

## SYLLABUS

### 1. Information regarding the programme

1.1 Higher education institution	<b>“Babes_Bolyai” University</b>
1.2 Faculty	<b>Faculty of Mathematics and Computer science</b>
1.3 Department	<b>Department of Computer Science</b>
1.4 Field of study	<b>Informatics(Computer Science)</b>
1.5 Study cycle	<b>Master</b>
1.6 Study programme / Qualification	<b>Data Bases</b>

### 2. Information regarding the discipline

2.1 Name of the discipline	<b>Workflow Systems</b>						
2.2 Course coordinator	<b>Assoc.Prof.PhD. Niculescu Virginia</b>						
2.3 Seminar coordinator	<b>Assoc.Prof.PhD. Niculescu Virginia</b>						
2.4. Year of study	<b>2</b>	2.5 Semester	<b>3</b>	2.6. Type of evaluation	<b>C.</b>	2.7 Type of discipline	<b>Optional</b>

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

3.1 Hours per week	3	Of which: 3.2 course	2	3.3 seminar/laboratory	1 sem.
3.4 Total hours in the curriculum	42	Of which: 3.5 course	28	3.6 seminar/laboratory	14
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					46
Additional documentation (in libraries, on electronic platforms, field documentation)					40
Preparation for seminars/labs, homework, papers, portfolios and essays					46
Tutorship					14
Evaluations					12
Other activities: .....					-
3.7 Total individual study hours			158		
3.8 Total hours per semester			200		
3.9 Number of ECTS credits			8		

### 4. Prerequisites (if necessary)

4.1. curriculum	<ul style="list-style-type: none"> <li>Algorithmics, Fundamentals of Programming</li> </ul>
4.2. competencies	<ul style="list-style-type: none"> <li>Programming skills and basic abilities for dealing with abstractions</li> </ul>

### 5. Conditions (if necessary)

5.1. for the course	<ul style="list-style-type: none"> <li>projector</li> </ul>
5.2. for the seminar	<ul style="list-style-type: none"> <li>projector</li> </ul>

## 6. Specific competencies acquired

<b>Professional competencies</b>	<ul style="list-style-type: none"> <li>Each student has to prove that (s)he acquired an acceptable level of knowledge and understanding of the subject, that (s)he is capable of stating these knowledge in a coherent form, that (s)he has correct habits of analysis, design of problems related to workflow systems.</li> </ul>
<b>Transversal competencies</b>	<ul style="list-style-type: none"> <li>Ability to use a workflow system tool in order to define and implement a business process.</li> </ul>

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

7.1 General objective of the discipline	<ul style="list-style-type: none"> <li>To introduce the notions of 'workflow', and workflow system.</li> <li>To analyze several workflow case studies in order to emphasize the advantages of automated workflow.</li> </ul>
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> <li>To emphasize the relation between workflow technology and business processes management</li> <li>To present the workflow reference model.</li> <li>To presents the most important workflow patterns.</li> <li>To present several concrete solutions for workflow modeling.</li> </ul>

## 8. Content

8.1 Course	Teaching methods	Remarks
1. Introduction. <ul style="list-style-type: none"> <li>Terminology.</li> <li>Definitions.</li> <li>Workflow concept evolution</li> <li>Primitive elements: object, task, transfer, resource, attribute, rule, route</li> </ul>	Exposure: description, explanation, examples, discussion of case studies	
2. Workflow classifications: Workflow basic building block structures <ul style="list-style-type: none"> <li>Sequential</li> <li>Forked</li> <li>Iterative</li> <li>Asynchronous</li> </ul>	Exposure: description, explanation, examples, discussion of case studies	

<p>3.</p> <p>The workflow reference model [6]</p> <ul style="list-style-type: none"> <li>○ Workflow Reference Model Diagram</li> <li>○ Workflow Enactment Services</li> <li>○ Process Definition</li> <li>○ Workflow Client Functions</li> <li>○ Invoked Application Functions</li> <li>○ Workflow Interoperability</li> <li>○ System Administration &amp; Monitoring <ul style="list-style-type: none"> <li>○ WAPI Structure, Protocol, and Conformance</li> </ul> </li> </ul>	<p>Exposure: description, explanation, examples, discussion of case studies</p>	
<p>4.</p> <p>Workflow systems modeling Activity diagrams [7]</p>	<p>Exposure: description, explanation, examples, discussion of case studies</p>	
<p>5.</p> <p>Workflow systems modeling Petri nets [1,9]</p>	<p>Exposure: description, explanation, examples, discussion of case studies</p>	
<p>6.</p> <p>Business Process Management [4, 5]</p> <ul style="list-style-type: none"> <li>○ Business Process Modeling Notation (BPMN)</li> <li>○ Business Process Execution Language (BPML)</li> </ul>	<p>Exposure: description, explanation, examples, discussion of case studies</p>	
<p>7.</p> <p>Workflow patterns [2]</p> <ul style="list-style-type: none"> <li>○ Basic Control Patterns</li> <li>○ Advanced Branching and Synchronization Patterns</li> </ul>	<p>Exposure: description, explanation, examples, discussion of case studies</p>	
<p>8.</p> <p>Workflow patterns [2]</p> <ul style="list-style-type: none"> <li>○ Structural Patterns</li> <li>○ Multiple Instances (MI)</li> <li>○</li> </ul>	<p>Exposure: description, explanation, examples, discussion of case studies</p>	
<p>9.</p> <p>Workflow patterns [2]</p> <ul style="list-style-type: none"> <li>○ State-based patterns</li> <li>○ Cancellation Patterns</li> <li>○</li> </ul>	<p>Exposure: description, explanation, examples, discussion of case studies</p>	
<p>10.</p> <p>WS –management of the resource allocation</p>	<p>Exposure: description, explanation,</p>	

+patterns for resource allocation ○	examples, discussion of case studies	
11. ( Re)designing workflows-Business Process Reengineering (BPR)	Exposure: description, explanation, examples, discussion of case studies	
12. Orchestration vs Choreography  Dataflow modeling	Exposure: description, explanation, examples, discussion of case studies	
13. Workflows for scientific applications	Exposure: description, explanation, examples, discussion of case studies	
14. Case studies	Exposure: description, explanation, examples, discussion of case studies	

<http://www.cs.ubbcluj.ro/~vniculescu/didactic/>

### Bibliography

1. Wil van der Aalst, Kees van Hee: *Workflow Management: Models, Methods, and Systems*, MIT Press, 2002, ISBN: [0-262-01189-1](#)
2. Wil van Der Aalst, Hofstede, Arthur H.M.; Kiepuszewski, Bartek; Barros, Alistair P. (2003). "Workflow Patterns". *Distributed and Parallel Databases* **14**: 5--51.
3. Layna Fischer: *Workflow Handbook 2005*, Future Strategies, [ISBN 0-9703509-8-8](#)
4. BPMN Specification <http://www.bpmn.org/>
5. *Stephen A. White, [Introduction to BPMN](#) - IBM May 2004*
6. [Workflow Reference Model](#) <http://www.wfmc.org/standards/referencemodel.htm>
7. UML specification, <http://www.omg.org/technology/documents/formal/uml.htm>
8. Peterson, James L. (1977). "Petri Nets". *ACM Computing Surveys* **9** (3): 223–252.  
[T. Murata](#), Petri Nets: Properties, Analysis and Applications Proceedings of the IEEE, Vol. 77, No 4, April, 1989, pp. 541-580.
9. Barker and J. van Hemert. Scientific Workflow: A Survey and Research Directions. Seventh International Conference on Parallel Processing and Applied Mathematics, Revised Selected Papers, volume 4967 of LNCS, pages 746- 753. Springer, 2008.

<b>8.2 Seminar</b>	Teaching methods	Remarks
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1. UML activity diagrams - examples	Explanation, dialogue, case studies	The seminar is structured as 2 hours classes every second week
2. Petri Nets -examples	Dialogue, debate, case studies, examples, proofs	
3. BPMN -examples	Dialogue, debate, case studies, examples, proofs	
4. Workflow patterns – analysis, examples and discussions	Dialogue, debate, explanation, examples	
5. Student presentations	Dialogue, debate, explanation, examples	
6. Student presentations	Dialogue, debate, explanation, examples	
7. Student presentations	Dialogue, debate, explanation, examples	

#### Bibliography

1. Wil van der Aalst and Kees van Hee, [Workflow Management](#), MIT Press 2004.
2. Howard Smith and Peter Fingan, [Business Process Management - the third wave](#), Meghan-Kiffer Press 2003.
3. Hajo A. Reijers, [Design and Control of Workflow Processes](#), Springer Publishers 2003.

### 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 for Computer Science studies;
- The course exists in the studying program of all major universities in Romania and abroad;

### 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 principles and paradigms of the domain;	Presentations, Questions while the research paper is presented.	20%

10.5 Seminar	- research paper ( <i>referat</i> ) that presents a workflow system management tool.	-presentation -discussion	80%
10.6 Minimum performance standards			
➤ At least grade 5 (from a scale of 1 to 10) for the final grade.			

Date

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Signature of course coordinator

.....Niculescu Virginia.....

Signature of seminar coordinator

.....Niculescu Virginia

Date of approval

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Signature of the head of department

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