Course programme

IFI7406.DT	Business Process Modeling and Automation		
ECTS credits: 4	Contact hours: 16	Semester: autumn	Exam
Course objective:	- Being able to model a business process from a (semi) informal to a formal level. - Specifying the resource perspective of a business process and understanding improvement scopes. - Analyzing workflows for detecting errors, injecting patterns, enhancing efficiency. - Understanding the functions and architecture of an enactment system for business processes.		
Brief description of course content:	The BPA-course combines the disciplines of business process re-engineering (BPR) and service-oriented computing (SOC) to achieve an automation with the help of Internet technologies. We define BPR as a fundamental reconsideration and radical restructuring of business processes in order to achieve drastic improvements in costs, quality and service. Here, a business process is one focused upon the production of particular products that may either be physical (such as a truck or bridge), or intangible (such as a design or damage assessment for an insurance case). We define SOC as a computer-science discipline that uses web services for developing loosely coupled applications where inter-system dependency is minimized. SOC relies on the technology stack of a service-oriented architecture (SOA) with the core layers XML, SOAP, and HTTP. For the purpose of BPA, we include WS-* languages in SOA, most notably BPEL.		
Learning outcomes	Fundamental skills will be acquired during the course: - Understanding the importance of business process management within companies; - Modeling of business processes with different notations; - Re-engineering business processes from a current state towards a target state, e.g., tackling bottlenecks and better workload distribution, faster completion time; - Patterns application for different business-process perspectives, i.e., control-flow, data-flow, organizational resources. - Checking of business processes for formal correctness properties, e.g., soundness, boundedness and safeness, invariance, correct termination;		

	• Automating re-engineered business processes: with SOC technologies, e.g., specification in SOA and WS-*, using specific SOC setup and enactment applications;
Assessment methods	1. Criterion (miniproject presentation, 20% of the grade) A – the presentation is excellent (it is topical, original, realistic, consistent, well structured, full of clarity, interesting, promotes discussion with the listeners and provides added value to the listeners). B – the presentation is very good. C – the presentation is good. D – the presentation is satisfactory. E – the presentation is weak. 2. Criterion (final report, 30% of the grade) A – The final report is completely adequate and thorough. B – The final report is adequate and thorough. C – The final report has some gaps (some significant aspects are not covered). D – The final report has some deficiencies (some significant aspects are not discussed and some treated inadequately). E – The final report has significant deficiencies (several significant aspects are not discussed). 3. Criterion (exam, 50% of the grade) A – 90-100% of the questions answered – excellent: outstanding work with no or few minor errors; B – 80-90% of the questions answered – very good: above average work but with some minor errors; C – 70-80% of the questions answered – good: generally good work with a number of notable errors; D – 60-70% of the questions answered – satisfactory: reasonable work but with significant shortcomings; and E – 50-60% of the questions answered – sufficient: passable performance meeting the minimum criteria. The final grade id calculated cumulatively, based on the assigned percentage weight of the respective course criteria.
Responsible lecturer	Alexander Norta, Ph.D.
Title in Estonian	Äriprotsessi modelleerimine ja automatiseerimine
Prerequisite course	Good motivation, a display of curiosity and work ethics

Compulsory literature	MASTERING E-BUSINESS, Paul Grefen, Routledge, 2010 WORKFLOW MANAGEMENT: Models, Methods, and Systems, Wil van der Aalst, MIT Press 2004 (free PDF download available)
Replacement literature	Modern Business Process Automation, Arthur H. M. ter Hofstede et al., Springer 2010
Participation and Exam requirements:	• Mandatory lecture participation with miniproject completion in a team-effort. • Exam-participation prerequisite is a successful miniproject completion and presentation
Independent work:	A running case that of business-process re-engineering and automation that will be carried out as teamwork
Grading criteria scale:	Students form teams of 3-4 people and each team prepares a miniproject for the design, re-engineering, and automation of a business-process case. The final report on the miniproject should contain approximately 2000 words of text along with appendices, figures, tables, graphs, and examples of source code. The assessment of the course consists of the following elements: ☐Final presentation of miniprojects – 20% ☐Submitted final report – 30% ☐Final written exam – 50% There will be a final written exam.
Information about	*Date and time:* *Form of study and course content by topic:*

the course:	Sept 10, 2017 at 15:00 – 16:30	<u>Objective</u>: Establishing a basic understanding for the e-business context. Introducing the vocabulary required for communicating with business analysts and consultants.

1.1 Lecture Content

Name: Organizational matters ,fundamentals of BPA and BOAT Commence with organizational matters about the course structure, dates, expectations with respect to exercises, and so on.

Discuss with students their backgrounds that could relate to this course. Let individual students talk about their relevant experience so that all students develop

Give elaborate definition for e-commerce and correlate to related terminology

Show some examples to allow students the building of a solid mind model about e-business so that it is easier for them to follow.

Introduce an analysis framework (BOAT) for e-business cases that allows students to understand the requirements for

Introduction of e-business relevant classification dimensions, i.e., classification dimension (time, parties, objects)

1.2 Lecture Content
Name: BOAT (continued) in detail

Explain in detail the business and organization classes of the BOAT analysis framework in greater detail while only mentioning less the architecture and technology classes. The first two are necessary to understand the process-automation lectures that are the main body of this course. The latter two classes are merely necessary to discuss the first exercise of case specification

Discussion of the BOAT-business classification: drivers with reach, richness, efficiency; chains with disintegration, reintegration, deconstruction and reconstruction; directions; structures with supply chain, demand chain, hybrid chain, highly dynamic chain; models with e-retailing, integrator, dynamic virtual enterprises, crowdsourcing

Sept 10, 2017 at 17:00 – 18:30	Student presentation of chosen running case: 20 minutes presentation for each project team and 10 minutes Q&A

Oct 08, 2017 at 15:00 – 16:30	Objective: being able to model a business process from a (semi) informal to a formal level
	2.1 Lecture Content
	Name: BPM-terminology definitions and BPMN as a visual notation
	Introducing relevant vocabulary with definitions and showing how the vocabulary relates to each other, e.g., process, task ,case, routing, enactment, triggers, conditions, process perspectives like control-flow, data-flow, organizational
	Present BPMN as an example of an informal process modeling technique
	2.2 Lecture Content
	Name: Petri nets as a formal notation and patterns
	Introduction of Petri nets as a formal means of presenting business processes, i.e., classical Petri nets, high-level Petri nets, color extensions, time extensions, hierarchy extensions
	Showing pattern catalogues for primarily control-flow and briefly mention the pattern catalogues for data flow, exceptions and the resource perspective
	Mapping workflow concepts onto Petri nets. Explanation of how to map from informal business-process representations like BPMN to a WF-net
	Exercise
	Translating the case into a business process in BPMN notation. By using the heuristically expressed rules, translate the BPMN process into a WF-net.
	Literature:
	WORKFLOW MANAGEMENT: Models, Methods, and Systems, Wil van der Aalst, MIT Press 2004, Chapter 2;
	From Informal Process Diagrams to Formal Process Models, Debdoot Mukherjee et al., BPM 2001

Oct 08, 2017 at 17:00 – 18:30	Objective: Specifying the resource perspective of a business process and understanding improvement scopes
	3.1 Lecture Content
	Name: The resource perspective of business processes
	Techniques for resource classification and the allocation of resources to activities
	An ontological model for explaining what concepts and properties relate to each other for resource definition
	3.2 Lecture Content
	Name: Task-allocation principles and efficiency enhancement through re-design
	More detailed allocation principles for resources and ways of improving the efficiency of business processes, e.g., completion time, capacity utilization flexibility, and so on
	Guidelines for re-designing business processes
	Exercise
	Extending the running example with a resource perspective and attempting a paper-based re-design following the methods presented in this lecture
	Literature:
	WORKFLOW MANAGEMENT: Models, Methods, and Systems, Wil van der Aalst, MIT Press 2004, Chapter 3

Nov 5, 2017 at 15:00 – 16:30	<u>Objective</u>: Analyzing workflows for detecting errors, injecting patterns, enhancing efficiency.

4.1 Lecture Content

Name: Analysis techniques and verification of structural properties

Introducing analysis techniques that aim to verify the structure of a business process.

Understanding a reachability graph for WF-nets

Soundness of business processes, deadlocks and livelocks

Computer-based analysis methods

4.2 Lecture Content

Name: Performance analysis and capacity planning

Performance analysis of business processes, Markovian analysis, queuing theory, simulation

Planning of capacity and capacity calculation

Exercise

Performing structural analysis of the business process. Performing reachability analysis, soundness check with tool support, Analyzing the process capacity.

<u>Literature:</u>

WORKFLOW MANAGEMENT: Models, Methods, and Systems, Wil van der Aalst, MIT Press 2004, Chapter 4 |

	Nov 5, 2017 at 17:00 – 18:30	**Objective**: Understanding the functions and architecture of an enactment system for business processes.

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5.1 Lecture Content

Name: WFMS reference architecture

Explaining the reference architecture of the Workflow Management Coalition

Zooming in on the components and interfaces of that reference architecture.

5.2 Lecture Content

Name: Verification with WofYAWL and YAWL-enactment

Using YAWL as an ideal example for an enactment environment

Explaining YAWL and mapping its functionalities to the WFMC reference architecture

Showing YAWL and and the business-process notation used

Verification tool WofYAWL for checking business processes

Exercise

Transferring the running case business process into YAWL notation, verify it is WofYAWL and enact the business process in YAWL.

Literature:

Modern Business Process Automation, Arthur H. M. ter Hofstede et al., Springer 2010

Dec 3, 2017 at 15:00 – 16:30	<u>Objective</u>: Using BPEL for process formulation and a verification tool. **6.1 Lecture Content** Name: BPEL language with variants and BPELWoflan Explaining the history of BPEL and the language elements available. Introducing BPEL4Chor, AbstractBPEL, BPEL4People Modeling tools for BPEL and enactment environments. Using BPELWoflan for verification **6.2 Lecture Content** Name: Running business process in BPEL and final Q&A Demonstration of the BPEL processes and students should discuss their experiences trying to map the running business-process example General Q&A session **Exercise** Mapping the business process to BPEL, verify it and possibly run the process <u>Literature:</u> Web Services Business Process Execution Language Version 2.0, OASIS Standard, 11 April 2007; [Modern Business Process Automation](#), Arthur H. M. ter Hofstede et al., Springer 2010	
Dec 3, 2017 at 17:00 – 18:30	Final miniproject presentation by student teams: 20 minutes presentation for each project team and 10 minutes Q&A	
Dec 18-23, 2017	Final Exam	
Jan 02-17, 2017	2nd Exam Attampt	