

What and Why

The current structure of the study program at the Faculty of Architecture combines courses of the engineering specialization in the following blocks:

1. The block of courses related to teaching building engineering and installation systems (table 1).
2. The block of courses related to teaching construction (table 2).
3. The block of courses related to the organization and economics of construction and the construction law (table 3).
4. The block of courses related to architectural design including detail design (table 4).

The sequence of particular courses in the study program is strictly fixed depending on their content.

Courses are ordered from basic topics and their simple applications to more complex implementations in designing.

The list of courses and the mutual relationships between them are presented in the study program of the Faculty of Architecture (figure 1).

Table 1

BLOCK OF COURSES IN BUILDING AND INSTALLATION SYSTEMS (OBLIGATORY COURSES)

Course title	Semester	Hours per week	Total number of hours/ECTS
Building materials	I	2	30/1
General construction	I	4	60/3
	II	4	60/3
	III	2	30/2
	IV	3	46/3
Physics of buildings	IV	2	30/2
Installation systems	II	2	30/2
Total number of hours			285 godzin
Total number of ECTS			16 ECTS

Table 2

BLOCK OF COURSES IN MECHANICS AND CONSTRUCTIONS (OBLIGATORY COURSES)

Course title	Semester	Hours per week	Total number of hours/ECTS
Mechanics of buildings I	I	4	120/8
Mechanics of buildings II	II	4	
Metal and wooden constructions	III	4	60/4
Prestressed and reinforced constructions	IV	4	60/4
Modern construction systems	V	2	60/4
	VI	2	
Total number of hours			300 hours
Total number of ECTS			20 ECTS

BLOCK OF OPTIONAL COURSES IN CONSTRUCTIONS AND ARCHITECTURAL CONSTRUCTIONS

Table 2A

Course title	Semester	Hours per week	Total number of hours/ECTS
Wooden constructions	IV,VIII	2	30/2
Foundation engineering	IV,VIII	2	30/2
Wooden constructions in historic buildings	IV,VIII	2	30/2
FORMIAN – programming language for special constructions	VIII	2	30/2
Total number of hours			120 hours
Total number of ECTS			8 ECTS

Table 3

BLOCK OF COURSES RELATED TO THE ORGANIZATION, ECONOMICS OF CONSTRUCTION AND CONSTRUCTION LAW

Course title	Semester	Hours per week	Total number of hours/ECTS
Construction law	III	2	30/1
Economic issues of the investment process	IV	2	30/1
Management	IX	2	30/1
Total number of hours			90 hours
Total number of ECTS			3 ECTS

Table 4

BLOCK OF COURSES RELATED TO ARCHITECTURAL DESIGN AND DETAIL

Course title	Semester	Hours per week	Total number of hours/ECTS
Basic design	I	5	75/5
Architectural design - introduction	II	5	75/5
Designing single-family houses	III	5	75/6
Designing fundamental services	IV	5	75/6
Designing multi-family houses	V	5	75/9
Designing industrial objects	VI,VII	10	150/16
Designing public objects	VII,VIII	10	150/17
Interior design	IX	5	75/9
Special purpose design with detail	IX	6	90/8
Historic preservation and historic detail	VIII	4	60/7
Total number of hours			900 hours
Total number of ECTS			88 ECTS

The number of hours/ECTS of obligatory and optional engineering courses in the study program is as follows:

- a. block of courses in building – 285 hours/16 ECTS
- b. block of courses in mechanics and constructions – 360 hours/24 ECTS
- c. block of courses supplementing building and constructions – 90 hours/3 ECTS

This gives a total of 735 hours (43 points) and constitutes over 20 % of the total number of hours within architectural studies and over 14 % of the number of points required for the Master's degree.

Part of the courses in architectural design covers designing architectural and construction detail, which is the main form of using knowledge gained in engineering courses in architectural design.

Out of the total of 900 hours in designing, ca. one fourth is connected with designing detail.

Engineering courses also provide basic knowledge for designing construction plans of the designed objects and their basic construction elements.

Courses in construction acquaint students with the basic construction elements, such as foundations, construction plans of buildings, walls, roofs, as well as elements of the interior of buildings – windows, doors, elements of internal communication, etc.

During classes students carry out the following designing tasks required for course completion in subsequent semesters:

- d. During the 2nd semester students prepare technical drawings of views, sections and elevation of simple objects as well as detail and joints of stair constructions (on a scale of 1:10),
- e. During the 3rd semester students design a wooden rafter framing and details of joints,
- f. During the 4th semester students carry out a detailed design of a single-family house in the form of a construction project, and design selected details. The basis for carrying out the design is the design of a single-family house prepared during the course in architectural design during the 3rd semester. This familiarizes the students preparing their own architectural project with the technical issues of design typical of the construction project.

Obligatory and optional courses cover approximately 10% (360 hours) of the total number of teaching hours for 5-year M.Sc. studies. Students must collect 28 Credits (ECTS) before graduation and diploma work.

Years I and II provide the elementary knowledge in construction which should enable the student to make a conscious selection of further courses from the facultative part (according to individual interests) and provide solutions to various construction problems which students might encounter in their designs.

Basically, teaching construction has the following forms:

- lectures 150 + 60 hours (total 210) 56%
- classes 120 hours 33%
- seminars 30 hours 8%
- laboratory 15 hours 3%

Additional hours are provided during consultations/office hours in architectural design studies. During the first year, students solve different tasks assigned by the lecturer after covering a certain range of topics. Students are required to carry out two home assignments, each of which consists of two tasks. The first task consists in determining the resultant of a coplanar of a system by means of graphical and analytical methods. The objective of the second task is to calculate the reactions and inner forces in a simple statically determined beam. To complete the second home assignment the student must calculate the values of the inner forces in a simple frame and, by means of graphical and analytical methods, determine the sizes of axial forces acting in a simple plane truss.

The third task is to design a selected set of elements of a structural system of a detached house. The fourth task consists in determining the values of inner forces acting in simple statically indeterminate systems, such as a continuous beam or frame, by implementing the Cross method.

During the second year, students carry out two assignments. The first consists in establishing a method of building metal or wooden constructions which should be characterized by stability and economic use of materials.

The students are also required to carry out the following tasks: designing a column grid, configuring floor beams, roof construction, skeleton of a structure, framing and bracing, calculation of indicated components, preparation of constructional drawings.

The second assignment concentrates on the analysis of spatial behavior of structures as to the rational use of concrete, reinforced concrete and pressed concrete in appropriate construction parts.

The students should be acquainted with the rules of calculating the design of bent, tensioned and compressed parts and their joints (nodes) made of a folded plate construction, a frame construction, a solid construction and a prefabricated construction.

During the third year students either prepare an outline of the structural system of a given object or prepare a structural system of an existing building, both structures being chosen by the lecturer. The students however may also present their own proposals. A single task is assigned to a group of maximum two students, but it also may be completed by one student.

Combining most of the courses in building and constructions during the first two years should acquaint students with the basic knowledge needed for solving issues pertaining to building and construction during classes in architectural design. However, such assumptions are too optimistic. Usually students do not possess the ability to implement the knowledge of building and construction in designing. On the one hand this results

When and to What Extent

from the fact that by rejecting this knowledge students have the possibility to create new ideas which are not characterized by simple building and constructional solutions – this is related to the freedom of shaping the form and function. On the other hand the magnitude of information received during courses in building and construction without its practical implementation in designing is in fact useless knowledge locked in a certain part of consciousness which does not have channels connected with architectural design. These channels are created by the experience gained in the process of designing during subsequent years of studies.

In fact, this requires the approximation of these subjects and integrating them into one design study, which is a complicated task as to the content and organization of such study.

The knowledge in building and construction is evolving quite rapidly – new technologies and constructional and material solutions are appearing.

Students of the 5th year should, in fact, be acquainted with the new building technologies which appeared during their studies. Thus the goal is to introduce such a course before the diploma work during the 9th semester.

The acquired knowledge may also be supplemented during post-graduate and doctoral studies. Doctoral studies at our Faculty offer courses in modern construction systems and new building technologies. These courses are offered both by academic teachers of the Faculty of Architecture as well as by specialists of the Faculty of Building Engineering and Environmental Engineering

Who

Courses in building are taught by architects and experts of the Faculty of Building Engineering specializing in acoustics, heat flow, lighting. The course in construction installations and building materials is also conducted by specialists.

The classes in mechanics of buildings and constructions are conducted by specialists in building constructions and the main lecturer teaching special purpose constructions is an architect.

The courses supplementing engineering courses: management, organization of construction and construction law are conducted by specialists. The courses in architectural design are conducted by teachers–architects. Moreover, at the Faculty there is a developed system of office hours for students who, at any time, may gain information from specialists of a given branch (obligatorily each employee is assigned 4 hours of consultations per week).

Within the course of architectural detail the instructors are mainly architects working in designing offices, which allows implementing the experience of a realistic design process in didactic classes.

How

The methods of teaching building and constructions at the Faculty of Architecture should primarily take into consideration the specific and creative character of the process of architectural design, the leading role of the architect in this process and the fact that modern design is team-

based work. Considering the mentioned circumstances, effective teaching of building and construction consists in:

- g. providing theoretical knowledge and methods of its practical implementation in a way enabling the student to be conscious of the possibilities and constraints in this field. This is carried out through lectures, design classes and laboratory classes,
- h. applying experimental methods, e.g. building models as well as using computer simulations in the analysis of new constructional solutions with focus on satisfying the constructional norms. This is carried out via optional courses and designing workshops as well as by computer programs available in computer laboratories at the Faculty,
- i. cooperation with specialists in construction during classes in architectural design from the beginning of studies shows the mutual relationships between them and the methods of implementing the knowledge in construction in architectural design. This cooperation should appear at a certain stage of the design process and should be intensified in its final phase. Apart from the form of consultations during obligatory classes a significant role is played by additional classes in the form of student workshops or scientific circles. During those classes it is possible to learn about new technologies and constructions, which are presented by construction firms and specialist with great experience in designing.
- j. An efficient method of testing the knowledge in construction is the examination of the level of design solutions delivered by students. In the final phase of the evaluation of their project the participation of specialists of this branch is necessary. This gives the opportunity to check whether the methods of teaching are effective.

At the Faculty of Architecture at the Wrocław University of Technology there is a traditional model of teaching engineering courses combined with additional, informal classes, which supplement the traditional model of teaching. This pertains to the participation of students in the tasks of the Structural Scientific Circle, the student designing workshops and student contests.

The fundamental task for the nearest future is further development of methods of teaching courses in building and construction and integrating these courses with classes in architectural design. This requires the following program and organizational changes, which will lay foundations for an effective combination of various scientific disciplines within one large multi-disciplinary design study:

- a. change of the courses in building and construction by introducing new courses at higher levels of study pertaining to new construction technologies and modern construction systems as well as by introducing laboratory classes in building and construction;
- b. increasing the number of hours of architectural design with participation of specialists from different branches and scientific fields;
- c. focusing on the team work in the process of designing and thus inviting students of the Faculty of Building Engineering, Faculty of Environmental

Conclusions

Engineering, Faculty of Electrical Engineering and Faculty of Electronics to cooperate in designing;

- d. introducing to a greater extent the multimedia techniques and visual presentations in the field of building and constructions within one multi-disciplinary design study.

