COURSE DESCRIPTION CARD - SYLLABUS

Course name
Modeling and Analysis of Business Processes [S2Inf1-TPD>MiAPB]

Course

Field of study
Computing

Year/Semester
1/2

Area of study (specialization)
Data Processing Technologies

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
30

Number of credit points

4,00

Coordinators

dr inż. Juliusz Jezierski
juliusz.jezierski@put.poznan.pl

dr inż. Tomasz Koszlajda
tomasz.koszlajda@put.poznan.pl

Lecturers

Prerequisites

A student starting this subject should have basic knowledge of Software Engineering, especially Systems Analysis, and in addition should be familiar with XML. He should have the ability to solve basic conceptual modeling problems and the ability to obtain information from indicated sources. He or she should also understand the necessity of expanding his or her competencies and have a willingness to cooperate as part of a team. In addition, in terms of social competence, the student must present such attitudes as honesty, responsibility, perseverance, cognitive curiosity, creativity, personal culture, respect for other people.

Course objective

1.To provide students with basic knowledge of business process management in terms of their modeling, simulation, analysis, implementation, management of the execution of their occurrences and process log mining. 2.To develop in students the ability to solve problems related to the modeling, design and construction of programs that process large and shared multimedia data repositories.

Course-related learning outcomes

Knowledge:
has a structured, theoretically underpinned knowledge of tools for modeling and verification of bines processes; (k2st_w1)
has theoretically underpinned detailed knowledge related to selected issues in computer science, such as modeling, simulation, formal business process validation analysis and process log mining; (k2st_w3)
has advanced and detailed knowledge of the processes occurring in the business process life cycle covering the stages of: business process modeling, implementation, management and analysis; (k2st_w5)

Skills:
is able to integrate knowledge from different areas of knowledge: business needs analysis, data mining, modern information systems architecture; (k2st_u5)
is able to assess the usefulness of methods and tools for solving an engineering task involving systemic management of the correct course of business processes; (k2st_u9)
is able to solve complex it tasks, e.g. by choosing the optimal scope of process automation; (k2st_u10)
is able to design a complex it system that monitors and manages the course of business processes; (k2st_u11)
is able to cooperate in a team, assuming various roles in it: system analyst, programmer, administrator; (k2st_u15)

Social competences:
understands the importance of using the latest it knowledge in relation to the increasing complexity and variability of business processes; (k2st_k2)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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The learning outcomes outlined above are verified as follows:
Formative assessment:
(a) for lectures:
- On the basis of attendance and activity in class,
b) in terms of exercises:
- on the basis of the correctness and quality of the independent solution of the problems analyzed in class,
c) in terms of the project:
- on the basis of the evaluation of the current progress of the project,
Summative evaluation:
a) in terms of lectures, verification of the established learning outcomes is realized by:
- evaluation of knowledge and skills demonstrated on a written colloquium of a problem-based nature, which consists of several open-ended tasks, consisting, for example, of demonstrating an understanding of the operation of a given model of a simple process, drawing a model of a simple business process, formally verifying the ownership of a process, defining a process model on the basis of a sample o log, etc. For a grade of 3.0, a score of at least 50% is required.
- discussion of the exam results,
b) in the field of exercises, verification of the established learning outcomes is realized by:
- evaluation of skills related to the implementation of exercises,
- continuous assessment, at each class (oral answers) -premise the growth of skills in the use of known principles and methods,
c) in terms of project classes, verification of the established learning outcomes is realized by:
- evaluation and defense by the student of the project report.
Obtaining additional points for activity during classes, especially for:
- the effectiveness of the application of the acquired knowledge when solving the assigned problem,
- comments related to the improvement of teaching materials,
- pointing out students" perceptual difficulties enabling ongoing improvement of the didactic process.

Programme content

The lecture program covers the following topics:

1. Introduction to the field of business process management. Global perspective on the informatization of enterprises and offices. Basic definitions of business processes and their management. Functionality and architecture of business process management systems. Life cycle of processes.
2. Objectives of business process modeling. Basic business process notations: BPMN, EPC and UML. Basic model constructs: tasks, subprocesses, events, gates, workflows, pools, tracks, etc. Workflow topology patterns in business processes. Methodologies for constructing and classes of process models.
3. Formal analysis of business process properties using Petri nets. Petri net model: basic constructs, static and dynamic properties of Petri nets. Process modeling using Petri nets. Basic patterns of processes modeled with Petri nets.
4. Verification of basic properties of processes modeled with Petri nets. Trees and state reachability graphs. Trees and coverage graphs. Limitation of places in Petri nets. Lifetime of Petri net transitions. Synchronous distance and fairness in Petri nets. Analysis of invariants in Petri nets. Latches and traps.
5. Mapping of BPMN models into a Petri net model. Basic mapping rules.
6. BPEL language. Implementation of business process models using the BPEL language. Basic constructs of the BPEL language. Mapping of BPMN process models to the BPEL language. BPEL server architecture.
7. Exploring business process logs. Types of log mining. Extracting source data from process logs. Languages for specification of information about the history of process occurrences: MXML, XES. Discovery of process models based on the content of logs. Algorithms for discovering process models. Quality criteria for the discovery process.
The exercise program includes the following topics:
1. Business process modeling using BPMN notation. Creation of simple business process models. Expanding and detailing models. Learning about good process modeling practices.
2. Modeling business processes using Petri nets. Modeling single process occurrences and modeling interactions between multiple process occurrences.
3. Analyzing business process properties using Petri nets.
4. Discovery of process models from logs.
Project classes are conducted in the form of fifteen 2-hour exercises, held in the laboratory, preceded by a 2-hour instructional session at the beginning of the semester. Projects are carried out individually by students. The program of project classes includes the following topics:
1. Types of BPM processes, types of gateways, flows, scripts,
2. Sub-processes, swim lanes, user roles,
3. Event handling, exception handling, business objects, process objects, BPM process as WebService, adapters, calling Web services from BPM processes,
4. Business rules, decision tables, user tasks, XML document transformation.

Course topics

none

Teaching methods

Lecture: multimedia presentation, presentation illustrated with examples given on the board, demonstration.
Exercises: solving tasks, practical exercises, performing experiments, discussion.
Project: instruction, consultation.

Bibliography

Basic
1. Bruce Silver, BPMN Method & Style, Cody-Cassidy Press, 2009
2. Wil van van der Aalst, Kees van van Hee, Workflow Management. Models, Methods and Systems, The MIT Press 2004
3. Wil van van der Aalst, Process Mining, Discovery, Conformance and Enhancement of Business Processes, Springer 2011
4. Marcin Szpyrka, Sieci Petriego w modelowaniu i analizie systemów współbieżnych, Wydawnictwa Naukowo-Techniczne 2008
5. BPMN 2.0 specification 3 ‑ 01 ‑ 2011 (OMG)
Additional
1. Oracle Fusion Middleware Business Process Composer User"s Guide for Oracle Business Process Management 11g Release 1 (11.1.1.5.0) Part Number E15177-04

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	60	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	2,00