

SYLLABUS

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 | Bachelor |
| 1.6 Study programme / Qualification | Computer Science |

2. Information regarding the discipline

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| 2.1 Name of the discipline | Pragmatic issues in programming | | | | | | |
| 2.2 Course coordinator | Lect. PhD. Radu Lupsa | | | | | | |
| 2.3 Seminar coordinator | Lect. PhD. Radu Lupsa | | | | | | |
| 2.4. Year of study | 3 | 2.5 Semester | 2 | 2.6. Type of evaluation | C | 2.7 Type of discipline | Optional |

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

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| 3.1 Hours per week | 3 | Of which: 3.2 course | 2 | 3.3 seminar/laboratory | 1 |
| 3.4 Total hours in the curriculum | 36 | Of which: 3.5 course | 24 | 3.6 seminar/laboratory | 12 |
| Time allotment: | | | | | hours |
| Learning using manual, course support, bibliography, course notes | | | | | 35 |
| Additional documentation (in libraries, on electronic platforms, field documentation) | | | | | 25 |
| Preparation for seminars/labs, homework, papers, portfolios and essays | | | | | 60 |
| Tutorship | | | | | 5 |
| Evaluations | | | | | 2 |
| Other activities: | | | | | - |
| 3.7 Total individual study hours | 127 | | | | |
| 3.8 Total hours per semester | 175 | | | | |
| 3.9 Number of ECTS credits | 7 | | | | |

4. Prerequisites (if necessary)

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| 4.1. curriculum | Advanced programming methods |
| 4.2. competencies | Average skills in programming. |

5. Conditions (if necessary)

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| 5.1. for the course | |
| 5.2. for the seminar /lab activities | Laboratory with computers; high level programming language environment (C++, Java, .NET, python) |

6. Specific competencies acquired

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| Professional competencies | <ul style="list-style-type: none">• C2.1 Identificarea de metodologii adecvate de dezvoltare a sistemelor software• C2.3 Utilizarea metodologiilor, mecanismelor de specificare și a mediilor de dezvoltare pentru realizarea aplicațiilor informatice |
| Transversal competencies | <ul style="list-style-type: none">• CT1 Aplicarea regulilor de munca organizată și eficientă, a unor atitudini responsabile față de domeniul didactic-stiințific, pentru valorificarea creativă a propriului potențial, cu respectarea principiilor și a normelor de etică profesională• CT3 Utilizarea unor metode și tehnici eficiente de învățare, informare, cercetare și dezvoltare a capacităților de valorificare a cunoștințelor, de adaptare la cerințele unei |

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

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| 7.1 General objective of the discipline | <ul style="list-style-type: none">• General improvement of programming efficiency.• Approach programming from a practical point of view. |
| 7.2 Specific objective of the discipline | <ul style="list-style-type: none">• Improve programming efficiency by using a disciplined approach;• Be aware of the time-consuming tasks while programming and the tools and methods to avoid them. |

8. Content

| 8.1 Course | Teaching methods | Remarks |
|--|--|---------|
| 1. Development speed, long-term versus short-term speed. Complexity as the main asymptotic slow-down factor. The role of a disciplined, systematic approach. | <ul style="list-style-type: none">• Interactive exposure• Explanation• Conversation• Didactical demonstration | |

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| <p>2. Programming discipline: Tracking changes and (automated) testing: goals, issues, best practices.</p> | <ul style="list-style-type: none"> • Interactive exposure • Explanation • Conversation • Didactical demonstration | |
| <p>3. Programming discipline: <i>One Responsibility Rule</i> principle, <i>Don't Repeat Yourself</i> principle, Coupling and cohesion. Refactoring.</p> | <ul style="list-style-type: none"> • Interactive exposure • Explanation • Conversation • Didactical demonstration | |
| <p>4. Programming discipline: code documentation. Pre/post conditions, border cases, well-chosen identifiers, tools.</p> | <ul style="list-style-type: none"> • Interactive exposure • Explanation • Conversation • Didactical demonstration | |
| <p>5. Programming discipline: Undefined behaviour, implementation defined behaviour, premature optimization, good optimization.</p> | <ul style="list-style-type: none"> • Interactive exposure • Explanation • Conversation • Didactical demonstration | |
| <p>6. Programming discipline: defensive programming. <code>assert()</code> on pre/post conditions and invariants. Input data validation. Fail fast principle.</p> | <ul style="list-style-type: none"> • Interactive exposure • Explanation • Conversation • Didactical demonstration | |
| <p>7. Programming discipline: Input data validation, efficient diagnosing of errors, secure code.</p> | <ul style="list-style-type: none"> • Interactive exposure • Explanation • Conversation • Didactical demonstration | |
| <p>8. Testing and debugging techniques: IDE debugger, <code>assert()</code>, core dumps, regression tests, logging and log filtering.</p> | <ul style="list-style-type: none"> • Interactive exposure • Explanation • Conversation • Didactical demonstration | |
| | <ul style="list-style-type: none"> • Interactive exposure | |

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| 9. Patterns and techniques: Classes: value semantic vs. object semantic. Immutable classes. | <ul style="list-style-type: none"> • Explanation • Conversation • Didactical demonstration | |
| 10. Patterns and techniques: Constructors, destructors, resources and invariants. RAI. | <ul style="list-style-type: none"> • Interactive exposure • Explanation • Conversation • Didactical demonstration | |
| 11. Patterns and techniques: exceptions. Exception safety levels. | <ul style="list-style-type: none"> • Interactive exposure • Explanation • Conversation • Didactical demonstration | |
| 12. Patterns and techniques: multi-threading patterns. | <ul style="list-style-type: none"> • Interactive exposure • Explanation • Conversation • Didactical demonstration | |

Bibliography

1. Michael Howard and David LeBlanc: *Writing Secure Code*, Microsoft Press, 2003.
2. Herb Sutter, Andrei Alexandrescu: *C++ Coding Standards: 101 Rules, Guidelines, and Best Practices*. Addison-Wesley, 2010.
3. Martin Fowler and others: *Refactoring: Improving the Design of Existing Code*. Addison-Wesley, 1999.
4. Robert C. Martin: *Clean Code: A Handbook of Agile Software Craftsmanship*. Prentice Hall.
5. Andrew Hunt, David Thomas: *The Pragmatic Programmer: From Journeyman to Master*. Addison-Wesley, 2000.
6. Marshall P. Cline, Greg Lomow, Mike Girou: *C++ FAQs (2nd Edition)*. Addison-Wesley, 1999.

| 8.2 Seminar / laboratory | Teaching methods | Remarks |
|--|--|---------|
| 1. Introduction, administrative issues. Code examples. Programming discipline: Tracking changes and (automated) testing. | Dialogue, debate, case study, guided discovery | |
| 2. Programming discipline: One Responsibility Rule principle, Don't Repeat Yourself principle, Coupling and cohesion. Refactoring. Code documentation. Pre/post conditions, border cases, well-chosen identifiers, | Dialogue, debate, case study, guided discovery | |

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| tools. | | |
| 3. Programming discipline: Undefined behaviour, implementation defined behaviour, premature optimization, good optimization. Defensive programming. assert() on pre/post conditions and invariants. Input data validation. Fail fast principle. | Dialogue, debate, case study, guided discovery | |
| 4. Programming discipline: Input data validation, efficient diagnosing of errors, secure code. Testing and debugging techniques: IDE debugger, assert(), core dumps, regression tests, logging and log filtering. | Dialogue, debate, case study, guided discovery | |
| 5. Patterns and techniques: Classes: value semantic vs. object semantic. Immutable classes. Constructors, destructors, resources and invariants. RAI. | Dialogue, debate, case study, guided discovery | |
| 6. Patterns and techniques: exceptions. Exception safety levels. Multi-threading patterns. | Dialogue, debate, case study, guided discovery | |

Bibliography

1. Michael Howard and David LeBlanc: *Writing Secure Code*, Microsoft Press, 2003.
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3. Martin Fowler and others: *Refactoring: Improving the Design of Existing Code*. Addison-Wesley, 1999.
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5. Andrew Hunt, David Thomas: *The Pragmatic Programmer: From Journeyman to Master*. Addison-Wesley, 2000.
6. Marshall P. Cline, Greg Lomow, Mike Girou: *C++ FAQs (2nd Edition)*. Addison-Wesley, 1999.

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 content of the course comes from practical field experience.

10. Evaluation

| Type of activity | 10.1 Evaluation criteria | 10.2 Evaluation methods | 10.3 Share in the grade (%) |
|-----------------------------|--|--------------------------------|-----------------------------|
| 10.4 Course | - | - | - |
| 10.5 Seminar/lab activities | - know the basic principles discussed at the course and know to apply them; - recognize the weak spots in | Verifying the practical works. | 50% |

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| | a program; - find good ways to avoid the weak spots | | |
| | - be able to show the understanding of the principles in a mini-project. | Verifying the project | 50% |
| 10.6 Minimum performance standards | | | |
| <ul style="list-style-type: none"> At least grade 5 (from a scale of 1 to 10) for the average. | | | |

Date

Signature of course coordinator

Signature of seminar coordinator

Date of approval

Signature of the head of department