COURSE DESCRIPTION CARD - SYLLABUS

Course name
Advanced Design Technologies 2 [S2Arch2>ZTP2]

Course

Field of study
Architecture

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

Lecturers

Prerequisites

-student has basic knowledge of the principles of safe use of computer equipment, -student has basic knowledge of graphics programs -student is able to obtain information from literature, databases and other properly selected sources, - student is able to integrate information, interpret it, and draw conclusions and justify opinions, -student correctly identifies and resolves dilemmas related to the performance of the profession - the student has basic skills related to the use of BIM modeling tools and GIS tools. - student understands and applies in practice the principles of information modeling of cubic objects - student has basic knowledge of Visual Programming Language - the student distinguishes between basic open data storage and exchange formats such as IFC, BCF, and IDS and is able to identify areas of their application. - the student understands the basic issues related to the practical implementation of artificial intelligence in the work of a designer.

Course objective

1. The purpose of the course is to provide the basis of up-to-date knowledge: theoretical and practical in the field of computer-aided design including Building Information Modeling (BIM), Geographic Information Systems (GIS) and artificial intelligence in architectural design. 2. In the course of the subject, the basics of knowledge on computer-aided design in the context of the architectural workshop are presented. During the course of the classes, specific design-graphic tasks are carried out to acquire knowledge specific to the discussed subject matter on modern computer-aided design workshop. Prelude to their performance are classes introducing the use of individual design applications

Course-related learning outcomes

Knowledge:
Knows and understands advanced analysis methods, tools and techniques used in design in an interdisciplinary environment, including interdisciplinary collaboration, data integration and the use of BIM, GIS and artificial intelligence technologies.
Knows and understands the interdisciplinary nature of architectural and urban design and the need to integrate knowledge from various disciplines, including the use of AI, BIM and GIS, in collaboration with representatives of other specialties.

Skills:
Can evaluate the suitability of advanced methods and tools for solving design tasks in architecture, urban planning and spatial planning, taking into account data integration, BIM and GIS technologies and appropriate selection of digital tools.
Can think creatively and act in the context of complex design conditions, formulate own concepts and critically refer to digitally assisted solutions, including those generated using artificial intelligence.
Can integrate, interpret and analyze data from various sources, draw conclusions and formulate opinions relevant to the design process, based on current knowledge and methods used in the discipline.
Can use advanced digital tools, such as computer simulations, spatial analysis and information technology (including BIM, GIS, AI) to support the architectural and urban design process, and evaluate their effects and usability.

Social competences:
Is capable of using imagination, intuition, creative approaches and independent thinking in solving complex design problems, including in the context of digital environments and integrated design data (BIM, GIS, AI).
Is capable of coordinating an interdisciplinary design process, managing a team, and effectively using interpersonal skills (conflict resolution, negotiation, delegation), including when working with digital tools and shared design environments.
Is capable of sound self-assessment and of formulating and accepting constructive criticism regarding the methods and tools used, including digital ones (e.g. AI, simulation, BIM/GIS analysis), and of using them creatively based on scientific knowledge and design practice.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

- Lectures:
Formative assessment:
1. Assessment of the online subtest (50% percentage of correct answers = pass). Completion of the test is mandatory.
2. Assessment of the colloquium at the end of the semester in the form of a written test to test knowledge. (50% percentage of correct answers = pass).
Attendance at the credit test is mandatory.
Summative assessment:
The average of the grades obtained in the semester:
online subtest : (20%)
written final test : (80%)
Attendance at lectures does not affect the grade.
- Laboratories:
Summative evaluation:

- 10% class attendance
- 90% grade for the term paper
Method of scoring the term paper:
1. accessibility of content development - 30%
2. quality of graphic elaboration - 30%
3. comprehension of the topic - 30%
4. defense of the work - 10%
Adopted grading scale: 2,0; 3,0; 3,5; 4,0; 4,5; 5,0
Grading rules: In order to pass the subject, the student actively participates in classes and the percentage of absences does not exceed the limit established by the provisions of the study regulations.

Programme content

The course focuses on advanced aspects of computer-aided design in the architect's work, with particular emphasis on Building Information Modeling (BIM) technology and artificial intelligence (AI) with elements of automation, generative methods and data integrations.

Course topics

The lectures discuss:
1. Introduction to the class, credit conditions
2. The role of data integration in the designer's work
3. integration of BIM + GIS
4. Standards as the basis for effective interprofessional cooperation in a digital environment
5. The role of open standards in data exchange in the investment process
6. - 7. - Expert lectures (Multi-discipline design in a digital environment, case study)
8. Final test
Meeting 1 - Introduction to the subject matter of the course, presentation of the course schedule, and the form and conditions of completing the course.
Meeting 2 - Presentation of practical aspects of data acquisition in various formats used in architectural design
Meeting 3 - Integrating BIM - GIS
Meeting 4 - Working with point clouds, segmentation of point clouds
Meeting 5 - Presentation and discussion of term paper topics
Meetings 6 - 13 - Working in groups, implementation of term paper topics
Meetings 14 - 15 - Presentations of term papers, discussion.

Teaching methods

1.Performing experiments using software that is an illustration of typical design problems after prior instruction;
2 Project method: project - practical; case analysis / discussion / problem solving.
3. ekursy.put.poznan.pl (system for supporting the didactic process and distance learning

Bibliography

Basic:
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Holzer, D., The Bim Manager's Handbook: Guidance for Professionals in Architecture, Engineering, and Construction , John Wiley & Sons Inc, Hoboken 2016
Kalantari, M., Clemen, C., Jadidi, M., BIM and 3D GIS Integration for Digital Twins An Introduction, CRC Press, Boca Raton 2024
Kensek, K., Building Information Modeling, Routledge, Abington 2014
Sacks, R., Eastman, C., Lee, G., Teicholz, P., BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers, 3rd Edition, John Wiley & Sons Inc, Hoboken 2008

Additional:
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Milgram P. i Kishino A. F. ;Taxonomy of mixed reality visual displays, IEICE Transactions on Information Systems, Vol E77-D, No.12, December 1994
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Stallman R.M., Free Software, free Society, Free Software Foundation, Boston 2002
Szot J., Application of live-link solutions in the architect’s practice and the Bauhaus heritage, Architectus, 2020, 4(64)
Tan Y., ,Liang Y., Zhu J., CityGML in the Integration of BIM and the GIS: Challenges and Opportunities, Buildings 2023, 13(7) .

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00