# SYLLABUS

## Research Project in High Performance Computing and Big Data Analytics

University year 2025-2026.

**1. Information regarding the programme**

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| 1.1. Higher education institution | Babeş Bolyai University |
| 1.2. Faculty | Faculty of Mathematics and Computer Science |
| 1.3. Department | Department of Computer Science |
| 1.4. Field of study | Computer Science |
| 1.5. Study cycle | Master |
| 1.6. Study programme/Qualification | High Performance Computing and Big Data Analytics |
| 1.7. Form of education | Full time |

**2. Information regarding the discipline**

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|---|---|---|---|---|---|---|---|
| 2.1. Name of the discipline | Research Project in High Performance Computing and Big Data Analytics | | | | | Discipline code | **MME9011** |
| 2.2. Course coordinator | | | | Assoc. Prof.Dr. Virginia Niculescu | | | |
| 2.3. Seminar coordinator | | | | Assoc. Prof.Dr. Virginia Niculescu | | | |
| 2.4. Year of study | 2 | 2.5. Semester | 4 | 2.6. Type of evaluation | C | 2.7. Discipline regime | Compulsory |

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

| | | | | | |
|---|---|---|---|---|---|
| 3.1. Hours per week | **3** | of which: 3.2 course | **0** | 3.3 seminar/laboratory/project | **3** |
| 3.4. Total hours in the curriculum | 36 | of which: 3.5 course | 0 | 3.6 seminar/laboratory/project | **36** |
| **Time allotment for individual study (ID) and self-study activities (SA)** | | | | | **hours** |
| Learning using manual, course support, bibliography, course notes (SA) | | | | | 24 |
| Additional documentation (in libraries, on electronic platforms, field documentation) | | | | | 24 |
| Preparation for seminars/labs, homework, papers, portfolios and essays | | | | | 36 |
| Tutorship | | | | | 24 |
| Evaluations | | | | | 6 |
| Other activities | | | | | |
| **3.7. Total individual study hours** | 114 | | | | |
| **3.8. Total hours per semester** | 150 | | | | |
| **3.9. Number of ECTS credits** | 6 | | | | |

**4. Prerequisites** (if necessary)

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| 4.1. curriculum | Computer Science Research Methodology |
| 4.2. competencies | |

**5. Conditions** (if necessary)

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|---|---|
| 5.1. for the course | - |
| 5.2. for the seminar /lab activities | None |

**6.1. Specific competencies acquired** [1]

[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.

| | |
|---|---|
| **Professional/essential competencies** | • Analysis and formalization of problems requiring big data analysis.<br>• Use high performance computing for speeding up the problems to be solved.<br>• Analysis, design, and implementation of software systems for big data analysis or for high performance-based systems oriented on different domains.<br>• Proficient use of methodologies and tools specific to programming languages and software systems |
| **Transversal competencies** | • Professional communication skills; concise and precise description, both oral and written, of professional results |

**6.2. Learning outcomes**

| | |
|---|---|
| **Knowledge** | • The graduate has the necessary knowledge to devise, model and design of complex software applications in the field of high performance computing and big data analytics.<br>• The graduate possesses the fundamental knowledge for modelling, being able to analyse real life problems and to translate them in concrete requirements and to design a corresponding software model |
| **Skills** | - The graduate has the ability to follow the entire life cycle of software system development<br>- The graduate has the ability to communicate and develop relation and partnerships with academic and industrial partners and with all actors involved in the software development process |
| **Responsibility and autonomy:** | • The graduate proves knowledge related to specifying the requirements of research activities in the domain of computer science in general and high performance computing and big data analytics in particular and he/she understands the role of research in promoting progress<br>• The graduate knows and respects the ethical and legal principles and rules in scientific research |

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

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|---|---|---|
| **7.1 General objective of the discipline** | This research project represents the individual work the student performs with the purpose to realize a scientific report on a given research topic.<br>This research project is associated to the internship project: the research project is the scientific and experimental documentation | |
| **7.2 Specific objective of the discipline** | At the completion of this course, the student should:<br>- have documentation abilities on an established topic<br>- be able to design the table of contents of the research report<br>- know how to write a technical document (research report) in many iterations | • |

**8. Content**

| 8.1 Course | Teaching methods | Remarks |
|---|---|---|
| 8.2 Seminar / laboratory | Teaching methods | Remarks |
| Establishing the research title/topic - due week 2 | Conversation, debate, case studies | |
| Bibliographical documentation –<br>Report 1 -due week 4 | Conversation, debate, case studies | |
| Table of contents: version 1.0 - | Conversation, debate, case studies | |
| Relevance of the bibliographical sources and their assignment to the designed structure - | Conversation, debate, case studies | |

| | | |
|---|---|---|
| Detecting possible original contribution; discussion and decision on experimental modelling – Report 2 week 8 | Conversation, debate, case studies | |
| Processing of selected documents and writing the paper – Report 3 – due week 10 | Conversation, debate, case studies | |
| Final form of the research report and presentation– due week 12 | Evaluation | |
| Bibliography<br>M. Frenţiu, I.A.Rus, Metodologia Cerceta rii Ştiinţifice î n Informatica , Ed. Presa Universitara Clujeana , 2014.<br>- to be decided by student based on his/her research topic - Internet resources on software projects and on the particular topics of the projects | | |

**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 respects the IEEE and ACM Curriculla Recommendations for Software Engineering studies;
- The course exists at the major universities in Romania offering similar study programs;
- Graduating a master program assumes experience in developing a research project

**10. Evaluation**

| Activity type | 10.1 Evaluation criteria | 10.2 Evaluation methods | 10.3 Percentage of final grade |
|---|---|---|---|
| 10.4 Course | | | |
| | | | |
| 10.5 Seminar/laboratory | The ability to write a research report and present the obtained results.<br>Each of the activities has a due date and corresponding mark, on a 10point scale. | A penalty of 1pt per week are considered for delays.<br>Portofolio: 3 research reports<br>Report 1: deliver: week 4<br>Report 2: deliver: week 8<br>Report 3: deliver: week 10<br>Presentation: week 12 | <br><br>15%<br>20%<br>40%<br>25% |
| | | | |
| 10.6 Minimum standard of performance | | | |
| • At least grade 5 (from a scale of 1 to 10) | | | |

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

*Not applicable*.

Date:
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Signature of course coordinator

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Signature of seminar coordinator

Assoc.prof.phd. Niculescu Virginia

[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.*".

Date of approval:
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Signature of the head of department

Assoc.prof.phd. Adrian STERCA