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**COURSE UNIT (MODULE) DESCRIPTION**

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| **Course unit (module) title** | **Code** |
| **Biological data analysis** |  |

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| **Lecturer(s)** | **Department(s) where the course unit (module) is delivered** |
| **Coordinator:**  Aleksandras Voicikas  **Other(s):** | Vilnius University, Life sciences center, Department of Neurobiology and Biophysics |

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| **Study cycle** | **Type of the course unit (module)** |
| Full-time studies (2nd  stage) | Compulsory |

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| **Mode of delivery** | **Period when the course unit (module) is delivered** | **Language(s) of instruction** |
| Lectures, practice | 2nd semester | Lithuanian/English |

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| **Requirements for students** | |
| **Prerequisites:**  computer literacy, basic math | **Additional requirements (if any):** |

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| **Course (module) volume in credits** | **Total student’s workload** | **Contact hours** | **Self-study hours** |
| 5 credits | 133 hrs. | 64 hrs. (32hrs. Lectures, 32hrs. Practice) | 69 hrs. |

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| **Purpose of the course unit (module): programme competences to be developed** | | |
| * Ability to preprocess and visualize data * Ability to synthesize signals * Ability to search, find and understand documentation of related packages * Ability to write and test programs | | |
| **Learning outcomes of the course unit (module)** | **Teaching and learning methods** | **Assessment methods** |
| Will be able to preprocess and visualize data with python. | Lectures, practice | Exam or cumulative score from practice and seminars |

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| **Content: breakdown of the topics** | **Contact hours** | | | | | | | | **Self-study work: time and assignments** | |
| Lectures | Tutorials | Seminars | Exercises | Laboratory work | Internship/work placement | **Contact hours** | **Self-study hours** | | **Assignments** |
| **2nd semester** |  |  |  |  |  |  |  |  | | Rreading of research papers, solving assignments |
| 1. Introduction | 2 |  |  | 2 |  |  | **4** | **4** | |
| 2. Programming basics: variables, flow control, functions | 6 |  |  | 6 |  |  | **12** | **12** | |
| 3. Python basics. Documentation, IO, standard library | 6 |  |  | 6 |  |  | **12** | **12** | |
| 4. Data manipulation | 2 |  |  | 2 |  |  | **4** | **4** | |
| 5. Data visualizing | 4 |  |  | 4 |  |  | **8** | **8** | |
| 6. Testing, dealing with errors and code style | 2 |  |  | 2 |  |  | **4** | **9** | |
| 7. Advanced packages for data analysis (SciPy, Pandas, NumPy) | 6 |  |  | 6 |  |  | **12** | **12** | |
| 8. Advanced programming | 2 |  |  | 2 |  |  | **4** | **4** | |
| 9. Reproducible research, analysis presentation | 2 |  |  | 2 |  |  | **4** | **4** | |
| **Total** | **32** |  |  | **32** |  |  | **64** | **69** | |  |

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| **Assessment strategy** | **Weight,%** | **Deadline** | **Assessment criteria** |
| Interim assessment | 100 | Semester | Cumulative score: four assessments during the semester. Students will solve data analysis and programming exercises.  If cumulative score is lower then 5 students must take an exam. If cumulative score is 5 or more students can take an exam, in this case final score is the exam score.  Exam consists of theoretical and practical data analysis and programming questions and exercises. |

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| **Author** | **Year of publication** | **Title** | **Issue of a periodical**  **or volume of a publication** | **Publishing place and house**  **or web link** |
| **Compulsary reading** | | | | |
| Guido van Rossum | 2018 | Python 3.7.2 documentation |  | https://docs.python.org/3/tutorial/ |
|  | 2018 | SciPy Tutorial |  | https://docs.scipy.org/doc/scipy/reference/tutorial/ |
| Langtangen, Hans Petter | 2012 | A primer on scientific programming with python |  | Heidelberg: Sorubger, 2012. xxxii, 792 p. |
| **Optional reading** | | | | |
|  | 2018 | Python module for array visualization - Matplotlib user guide |  | http://matplotlib.org/contents.html |
|  | 2018 | Python module for arrays - NumPy Reference |  | http://docs.scipy.org/doc/numpy/reference/ |
|  | 2018 | Pandas documentation |  | pandas.pydata.org/pandas-docs/stable |
| Langtangen, Hans Petter | 2008 | Python scripting for computational science |  | Berlin; Heidelberg:Springer, 2008. XXIV, 750 p. |