

SBSE Retreat 2002

Greening Your Curriculum: Russian Architectural Curriculum

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I - Russian architectural education

General structure of Russian higher education

The Russian system of architecture education is very different from the American one, both in the administrative structure and in the level of environmental issues involved in the architecture education process. The major difference is that in Russia students don't choose the classes that they take, but just follow a curriculum that is set by the university for the specific major. This system has its pluses and minuses. On the positive side, the university has greater control over what students are studying, and is able to create the specific course sequence that would insure the most efficient progression through the courses. The negative side of such a system is that it is very difficult to introduce new courses into a set curriculum, and students are unable to investigate more deeply the areas of their particular interest by taking additional courses in other departments. However, in recent years, educational reforms have led to including several elective courses in the usual set curriculum. That change somewhat lessens the negative effect by providing more flexibility in the system. Students have a chance to choose classes in areas that they are more interested in, and new courses can be introduced more easily.

At each university architecture departments create a program based on the State Education Standard for Architecture area of study that is delineated by the Ministry of Education. The Standard that governs architecture education sets three majors within the study area of architecture: architecture, design of the built environment, and restoration and renovation. Each major also includes "specializations" – emphasis on certain aspects of the major, such as "residential and commercial building design" for the architecture major, or "interior design" for the design of the built environment major (Table 3.1).

Table 3.1 Classification structure of the Russian study area of architecture

Study area	Architecture		
Major	Architecture	Design of the built environment	Restoration and renovation
Specializations	Residential & commercial architecture Industrial architecture	Interior design Urban space design	No specialization

The Standard sets the courses that have to be included in the program, their length (in hours) and the mandatory content requirements. The courses are separated into several “cycles” depending on their role in the curriculum: humanities and social sciences; math, natural sciences and general engineering disciplines; general professional disciplines; and special disciplines required for each major, including specialization.

Each of the “cycles” consists of 3 types of courses: first, the so-called “federal component” – required courses that have to be offered by every architecture program to be accredited; second, the “national-regional (university) component” – required courses that are offered by particular university based on its research interests; finally, required elective courses offered at the discretion of the university. There are also non-required elective courses such as military training courses.

Sample architecture curriculum

As an example of a typical architecture curriculum, I chose to review the architecture curriculum developed by Southern-Ural State University. As any curriculum in a state university it is based on the State Standard of Education for architecture. The curriculum takes five and one half years to complete, where the first five years the students take courses in the university and then from September through February of the sixth year they work on a comprehensive “diploma” project under the supervision of an assigned faculty advisor (Table 3.2).

Humanities and social sciences

Humanities and social sciences include the history of Russia, foreign language, philosophy, cultural studies, psychology and pedagogy, sociology, economics and physical education as the federal component; Russian, law, political science as the university component; and Russia in the system of the world civilizations, and logic as the elective courses.

Math and natural sciences

Math and natural sciences include calculus, information technologies and computers, structural mechanics, descriptive geometry and technical drawing, and physics (architecture-related) as the federal component; computer methods for physics as the university component, and modern finishes, energy-efficiency basics, evolution of construction techniques, and computer graphics as the electives.

General professional courses

General professional courses include building structures, building materials, geodesy and site design and transport, building mechanical systems, construction process basics, life safety, economics and organization of design and construction, freehand drawing, painting and color studies, sculpture, history of arts, architecture and city planning, modern architecture, modern studies in history and theory of architecture, and aesthetics in architecture as the federal component; marketing and management in architecture (professional practice), ecology as the university component; and freehand drawing, painting, sculpture and color studies as the electives.

Special courses for architecture major

Special courses for architecture major include design studios, volumetric-spatial composition, social and ecological basis of architecture design, and theoretical basics of city and regional planning as the federal component; and theory of art, architecture, city planning and design, and computer modeling as the electives. Specialization courses are taken depending on the emphasis chosen by student and include advanced design studios, theory, construction and composition courses with the focus on particular building type – residential, commercial or industrial.

Table 3.2 Sample Russian architecture curriculum

First year	Hours		Hours
Fall semester	per week	Spring semester	per week
Basic design studio	8	Basic design studio	8
Volumetric-spatial composition	2	Volumetric-spatial composition	2
Drawing	4	Drawing	3
Architectural materials	2	Painting	3
Descriptive geometry	4	Geodesy	2
Math	2	Descriptive geometry	3
History of art	2	Information technologies and	
Russian	2	computers	2
Russian history	2	History of art	2
Physical education	4	Foreign language	2
		Russian history	1
		Physical education	4
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Second year			
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Design studio	8	Design studio	8
Volumetric-spatial composition	2	Volumetric-spatial composition	2
Drawing	4	Drawing	3
Painting	3	Painting	4
Structural mechanics	2	Structural mechanics	2
Information technologies and		Building structures	2
computers	2	History of architecture and city	
History of architecture and city		planning	2
planning	2	Philosophy	2
Philosophy	2	Foreign language	4
Cultural studies	2	Physical education	4
Foreign language	4		
Physical education	4		

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Table 3.2 Sample Russian architecture curriculum (continued)

Third year			
Design studio	8	Design studio	8
History of architecture and city planning	2	History of architecture and city planning	2
Building structures	1	Building structures	1
Site design and transport	2	Drawing	3
Construction process basics	2	Painting	4
Drawing	3	Life safety	2
Painting	4	Ecology	2
Physical education	2	Political science	2
Approved humanities elective	2	Physical education	2
Forth year			
Design studio	8	Design studio	8
Architectural physics	2	Architectural physics	2
Building structures	2	Building structures	2
History of architecture and city planning	2	Modern architecture	2
Sculpture	4	Sculpture	4
Psychology and pedagogy	2	Psychology and pedagogy	2
Sociology	2	Sociology	2
Economics and organization of building construction	2	Economics and organization of building construction	2
Specialization course	2	Specialization course	2
Fifth year			
Design studio	8	Design studio	8
Modern architecture	2	Modern architecture	2
Theoretical basics of city and regional planning	2	Modern studies in history and theory of architecture	2
Building mechanical systems	2	Building mechanical systems	2
Economics	4	Social and ecological basis of architecture design	2
Marketing and management in architecture	2	Law	2
Specialization course	2	Specialization course	4
Approved art elective	2	Approved art elective	2
Approved professional elective	2	Approved professional elective	
Final project			

An academic year is comprised of 2 semesters – Fall and Spring – with 3-week exam sessions in January and June. The Fall semester is 18 weeks and the Spring semester is 17 weeks. The schedule is set up in “pairs” – two 40 minute periods with a 5-minute break in between (“2 hours”). A “17-18 hour” course is one that meets once every other week for one “pair” for one semester. A “34-36 hour” course meets every week for one “pair” for one semester. Most of the courses are taught as “34-36 hour” courses for 2 semesters, combining to 70 hours total. Drawing and painting classes meet twice a week for 2 “pairs” totaling 140 hours of class in a year. Architecture studios meet for 2 “pairs” 3 times a week. In a typical semester an architecture student will take around 10 different courses, having 3 to 4 “pairs” a day studying 6 days a week. There is a requirement for a 1-month professional training/internship each summer: geodesy, fine arts, construction, architecture internship and pre-diploma research.

Integration of ecological issues into architecture curriculum

There are 3 courses in the most current architecture curriculum offered by Southern-Ural State University that deal with environment and ecology in one way or another: ecology – a required course taught at the end of the 3rd year; energy efficiency basics – an elective course offered at the end of 5th year; and social and ecological basis of architectural design – a required course taught at the end of 5th year. All of the courses are lecture courses with minor homework assignments.

Ecology

Ecology is a 34-36 hours course that is taught to architecture students by Department of Architecture faculty (the teacher is actually an architectural engineer). The course provides students with some background on general ecological issues, such as biosphere, ecosystems, natural resources management, and then focuses on reclaiming abandoned mining sites, which are quite common in the region, for use as recreational parks.

Energy efficiency basics course

Energy efficiency basics course is a fairly new (introduced in 2001) 34-36 hours course. It is mostly focused on reducing energy loss in mechanical HVAC systems with some attention to decreasing heat loss by buildings through better insulation and compact layout.

Social and ecological basis for architectural design course

Social and ecological basis for architectural design course is taught for two semesters: one semester as a 34-36 hours course, and one semester as 17-18 hours course. The course is mostly concerned with the social part (before 2000 it used to be only social basis of architecture design), such as life styles, family structure, and other demographic aspects. Ecological issues are mostly addressed through the relation to city planning and creation of open space.

The mechanical building systems course, which might sound similar to environmental control systems (ECS) courses taught in U.S., presents a totally different approach. The general physics principles behind EC systems, as well as lighting and acoustics, taught in the U.S. as an integral part of ECS, in Russian universities are separated into an individual course – architectural physics. The mechanical building systems course is focused on learning traditional HVAC and water supply and sewage systems. Neither of the courses teaches solar heating or passive cooling strategies and systems.

Ecology and social and ecological basics of architectural design, as well as architectural physics and mechanical building systems, are federal component courses that have to be offered by every architecture program. Their content determines what every graduating architecture student in Russia knows about environmental issues and their relation to architecture. That knowledge is usually

limited to the general understanding of the environmental problems and the ability to integrate green space into urban planning and site design. Most of the concepts and strategies of sustainable building design remain unknown.

Opportunities for interdisciplinary studies

The Russian educational system in general doesn't support interdisciplinary studies, due to its rigid structure. It is almost impossible for an architecture student to take additional courses in environmental studies or public policy or any other field outside of the architecture curriculum. The new State Educational Standard somewhat expanded that opportunity, by including several approved electives into curricula. The choice of the electives depends on the university. At the Southern-Ural State University half of the electives are offered through the architecture department, limiting even further the possibility for taking courses outside of the usual curriculum.

The opportunities for the multidisciplinary approach are limited to occasional cooperation with architectural engineering students in the design of the building structure, or using a design studio project for the ECS assignment, and in the final project – consulting with the engineering departments in the design of structural and mechanical systems. All such work is always done within the Architectural-Construction Faculty (administrative part of the university that includes the architecture department and several engineering departments related to construction).

II – Proposal for integration of sustainability into the Russian architectural curriculum

Based on my understanding of the Russian educational system, I propose to integrate issues of sustainability into the Russian university in several stages. The first stage would consist of adding to the existing courses, without dramatically changing the basic curriculum. While this step is being completed and sustainability is starting to become an ordinary part of the curriculum, it will at the same time create the basis for deeper changes to the architecture program and the whole university curriculum. This would become a second step in bringing ecological design into the university education and professional practice.

Integration into present curriculum

The integration into the present curriculum can be accomplished fairly easily through adding to and revising existing courses. A good start would be organizing guest presentations in the design studios. In the first year the presentations should be conducted in the studios of all levels, to introduce all of the students in the architecture department to the concepts of sustainable architecture. In the following years such presentations can become an integral part of the first year design studio (that also serves as an introduction to the profession). These presentations will give students a head start, a general idea, on what sustainable architecture is, and why it is important. It would stimulate further interest among students and provide them with an incentive to explore the subject on their own and through the elective class offerings.

Such an elective course can be easily included in the curriculum through the current system of elective courses. This course would be a specific lecture-seminar course focused on sustainable architecture. The course would explore such topics as: sustainable design philosophy, thermal comfort and climate, sun as an energy source, building energy analysis (see proposed syllabus). This course should become an integral part of the existing architectural physics – mechanical building systems sequence to close the gap in studying of non-mechanical means of environmental control

and other issues related to sustainable architecture (alternative materials, rain water collection, etc.) The course should be taught at the same time and in coordination with the architectural physics class (1st semester 4th year), before the building mechanical systems class. This would ensure the more beneficial approach to design – first, design the building in such a way that it works with climate and uses as much passive heating and cooling as possible, then add mechanical systems.

Students who took this course at the beginning of the 4th year can be assigned special design studio projects that focus on sustainable design process during 2nd semester of the 4th year. By this time the students already would have taken a visual communication course, where they learned how to present their design, and basic design studios that taught them the basics of the design process. In their 3rd year they have had a chance to work on more complex projects that taught them how to integrate a wide range of program requirements into the building design. Some of the students, inspired by the presentation during their 1st year or the sustainability class, may have already tried to integrate issues of sustainability into their design. During 4th year Spring semester studio they would be able to use all the knowledge they acquired in a specific project. The same students can also expand their knowledge in environmental design while working on their final project.

During 5th year a series of lectures on modern sustainable buildings can be included into the History of Modern Architecture course. The lectures should cover the history of the development of sustainable architecture and the most prominent architects working in sustainable design.

Making these changes to the existing courses and curriculum will be the first step toward integrating sustainability into architecture curriculum. Students are introduced to the issues of sustainability early in their studies, the exploration of them continues throughout their education and there is an opportunity to get in-depth knowledge of the applicable strategies and methods.

Possibilities for further improvement

The aforementioned changes would create a basis for further improvements in the curriculum. It would produce general awareness of the ways architecture can help in forming the sustainable world, but it should also create an understanding that the whole architecture curriculum and all of the individual courses should be revised to better integrate the issues of sustainability. The whole sequence of courses should be revised to integrate sustainability from the first year.

Changing the course requirements would involve revisions to the State Standard of Education. This would be a tenuous and long-term process that requires certain pressure on the Ministry of Education. That would require collaboration with interested trained faculty throughout Russia and possibly formation of a Russian chapter of SBSE. A project similar to the EASE also should be initiated to facilitate the process of changing the State Standard.

Changes to the curriculum based on demands of sustainable design should be made in all the other departments of the university. After all, architecture is only one aspect of a sustainable society. Changes in other departments would provide a broad forum for a truly multidisciplinary and holistic approach to understanding and preserving the complex environment in which we live. Collaboration with the Second Nature program or at least integration of its recommendations would provide valuable help in this process.

III - Syllabus of proposed Design with Climate course

Course Title: Design with Climate

Class time: 2 periods of 40 minutes once a week for 18 weeks

Room & Building:

Teacher:

Course description:

A lecture course with a seminar/lab component. The class provides students with the knowledge for designing energy and resource-efficient buildings that provide high level of human comfort based on specific climate conditions.

Textbook:

Lechner, N. 2000. Heating, Cooling, Lighting: Design methods for architects (2nd edition), John Wiley & Sons.

General concepts:

In this class we will cover the following topics:

- ?? Sustainable design philosophy
- ?? Thermodynamics basics, thermal comfort and climate
- ?? Sun as an energy source: passive and active solar heating, passive cooling, shading
- ?? Lighting
- ?? Thermal envelope and building energy analysis
- ?? Materials and life cycle analysis
- ?? Water usage

Learning outcomes:

By the end of the semester the students will have following knowledge, skills and attitudes:

- ?? Understand ecological issues as applied to architectural design
- ?? Have an understanding of the different climatic conditions throughout the country and their effect on building design
- ?? Know methods and guidelines for designing a building that utilizes passive and active solar heating systems, passive cooling, effective shading devices and lighting techniques
- ?? Know appropriate computer software and physical modeling methods

Course schedule:

<u>Week</u>	<u>Lesson topic</u>	<u>Reading</u>
1	Course overview. Introduction.	1-36
2	Energy fundamentals. Thermal comfort.	37-66
3	Climate and design strategies.	67-124
4	Solar geometry (lecture/lab).	125-140
5	Shading	201-244
6	Shading lab	Lab reader
7	Passive cooling. Air movement.	245-279
8	Passive solar heating	141-170
9	Active solar heating and PV	171-200
10	Solar heating/cooling lab	Lab reader
11	Site design and community planning	279-324
12	Lighting. Electrical lighting	324-358, 407-432
13	Daylighting	359-406
14	Lighting lab	Lab reader
15	Thermal envelope and building energy analysis (lecture/lab)	433-470
16	Water usage and conservation	Water reader
17	Materials and life cycle analysis	Materials reader
18	Final exam	

Course requirements:

Each lecture includes a discussion section in which every student is expected to participate. Lab sessions would require a completion of an in-class assignment, followed by short presentation and discussion. Finalized version of the assignment should be submitted by the beginning of next class section. Due to the format of the class attendance is mandatory. Two excused absences are permitted.

Grading and make-up policy:

Students' performance would be evaluated based on completion of the assignments, participation in class discussions, attendance, and final's grade:

Shading assignment	15 pt	<u>Final grade</u>	Points	
Heating/cooling assignment	15 pt		5	90-100
Lighting assignment	15 pt		4	75-89
Participation	15 pt		3	60-74
Final exam	40 pt		2	59 or below

All absences from the lab sessions have to be made-up by completing the assignment. Excused absence make-up assignments would be graded on the general basis, unexcused absence make-up assignments will be dropped 5 points. Unexcused absence from lecture/discussion sections will drop final grade by 5 points for each absence.

IV – Questions for the discussion

What are the ways to overcome the problems that arise, such as textbook unavailability?

What other learning modules or courses should be taught?

What extracurricular activities should be included?

Any help on detailing the lab assignments will be greatly appreciated.