SYLLABUS

1. Information regarding the programme

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	**Cyber Security**

2. Information regarding the discipline

2.1 Name of the discipline (en) (ro)			**Program Analysis for Software Security** **Analiza Programelor pentru Securitatea Software**					
2.2 Course coordinator			**Assoc. Prof. PhD. Florin Craciun**					
2.3 Seminar coordinator			**Assoc. Prof. PhD. Florin Craciun**					
2.4. Year of study	**2**	2.5 Semester	**3**	2.6. Type of evaluation	**E**	2.7 Type of discipline	**Mandatory**	
2.8 Code of the discipline		**MME8201**						

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

3.1 Hours per week	4	Of which: 3.2 course	2	3.3 seminar/laboratory	1 sem/lab + 1 project
3.4 Total hours in the curriculum	56	Of which: 3.5 course	28	3.6 seminar/laboratory	28

Time allotment:	hours
Learning using manual, course support, bibliography, course notes	25
Additional documentation (in libraries, on electronic platforms, field documentation)	25
Preparation for seminars/labs, homework, papers, portfolios and essays	25
Tutorship	5
Evaluations	14
Other activities:	-

3.7 Total individual study hours	94
3.8 Total hours per semester	150
3.9 Number of ECTS credits	6

4. Prerequisites (if necessary)

4.1. curriculum	• None
4.2. competencies	• Computational Logic knowledge • Advanced Programming Languages Knowledge

5. Conditions (if necessary)

5.1. for the course	• video projector
5.2. for the seminar /lab activities	• video projector

6. Specific competencies acquired

Professional competencies	• Using specific theories and tools (algorithms, schemes, models, protocols, etc.) for explaining the structure and the functioning of hardware, software and communication systems • Building models for various components of computing systems • Formal evaluation of the functional and non-functional characteristics of computing systems • Explaining the role, interaction and operation patterns of software system components • Developying specifications and designing information systems using specific methods and tools
Transversal competencies	• Honorable, responsible, ethical behavior, in the spirit of the law, to ensure the professional reputation • Identifying, describing, and conducting processes in the projects management field, undertaking different team roles, and clearly and concisely describing own profesional results, verbally or in writing, in Romanian and in an international language. • Demonstrating initiative and pro-active behavior for updating professional, economical and organizational culture knowledge

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

7.1 General objective of the discipline	• To be able to develop secure software systems • To be able to identify possible security problems in the software systems
7.2 Specific objective of the discipline	• to understand the classical static analyses techniques used for program security analysis and verification. • to get the state of the art • to use security techniques in developing software systems. • to design and implement security checking tools.

8. Content

8.1 Course	Teaching methods	Remarks
1. Introduction in Security Analysis Tools	Interactive exposure Explanation Conversation Didactical demonstration	

2. Security Tools based on Abstract Interpretation	Interactive exposure Explanation Conversation Didactical demonstration	
3. Security Tools based on Type Systems	Interactive exposure Explanation Conversation Didactical demonstration	
4. Security Tools based on Separation Logic	Interactive exposure Explanation Conversation Didactical demonstration	
5. Security Tools for mobile applications	Interactive exposure Explanation Conversation Didactical demonstration	
6. Security of Blockchain	Interactive exposure Explanation Conversation Didactical demonstration	
7. Security Tools for Smart Contracts	Interactive exposure Explanation Conversation Didactical demonstration	
8. Security Tools for Datacenters	Interactive exposure Explanation Conversation Didactical demonstration	
9. Security Tools for Networks	Interactive exposure Explanation Conversation Didactical demonstration	
10. Security tools for databases	Interactive exposure Explanation Conversation Didactical demonstration	
11. Security tools for Deep Learning frameworks	Interactive exposure Explanation Conversation Didactical demonstration	
12. Security tools for Quantic Programming	Interactive exposure	

	Explanation Conversation Didactical demonstration	
13. Machine learning for security	Interactive exposure Explanation Conversation Didactical demonstration	
14. Machine learning for security	Interactive exposure Explanation Conversation Didactical demonstration	

Bibliography

Benjamin C. Pierce, Arthur Azevedo de Amorim, Chris Casinghino, Marco Gaboardi, Michael Greenberg, Catalin Hritcu, Vilhelm Sjöberg, Andrew Tolmach, and Brent Yorgey. *Programming Language Foundations*. Software Foundations series, volume 2. Electronic textbook, May 2018. Version 5.5.

Benjamin C. Pierce, Arthur Azevedo de Amorim, Chris Casinghino, Marco Gaboardi, Michael Greenberg, Catalin Hritcu, Vilhelm Sjöberg, and Brent Yorgey. *Logical Foundations*. Software Foundations series, volume 1. Electronic textbook, May 2018. Version 5.5.

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Benjamin C. Pierce, editor. *Advanced Topics in Types and Programming Languages*. MIT Press, 2005.

Benjamin C. Pierce. *Types and Programming Languages*. MIT Press, 2002.

8.2 Seminar / laboratory	Teaching methods	Remarks
• Program Analysis tools for security • Security Tools for mobile applications • Security tools for smart contracts • Security tools for datacenters • Security tools for databases • Security tools for networks • Security tools for AI • AI techniques used in security verification	Dialogue, debate, case studies, examples, proofs	

Bibliography

Benjamin C. Pierce, Arthur Azevedo de Amorim, Chris Casinghino, Marco Gaboardi, Michael Greenberg, Catalin Hritcu, Vilhelm Sjöberg, Andrew Tolmach, and Brent Yorgey. *Programming Language Foundations*. Software Foundations series, volume 2. Electronic textbook, May 2018. Version 5.5.

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Benjamin C. Pierce. *Types and Programming Languages*. MIT Press, 2002.

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 Curricula Recommendations
- The content of the course is considered by the software companies as important for average software development skills and security assurance skills

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	know the basic principle of the domain; - understand and apply the course concepts - problem solving	Written exam	40%
10.5 Seminar/lab activities	- be able to implement course concepts - use tools for different security aspects	Laboratory assignments Project	40% 20%
10.6 Minimum performance standards			
➢ At least grade 5 (from a scale of 1 to 10) at both written exam and laboratory work			

Date	Signature of course coordinator	Signature of seminar coordinator
20.05.2022	**Assoc.Prof. Eng Florin Craciun**	**Assoc.Prof. Eng Florin Craciun**

Date of approval   Signature of the head of department

.... **Prof. PhD. Laura Dioşan**