SYLLABUS

Command line scripting

Academic year 2025-2026

1. Information regarding the programme

1.1. Higher education institution	Babeș-Bolyai University
1.2. Faculty	Faculty of Biology and Geology
1.3. Department	Department of Molecular Biology and Biotechnology
1.4. Field of study	Biology
1.5. Study cycle	Master, 4 semesters
1.6. Study programme/Qualification	Bioinformatics Applied in Life Sciences (English)/ Biologist
1.7. Form of education	Full-time

2. Information regarding the discipline

2.1. Name of the discipline	**Command line scripting**					Discipline code	**BME 1116**
2.2. Course coordinator					Dorin Mirel Popescu, PhD Andrei Tiberiu Alexsson, MSc		
2.3. Seminar coordinator					Dorin Mirel Popescu, PhD Andrei Tiberiu Alexsson, MSc		
2.4. Year of study	1	2.5. Semester	1	2.6. Type of evaluation	E	2.7. Discipline regime	Optional

3. Total estimated time (hours/semester of teaching activities)

3.1. Hours per week	**4**	of which: 3.2 course	**4**	3.3 seminar/laboratory	**4**
3.4. Total hours in the curriculum	56	of which: 3.5 course	28	3.6 seminar/laborator	**28**
Time allotment for individual study (ID) and self-study activities (SA)					**hours**
Learning using manual, course support, bibliography, course notes (SA)					32
Additional documentation (in libraries, on electronic platforms, field documentation)					30
Preparation for seminars/labs, homework, papers, portfolios and essays					20
Tutorship					10
Evaluations					4
Other activities: two-way communication with the course holder / tutor					2
3.7. Total individual study hours	98				
3.8. Total hours per semester	154				
3.9. Number of ECTS credits	6				

4. Prerequisites (if necessary)

4.1. curriculum	• Basic algebra calculation skills
4.2. competencies	• Average programming skills

5. Conditions (if necessary)

5.1. for the course	Online meeting platform Beamer, projection screen
5.2. for the seminar / lab activities	Attendance of a minimum of 90% of seminar classes is mandatory for granting the participation at the written exam. Computers, specific environment for developing and implementing bioinformatic pipelines/tools

6. Specific competencies acquired [1]

Professional competencies	• Ability to navigate and use the command line in a Linux environment for accessing and analyzing biological data efficiently. • Skills in executing commands, managing files, and automating tasks using scripts. • Ability to manipulate biological data files for preparing data for further analysis and visualization of large-scale genomic datasets. • Skills in writing and executing BASH scripts to automate data processing tasks and to increase workflow efficiency through improved reproducibility and scalability in data analysis.
Transversal competencies	• Capacity to analyze complex biological problems, break them down into smaller components, and devise effective solutions through means of logical reasoning, creativity, and adaptability • Ability to work effectively in multidisciplinary teams, share and document scripts and workflows, and communicate findings clearly to both technical and non-technical audience.

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	• To train students on practical skills for efficiently working with biological databy introducing them to Linux and command-line basics, teaching scripting and automation, and demonstrating how to manipulate biological data files using study cases
7.2 Specific objective of the discipline	• To familiarize students with the Linux operating system, show them how to navigate the command line, execute basic and advanced commands, and understand the file system structure • To train students in writing and executing simple Bash scripts • To provide hands-on exercises using Linux commands to handle biological data files including data export into other environments for further analysis. • To apply command-line skills on real biological data examples and specific research contexts

8. Content

8.1 Course	Teaching methods	Remarks
Introduction to Bash and the Command Line (Basic Shell Commands)	• Presentation • Explanation • Conceptualized-lerning • Active learning through case-study discussions	
Variables, Arrays and Parameters		
Shell Scripting Basics - creating and running shell scripts		
Control Structures (conditional statements and looping)		
File Permissions and Ownership		
Functions in Bash		
Working with Text Files (awk, vim, sed)		
Regular expressions		
Input and output redirection, Error handling and debugging		
Managing processes (ps, top, kill, bg, fg, etc)		
Integrating bash with other programming languages		
Running bioinformatics tools in bash		
Bibliography 1. Bash Reference Manual, freely available at https://www.gnu.org/software/bash/manual/bash.html 2. Linux Handbook, https://linuxhandbook.com/ 3. The Bash Guide, freely available at https://guide.bash.academy/		
8.2 Seminar / laboratory	Teaching methods	Remarks
Real-world applications and case studies		

[1] One can choose either competences or learning outcomes, or both. If only one option is chosen, the row related to the other option will be deleted, and the kept one will be numbered 6.

Team-work or individual assignments focused on creating scripts for various bioinformatic applications (data retrieval from databases, alignments, etc.) Students project presentations, discussions and conclusions Final evaluation	• Interactive duiscussion • Explanation • Conversation • Project-based learning • Practical demonstration	
Bibliography 1. Printed hands-on provided by the trainers 2. Bash Shell Scripting Practice Exercises, available at: https://linuxhandbook.com/practice/bash/ 3. w3resource's Bash Scripting Exercises, available at: https://www.w3resource.com/bash-script-exercises/index.php		

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

- The course is present in the curriculum of many universities in the world.
- The course enables the developing fundamental skills in efficient handling and analysis of large-scale biological data, automating repetitive tasks and enhancing reproducibility through scripting. .

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4. Course	Know concepts and methods from the topics of the course	Oral exam	50%
10.5. Seminar/lab activities	Apply tools and concepts of scripting in real-life problems	Solving an individual assignment and presenting/explaining the solutions of the assigned project.	50%
10.6. Minimum performance standards			
Each student should obtain a minimal mark of 5 (five) for the oral exam and for the individual assignment. To obtain the minimum grade 5, the student must demonstrate the mastery of the basic concepts described during the course and seminars/practical classes, respectively.			

11. Labels ODD (Sustainable Development Goals)[2]

	SDG 3. Health and well-being

Date:
08.01.2025

Signature of course coordinator

Dr. Dorin Mirel Popescu

Andrei Alexsson

Signature of seminar coordinator

Dr. Dorin Mirel Popescu

Andrei Alexsson

Date of approval:
...

Signature of the head of department

Assoc. Prof. Beatrice Kelemen, PhD

[2] Keep only the labels that, according to the *Procedure for applying ODD labels in the academic process*, suit the discipline and delete the others, including the general one for *Sustainable Development* – if not applicable. If no label describes the discipline, delete them all and write „*Not applicable.*".