

# Concept of Education in Architecture

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## ABSTRACT

IT Education and CAD application in field of architecture and engineering offers various concepts. Concept implemented at Faculty of Architecture, University of Zagreb is based on wide range of information, application and knowledge for the students opposite to single application concept. After ten years of CAAD Lab at the Faculty of Architecture, CAD related courses among others were under recent assessment, according to Bologna process at European higher education institutions. It was just part of whole curriculum transformation at University of Zagreb. For last ten years core of IT education was and still is 3D CAAD. Recent changes are related to tighter connection with other courses forming module, on one side, and integration with other courses based on practical work on the architectural projects on other side. Focus becomes practical implementation on the actual projects in the field of architecture.

**Keywords:** IT education, CAD, architecture, Bologna process

## BACKGROUND

Based on more than ten years of experience of education IT in Architecture, each course syllabus, from first to third semester, were reorganized according to new Bachelor level idea which states that course should provide appropriate computer skills and application [1]. Opposing to that, more scientific research approach should be in Master level. In order to offer students up to date applications, constant research and evaluation of state of the art technology is made. The goal is to provide topics that are interesting for Bachelor students and provocative enough for research thesis in Master level.

## CONCEPT

Bachelor level starts with IT education from first semester. Three obligatory courses on the start of the study should provide students with adequate skills that can be used both during stay on faculty but also in professional work after. In the consultation with other courses those courses provide skills used in other courses syllabuses. Starting with introduction to computer graphics in first semester it is also used to level differences between students in this starting semester. Following two courses are used to provide information about concepts in CAAD, and how to present architectural project. After third semester courses are elective and more focused on specific fields like urban planning with GIS, Virtuality in architecture, and other courses still under proposal [2]. Elective courses for Master level are still “under development”, but idea is to offer advanced topics to fulfill knowledge of ITC through research.

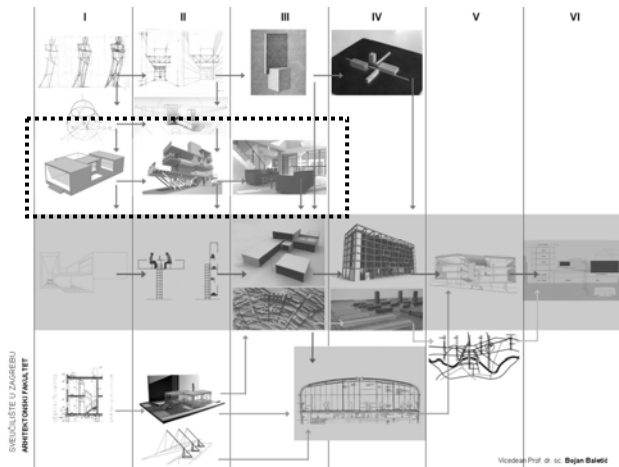
## STRUCTURE

All three courses on the start have the same structure of their syllabuses; each course is structured in three intensive four week educational module. Every module is related to specific topic [3].

Educational modules are organized to offer basic insights of the theme in first week, student practical work with application in second, basic skills checkup in third and practical work with consultation on specific task in the fourth week. Practical work is always related to certain topic and submitting the topic project is due the first week of the next module.

Each topic is prepared with project task that students are working on during whole educational module (five or six weeks).

Strong integration with other syllabus, like Architectural Design or Architectural Construction, offers various possibilities in using computers as architectural documentation tool and visualization tool for exploring architectural idea [4]. This integration could be also disadvantage because dynamic on one course is related to another.



**Figure 1.** Courses integration at Faculty of Architecture [5]

## TOPICS

First three semester courses are obligatory for all students. They offer elementary knowledge but also provide overview of various techniques and skills. Those three courses are organized according to the topics related to application in architecture courses:

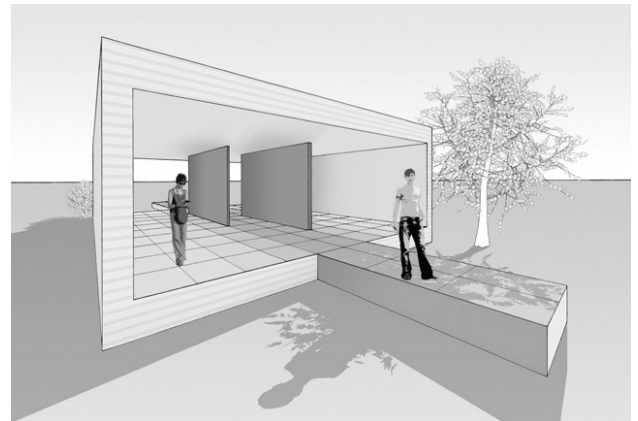
1. Introduction to CAD
2. 3D modeling for Architecture
3. Visualization & presentation

### Introduction to CAD

First semester as introduction to practical application of computers in Architecture offers basic skills that are required in following courses during Bachelor and Master level. Topics in first semester are following:

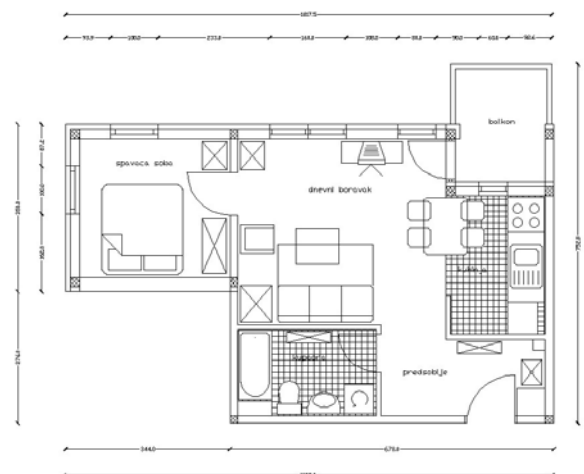
- a. 2D computer graphics
- b. 2D Computer Aided Design (CAD)
- c. 3D concept modeling

Basics of 2D computer graphic are used for other courses. Skills in image processing, digitalization, format conversion, etc. are used for analysis and reports for other courses [6].



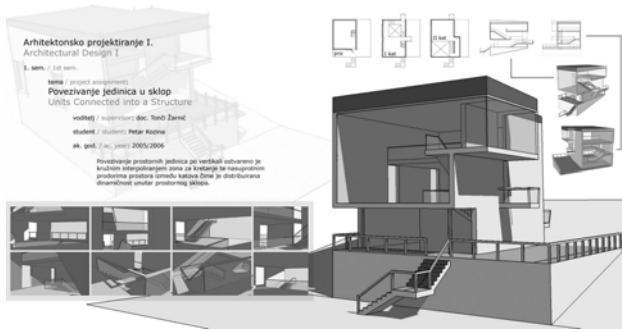
**Figure 2.** Student results using image processing

Second part is introduction to 2D CAD and drafting. But it is also provide information about raster to image conversion and other vector graphics manipulation. Task for students is to draft their own living space [7].



**Figure 3.** CAD drawing of student living space

Third topic is connected to Architectural Design course in same semester. It is provide students with elements of 3D conceptual modeling. Using simple but also powerful computer application Google SketchUp [8] with different modeling approach, so called “push & pull” approach, it is easy, useful, and very good accepted from the students. Good analysis tools (sections, sun shadows, x-ray view) are also help students to describe architectural idea of first architectural design projects done by students. For advanced students it is also provided resources related to Google Earth connection and some other tools.



**Figure 4.** Student poster for Architectural Design project

### 3D modeling for Architecture

Second semester course goes further in 3D. Two main topics are related to 3D modeling and third topic is extension of the 3D CAAD:

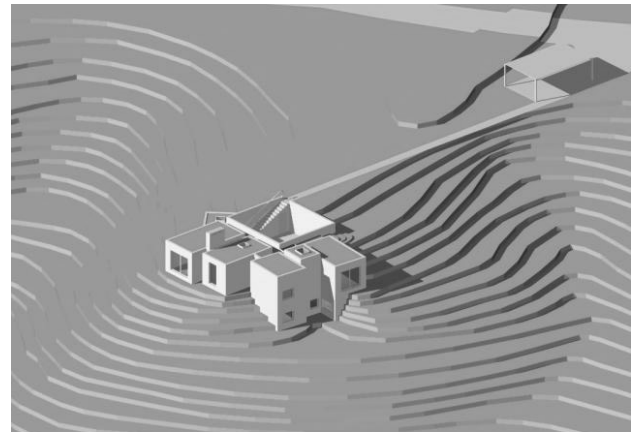
- 3D freeform modeling (NURBS)
- 3D CAAD concept – Virtual building
- 2D technical documentation

Freeform NURBS modeling although it is complex and advanced offers creative freedom in exploring new architectural forms [9]. Therefore basic of such advanced modeling approach is used for start of this second semester. Rhinoceros provides as much freedom as much student is want to learn and control with this application.



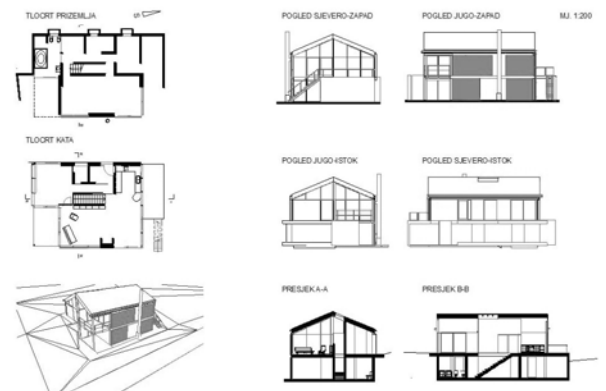
**Figure 5.** Student poster integrating NURBS model of furniture

Graphisoft Virtual building concept [10] is used to provide students with basic of 3D CAAD. Task is to build 3D model of one family house. To build 3D model student is forced to analyze plans with understanding how architectural space is organized, what are characteristics, and to collect other resources about house using literature, Internet and even to contact architects worldwide.



**Figure 6.** 3D model of family house in Archicad

Once when 3D model is built, student can easy provide technical documentation and other required reports by simple making sections, elevations or 3D analysis like sun study. This topic should be in the future more connected to construction courses.



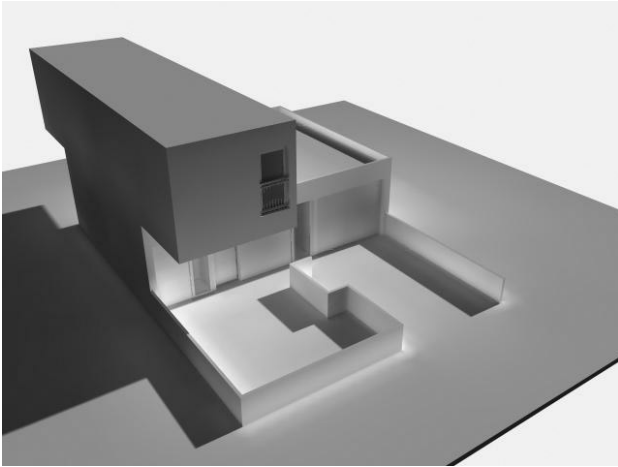
**Figure 7.** Technical documentation based on 3D model

### Visualization & presentation

Two main topics, visualization and presentation are covered, but visualization is divided in two subtopics:

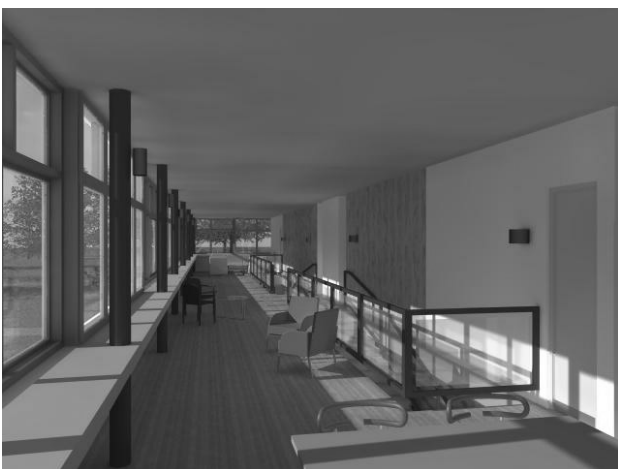
- Visualization I – camera and light
- Visualization II – shaders and textures
- Multimedia presentation

To learn architectural visualization students use 3D model from previous semester built in CAAD application and visualize it using camera control tools for static, dynamic and interactive content, like QTVR or panoramas [11].



**Figure 8.** Student volume analysis

Students are also placing appropriate light sources and learn how to apply shaders and textures to provide high quality architectural renderings. Use of simple application like Abvent Artlantis is well accepted from students to learn elements of 3D scene and visualization avoiding confuse with complex parameters and tools that can be find in advanced visualization and animation applications.



**Figure 9.** Student results for exterior and interior visualization



**Figure 10.** Powerpoint presentation interface

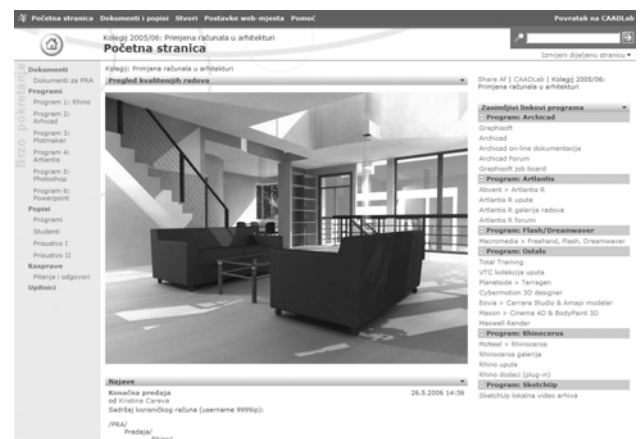
Conclusion of those three courses is last task, to prepare small portfolio of previous tasks as multimedia presentation. Powerpoint is used for elementary presentation [12] and Adobe Flash is used by advanced students [13] to prepare such presentation which include all topics from 2D graphics to visualization.

Multimedia elements of presentation are used to prepare linear or nonlinear, hyperlinked, online or offline (CD-ROM) presentation.

## SUPPORTING SYSTEM

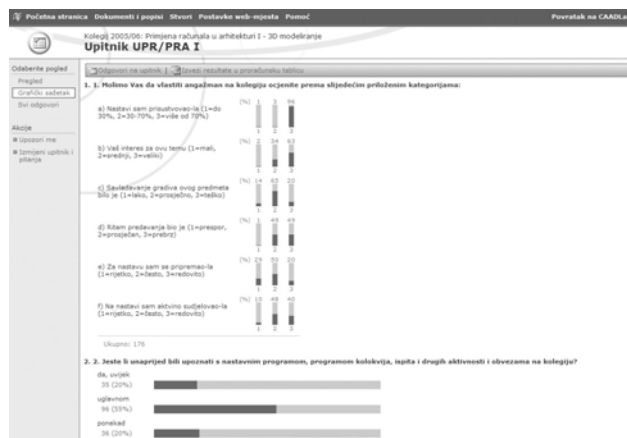
To provide and successfully accomplish such intensive and practical program, Intranet system ShareAf based on Microsoft Sharepoint system [14] has been developed. It has to be emphasized that lacking of human resources produced initial need for such system.

Offering 24/7 support, real-time work, submitting and publishing as well as various communication options were additional value.



**Figure 11.** Share Af content with image of the day

Together with major increase of efficiency, this system has provided transparency of all class events from student attendance and grades to presentation of their work and results. This was essential for student competition and motivation as well as self teaching process. Such system provides elements for extensive use of e-learning in future for this but also for other courses.



**Figure 12.** Student evaluation are published in realtime

## FUTURE

In the future current modules and tasks will be fine tuned and further work should be done to provide tighter integration to other architectural syllabus in Bachelor, and to research new trends in Master, like Virtual building/Building Information Modeling, advanced rendering techniques, use of multimedia, etc.

Based on student evaluation and suggestions that are also provided through ShareAf further tuning would be done. Share system should be reorganized and provide more e-learning content in the future. Although large number of content is already online idea is to provide lectures as multimedia reach and streamed content on server.

## CONCLUSION

Seven different applications, several tasks and overview to important use of computers in Architecture in only three semester's could be difficult. Therefore student's evaluation is very important. At the moment most of the students are accepting this concept quite well. They are exciting when facing new technology that can be used in their architectural design projects on other courses. Tighter integration inside Project and

Technical Studio modules would provide students with some other application that would open research topics for Master level.

## REFERENCES

- [1] B.Baletić, Bologna process on Faculty of Architecture, Faculty of Architecture University of Zagreb, 2004.
- [2] B. Baletić, Nastavni plan studij arhitekture, Faculty of Architecture University of Zagreb, 2005.
- [3] R. Vdović, ShareAf | CADLab, <http://share.arhitekt.hr/cad>
- [4] B. Baletić, Analiza novog nastavnog plana, Faculty of Architecture University of Zagreb, 2006.
- [5] B. Baletić, Bologna process at Faculty of Architecture, Faculty of Architecture University of Zagreb, 2006.
- [6] Adobe Systems, Inc., Photoshop, [www.adobe.com](http://www.adobe.com)
- [7] Autodesk, Inc., Autocad, [www.autodesk.com](http://www.autodesk.com)
- [8] Google, SketchUp, 3D for Everyone, [www.sketchup.com](http://www.sketchup.com)
- [9] McNeel, Rhino, [www.rhino3d.com](http://www.rhino3d.com)
- [10] Graphisoft, Virtual Building, [www.graphisoft.com](http://www.graphisoft.com)
- [11] Abvent, Artlantis, [www.abvent.com](http://www.abvent.com)
- [12] Microsoft, Powerpoint, [www.microsoft.com](http://www.microsoft.com)
- [13] Adobe Systems, Inc., Flash, [www.adobe.com](http://www.adobe.com)
- [14] Microsoft, Sharepoint, [www.microsoft.com](http://www.microsoft.com)

Note: Figures published in this paper (no. 2 – 12) represent complete or part of the different student's work in academic year 2005/06. and 2006/07.