

## **Modern technologies and innovations - landscape architecture education at Cracow University of Technology in Kraków, Poland**

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**ABSTRACT:** This article reports on the influence of newer technologies, ideas and innovations, and creation of the landscape architecture curriculum at Cracow University of Technology (CUT) in Kraków, Poland. The main overview of the curriculum at CUT, including new technologies, is given in the first part of the article. The second part explains the meaning of the relationship between the 1st, 2nd and 3rd year programmes of the BA Landscape Architecture Studies degree. The third part is dedicated to the international collaboration between CUT and universities in Europe and Asia. By analysing the curriculum, the author wanted to show the new approach to landscape architecture studies adopted at CUT.

### INTRODUCTION

Nowadays, it is not possible to work in any field without using computers, new technologies and materials [1][2]. Landscape architects represents a profession, which is suspended between fine arts and technical science. They create their own masterpieces using modern building technologies, the newest materials and the CAD program. This can help them explore new ways of expression and find unknown spatial forms both in the aesthetic and functional aspects of the works created [3]. In order for landscape architects to act progressively more creatively, new technologies and advancements are used in the educational process at universities all over the world. Many new programmes in the field of landscape architecture are being created. There are various vital topics, concepts and ideas in the curriculum, including alternative methods of providing education and training. Moreover, the interaction between academia, industry, design offices, and coordination between universities becomes more and more significant in students' development.

### LANDSCAPE ARCHITECTURE IN POLAND

*Natural solution to a problem affected art - as the best answer under existing conditions, satisfies both technician and artist [4].*

E. Torria

Landscape architecture is a discipline, the aim of which is the creation and protection of beauty in the surroundings of human settlements. [5] To be able to meet this formulated task, it has to be subject to a continuous transformation process, to keep up with prevailing fashions, human tastes and needs, as well as technologies changing with the process of civilisation. At the same time, it must remain faithful to history and tradition. Hence, landscape architecture appears as a field that is continuously developing with new technologies, new plant varieties and new building materials. It is also gaining a broader scientific basis, which is the result of interdisciplinary cooperation [6]. Although landscaping is now a completely independent art and science, one has to remember that it stems from gardening, as well as architecture and several related fields, and it is still connected with them, drawing on the theoretical and practical experience [6].

Landscape architecture is a field of expertise developing dynamically in Poland, one that has been gaining a wider scientific basis for several years. [6] This means, among other things, that a number of specialists in various fields have been exploring the possibility of using new construction technologies in the teaching and practising the profession; thus, outlining the prospects for the development of specialised techniques and technologies.

The emergence of new building technologies becomes an incentive to carry out a wide range of analyses. In basic terms, these technologies can be tested for the suitability of their solutions in:

- shaping the elements of landscape interiors;
- creating new aesthetic, spatial and technical values;
- practical application in the relationship between the new and previously used (traditional) technologies;
- amending the landscape architect's workshop (the so called ready-made and system solutions).

The results of these, and other similar analyses, have become a key part of education processes in the field of landscape architecture, giving its entrants an up-to-date, modern and reliable technical workshop basis. Accordingly, recognised and well-established knowledge of construction technologies, including upgraded or completely new ones, puts landscape architecture in a strong and responsible position among a number of both artistic and engineering professions.

Böhm wrote: *...The role of healthy and beautiful places under a clear sky is replaced by nothing - just as irreplaceable is the role of the landscape architect in their furnishing* [7]. As a representative of the profession with a broad humanistic, technical and natural sciences basis [5], it has to fulfil the primary mission described by Hellwig: to put an end to the spread of ugliness and meaninglessness in our system of civilisation [6]. Although the task is strictly defined, it causes many difficulties in the light of everyday experience. In Poland, the reasons can be seen *inter alia* in the lack of scientific studies determining the whole wide spectrum of issues related to teaching and practising the profession (design and implementation) of the landscape architect, as well as the legal restraints (including construction and designing licenses).

Recently, the education of landscape architects has been a new issue in Poland. Therefore, from the year 2000, a plan concerning the creation of a comprehensive educational programme in this field was drawn up [8]. The academic staff members, headed by Professor Aleksander Böhm, from CUT's Faculty of Architecture created a new field of studies at CUT, which opened research fields whose exploitation was to serve credible preparation of entrants into the profession.

Currently in Poland, the landscape architecture field of knowledge has begun the process of genuine reactivation, a full restoration after a period of attempting to bring it to the role of knowledge in the field of economy of vegetation. The present exchange of views on landscape architecture, during the annual Landscape Architecture Forum, demonstrates the multiplicity of issues and the complexity of knowledge, which is to serve landscape architects. These activities are intended to create the vision of landscape architects' competence and licences in the Polish reality.

#### NEW TECHNOLOGIES AND ADVANCEMENTS IN THE EDUCATION PROCESS

*If a landscape architect does not want to be the designer existing condition, they cannot avoid the mainstream of contemporary experiments. It is here that they open up dormant capabilities, including the exchange of ideas and partnerships with creators representing related areas (...) Let us not put on airs, creativity also consists in innovative ideas of our colleagues engineers, which can be invaluable inspiration for us* [7].

A. Böhm

The curriculum of Landscape Architecture at CUT involves a number of methods. One of them is analysis in terms of modern technology applications. The knowledge gained during the landscape architecture studies is very versatile. It covers humanities, natural sciences and technical areas [7]. The subject of this article is about the way in which new construction and information technologies can be used in teaching landscape architects. The integration of these technologies in the curriculum is significant, and has become especially important when the newest technologies and innovations have the power to create a modern landscape. They become material through which the vision of landscape architecture can become real in the concept phase, and during the project construction and implementation.

Landscape architects perform and implement architectural and urban projects of different scales, ranging from planning at the macro-scale to architectural detail. Designing landscape architecture elements (e.g. home gardens, courtyards, roof gardens, parks and gardens in residential complexes, public parks, spas, housing estate gardens, squares, boulevards, sports grounds, playgrounds, botanical and zoological gardens, ethnographic parks, horticultural exhibitions, allotment gardens, cemeteries, etc), shaping the space around public buildings (e.g. office and administrative buildings, hospitals, schools, churches, shopping centres, industrial buildings), designing pedestrian areas, cycle paths, viewpoints, and shaping the landscape surrounding traffic routes requires the knowledge of specific technical issues.

As mentioned earlier, new technologies and advancements in the education process have emerged since the year 2000, when the curriculum was established. These were the first landscape architecture studies available at a technical university in Poland (innovation and innovative programmes in technology and engineering education). By analysing the curriculum, the author wants to show the new approach to landscape architecture studies adopted at CUT. The courses, which the author wants to collate are connected with construction and information technologies. These are the following: Building Engineering, Building Constructions, Materials Science and Computer Studies - Basic Mathematics for Computer Graphics, Computer Studies - Cad - Introduction to Design, Computer Studies - Cad Visualisations, Computer Studies - CAD and Landscape Information Model.

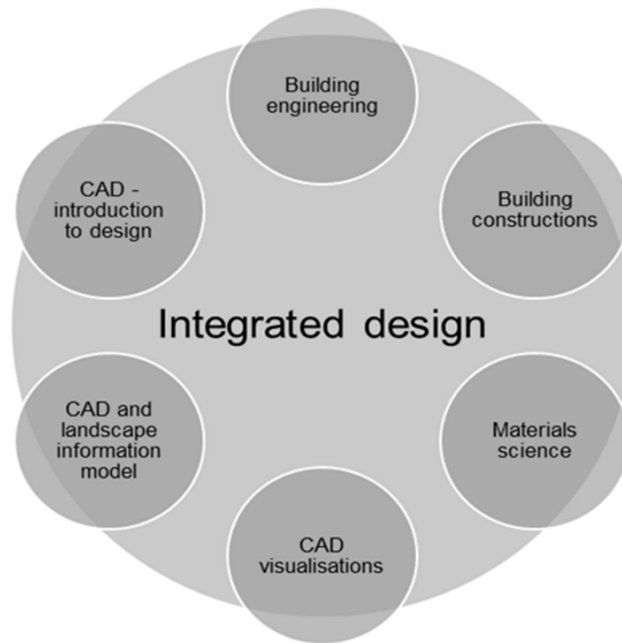


Figure 1: Relation between subjects at Cracow University of Technology in Kraków, Poland (by S. Kuc).

At the Faculty of Architecture at CUT, a student majoring in landscape architecture has contact with technical issues from the first year of studies within integrated design [9]. The formula of integrated design aims to prepare the student and future landscape architect, in a harmonious way not just in design, but also in terms of supplementary subjects - arts, humanities and technical ones, appropriate at each educational stage [10]. Building Engineering and Materials Science appear as technical subjects here. In subsequent semesters one sees the continuation of Building Engineering (semesters 3, 4 and 5) and Materials Science (semester 3). New subjects in the course of the programme are Building Infrastructure, introduced in semester 3 and Building Constructions - in semester 4. Building Engineering, within the developed curriculum, functions as building design in the strict sense [3]. Such a new approach allows the execution of a construction design with elements of detailed design for a given facility, whose concept was created at an earlier stage.

The student has the opportunity to apply technologies and materials to their construction designs, which they acquaint themselves with in the Building Engineering and Materials Science courses. These subjects consist of a series of lectures, design classes and field practice. Presented and developed issues concerning building engineering have been synchronised with the progress of work within the integrated design, both in substantive and time terms. This was done in such a way that students have to prepare a construction design with elements of detailed design within design classes in this subject, which is another stage, after the concept one, of creating their own design. Students assign a suitable structure and choose the most appropriate building solutions for the designed form of the facility they are working on. This often results in a change or a minor correction of the form due to the civil and structural solutions applied. Likewise, they must proceed with the selection and description of building materials in terms of their performance, colour and texture. Then, they learn about proper labelling and dimensioning. Design classes are supplemented with lectures. The syllabus of the lectures has been designed in such a way as to provide students with the necessary knowledge to execute a construction design, according to the progress of instructional design work.

At the same time, it is possible for the student to apply information technologies to their architectural and construction designs, with which they become familiarised in the following subjects: Computer Studies - Basic Mathematics for Computer Graphics, Computer Studies - CAD - Introduction to Design, Computer Studies - CAD Visualisations, Computer Studies - CAD and Landscape Information Model. The first, Computer Studies - Basic Mathematics for Computer Graphics, familiarises the student with higher mathematics, algebra, analytic geometry and analysis. It shows links between vector graphics and mathematical language. This subject is not directly connected to the integrated design, but provides the student with the basic knowledge for further studies. The second, Informational Technology is the introduction to design in CAD. The student learns about creating digital documentation of the projects and simplified technical documentation in the AutoCAD program. The third is Computer Studies - CAD - Introduction to Design, conducted during semester 2. It teaches the student about spatial modelling, virtual and 3D modelling using the AutoCAD program. In this course, the student creates visualisation of the project made during the Integrated Design course. The fourth is Computer Studies - CAD Visualisations conducted during semester 3. The student becomes acquainted with issues of modelling and shaping the ground by making computer visualisations. It also teaches the student spatial modelling, virtual and 3D modelling in the AutoCAD program, but it is more advanced, as during this course the student also creates visualisations of the project made simultaneously in the Integrated Design course. The fifth is Landscape Information Model, which is the newest course during semester 5. It shows new methods of garnering information and digital data about grounds. The student can learn about the use of computer techniques in the analyses of spatial data and implement this knowledge in their own projects.

The structure of the education process adopted allows for the presentation of a wide range of building solutions, while providing an opportunity to show variants of their application in architectural and construction designs. The following criteria are taken into account in the teaching process, in assessing the usefulness of new technologies in practical design and the subsequent implementation: aesthetics, durability, safety of use, and the complexity and unification of solutions in relation to the conceptual plan, on the one hand and, on the other hand, to standard requirements and applicable building regulations [11]. Designing with the use of CAD technology allows for the implementation of bold functional and spatial ideas. Modelling the spatial concepts of the designed facilities gives one the opportunity to present them in three dimensional space.

Throughout their creative path, landscape architects use construction and information technologies. These are important tools for expanding their creative horizons. In their professional work, it is reflected in the creation of newer and more interesting solutions and by expanding the range of spatial and aesthetic values in the landscape [11][12].

## COOPERATION

This part of the article is dedicated to international collaboration between CUT, and universities in Europe and Asia (advanced and alternative methods of education and training). This interaction with foreign professors and students has helped in the advancement of technology and engineering education. CUT is also involved in cooperation with Polish universities, as well as other academic and industrial organisations in Poland. Many representatives come to Kraków to give lectures and students go to these institutions to do their internships as part of student internship cooperation programme. Owing to the constant development of interaction between academia, industry and local government, CUT remains the leading technical university offering landscape architecture studies in Poland.

International cooperation consists of exchanges of both academic staff and students. Exchanges are carried out under bilateral agreements, grants and the Erasmus programme. Under the bilateral agreement, Emeritus Professor Oskar Büttner of Bauhaus Universität in Weimar, has visited CUT's Faculty of Architecture.

The Professor's involvement in the General Building Engineering course in academic years 2002/2003 and 2003/2004 became a freestanding design element (e.g. in the garden, park, etc) [13-15]. The Professor's teaching activities consisted of the presentation of his original lectures as part of lectures in General Building Engineering and providing consultation to projects developed in this subject. The Professor consulted with students on their designs of a field altar, multi-functional roofing in the school garden and an underground car park under the city square. The design of all of the above facilities required a thorough knowledge of building and structure. The Professor was able to develop students' awareness of the inextricable link between architecture and construction. In the designs, one can see clearly the idea of the architect realised in a conscious manner with the use of building technology, especially chosen for the purpose. The Professor's experience, and particularly his kindness and forbearance, enabled the author and her colleagues to achieve didactic and design results, which will remain the benchmark for the next few years.

Under the UE POKL grant *Politechnika XXI wieku - Program rozwojowy Politechniki Krakowskiej - najwyższej jakości dydaktyka dla przyszłych polskich inżynierów* (Technical University of the XXI Century. CUT Development Programme - the Highest Quality Teaching for the Future of Polish Engineers) classes were conducted by Professor Sara S. Sadykova, Head of the Department of Architecture of the Eurasian National University, Astana, Kazakhstan, and Professor Halyna Petryshyn, Head of the Department of Urban Planning Lviv Polytechnic National University, Lviv, Ukraine. The series of lectures included various topics, such as characteristics of buildings issues and their impact on shaping urban landscape of Astana - the capital city of Kazakhstan, and the scale of work of the landscape architect through the prism of new surrounding elements and their technical use.

A significant element of the programme is cooperation with the local administration, specialised design offices and suppliers of modern technologies used in construction. Because of funding from the EU POKL fund, representatives of these units were able to give lectures on the use of new technical solutions in the architects' work. Other programmes and exchanges, such as the Erasmus Programme are important for scientific and student development. Under the Erasmus Programme, students continue their studies at selected European universities within one semester, as an extension of the *Alma Mater* programme.

As a result of the cooperation, facilities of diverse, interesting architectural forms with detailed building and structural solutions have been designed. The professors' extensive knowledge and experience and, especially, their teaching experience helped to refocus the creativity of students and engage them in broader building and structural design issues.

## CONCLUSIONS

The process of teaching landscape architects - engineers at CUT is based on an innovative curriculum (innovation and innovative programmes in technology and engineering education). A new approach to the landscape architect's study can be found in the introduction of technical subjects and by integrating them in the Integrated Design course syllabus (new technologies and advancements in the education process).

Along with the enrichment of the curriculum, landscape architects in Poland are now equipped with stores of knowledge virtually non-existent in their work in the past. These activities simultaneously bring them closer to their colleagues in Western countries, professionally and in terms of their skills and competency.

A significant part of the teaching programme is also international cooperation and cooperation with Polish universities, as well as other academic and industrial organisations in Poland. This cooperation results in advanced and alternative methods of education and training. This cooperation not only provides the opportunity to identify the role of technology in the education of landscape architects, but it also shows that the experience and expertise of practitioners and researchers from other Polish and foreign universities can be used in the educational process of landscape architects for the mutual benefit.

Apart from the scientific dimension, these actions are becoming a real contribution to the process, which leads to upgrading the standard of technical solutions, enhancing aesthetic and operational values of implemented landscape architecture objects, as well as optimising applications in economic and environmental terms. An indication of the specifics of technical solutions and the determination of their impact on different ways of landscaping serve to create guidelines for industry requirements in the field of agrarian, construction and information technology. It also complements the base knowledge for creating manuals, textbooks and other publications in this field.

Indirectly, the new curriculum comprehensively shows the significant role of technology in the landscape architect's workshop, their relevance and necessity. By selecting current technology trends, cooperation can play an important role in the multilateral substantive dialogue between designers, recipients of their work and suppliers of these technologies. These activities are an opportunity to fit the needs of the Polish consumer market in this area.

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