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PENS

Pathway in Enterprise Systems Engineering

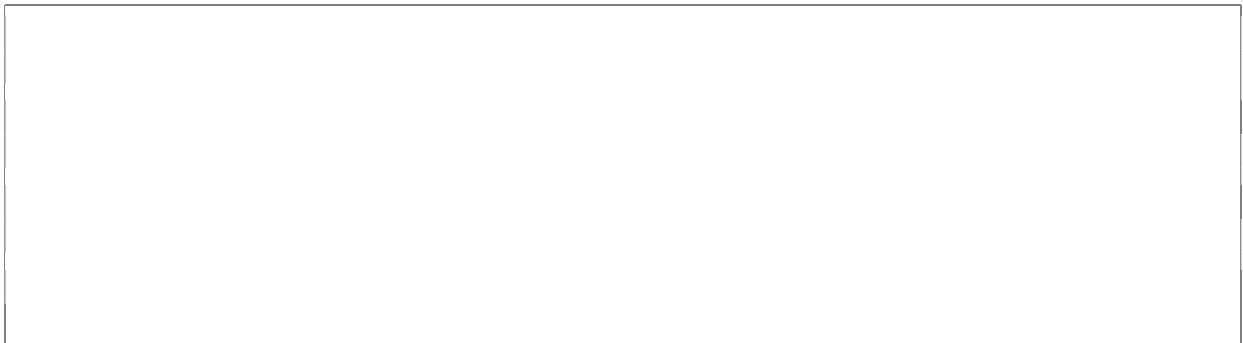
Pathway in Enterprise Systems Engineering (PENS)

Project Ref. No.: 586301-EPP-1-2017-1-PS-EPPKA2-CBHE-JP

<http://www.pens.ps>

System and Data Integration

Course Specification



Course Specification

I. Course details

Course Name	System and Data Integration
Course Code	PENS SDI
Number of Credit Hours	3
ECTS Credits	5.5 (140 learning hours)
Course type (core / elective)	Core
Pre-requisites	Mandatory: Component oriented programming, Data Models Recommended: OOP, Web development
Weekly Hours	<ul style="list-style-type: none"> • Theoretical • 1.5 • Practical • 3 • Total • 4.5
Course Description (provide 60-100 words describing the focus of the syllabus)	
<p>This course tackles both aspects of integration namely data and application/system integration. It contains an introduction that helps students raise awareness about problems of integration within enterprise systems, information systems and other kinds of applications. It provides five chapters for data integration and six other chapters for system integration. The final chapter attempts to cover simultaneously both aspects. It also gives insights about current and future trends related to integration in the era of the Web and cloud computing.</p>	
Course aim(s) (provide 30-50 words describing the aim of the course)	
<p>This course aims to address issues related to:</p> <ul style="list-style-type: none"> - data and systems interoperability - data and systems integration <p>in the context of enterprises' systems either intra-enterprises, inter-enterprises or by considering customers' interactions.</p> <p>It aims therefore to help students to:</p> <ul style="list-style-type: none"> - Understand those issues - Provide relevant integration solutions. <p>Moreover, this course aims to allow students to keep learning and acquiring skills related to :</p> <ul style="list-style-type: none"> - technological trends and evolution - enterprises' systems' continuous change <p>while considering different perspectives (social, organizational, business, etc).</p>	

II. Intended Learning Outcomes of Course (ILOs)

On completing the course, students will be able to (provide 4-6 learning outcomes):

- LO.1 Explain fundamental concepts, principles, and terminology of data integration
- LO.2 Identify commonly used tools, methods and strategies for integrating data and systems, describing the benefits of using each.
- LO.3 Recognize and solve issues related to enterprise systems, applications as well as data integration issues and appraise their interoperability degree and compliance to standardized architectures

LO.4 Describe the role of middleware solutions to solve integration issues and explain the entire process of data and applications integration from analyzing the problem to its implementation.

LO.5 Investigate and Develop within a group of peers or within an industrial context, fully defined integration projects and present/demonstrate the proposed solution

LO.6 Judge whether learnt integration solutions could fit into newly defined integration projects and issues

III. Course Matrix Contents

Week	Main Topics / Chapters	Learning Hours	Intended Learning Outcome (s)
1	Introduction: Application and systems architecture overview Authentic Integration Project Definition	[1.5 Lecture, 3 Lab] + 5.5 Homework Groups formation	N/A (raise awareness about the need for system and data integration LO.#4
2	Foundational data integration techniques <ul style="list-style-type: none"> • Manipulating Query Expressions • Describing Data Sources • String Matching • Schema Matching and Mapping • General Schema Manipulation Operators • Data Matching • Query Processing • Wrappers • Data Warehousing and Caching 	[1.5 Lecture, 3 Lab] + 5.5 Homework	LO.# - 1,2,4
3	Fundamentals of Data Modeling and Metadata Management <ul style="list-style-type: none"> • Understanding Data • Metadata Management • Data Modeling • Data Profiling 	[1.5 Lecture, 3 Lab] + 5.5 Homework	LO.# - 1,2,3,4
4	Ensuring Data Quality in Data Integration <ul style="list-style-type: none"> • Quality Basics • Quality Management • Data Quality Basics • Data Quality Management 	[1.5 Lecture, 3 Lab] + 5.5 Homework	LO.# - 3,4,5
5	Integration with extended data representations <ul style="list-style-type: none"> • XML • Ontologies and Knowledge Representation • Incorporating Uncertainty into Data Integration • Data Provenance 	[1.5 Lecture, 3 Lab] + 5.5 Homework	LO.# - 3,4,5,6

6	<p>Novel integration data architectures</p> <ul style="list-style-type: none"> • Data Integration on the Web • Keyword Search • Peer-to-Peer Integration • Integration in Support of Collaboration • The Future of Data Integration 	[1.5 Lecture, 3 Lab] + 5.5 Homework	LO.# - 3,4,5,6
7	<p>Introducing the middleware solutions and their roles:</p> <ul style="list-style-type: none"> • Middleware definitions • Motivating integration cases using Middleware based solutions • Provided Middleware solution for each case 	[1.5 Lecture, 3 Lab] + 5.5 Homework	LO.#-2,3,4
8	<p>Examples of middleware solutions :</p> <ul style="list-style-type: none"> • Main principles and concepts of the chosen middleware • Characteristics: <ul style="list-style-type: none"> ○ Managed entities ○ Communication modes ○ Solved issues ○ Adopted standards 	[1.5 Lecture, 3 Lab] + 5.5 Homework	LO.#-[3, 4]
9-10	<p>Integration through Web services:</p> <ul style="list-style-type: none"> • Web services types • Web services standards • Web services protocols • Case study 	[3 Lecture, 6 Lab] + 11 Homework	LO.#-3,4,5
11	<p>New trends of integration solutions:</p> <ul style="list-style-type: none"> • Micro-services, • Bounded contexts, <p>Continuous Integration and delivery</p>	[1.5 Lecture, 3 Lab] + 5.5 Homework	LO.#-3,4,5]
12	<p>Mobile applications and integration issues:</p> <ul style="list-style-type: none"> • Mobile integration needs • Web services, Widgets and Mashups • Synchronization, mobility and integration 	[1.5 Lecture, 3 Lab] + 5.5 Homework	LO.#-1, 2,5,6
13	<p>Integration issues and cloud computing:</p> <ul style="list-style-type: none"> • Cloud computing and cloud infrastructures • Cloud based application/system architecture • Cloud system and data integration through cloud infrastructures : case studies 	[1.5 Lecture, 3 Lab] + 5.5 Homework	LO.#-4,6
14	Authentic integration project Presentations	[4.5 presentations]	LO.#1..6

Total Learning Hours	140
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IV. Assessment Methods, Schedule and Grade Distribution

Assessment type	Assessment criteria	Used	Formative	Weight	Week	ILO(s)
Written exam (midterm)		Y	N	10%	#7	• [3,4]
Written exam (final)		Y	N	30%	#16	• [1..6]
Written coursework (individual)		Y	Y	10%	#10	• [2,3,4]
Written coursework (group)		N	N/Y	%		•
Oral presentation (individual)		Y	Y	10%	#8	• [2,3,5,6]
Oral presentation (group)		Y	Y	10%	#14	• [5,6]
Test/Quiz		Y	Y	10.0%	#2,4,6,8,10,12,14	• [1..6]
Other (Project)		Y/N	Y	20%	#16	• [1..6]

V. List of References

Essential textbook(s)	• [.....]
Recommended textbook (s)	<ul style="list-style-type: none"> • Anhai Doan, Alon Y. Halevy, Zachary Ives. Principles of Data Integration. Morgan Kaufmann Publishers, 2012. • Middleware Architecture with Patterns and Frameworks (Sacha Krakowiak) February 27, 2009. • Building Microservices Designing Fine Grained systems Sam Newman (Oreilly)
Course notes	• [.....]
Journal(s) / periodical(s)	<ul style="list-style-type: none"> • https://ieeexplore.ieee.org/ • http://www.dbjournal.ro
Specific article(s)	<ul style="list-style-type: none"> • Special issue on Data Provenance, Data Engineering Bulletin, December 2007, IEEE Computer Society. • Special issue on Data Quality, Data Engineering Bulletin, June 2006, IEEE Computer Society. • A. Doan, P. Domingos, and A. Halevy. Learning to Match the Schemas of Databases: A Multistrategy Approach. Machine Learning, 2003
Websites and other online resources	• https://www.mooc-list.com/tags/data-integration

VI. Facilities required for teaching and learning

- LMS
- Data Show
- Lab With PC
- Middleware software