UNIWERSYTET IM. ADAMA MICKIEWICZA W POZNANIU

Basic R programming for scientists

Educational subject description sheet

Basic information

Study programme Environmental Protection **Speciality** - **Organizational unit** Faculty of Biology **Study level** Second-cycle programme **Study form** Full-time **Education profile** General academic	**Didactic cycle** 2024/25 **Subject code** 01EVPS.21N.12949.24 **Lecture languages** English **Course type** Elective **Block** Subjects not assigned

Subject coordinator	Paweł Bogawski
Lecturer	Paweł Bogawski, Bartosz Łabiszak, Łukasz Grewling

Period	**Activities and hours**	**Number of ECTS points**
Semester 1	• Lecture: 6, Graded credit • Classes: 24, Graded credit	3

Goals

Code	Goal
C1	to learn basics of R syntax, objects, expressions
C2	how to import data to R and cleaning the data
C3	to learn how to manage the data using base R and some commands from dplyr package
C4	to perform simple calculations and statistical modelling on data frames
C5	to learn how to access different biological and climatic databases through R
C6	to learn how to automate repeating tasks, procedures using simple loops and functions
C7	to practice visualisation of the results using ggplot R package

Subject learning outcomes

Code	Outcomes in terms of	Learning outcomes	Examination methods
Knowledge – Student:			
W1	knows and is able to apply basic R syntax	EVP_K2_W01	Test
W2	is able to plan how to solve simple calculations tasks in R and how to use R to test biological and ecological hypotheses	EVP_K2_W01, EVP_K2_W04	Test
Skills – Student:			
U1	recognizes different data types in R such as vectors, matrices, lists, data frames, and also knows object classes such as numeric, logical, characters, factors; is able to import and export different data in R, for example excel file or files with different extensions (i.e. .csv, .txt, png, tif)	EVP_K2_U03	Report
U2	processes the data at basic level, is able to effectively clean the data, change formats, add and remove columns, do selections, joining tables and other activities connected with data processing; downloads data from Internet databases through R	EVP_K2_U01, EVP_K2_U02, EVP_K2_U03	Report
U3	is able to visualize the results using boxplots, barplots, scatterplots with custom modifications and explains how they work	EVP_K2_U03, EVP_K2_U05	Report
U4	is able to write simple functions shortening the code and automatically repeat simple calculations using loops	EVP_K2_U01, EVP_K2_U03	Report
Social competences – Student:			
K1	is able to search for the information in the Internet, critically assess its reliability and correctness and to use the existing code to extend and modify their own code needed to resolve the problem	EVP_K2_K01, EVP_K2_K05	Report

Study content

No.	Course content	Subject learning outcomes	Activities
1.	Learning of the basics of R syntax	W1, U1, U2	Lecture, Classes
2.	Import, export and data processing	U1, U2	Classes
3.	Performing simple calculations on data frames (among others); downloading the data from the Internet, from servers through R	U1, U2	Classes
4.	Writing simple functions and automation of tasks using loops	U2, U4	Classes
5.	Using the existing open code and information from the Internet for modification of their own code and for their own purposes	W2, U2, K1	Classes
6.	Visualization of the results and their interpretation, presenting the results in front of the group and discussion	W2, U2, U3, K1	Lecture, Classes

Additional information

Activities	Teaching and learning methods and activities
Lecture	Lecture with a multimedia presentation of selected issues, Conversation lecture, Discussion
Classes	Problem-based learning, Workshop method, Demonstration and observation, Work in groups, Solving calculation tasks, Solving practical tasks

Activities	Credit conditions
Lecture	To pass the lecture part the student has to obtain at least 50% of the total points on the final calculation test. Very good (5.0): 88-100% of points awarded for the test. good plus (4.5): 80-87.5% of points awarded for the test. good (4.0): 70-79.5% of points awarded for the test. satisfactory plus (3.5): 61-69.5% of points awarded for the test. satisfactory (3.0): 50-60.5% of points awarded for the test. unsatisfactory (2.0): <50% of points awarded for the test.
Classes	To pass the practical part the student has to prepare correct reports on at least 50% of tasks being solved during the classes and at least 50% of homework tasks. Very good (bdb; 5.0): excellent knowledge, skills and social competences Good plus (+db; 4.5): very good knowledge, skills and social competences Good (db; 4.0): good knowledge, skills and social competences Satisfactory plus (+dst; 3.5): satisfactory knowledge, skills and social competences, but with significant shortcomings Satisfactory (dst; 3.0): knowledge, skills and social competences with numerous errors Unsatisfactory (ndst; 2.0): unsatisfactory knowledge, skills and social competences

Literature

Obligatory

1. Wickham H. Çetinkaya-Rundel M., Grolemund G. R for Data Science. https://r4ds.hadley.nz/
2. Statistical tools for high-throughput data analysis: http://www.sthda.com/english
3. Other internet resources, for example Data Carpentry: https://datacarpentry.org/R-ecology-lesson/

Optional

1. Wickham H. Advanced R: https://adv-r.hadley.nz/

Calculation of ECTS points

Activities	**Activity hours***
Lecture	6
Classes	24
Preparation for classes	10
Report preparation	30
Reading the indicated literature	5
Preparation for the exam	15
Student workload	**Hours** 90
Number of ECTS points	**ECTS** 3

* academic hour = 45 minutes

Efekty uczenia się dla kierunku

Kod	Treść
EVP_K2_K01	The graduate is ready to critical assessment of received information on environmental protection as well as formulation of rational judgments on this subject
EVP_K2_K05	The graduate is ready to developing professional achivements, targeted training and self-improvement in relation to new scientific trends in environmental protection
EVP_K2_U01	The graduate can creatively use his/her knowledge in the field of environmental protection, i.e. search for, formulate and solve complex problems, conduct a critical analysis of information from various sources
EVP_K2_U02	The graduate can independently plan and conduct research as well as analyse the correctness of tasks performed and the reliability of the results obtained, and draw conclusions useful in environmental protection
EVP_K2_U03	The graduate can use the tools, methods and research techniques applied in laboratory and field work, especially for monitoring and assessment of the state of the environment
EVP_K2_U05	The graduate can conduct educational activities and disputes about environmental protecion, threats and biodiversity protection
EVP_K2_W01	The graduate knows and understands theories, processes, facts, and objects related to general knowledge about environmental protection and related sciences
EVP_K2_W04	The graduate knows and understands rules of practical use of theoretical knowledge in assessing the condition of terrestial environments and maintaining or restoring them to their proper condition