 e54, doi:10.1016/j.str.2020.09.013.
17. Vedula, P.; Kashina, A. The makings of the 'actin code': regulation of actin's biological function at the amino acid and nucleotide level. *J Cell Sci* **2018**, *131*, doi:10.1242/jcs.215509.

*niepotrzebne skreślić