

**AGH**AGH UNIVERSITY OF SCIENCE
AND TECHNOLOGY

Code: UBPJO-228 Module name: R software

Academic year: 2017/2018 Semester: Fall ECTS credits: 4

Programme: Physics and Applied Computer Science

Course homepage: Lecture language: English

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Module summary

The course is meant as an introduction to R software. It will be divided into two parts: a) tutorial of the basic R functionality, b) development of the student's own projects.

Description of learning outcomes for module

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Method of learning outcomes verification (form of completion)
Social competence		
M_K001	Student can communicate the results of his work and discuss them.	Presentation
Skills		
M_U001	Student can write complete applications, using both own code and available third-party libraries.	Report, Project, Execution of laboratory classes
M_U002	A student can work as a part of a small team and can interact with his/her co-workers in appropriate and efficient manner.	Presentation, Project
Knowledge		
M_W002	Student gains knowledge on basic and intermediate-level topics related to the R language	Report, Project, Execution of laboratory classes, Activity during classes

FLO matrix in relation to forms of classes

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Form of classes										
		Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Others	E-learning
Social competence												
M_K001	Student can communicate the results of his work and discuss them.	-	-	-	+	-	-	-	-	-	-	-
Skills												
M_U001	Student can write complete applications, using both own code and available third-party libraries.	-	-	+	+	-	-	-	-	-	-	-
M_U002	A student can work as a part of a small team and can interact with his/her co-workers in appropriate and efficient manner.	-	-	-	+	-	-	-	-	-	-	-
Knowledge												
M_W002	Student gains knowledge on basic and intermediate-level topics related to the R language	-	-	+	+	-	-	-	-	-	-	-

Module content

Laboratory classes

Laboratory classes

The goal of the course is to provide students with an introduction to R software. R is a free, open-source environment designed for statistical computing and graphics. Supported by a huge worldwide community of users, it can be expanded with third-party libraries to supply specialized tools in a multitude of fields, including science, economy, engineering and others. During the laboratory classes, intensive tutorial of the basic R functionality will be given, with selected applications given as examples of usage.

Project classes

Project classes

The second part will be focused on developing the student's own projects (in teams of two), which will be presented at the end of the course. This presentation will include both a written report as well as a short oral presentation.

Method of calculating the final grade

The laboratory classes will not be graded; however, the "pass" mark will be given after fulfilling the

appropriate criteria. These include: a) presentation of the working code from each classes to the supervisor; b) two or three written reports summarising the problems analysed during the classes. Project grade will be assigned based on: a) final report (40%); b) oral presentation of the project's results (30%); c) the code of the final report (with documentation, 30%). The project grade will be calculated as a weighted mean of these, with weights given above. Final grade will be assigned based on project grade (90%) and activity during laboratory classes (10%). Passing the laboratory course is obligatory to receive a grade.

Prerequisites and additional requirements

- Previous knowledge of R is NOT required

Requirements:

- Knowledge of linear algebra
- Knowledge of basic statistics
- Knowledge of procedural programming language is strongly recommended

Recommended literature and teaching resources

Web resources on R software page: <https://www.r-project.org/>

Manuals webpage: <https://cran.r-project.org/manuals.html>

A good introduction course is available as a part of the openair package manual: http://www.openair-project.org/PDF/OpenAir_Manual.pdf

Example of introductory course in Polish: <https://cran.r-project.org/doc/contrib/Biecek-R-basics.pdf>

Description of language:

R Core Team (2014). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <http://www.R-project.org/>.

Scientific publications of module course instructors related to the topic of the module

Publications with data analysis performed in R:

- 2016, Kazimierz Róžański, Łukasz Chmura, Michał Gałkowski, Jarosław Nęcki, Mirosław Zimnoch, Jakub Bartyzel, Simon O'Doherty, Monitoring of greenhouse gases in the atmosphere – a polish perspective, PAPERS on GLOBAL CHANGE, 23, 111-126, 2016, DOI: 10.1515/igbp-2016-0009
- 2016, J. M. Nęcki, M. Gałkowski, Ł. Chmura, C. Gerbig, M. Zimnoch, D. Zięba, J. Bartyzel, W. Wołkowicz, K. Róžański. Regional Representativeness of CH₄ and N₂O Mixing Ratio Measurements at High-Altitude Mountain Station Kasprowy Wierch, Southern Poland. Aerosol and Air Quality Research, 16: 568-580, 2016, ISSN: 1680-8584 print / 2071-1409 online, doi: 10.4209/aaqr.2015.05.0357
- 2015, Gałkowski Michał, Temporal and spatial variability of nitrous oxide in the atmosphere over Malopolska region: determination of loads and emissions. WFIS AGH, Kraków, PhD thesis
- 2013, M. Gałkowski, A „front-flush” mode implementation in the GC system with a μ -ECD detector in high-quality measurements of atmospheric N₂O mixing ratios, Proceedings of the ISD Workshops, Faculty of Physics and Applied Computer Science, AGH University of Science and Technology, Krakow, 2013, ISBN: 978-83-925779-3-5, pp. 59-61

Additional information

Absence in ONE laboratory class is allowed without documented cause. However, student must present the code from the skipped exercise.

Absence in more than ONE laboratory classes is not allowed without documented cause. If a documented cause is given, previously stated requirements need to be fulfilled AND the student might be required to pass a short written test from the materials covered in classes (decision will be made by class supervisor). The student who has left more than two laboratory classes without a documented cause will receive a “not passed” grade from the laboratory class, thus failing the course.

Student workload (ECTS credits balance)

Student activity form	Student workload
Participation in project classes	15 h
Completion of a project	16 h
Preparation of a report, presentation, written work, etc.	28 h
Preparation for classes	14 h
Participation in laboratory classes	30 h
Summary student workload	103 h
Module ECTS credits	4 ECTS