



National Research University Higher School of Economics
 Syllabus of (adaption) course "Enterprise architecture"
 for bachelor "Business informatics" and master "Big Data Systems" students (38.04.05)

**The Federal State Autonomous Institution of Higher Education
 "National Research University – Higher School of Economics"**

Faculty of Business and Management

School of Business Informatics

Department for Management of Information Systems and Digital Infrastructure

Syllabus of (adaptation) course "Enterprise Architecture"

For "Business informatics" educational program
 38.04.05 "Business informatics" educational course
 bachelor degree
 38.04.05 "Big Data Systems" educational course
 master degree

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Head of Department

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Approved by the Academic Council of Business Informatics

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Academic Head of the educational program

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1 Course Description

This syllabus of educational practical-oriented (adaptation) course "Enterprise Architecture (EA) declares the *minimum* requirements to the knowledge and the capability of students obtained after adopting the course content. It determines the content of classes and type of knowledge control (examination).

This syllabus is intended for tutors that are running this EA course, student assistants and students. The syllabus was developed in correspondence with:

- FGOS of higher professional education of master program 38.04.05 Business informatics;
- The running university study (RUP) of master program 38.04.05 Business informatics Master program "Big Data Systems" that was accepted by the scientific committee of NRU HSE in 2018.

2 Learning Objectives

The course «Enterprise Architecture» is aimed on acquiring the basic level of knowledge about the Enterprise Architecture subject, including:

- The understanding of EA as a key area of enterprise engineering that provides:
 - The coherence of business operations to mission and goals of one's company,
 - The actuality of current state of an enterprise, transparency of its business-processes,
 - Controlled transformation of its' business asserts,
 - Increase of business performance using information technologies (IT).
- The basics of business-process modelling, creating organization charts, information and technology architectures;
- The basics in enterprise engineering: main models and methodologies of enterprise building.
- The service orientation during EA building, as well as technological opportunities for Big Data handling as a source of sustainable competitive advantage (CA).

3 Learning Outcomes and Competences

After passing the exam of EA students should:

- Know theoretical foundations of modern enterprise governance, goal-setting and business process management;
- Know main theoretical prerequisites of the current role of IT in business models;
- Can shortly formulate his/her vision of the in form of academic essay and presentation;
- Use methods of interactive modelling of EA using Archimate/Archi or other modelling tools.

In current course students obtain the following competences and knowledge:

Competence	Code ES HSE	Competence formation level	Descriptors – main features of knowledge acquiring (indicators of result achievement)	Forms and methods of learning that contribute to formation and development of competence	Form of control of competence formation level
Ability to work with information from different sources	OK-16		Student uses all available information sources	Lectons, Seminars, Case-studies	The active participation on lectures and
Enterprise Architecture analysis	PIK-4		Student shows possibilities of selecting types of EA		seminars, express-assignment, exam



Capability to formulate scientific goals in EA research	CK-3		Student shows the understanding of the practical field of EA		
Application of program components for handling , analysis and classification of information	ПК-22		Student shows the application of necessary instruments for researchers		
Preparation of scientific (technical) reports, presentations, scientific publications	ПК-23		Student uses reports, presentations during seminars and prepares publications on the topic		
Application of system approach to research and modelling of business architecture	New competence		Student shows understanding of system approach with an ability to use Cloud services & Big Data advantages building enterprise architectures		

4 Course Plan

H – hours of topic; L – lectures; S – seminars; P – practical studies

№	Chapter name	H	L	S	P
1	Introduction to EA	36	20	8	8
a	System analysis, general system theory, definitions and objectives of considerations				
b	Properties of EA, system approach to EA development, principle definitions				
c	Business architecture, definition and features				
d	BSC – balanced score card basics and its reflection in EA				
e	Strategic governance				
f	EventCausality effects in EA under scope of BSC				
g	Organizational structure of EA and basic models				
h	Information and technology architecture basics				
2	Introduction to EA structuring and modelling	36	12	12	12
a	Business architecture (inc. business process modelling, IBM Component business model)				
b	Information architecture, Technology architecture and integration between the layers model				
3	Introduction to enterprise engineering (EE)	24	6	8	10
a	Enterprise transformations (waterfall and agile), EAP				
b	EA methodologies: PRISM, ARIS Framework, Zachmann Framework , FEAF, DODAF and TOGAF				
4	Introduction to Service orientation in Enterprise Engineering (SOA, SoEA)	18	6	6	6
a	Technological infrastructure for Big Data handling in EA				
b	Cloud computing opportunities for EA				
c	Flexible (agile) business and information architectures (SoEA)				
	Outcome: 3 Practical cases				
	o The Walt Disney Company – Enterprise Architecture Overview				
	o Cirque du Soleil				
	o CAPGEMINI – DIGITAL TRANSFORMATION				
	Total hours	114	44	34	36



5 Grading system

Type of control	Form of control	Weeks				Parameters
		1	2	3	4	
During studies	The active participation on lectures and seminars			The mark is composed from the home assignment results (essays, presentations) and from the level of student involvement into seminars (O_{seminar})		The active involvement into seminar discussions (questions & answers, suggestions, voluntary reports made, etc.)
	Express-assignment (before the lecture)			Mark for express-assignment, $O_{\text{assignment}}$		Express assignment could happen before any lecture (10-15 minutes) in form of opened questions. It checks the amount of course content understood during the course.
Mid-term	The aggregated results of assignments				The aggregated mark, $O_{\text{collected}}$	All assignment marks are taken into consideration
	Exam				Mark for exam, O_{exam}	Answers in written or electronic form
Final	Aggregated results of mid-term milestones				Final mark, O_{final}	All marks are taken into consideration as well as the mid-term results

6 Criteria's of students' knowledge and competences appraisal

Following criteria are used to estimate the level of student's knowledge:

- Activity discussions during seminars;
- Assisting to tutors during lectures and seminars;
- Express assignments results.

During mid-term control following criteria are used:

- The aggregated results of assignments
- Accuracy and completeness of answers



By final control following criteria are used:

- Accomplishment of mid-term criteria
- Aggregated mark

For gaining marks the 10-grade scale is used, where 1 is the lowest mark, 10 the highest.

7 Course content

Section 1. Introduction to Enterprise Architecture

Topic 1.1. Business and Information Technology: from strict dependence through B/IT alignment to strategic coherence

Historical and theoretical roots of enterprise architecture, main milestones (computer architecture, information systems architecture, enterprise architecture); strategic alignment model; Triangle model of business, information and technology coherence

Literature:

1. Proper H., Langhorst, M. Enterprise architecture towards essential sense making. Enterprise modelling and Information Systems Architectures, Vol. 9 No 1., June 2014
2. Henderson, J.C., Venkatraman, N.: Strategic Alignment: Leveraging Information Technology for Transforming Organizations, IBM Systems Journal, 1999

Topic 1.2. Competitive advantage by means of Information Technology (IT)

Market-based and Resource-based views on enterprise; Sustainable competitive advantage: how to cut cost, to differentiate and to reduce operation risks by means of IT? Practical cases

Literature:

1. Neubauer M., Sary CH., S-BPM in the Production Industry. Stakeholder approach, Springer Open, 2017
2. Porter M. Competitive Advantage: Creating and Sustaining Superior Performance
3. Porter M. How competitive forces shape strategy HBR, 1999
4. Carr N G.: IT Doesn't Matter, Harvard business review 81, May 2003, pp 41-49

Section 2. Introduction to EA structuring and modelling

Topic 2.1. Business architecture

EA modelling tools: Archimate, ARIS, Metasonic. Mission and strategic goals of companies, map of strategic goals and the balanced score card; Key performance indicators (KPI) ; The notion of Business Architecture (BA); IBM Component business model (CBM); Types of organizational structures; Place of BA in



EA Reference model; Components of BA; Business processes and components modelling; Creating business architectures

Literature:

1. Business Architecture: A Practical Guide by Jonathan Whelan and Graham Meaden. Gower Pub Co (August 28, 2012), 271 c.
2. Kaplan R., Norton D. The Balanced Scorecards.
3. Marc Lankhorst. Enterprise architecture at work. Modelling, Communication and Analysis. EE series. Springer, 2009 - 345c.
4. The Open Group (2005) TOGAF – The Open Group Architectural Framework – Version 8.1 Enterprise Edition. The Open Group – Van Haren Publishing, Zaltbommel, The Netherlands

Topic 2.2. Information and technology architectures

Notion of information architecture (IA); Place of IA in reference model of EA; Application Architecture; Data Architecture; Application Architecture building; Data architecture building; basics of UML,

Literature:

1. Marc Lankhorst. Enterprise architecture at work. Modelling, Communication and Analysis. EE series. Springer, 2009 - 345c.
2. The Open Group (2005) TOGAF – The Open Group Architectural Framework – Version 8.1 Enterprise Edition. The Open Group – Van Haren Publishing, Zaltbommel, The Netherlands

Section 3. Introduction to Enterprise Engineering (EE)

Topic 3.1. An overview of historical methodologies of Enterprise Architecture development and Enterprise transformations

Frameworks and methods of enterprise structuring: PRISM, ARIS Framework, Zachman framework, Federal Enterprise Architecture Framework (FEAF), Department of Defense Architecture Framework (DoDAF); System approach to enterprise engineering; Enterprise Architecture Planning (EAP); IBM Portfolio management.

Literature:

1. Zachman J. (1987) A framework for information systems architecture. In: IBM Systems Journal a. 26(3)
2. The Open Group (2011) TOGAF – The Open Group Architectural Framework – Version 9.1 a. Enterprise Edition. The Open Group – Van Haren Publishing, Zaltbommel, The Netherland
3. <http://msdn.microsoft.com/en-us/library/bb466232.aspx>
4. Spewak S. (1993) Enterprise Architecture Planning: Developing a Blueprint for Data, a. Applications, and Technology. Wiley, New York
5. Marc Lankhorst. Enterprise architecture at work. Modelling, Communication and Analysis. EE a. series. Springer, 2009 - 345c.
6. Gromoff A. I., Zykov S. V., Kazantsev N. *Software Engineering for Enterprise System Agility: Emerging Research and Opportunities*. Hershey : IGI Global, 2018.

Topic 3.2. TOGAF

Architecture Development Method (ADM); Enterprise Continuum; Architecture Content Framework; Architecture Building Blocks, Solution Building Blocks, TRM, IIIM, Industry models (eTOM, SCOR,

etc.)



Literature

1. Marc Lankhorst. Enterprise architecture at work. Modelling, Communication and Analysis. EE series. Springer, 2009 - 345c.
2. The Open Group (2011) TOGAF – The Open Group Architectural Framework – Version 9.1 Enterprise Edition. The Open Group – Van Haren Publishing, Zaltbommel, The Netherlands

Section 4. Introduction to Service orientation in Enterprise Engineering (SOA, SoEA)

Topic 4.1. Introduction to Service-Oriented Architecture and its place in Enterprise Architecture

Data & Information Integration in enterprise engineering, Service paradigm, business, information and technology services, main SOA notions, reference SOA model, Service catalogue of SOA, Enterprise Service Bus, Choreography and Orchestrating of Services. Advantages of SOA

Literature:

1. Service-Oriented Architecture (SOA): Concepts, Technology, and Design, Prentice Hall (August 12, 2005), c. 792
2. Erl T. (2005) Service-Oriented Architecture (SOA): Concepts, Technology, and Design. Prentice Hall.
3. <http://www-01.ibm.com/software/solutions/soa/>

Topic 4.2. Technological infrastructure for Big Data handling in EA

Advantages of data keeping and analysis "In-Memory"; solutions and implementation approaches. Peculiarities of Big Data Storage, architectural solutions and BigData handling. SAP HANA.

Literature:

1. Plattner, H. and Zeier A., "In-memory data management." Heidelberg [ua]: Springer Verlag (2011).

Topic 4.3. Cloud computing opportunities for EA

Cloud computing and the EA, Make of buy decisions considering outsourcing, third party service provider, IaaS, PaaS, SaaS

Literature:

1. Mahmood, Z. and Hill R., "Cloud Computing for Enterprise Architects", London, Springer Verlag (2011).

Topic 4.4. Flexible (agile) business and information architectures (SoEA)

Agility of business architectures, the transformation abilities of current enterprises, Service oriented enterprise engineering

Literature:

1. Gromoff A. et al., Newer Approach to Create Flexible Business Architecture of Modern Enterprise, Global Journal of Flexible Systems Management (December 2012) 13(4):207–215
2. Proper H., Langhorst, M. Enterprise architecture towards essential sense making. Enterprise modelling and Information Systems Architectures, Vol. 9 No 1., June 2014



8 Guidelines for knowledge Assessment

8.1 Topics of express-assignments

1. Reflective analysis of previous lectures
2. Actual scientific or practical problems related to subject

8.2 Questions for appraisals of understanding the course content

1. Which parts has Enterprise Architecture? What is their role? What methodologies are used to model the EA? What is Strategic alignment? What drivers have changed the concept during the last 20 years?
2. That is the peculiarity of system approach to enterprise engineering?
3. How mission and aims of the company are decomposed?
4. What theoretical and practical foundations exist for building EA on BigData?

Questions to part 1. Introduction to Enterprise Architecture

Questions to 1.1. Business and Information Technology: from strict dependence through B/IT alignment to strategic coherence

1. Name the main milestones of EA development
2. What is the «strategic alignment»?
3. The main aspects are addressed by Strategic alignment model
4. That is the role of IT strategy in business transformation?

Questions to 1.2. Competitive advantage by means of Information Technology (IT)

1. What is the difference between Market-based and Resource-based views on enterprise?
2. Name five Porter Forces and their influence on companies
3. What is Value added chain?
4. How competitive advantage (CA) by means of IT could be achieved?
 - a. CA by cutting costs, examples
 - b. CA by differentiation, examples
 - c. CA by risks reduction.

Questions to part 2. Introduction to EA structuring and modelling

Questions to 2.1. Business architecture

1. From which components does EA Model consist?
2. What is organizational chart? When is it created?
3. What is business architecture?
4. How business goals are decomposed?



5. BSC view points on enterprise goals, the role of KPI
6. What is the purpose of IBM CBM model
7. Difference between the EA modelling tools: Archimate, ARIS, Metasonic,

Questions to 2.2. Information and technology architectures

1. What is information architecture? From what parts it consists?
2. The role of application and data integration during enterprise building

Questions to part 3. Introduction to Enterprise Engineering (EE)

Questions to 3.1. An overview of historical methodologies of Enterprise Architecture development and Enterprise transformations

1. What main question addresses the Zachmann framework?
2. What are the a layers of Zachmann model?
3. What are the peculiarities of system approach to enterprise engineering?
4. What are the peculiarities of FEAF. DODAF
5. Name a motivation for development of TOGAF

Questions to 3.2. TOGAF

1. Name the main steps of ADM
2. What is the role of Enterprise Continuum;
3. What is the role of Architecture Content Framework;
4. What is the difference between Architecture Building Blocks, Solution Building Blocks
5. TRM, IIM and Industry models (eTOM, SCOR, etc.) in EA

Questions to part 4. Introduction to Service orientation in Enterprise Engineering (SOA, SoEA)

Questions to 4.1. Introduction to Service-Oriented Architecture and its place in Enterprise Architecture

1. List the main characteristics of SOA.
2. What are the peculiarities of SOA implementation?
3. Give a definition to following notions: Service, composite service, service repository, loose coupling, interface, and protocol, Enterprise Service Bus, Choreography and Orchestrating of Services. Advantages of SOA
4. What protocols are used in SOA?
5. What is SOMA?

Questions to 4.2. Technological infrastructure for Big Data handling in EA

Advantages of data keeping and analysis "In-Memory"; solutions and implementation approaches. Peculiarities of Big Data Storage, architectural solutions and Big Data handling. SAP HANA.



1. What are the advantages of storing data In-Memory?
2. How the database schema does look like?
3. Main characteristics of SAP HANA.

Questions to 4.3. Cloud computing opportunities for EA

1. Make of buy arguments considering our sourcing of enterprise functions
2. Historical role of third party service provider,
3. Differences between DaaS, IaaS, PaaS, SaaS and PaaS

Questions to 4.4. Flexible (agile) business and information architectures (SoEA)

1. Why agility is an important requirement for modern company?
2. How enterprises could transform? Why does it happen?
3. What are the foundations of service oriented enterprises?

9 The properties of mark

A tutor appraises the student's work during lectures and seminars according to criteria are mentioned in 6.1. Student marks are collected into the resulting table. The collected mark for student involvement into seminar work is formed before the exam.

A tutor appraises also the self-preparation of students. It is taken into consideration the correctness of tasks accomplishment: this appraisal is being put into the working table. Collected mark for self-preparation is detected before the mid-term or final examination.

The collected mark for current control takes into consideration the students the following way:

$$O_{\text{collected}} = k_1 * O_{\text{assignment}} + k_2 * O_{\text{seminar}}$$

$$k_1 + k_2 = 1,$$

where:

k_1, k_2 – are weighted coefficients, that comprises the significance of class work and self-preparation; the exact values are detected by a tutor depending on the overall level of the group;

$O_{\text{assignment}}$ - mark for express-assignment;

O_{seminar} - оценка за подготовку задания по проекту и выступление на семинаре;

The final mark for the course is calculated the following way:

$$O_{\text{final}} = k_3 * O_{\text{collected}} + k_4 * O_{\text{exam}},$$

$$k_3 + k_4 = 1,$$

where:

k_3, k_4 – are weighted coefficients, that comprises the significance of class work and self-preparation; the exact values are detected by a tutor depending on the overall level of the group;



The final mark is recorded to Bachelor (Master) Diploma.

10 Reading List

10.1 Required

Marc Lankhorst. Enterprise architecture at work. Modelling, Communication and Analysis. EE series. Springer, 2009 - 345c.

10.2 Optional

1. Business Architecture: A Practical Guide by Jonathan Whelan and Graham Meaden. Gower Pub Co (August 28, 2012), 271 c.
2. Gromoff A.I., Ferapontov M.M., Shmatalyuk A.E. Business modelling. ARIS technology. – M.: Весть-МетаТехнология, 2001. С. 36-115
3. Know Service-Oriented Architecture (SOA): Concepts, Technology, and Design, Prentice Hall (August 12, 2005), c. 792
4. Enterprise architecture. [Electronic resource]. URL <https://learn.open2study.com/mod/youtube/view.php?id=42933>. Access: Free.

11 Special Equipment and Software support (if required)

For preparing practical tasks, reports and presentations following program tools are used:

Standard packages of programs, inc. :

- Essays & assignments (Microsoft Word);
- Presentations (Microsoft PowerPoint);
- The Open Forum Archimate/ Architec

