Project Acronym: MEDIS

Project Title: A Methodology for the Formation of Highly Qualified Engineers at Masters Level in the Design and Development of Advanced Industrial Informatics Systems

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Context

WP 3	Adaptation of AIISM to specific curricula in PC
WPLeader	NTUU-KPI
Task 3.1	Adaptation AIISM - Analyze Curricula
Task Leader	NTUU-KPI
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History

Version	**Date**	**Author**	**Comments**
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1 Executive summary

This deliverable presents the report on the analysis of the possibilities of AIISM courses integration in the curricula of Master Programs at the Faculty of Applied Mathematics that is responsible for MEDIS Project in the National Technical University of Ukraine "Kyiv Polytechnic Institute".

2 Introduction

The Faculty of Applied Mathematics was founded in 1990. It consists of three departments:

1. Applied Mathematics Department;
2. Special-Purpose Computer Systems Department;
3. Computer Systems Software Department.

In scientific sphere the main areas of the faculty's research include the development and the application of various mathematical approaches to scientific, technical and industrial problems as well as the design and implementation of modern software and hardware technologies.

In academic sphere the Faculty of Applied Mathematics offers three Bachelor Programmes (4 years), 5 Specialist Programmes (1.5 years after a Bachelor Programme) and 5 Master Programmes (2 years after a Bachelor Programme).

The Applied Mathematics Department conducts teaching in the following programs:

- Bachelor Programme "APPLIED MATHEMATICS"
  - Master Programme / Specialist Programme "*Applied Mathematics*"

The Special-Purpose Computer Systems Department conducts teaching in the following programs:

- Bachelor Program "COMPUTER ENGINEERING"
  - Master Programme / Specialist Programme "*Computer Systems and Networks*"
  - Specialist Programme "*System Programming*"
  - Master Programme / Specialist Programme "*Special-purpose Computer Systems*"

The Computer Systems Software Department conducts teaching in the following programs:

- Bachelor Programme "SOFTWARE ENGINEERING"
  - Master Programme / Specialist Program "*Systems Software*".
  - Master Programme "*Software Engineering*"

3 Analysis of the Unit Responsible for MEDIS Project

The Computer Systems Software Department has been chosen as the unit responsible for the fulfilment of MEDIS Project. This decision is caused by the following reasons:

1. The existing curricula of Master Programmes offering by this department have to be changed next year according to the reform in this academic branch. Thus, it will enable the integration of AIISM courses into new curricula easier than in other cases.

2. This department has solid long-term collaboration with IT-industry what will enable the receiving of the feedback about the quality of new Master Programme students' professional skills from the following organizations:
   – Association "IT Ukraine"; it unites 29 IT companies (including all large IT-development companies and IT-consulting companies) and 21 educational and research institutions (http://www.itukraine.org.ua/en/);
   – Leading IT-companies, such as EPAM (http://www.epam.com/), GlobalLogic (http://www.globallogic.com.ua/en/), and Miratech (http://miratech.ua/en).
3. This department has both relevant experience and high potential for the effective participation in the project. Additional staff from other departments can be involved to the project if necessary.

4 Degree Structures

4.1 Master Programme "Systems Software"

The Master Programme 8.05010301 – "Systems Software" includes 120 credits of ECTS. It is based on the Bachelor Programme 6.050103 – "Software Engineering".

The degree structure of the Master Programme 8.05010301 – "Systems Software" for 2013/2014 academic year is presented in Table 1.

Table 1

First Year			
First Semester		***Second Semester***	
Course Title	*Credit*	*Course Title*	*Credit*
Corporate Information Systems Design 1	3	Corporate Information Systems Design 2	5,5
Technology of Software Systems Engineering	4	Mathematical Programming	3
Multimedia Technology	6	Modern Operating Systems	3
Applied Tasks of Software Engineering 1	1,5	Applied Tasks of Software Engineering 2	1,5
Information Security Means	3	Digital Signals and Images Processing	3
Applied Programming Technology 1	3	Applied Programming Technology 2	4
Fundamentals of Scientific Researches	2	Scientific Researches in Software Engineering 1	4
Models and Algorithms of Artificial Intelligence	5	Pedagogy of Higher Educational Institutions	1,5
Foreign Language for Profession (Advanced) 1	1,5	Foreign Language for Profession (Advanced) 2	1,5

Continuation of Table 1

Civil Defence	1	Factors of Successful Professional Career	1
		Labour Protection in the Branch	1
		Intellectual Property	1
		Marketing	1,5
Total	***30***	***Total***	***31,5***
Second Year			
Third Semester		***Fourth Semester***	
Course Title	*Credit*	*Course Title*	*Credit*
Object-oriented Analysis, Design and Development of Software Systems	4	Scientific Research Practical	6
High-Performance Computing	5	Preparation of Master's Thesis	22,5
Theory of Formal Languages and Compilation	3		
Operations Research	4		
Mathematical Modelling of Systems and Processes	5		
Scientific Researches in Software Engineering 2	2		
Fundamentals of the Society Sustainability	2		
Philosophic Problems of Scientific Knowledge	1,5		
Science of Patent and Copyright	2		
Foreign Language for Profession (Advanced) 3	1,5		
Total	***30***	***Total***	***28,5***
Total for the Programme	***120***		

4.2 Master Programme “Software Engineering”

The Master Programme 8.05010302 – “Software Engineering” includes 120 credits of ECTS. It is based on the Bachelor Programme 6.050103 – “Software Engineering”.

The degree structure of the Master Programme 8.05010302 – “Software Engineering” for 2013/2014 academic year is presented in Table 2.

Table 2

First Year			
First Semester		***Second Semester***	
Course Title	*Credit*	*Course Title*	*Credit*
Modelling and Design of Information Systems 1	3	Modelling and Design of Information Systems 2	5,5
Technology of Software Systems Engineering	4	Mathematical Programming	3
3D Modelling and Visualisation	6	Modern Operating Systems	3
Applied Tasks of Software Engineering 1	1,5	Applied Tasks of Software Engineering 2	1,5
Information Security Means	3	Digital Signals and Images Processing	3
Web-Programming and Web-Services 1	3	Web-Programming and Web-Services 2	4
Fundamentals of Scientific Researches	2	Scientific Researches in Software Engineering 1	4
Methods of Cryptographic Protection	5	Pedagogy of Higher Educational Institutions	1,5
Foreign Language for Profession (Advanced) 1	1,5	Foreign Language for Profession (Advanced) 2	1,5
Civil Defence	1	Factors of Successful Professional Career	1
		Labour Protection in the Branch	1
		Intellectual Property	1
		Marketing	1,5
Total	***30***	***Total***	***31,5***
Second Year			
Third Semester		***Fourth Semester***	
Course Title	*Credit*	*Course Title*	*Credit*
Object-oriented Analysis, Design and Development of Software Systems	4	Scientific Research Practical	6
Supercomputer Calculations	5	Preparation of Master's Thesis	22,5
Theory of Formal Languages and Compilation	3		

Continuation of Table 2

Operations Research	4		
Mathematical Modelling of Systems and Processes	5		
Scientific Researches in Software Engineering 2	2		
Fundamentals of the Society Sustainability	2		
Philosophic Problems of Scientific Knowledge	1,5		
Science of Patent and Copyright	2		
Foreign Language for Profession (Advanced) 3	1,5		
Total	***30***	***Total***	***28,5***
Total for the Programme	***120***		

4.3 Bachelor Programme "Software Engineering"

The Bachelor Programme 6.050103 – "Software Engineering" includes 247.5 credits of ECTS. It is a basis for both the Master Programme 8.05010301 – "Systems Software" and the Master Programme 8.05010302 – "Software Engineering".

The degree structure of the Bachelor Programme 6.050103 – "Software Engineering" for 2013/2014 academic year is presented in Table 3.

Table 3

First Year			
First Semester		***Second Semester***	
Course Title	*Credit*	*Course Title*	*Credit*
Linear Algebra and Analytic Geometry 1	3	Linear Algebra and Analytic Geometry 2	3
Mathematical Analysis 1	5	Mathematical Analysis 2	5
Theory of Information and Coding	2,5	Discrete Structures	3
Computer Discrete Mathematics	5	Algorithms and Data Structures	5
Fundamentals of Programming 1	5	Fundamentals of Programming 2	5

Continuation of Table 3

Fundamentals of Software Engineering 1	5	Group Dynamics and Communications	2
History of Ukraine	3	Professional Practice in Software Engineering	4
Foreign Language 1	1,5	Foreign Language 2	1,5
		Ukrainian Language	3
Total	***30***	***Total***	***31,5***
Second Year			
Third Semester		***Fourth Semester***	
Course Title	*Credit*	*Course Title*	*Credit*
Object-Oriented Programming 1	3,5	Object-Oriented Programming 2	4,5
Operating Systems 1	2,5	Operating Systems 2	4,5
Human-Computer Interface	3	Software Development	4
Computer Architecture	5	Empiric Methods of Software Engineering	4
Mathematical Analysis 3	2,5	Mathematical Analysis 4	5
Theory of Probability and Mathematical Statistics	3	Computer Logic 1	3
Physics	4	Data Bases 1	3
Ecology	2	Humanitarian Subject 1 by student's choice	2
Foreign Language 3	1,5	Foreign Language 4	1,5
Philosophy	3		
Total	***30***	***Total***	***31,5***
Third Year			
Fifth Semester		***Sixth Semester***	
Course Title	*Credit*	*Course Title*	*Credit*
Software Modelling and Analysis	5	Software Architecture and Design	6
Analysis of Demands to Software	4	System Programming	3
Data Bases 2	4,5	Graphical and Geometrical Modelling	3

Continuation of Table 3

Physical and Mathematical Practicum 1	2	Physical and Mathematical Practicum 2	2
Numerical Methods 1	3,5	Numerical Methods 2	4,5
Computer Logic 2	3	Computer Networks Organization	5
Parallel and Distributed Computing	3	Life Safety	1,5
History of Ukrainian Culture	2	Foreign Language for Profession 2	2
Humanitarian Subject 2 by student's choice	2	Economical Theory Fundamentals	2
Foreign Language for Profession 1	1	Political Science	2
		Industrial Practical Training	5
Total	***30***	***Total***	***36***
Fourth Year			
Seventh Semester		***Eighth Semester***	
Course Title	*Credit*	*Course Title*	*Credit*
Fundamentals of Cross-Platform Programming	4	Project Training	3
Internet Programming	3	Software Project Management	4
Java Technology 1	4	Java Technology 2	4,5
Physical and Mathematical Practicum 3	2	Physical and Mathematical Practicum 4	2
Software and Data Security	4	Pregraduation Practical Training	6
Software Quality and Testing	5	Preparation of Diploma Project	9
Economics of Software	3		
Labour Protection Basics	1,5		
Humanitarian Subject 3 by student's choice	2		
Foreign Language for Profession 3	1,5		
Total	***30***	***Total***	***28,5***
Total for the Programme	***247,5***		

5 Analysis of Possibilities for the Integration of AIISM Courses

The analysis of both the proposed AIISM courses (fulfilled on the basis of available Deliverables of WP1) and the curricula of the programmes:

- Master Programme “Systems Software”,
- Master Programme “Software Engineering”,
- Bachelor Programme “Software Engineering”

enables to conclude the following:

1. The duration of the proposed courses is 15 weeks and the duration of each semester in the National Technical University of Ukraine “Kyiv Polytechnic Institute” is 18 weeks. Thus, 3 weeks can be used for additional lectures if necessary.
2. Both Master Programs (“Systems Software” and “Software Engineering”) can be used as the basis for AIISM implementation.
3. The proposed AIISM courses can be integrated into curricula as courses of a variable part of a Master Program. According to current regulations a variable part equals to 19 credits of ECTS and may include several alternatives (elective courses). Thus, the proposed courses can be considered as elective courses to be chosen by students.
4. The Bachelor Programme “Software Engineering” doesn’t provide prospective Master students with sufficient knowledge in electronics (in particular in analog electronics) necessary for some AIISM courses. To overcome this knowledge gap the additional 3 weeks mentioned above can be used for introductory lectures.
5. The Bachelor Programme “Software Engineering” provides prospective Master students with good knowledge in computer architecture that will meet requirements of AIISM courses.
6. The Bachelor Programme “Software Engineering” provides prospective Master students with good knowledge in programming that will fully satisfy requirements of AIISM courses.

6 Available Equipment

The Computer Systems Software Department has two computer laboratories and the specialised laboratory of IT-company EPAM. Every laboratory is equipped with modern PCs integrated into a local network with the connection to both Intra- and Internet as well as equipped with a projector. The specialised laboratory of EPAM IT-company is also equipped with an interactive whiteboard.

The Computer Systems Software Department has several classrooms that can be reorganized into specialized laboratories according to MEDIS Project requirements.

7 Conclusion

The fulfilled analysis presented above (in particular in both Section 3 and Section 5) enables to conclude that the effective adaptation of AIISM into curricula of both the Master Programme “Systems Software” and the Master Program “Software Engineering” is possible as well as the unit responsible for the new curricula has enough potential for the successful implementation of MEDIS project.