

WP1 Current Programmes in EU and Partner HEIs - State of the Art

ACT 1.2 Analysis of related programmes and practices at partner universities

DELIVERABLE 1.2 REPORT ON EXISTING PARTNER HEIS PROGRAMMES AND PRACTICES

**CASE STUDY OF THE NATIONAL UNIVERSITY OF ARCHITECTURE AND CONSTRUCTION OF
ARMENIA (REPUBLIC OF ARMENIA)**

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I. Curriculum of “073201.01.6 – Industrial and Civil Engineering” Bachelor Program

1. General Context

The last version of the “073201.01.6 – Industrial and Civil Engineering” Bachelor Program Curriculum, which has been functioning to date, was created in 2016. That academic program is carried out in the “Construction” faculty of the National University of architecture and Construction of Armenia (NUACA). The mission of the Construction Faculty is to prepare the qualified specialists for all subdivisions of construction field, who will be able to use the acquired knowledge and skills to develop the construction sector that is important for the country's economy.

2. Bachelor Curriculum

2.1 Analysis of “073201.01.6 – Industrial and Civil Engineering” Bachelor Program Curriculum

“073201.01.6 – Industrial and Civil Engineering” Bachelor study program curriculum aims at fostering the students’ professional and scientific career advance through imparting teaching knowledge and skills necessary for the students. To fulfill this, the eight chairs of the “Construction faculty” are using the contemporary methods of teaching (particularly, lectures, practical work, seminars, laboratory work and internship), supervise the scientific and educational progress in developing new courses and improving the existing ones, evolve ties with higher education institutions of national and international levels and closely collaborate with local and foreign universities, companies and research institutions.

The curriculum involves a wide range of courses (see Annex 1). Special emphasis is placed on basic and professional subjects that makes about 94 %. After graduating from this educational program, the students can find a job in construction organizations and enterprises/companies of state and private sectors as the educational program proposed makes a basis for the students not only for further education but also to find a job in construction industry.

2.1.1 Qualification Degree

After completion the education by “073201.01.6 – Industrial and Civil Engineering” Bachelor study program, the graduates are awarded by the qualification degree “Bachelor of Engineering”.

2.1.2 Structure and Duration of Study

The study program under discussion is functioning within “Construction” speciality. Years of study makes 8 semesters. The students have been offered with 8 directions within the speciality “Construction” so far out of which they can choose one at the end of their second year. One of those directions mentioned above is “073201.01.6 – Industrial and Civil Engineering” educational program. Every semester of study process is combined with practical and laboratory work. The students are required to attend the lectures and practical, laboratory classes, work on individual or team projects and present the results orally or in written form.

The main/final project which is compulsory for the completion of studies is based on the theme chosen by the student and offered by the teaching staff principally on the labour market demand. It enables the student to focus on the theme he/she is interested in, use the knowledge and skills obtained during the years of education, participate in experiments of average and wide range, get acquainted with research techniques of literature and apply technical writing skills.

Internship (academic and industrial) headed by a member of the faculty staff is also compulsory for the completion of studies. It gives the students an opportunity to broaden their knowledge acquiring practical experience in real conditions, get acquainted with the labour legislation, workplace safety procedures and obtain necessary information for the completion of their academic program.

Syllabus of the disciplines is based upon 25 hours load per week required for the average student. Classroom hours per week make 23-27 academic hours depending on the semester. 28-32 ECTS credits are carried out every semester providing 60 ECTS annually. To complete the bachelor program on the whole 240 ECTS is required.

Within the framework of “073201.01.6 – Industrial and Civil Engineering” Bachelor study program the total number of subjects taught is 43. The ratio of theoretical and practical courses among the total number of subjects taught is accordingly 57% and 43%. For 48% of the subjects taught by the curriculum no practical classes are envisaged and 67% have not laboratory work. 26 % of the subjects taught have a course project while 37% have graphic work component. The ratio of the vocational subjects, or in other words, subjects directly concerning construction sphere is 47% within the total number.

2.1.3 Table of all the Subjects on the Curriculum

Annex 1 presents all the subjects taught within the framework of “073201.01.6 – Industrial and Civil Engineering” Bachelor study program with their credits (ECTS) and academic hours.

3. Conclusion

The strengths of the study program analyzed are as follows:

- 80% of the graduates work in their speciality in local or foreign construction companies.
- Most of the teaching staff in this curriculum are practical teachers.
- This academic program is in great demand among the students.

The weaknesses of the study program analyzed are as follows:

- The majority of the students are young boys who interrupt their education because of the service in the army and after its completion some of them do not want to continue their education.
- The increase in the number of people seeking work abroad as a result of economic instability in the country impacts the number of the applicants of this academic program.

Directions for the improvement of the study program analyzed are as follows:

- Implementation of contemporary computer technologies (software packages BIM) in academic subjects.
- Compliance of academic program outcomes with labour market demands in the framework of TACEESM ERASMUS+ project based on the results of the employers' survey.

II. Curriculum of “073101.01.7 - Architecture” Master Degree Program

1. General Context

The latest version of “073101.01.7 - Architecture” Master Degree Program Curriculum was created in 2020. The qualification Master of Architecture by this study program can be granted to the Bachelor graduates of the mentioned program. The given study program is realized at the National University of Architecture and Construction of Armenia (NUACA), in the faculty of “Architecture”.

The mission of “Architecture” faculty is to prepare such exceptional specialists as architects are. The core bearers of this mission are the faculty chairs where renowned architects, scientists, specialists from leading construction companies are teaching, which contributes not only to close collaboration with external stakeholders and employers, but also to the integration of educational, scientific-research and manufacturing processes.

2. Master Degree Curriculum

2.1. Analysis of Curriculum of “073101.01.7 - Architecture” Master Degree Program

“073101.01.7 - Architecture” Master Degree Program provides the students’ professional and scientific career advance in architecture field by means of teaching and passing knowledge and skills necessary for the students. To fulfill this, the three Chairs of “Architecture” faculty are using the contemporary methods of teaching (particularly, project development, lectures, practical work, seminars, studio classes, team and individual work, exhibitions, competition-reviews), supervise the scientific and educational progress in developing new courses and improving the existing ones, evolve ties and collaborate with national and international higher education institutions as well as with companies and research institutions relative to the sphere.

The curriculum involves a wide range of courses (see Annex 2). Special emphasis is laid upon the professional subjects, nearly 95 %. After finishing education by this study program, the students can find a job in state and private architectural and research organizations and enterprises / companies, because this study program provides the fundamentals for the graduates’ further education (postgraduate) as well as in architecture and urban planning spheres.

2.1.1. Qualification Degree

After completion the education by “073101.01.7 - Architecture” Master Degree Program the graduates are awarded by the qualification degree “Master of Architecture”.

2.1.2. Structure and Duration of Study

The study program analyzed is functioning within the speciality of “Architecture”. Study period makes 2 years (4 semesters). The courses are distributed under specializing, elective and research disciplines. The education is carried out in a cyclical manner (by modules). During each cycle (module) the students study a number of courses which are combined with theoretical, practical, project design classes as well as

students' individual work. The students are required to attend the lectures, work on individual or team projects and present the results orally or in written form.

The final project, Master's Thesis which is compulsory in order to receive a qualification, is offered by the teaching staff in the form of a topic list, mainly according to the labour market demand. It enables the student to focus on the theme he/she is interested in, use the knowledge and skills obtained during the years of education, get acquainted with research techniques of literature and apply architectural project development skills.

A compulsory component of the learning process is the acquirement of experience in professional studios, which lasts 6 weeks and gives the students a chance to broaden their knowledge attaining practical experience in studios, get acquainted with the labour legislation, workplace regulations and collect data necessary for the completion of their study program. Syllabus of subject is based upon 19 hours load per week required for the average student. Throughout the whole process of education the students acquire 120 ECTS credits.

Within the framework of "073101.01.7 - Architecture" Master Degree Program the total number of subjects taught is 26. The number of professional subjects involved in the curriculum makes about 95%. The majority part of the subjects taught include a course project. The student's individual work component is a significant part in the process of the study program outcomes which is provided by the execution of the assignments envisaged within the given course.

2.1.3. Table of All the Courses on the Curriculum

Annex 2 presents all the subjects taught within the framework of "073101.01.7 - Architecture" Master Degree Program with their credits (ECTS) and academic hours.

3. Conclusion

The strengths of the study program analyzed are as follows:

- Proportional distribution of academic and specializing subjects on the curriculum.
- Wide possibilities for specializing component research preparing the student for postgraduate education, creating top quality specialists.
- Ensuring the principle of equivalence for professional orientation.

The weaknesses of the study program analyzed are as follows:

- Scarcity of optional subjects.
- Need for refreshment and modernization of narrow professional subjects in urban planning and restoration sphere.
- Shortage of contemporary literature.

Directions for the improvement of the study program analyzed are as follows:

There is shortage of some subjects in order to carry out more qualified professional operations after graduation, particularly:

- Rhetoric (presentation of thoughts and professional ideas).

- Architectural and general ethics.
- Innovation technologies in architecture (available but there is need for improvement).
- Implementation of BIM technologies in architecture (available but still needs to be improved).
- REVIT program advanced study and formation of general platform for BIM technologies use.
- Subjects that foster creative (design) thinking (lateral thinking, NLP and others).
- Advanced disciplines of restoration-oriented narrow specializing.
- Saturation of the applied restoration laboratory with up-to-date equipment .

III. Curriculum of “073102.02.7- Heat and Gas Distribution and Ventilation” Master Degree Program

1. General Context

The latest version of “073102.02.7-Heat and Gas Distribution and Ventilation” Master Degree Program Curriculum was created in 2020. The qualification Master of Engineering by this academic program can be granted to the Bachelor graduates of the mentioned or adjacent academic programs. The given academic program is realized at the National University of architecture and Construction of Armenia (NUACA), in the faculty of “Urban Economics and Ecology”.

The mission of the “Urban Economics and Ecology” faculty is to prepare qualified specialists in urban economics, transportation systems, tourism fields who will be able to use the knowledge and competences obtained in designing engineering systems, develop the fields essential for the country’s economy.

2. Master Degree Curriculum

2.1. Analysis of Curriculum “073102.02.7-Heat and Gas Distribution and Ventilation” Master Degree Program

“073102.02.7-Heat and Gas Distribution and Ventilation” Master Degree Program aims at fostering the students’ professional and scientific career advance by the means of teaching and imparting knowledge and skills necessary for the students. To fulfill this, the “Heat and Gas Distribution and Ventilation” Chair faculty are using the modern methods of teaching (particularly, lectures, practical work, seminars, laboratory work, team and individual work), supervise the scientific and educational progress in developing new courses and improving the existing ones, evolve ties and closely collaborate with higher education institutions of national and international levels as well as with companies and research institutions relative to the sphere.

The curriculum involves a wide range of courses (see Annex 3). Special emphasis is laid on the professional subjects, nearly 95 %. After graduating from this educational program, the students can find a job in construction research companies and enterprises in state and private sectors because the educational program proposed provides the basis for the students’ further education (postgraduate) as well as in urban economics planning sphere.

2.1.1. Qualification Degree

After completion of education by “073102.02.7-Heat and Gas Distribution and Ventilation” Master Degree Program the graduates are awarded by the qualification degree “Bachelor of Engineering”.

2.1.2 Years of Study and Structure

The study program analyzed is functioning within “Urban economics” speciality. Learning lasts 3 semesters. The courses are distributed under mandatory, research and elective disciplines. The education is carried out in a cyclical manner (by modules). During each cycle (module) the students study a number of courses which are combined with theoretical, practical, project design classes as well as students’ individual work. The students are required to attend the lectures and practical classes, work on individual or team projects and present the results orally or in written form.

The final project which is compulsory for the completion of study is based on the theme chosen by the student from the thesis topics list suggested and offered by the teaching staff principally on the labour market demand. It enables the student to focus on the theme he/she is interested in, use the knowledge and skills obtained during the years of education, carry out experiments on their own, get acquainted with research techniques of literature and apply technical writing skills.

A compulsory component of the learning process is Internship, the experience acquired in the professional organization, which lasts 6 weeks and gives the students an opportunity to broaden their knowledge acquiring practical experience in real conditions, get acquainted with the labour legislation, workplace safety procedures and collect necessary information for the completion of their study program. Syllabus of subject is based upon 20-22 hours load per week required for the average student. Throughout the whole process of education the students acquire 90 ECTS credits.

Within the framework of “073102.02.7-Heat and Gas Distribution and Ventilation” Master Degree Program the total number of subjects taught is 19. The number of professional subjects involved in the curriculum makes 95%. 15% of the subjects taught have a course project. 60% of the classroom hours are practical classes. The student’s individual work component is a significant part of the study program outcome process which is provided by the assignments envisaged within the given course.

2.1.3. Table of All the Courses on the Curriculum

Annex 3 presents all the subjects taught within the framework of “073102.02.7-Heat and Gas Distribution and Ventilation” Master Degree Program with their credits (ECTS) and academic hours.

3. Conclusion

The strengths of the study program analyzed are as follows:

- 90% of the graduates work in their speciality in HGDV system design, production and service fields.
- Most of the teaching staff on this curriculum are specialists of the sphere leading companies.
- This academic program provisions accord with the labour market requirements.

The weakness of the study program analyzed are as follows:

- In spite of the local labour market demand, there is still scarcity of the applicants who want to get an engineering education.
- There is an increase in the number of young people wishing to get an education abroad as a result of economic and political instability in the country.

Directions for the improvement of the study program analyzed are as follows:

- Implementation of contemporary computer technologies (software packages BIM) in academic subjects.
- Compliance of academic program outcomes with labour market requirements in the framework of TACEESM Erasmus+ project based on the results of potential employers' survey.

Annex 1. Curriculum of “073201.01.6 – Industrial and Civil Engineering” Bachelor Program

NN	SUBJECT	Credits (ETCS)	Classroom hours			
			Total	Lecture	Practical	Laboratory
1.	Humanities					
1.1	Political History of Armenia	2	32	32	0	0
1.2	Philosophy	1	16	16	0	0
1.3	Armenian Language and Culture of Speech	4	64	0	64	0
1.4	Russian	4	64	0	64	0
1.5	Foreign Language	4	64	0	64	0
1.6	Physical Training	0	128	0	128	0
	Total	15	368	48	320	0
2	Natural and Technical Disciplines					
2.1	Higher Mathematics	15	192	96	96	0
2.2	Physics	6	80	48	0	32
2.3	Chemistry in Construction	4	48	32	0	16
2.4	IT Fundamentals	4	48	16	0	32
2.5	Fundamentals of Ecology	4	48	32	0	16
2.6	Engineering Graphics	4	48	16	32	0
2.7	Constructional Drawing	4	48	0	48	0
2.8	Civil Defence and Emergency Basic Problems	2	32	32	0	0
2.9	Building Materials	6	80	48	0	32
2.10	Theoretical Mechanics	9	112	64	48	0
2.11	Engineering Supply of Construction					
	a) Engineering Geodesy	4	48	32	0	16
	b) Engineering Geology	2	32	16	0	16
2.12	Strength of Materials	10	128	64	48	16
2.13	Hydraulics	5	64	32	0	32
2.14	Structural Mechanics	9	112	64	48	0
2.15	Architecture of Buildings and Structures	9	112	80	32	0
2.16	Soil Mechanics, Foundations and Bases	7	96	64	16	16
2.17	Construction Machinery	4	48	32	0	16
	Total	108	1376	768	368	240
3	Majors					
3.1	Reinforced Concrete Structures	23	270	180	74	16
3.2	Steel Structures	19	241	151	90	0
3.3	Engineering Systems of Buildings and Structures					
	a) Heat - and - Gas Distribution and Ventilation	3	32	32	0	0
	b) Water Supply and Water Disposal	3	32	32	0	0

	c) Power Supply	3	32	32	0	0
3.4	Up-to-date Building Materials	4	64	48	0	16
3.5	Construction Technology	8	112	80	32	0
3.6	Organization of Construction Operations	7	97	63	34	0
3.7	Physics of Civil Engineering	2	26	26	0	0
3.8	Geodesy in Civil and Industrial Engineering	2	32	16	16	0
3.9	Masonry Structures	3	48	32	16	0
3.10	Modeling and Computation of Building Structures	2	26	26	0	0
3.11	Wooden and Plastic Structures	5	65	39	26	0
3.12	Earthquake Resistance of Structures	4	48	24	24	0
3.13	Survey and Testing of Buildings and Structures	3	32	16	8	8
3.14	Construction Economics	2	16	16	0	0
3.15	Management	1	16	16	0	0
3.16	Branch Law	1	16	16	0	0
3.17	Standardization, Certification and Quality Monitoring	2	26	26	0	0
	Total	97	1231	871	320	40
	Sum Total		2975	1687	1008	280
	Examinations					
	Tests					
	Course Project					
	Course Work					
	Practice (by weeks)					
	Academic (geodetic)	2				
	Academic (1 week by BMIC, 1 week by CMT)	2				
	Field Study (2 weeks by CIT, 1 week by BC)	3				
	Pre-diploma	1				
	Final work	12				
	Sum of credits	240				

Annex 2. "073101.01.7 - Architecture" Master Degree Academic Program Curriculum

NN	Subjects	Credits	Student's work volume in hours		
			Total	Classroom	Individual work
1	Minors				
1.1	Sphere Basic Problems	2	60	24	36
1.2	Architectural Design Management (BIM Technologies)	6	180	44	136
1.3	Legal Base of Town Planning and Architecture	4	120	30	90
1.4	Creative Team Work (I) / studio	4	120	30	90
1.5	Creative Team Work (II) / studio	3	90	24	66
Total		19			
2	Architectural Design Methodology Disciplines				
2.1	Basics of Architectural Design for Earthquake-Resistant Buildings	2	60	16	44
2.2	Design Interference in Residential and Public Construction	3	90	32	58
2.3	Design Fundamentals for Energy Saving Buildings	3	90	24	66
2.4	Architectural Environment Modernisation	4	120	30	90
2.5	Peculiarities of High-Rise Building Design	2	60	20	40
2.6	Spatial and Large-Scale Systems	3	90	30	60
2.7	Design of Architectural Environment (studio)	4	120	30	90
Total		21			
3	Urban Planning Disciplines				
3.1	Urban Planning in Emergency	2	60	16	44
3.2	Urban Planning and Ecology	2	60	24	36
3.3	Urban Planning and Landscape	2	60	16	44
3.4	Urban Planning Economics	2	60	24	36
3.5	Urban Planning and Transport	2	60	24	36
3.6	Problems of Megacities	3	90	24	66
Total		13			
4	Theory of Architecture, Historical and Cultural Heritage Disciplines				
4.1	Architecture Theory Development and Architectural Design Methodology	3	90	32	58
4.2	Architecture Development Modern Tendencies	4	120	48	72
4.3	Rehabilitation Methodology of Architectural Monuments	3	90	24	66
4.4	Restoration of Historical Towns and Architectural Monuments	3	90	30	60
Total		13			
5	Electives*				
5.1a	Interior Design (studio)	2	60	20	40
5.1b	History of Interior Design	2	60	20	40
5.1c	Lithography and Archeology of Architectural Monuments	2	60	20	40
5.1d	Innovation Technologies in Architecture	2	60	20	40
5.2a	Urban Infrastructures and Their Transformation	2	60	12	48
5.2b	Sphere Cadastre and GIS Systems	2	60	12	48
5.2c	Sustainable Town Planning and Architecture	2	60	12	48

5.2d	Architectural Construction Analysis	2	60	12	48
Total		8			
6	Research Disciplines				
6.1	Theory of Science and Research Work Methodology	2	60	12	48
6.2	Internship (studio hours)	8	240	12	228
6.3	Research, Design (2CP), Master's Thesis (MT) Development and Defence	36	1080	176	904
Total		46			
Sum of Hours			3600	860	2740
Sum of Credits		120			

Annex 3. Curriculum of “073102.02.7-Heat and Gas Distribution and Ventilation” Master Degree Program

NN	Subjects	Credits (ETCS)	Student's work volume in hours		
			Total	Lecture	Individual work
1	Mandatory Disciplines				
1.1.	Sphere Basic Problems– Basic Problems of Municipal Services	2	60	16	44
1.2.	Sphere Basic Problems- Basic Problems of HGDV Systems	2	60	16	44
1.3.	Special Course in Mathematics	5	150	52	98
1.4.	Protection of Environment and Climate Change Basic Problems	2	60	16	44
1.5.	Modern Fire-Tube Boiler Stations (CP)	6	180	48	132
1.6.	Safety and Reliability Fundamentals of HGDV Systems	2	60	16	44
1.7.	Methodology for Energy Efficiency Increase of HGDV Systems	3	90	36	54
1.8.	Cogeneration Methods and Installations	3	90	36	54
1.9.	Modern Trends in Application of Non-Traditional Energy Sources (TP)	4	120	36	84
1.10.	Design Principles and Normative Documentations for Gas Distribution Networks	4	120	48	72
1.11.	Project Management of HGDV Systems	4	120	42	78
1.12.	Theory of Measurement and Application of Measuring Instruments in HGDV Systems	4	120	42	78
1.13.	Mathematical Modelling and Optimization of Heat - Cold Distribution Systems (TP)	5	150	42	108
1.14.	Energy Saving Methods and Energy Efficiency Labelling of Buildings	3	90	28	62
1.15.	Gas Transportation and Gas Storage Systems	3	90	40	50
1.16.	Operation and Service Main Principles of Gas Distribution Systems	3	90	34	56
1.17.	Energy Audit	3	90	36	54
	Total	58	1740	584	1156
2	Electives*				
2.1.	a) Industrial, Emergency and Smoke Ventilation b) Energy Saving Efficiency Management of HGDV Systems	2	60	24	36
	Total	2	60	24	36
3	Research Disciplines				
3.1.	Theory of Science and Research Work Methodology	2	60	12	48
3.2.	Software Use in Research Works	2	60	24	36
3.3.	Internship	6	180	0	180
3.4.	Master's Individual Classes with Diploma Supervisor (TP, CP) / Master's Thesis Development and Defence	20	600	126	474
	Total	30	900	162	738
	Sum Total	90	2700	770	1930