

## Detailed course description (SUBJECT CARD)

**Course title:** **New Technologies and Design Methods in Architecture**  
**Course code:** **RAr-A-SSII-II-NT&DMiA**  
**Classification of a course group:** **B.3**  
**Course type:** ~~basic~~ / field-related/ ~~general~~/ ~~specialty-related~~\*  
obligatory/ ~~elective~~\*  
**Field of study:** **Architecture**  
**Level of study:** ~~first-cycle~~ / second-cycle\*  
**Profile of study:** general academic / ~~practical~~\*  
**Mode of study:** full-time programme / ~~part-time programme~~\*  
**Specialty (specialisation):** Architecture  
**Year of study:** 1  
**Semester:** 2  
**Teaching modes and teaching hours:**  
lectures – 15;  
project – 5.

**Language/s of instruction:** English

**Number of ECTS credits** (according to the study programme): 1

\* – leave the appropriate option

### 1. Course objectives:

The student is expected to acquire knowledge of the use of the latest methods, techniques and tools for analyzing the performance of buildings, including advanced computer-aided architectural design tools. As a result of completing the course the student acquires the following information: definitions, terminology, general, basic area of problems related to the question of "methods of analyzing the efficiency of functioning of buildings"; Basic questions about how to use the latest, high-tech tools for analyzing the effectiveness of the project solutions in question. In addition, the student is expected to acquire skills in the use of building performance analysis techniques as well as innovative architectural design methods used in the design of passive and zero energy buildings.

### 2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes <i>a student who completed the course:</i>	teaching modes	verification methods and learning outcomes assessment
Knowledge: a student knows and understands			
...	...		
Skills: he/she is competent			
E2A_B.U5	use properly selected advanced computer simulations, analyzes and information technologies supporting architectural and urban design, as well as assess the results obtained and their usefulness in design, and draw constructive conclusions	Lecture, project classes implemented in the computer lab	presentation
E2A_B.U6	prepare and present detailed results of the design engineering task in the form of presentations, using various communication techniques, in a commonly understandable way	Lecture, project classes implemented in the computer lab	presentation
Social competence: he/she is ready to			
...	...		

### 3. The content of study programme ensuring learning outcomes (according to the study programme):

As part of the subject the following issues are presented:

- definitions of a high-performing building.
- presentation of selected, the most advanced technologies and methods of analyzing the efficiency of design solutions used in the course of designing in architecture (building performance analyzes).
- technical breakthroughs in the development of technologies used in architectural design.
- selected, most advanced technologies and parametric modeling methods and prefabrication in

architectural design,

- optimization of design solutions using genetic and AI algorithms

The student has to gain knowledge in the use of the latest methods, techniques and tools to analyze the efficiency of buildings, including technologically advanced computer tools to support architectural design. After completing the course the student acquires the following information: definitions, terminology, general, basic area of problems related to the issue of "methods of analyzing the efficiency of buildings' functioning"; basic issues regarding the methods of using the latest, technologically advanced tools for analyzing the effectiveness of considered design solutions. In addition, the student is to acquire skills in the use of techniques to analyze the efficiency of buildings and innovative architectural design methods used in the design of passive and zero-energy buildings.

#### 4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	20/0,7
Student's workload - getting acquainted with the literature, model preparation, work with the building model, simulations of energy demand	7/0,2
Student's workload - interpretation of results, presentations preparation	3/0,1
<b>Total hours:</b>	30
<b>Number of ECTS credits allocated to a course</b>	1

Explanation:

\* - student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation and report, doing written assignment, etc.*

\*\* - the other e.g. *extra course hours*

#### 5. Summary indexes:

- number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students: **20 h / 0,7 ECTS**
- number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile: **20 h / 0,7 ECTS**
- number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies;
- number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace: **20 h**

#### 6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

**Michał Sitek, dr. inż. arch., [michal.sitek@polsl.pl](mailto:michal.sitek@polsl.pl)**

**Dariusz Masły, dr. inż. arch., [dariusz.masly@polsl.pl](mailto:dariusz.masly@polsl.pl)**

**Tomasz Szuliński, mgr inż. arch., [tomasz.szulinski@polsl.pl](mailto:tomasz.szulinski@polsl.pl)**

#### 7. Detailed description of teaching modes:

##### 1) lectures:

- teaching methods, including distance learning:

multimedia presentations, discussions;

- form and criteria for semester completion, including retake tests, as well as conditions for admission to the examination:

attendance at a minimum of four out of seven lectures, and giving presentations about a selected architectural object - in accordance with the guidelines provided by the subject supervisor;

- course organisation and rules of participation in the course, with an indication whether a student's attendance is obligatory:

classes are conducted in blocks of 2 hours (eight meetings per semester) for the whole year, using the

facilities of the lecture halls of the Faculty of Architecture. The student is required to attend lectures;

2) project:

– teaching methods, including distance learning:

creating and editing building models based on CAD / BIM software for the needs of simulation of energy consumption and optimization of design solutions to reduce negative impact on the environment (CO2 "footprint") - Archicad - EcoDesigner STAR (GRAPHISOFT), Revit - Energy Plus (Autodesk);

– form and criteria for semester completion, including retake tests, as well as conditions for admission to the examination:

submission of project work carried out during classes and presentations - in accordance with the guidelines provided by the group supervisor;

– course organisation and rules of participation in the course, with an indication whether a student's attendance is obligatory:

classes are conducted in blocks of 2h for project groups (15 people), using the facilities of the computer room of the Faculty of Architecture. The student works independently under the supervision of a group supervisor, carrying out a project task using available supporting software.

3) description of other teaching modes:

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8. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

the final grade is the arithmetic average of partial grades obtained during the course of the course.

9. Method and procedure for making up for

- student's absence from the course,

in agreement with the group supervisor, the student performs an outstanding design exercise and presents its effect to supplement theoretical and practical knowledge

- differences in study programmes for students changing their field of study, changing university or resuming studies at the Silesian University of Technology,

on the basis of the assessment of the knowledge of the student, the subject supervisor decides to perform additional partial works.

10. Prerequisites and additional requirements, taking into account the course sequence:

Introductory subject - KWP1 sem. 2, KWP 2 sem. 3 and Intelligent Building or relevant/similar. The student should have mastered the basic concepts and knowledge of the design of energy-saving, sustainable, environmentally-friendly constructed buildings and with high functioning efficiency, guaranteeing high comfort of living; moreover, he should demonstrate knowledge of basic computer programs for architectural design

11. Recommended sources and teaching aids:

The American Institute of Architects [2012], An Architect's Guide to Integrating Energy Modeling in the Design Process.

Anderson, K. [2014], Design Energy Simulation for Architects. Guide to 3D Graphics, Routledge, Taylor&Francis Group, New York.

Autodesk Sustainability Workshop (<http://sustainabilityworkshop.autodesk.com>).

Reinhart C. [2014], Daylighting Handbook I. Fundamentals Designing with the Sun.

Tedeschi A., [2014] AAD\_Algorithms-Aided Design Parametric Strategies Using Grasshopper, Edizioni Le Pensur

Kolarevic B. [2005] Architecture in the Digital Age Design and Manufacturing, Taylor & Francis

Training materials and tutorials located on the following websites:

- <https://myarchicad.com/>

- <https://www.autodesk.pl/education/free-educational-software>

- <https://academy.autodesk.com/explore-and-learn>

12. Description of teachers' competences ( e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

Michał Sitek - many years of research and teaching experience related to the use of CAD / BIM / 3D software in architectural design. Professional practice in cubature design. Supervisor of the Department studio / CNC modeling and 3D printing. Tutor and tutor of paid courses and training in the use of computer tools in architectural design. Numerous publications in the subject - ORCID 0000-0001-7348-1923.

Significant course: Autodesk Building Performance Analysis Certificate, BPAC v2.0 - August 2014

13. Other information:

All disputes and issues not addressed in this document are regulated by the Study Regulations.