

(Table 5.2) Course unit description

|   |                      |   |                      |
|---|----------------------|---|----------------------|
| <b>Study program:</b> Physics   |                      |   |                      |
| <b>Type and level of studies:</b> Master studies  |                      |   |                      |
| <b>Course unit:</b> Molecular biophysics  |                      |   |                      |
| Teacher in charge: Sanja Janičević/Momir Arsenijević, assistant professors  |                      |   |                      |
| <b>Language of instruction:</b> English   |                      |   |                      |
| <b>ECTS:</b> 8  |                      |   |                      |
| <b>Prerequisites:</b> Basic knowledge of molecular physics  |                      |   |                      |
| <b>Semester:</b> Winter semester  |                      |   |                      |
| <b>Course unit objective</b><br>Familiarization with the molecular structure of the cell and modeling the cell from the standpoint of physics using mathematical and physical methods acquired during undergraduate academic studies, especially in the courses Molecular Physics and Classical Theoretical Physics.  |                      |   |                      |
| <b>Learning outcomes of Course unit</b><br>Gaining insight into certain mechanisms and physical laws that are of interest for understanding the functioning of the cell as the basic structural unit of living organisms.   |                      |   |                      |
| <b>Course unit contents</b><br><b>Theoretical instruction:</b><br>Structure of the cell: molecular aspect. Transport processes as fundamental mechanisms for the transfer of substances, energy, and information through the cell. Physical modeling of transport processes. Viscosity and Reynolds number. Brownian motion and the cell as an open system: thermodynamic and kinetic properties. The concept of osmosis and osmotic pressure. Molecular motors and their role in cell functioning.<br><b>Practical instruction:</b><br>Theoretical classes are accompanied by problem-solving exercises covering nearly all areas of the course. |                      |   |                      |
| <b>Literature</b><br>1. R. Phillips, J.Kondev, J. Theriot, N. Orme, Physical Biology of the Cell, Garland Science, 2013<br>2. P. Nelson, Biological Physics: Energy, Information, Life -W. H. Freeman, 2003<br>3. W. Bialek, Biophysics: Searching for Principles, Princeton University Press, 2012<br>4. K. Sneppen, G. Zocchi, Physics in Molecular Biology, Cambridge UP, 2005<br>5. W. Poon, D. Andelman, Soft Condensed Matter Physics in Molecular and Cell Biology, Taylor and Francis, 2006   |                      |   |                      |
| <b>Number of active teaching hours</b>  |                      |   | Other classes:       |
| Lectures:   | Practice:            | Other forms of classes:<br>mentoring system for small groups of students<br>30+30 |                      |
| Independent work:   |                      |   |                      |
| <b>Teaching methods</b><br>Lectures, consultations, problem-solving exercises with active student participation during class, tests and midterm exams throughout the year and active classroom discussions.   |                      |   |                      |
| <b>Examination methods (maximum 100 points)</b>   |                      |   |                      |
| <b>Exam prerequisites</b>   | <b>No. of points</b> | <b>Final exam</b>   | <b>No. of points</b> |
| Practical classes   |                      | Written examination   |                      |

| Tests                 |                      | Oral examination | 50                 |
|-----------------------|----------------------|------------------|--------------------|
| Homework              | 50                   | Other            |                    |
| Seminars              |                      |                  |                    |
| Project               |                      |                  |                    |
| <b>Grading system</b> |                      |                  |                    |
| <b>Grade</b>          | <b>No. of points</b> |                  | <b>Description</b> |
| 10                    | ≥ 91                 |                  | Excellent          |
| 9                     | 81-90                |                  | Exceptionally good |
| 8                     | 71-80                |                  | Very good          |
| 7                     | 61-70                |                  | Good               |
| 6                     | 51-60                |                  | Passing            |
| 5                     | ≤ 50                 |                  | Failing            |