Attachment no. 5 to ZW 16/2020

Attachment no. **36** to studies program

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| **FACULTY OF ARCHITECTURE****COURSE SYLLABUS**Course title in Polish: **Projektowanie przez modelowanie – od fotogrametrii po prototypowanie**Course title in English: **Designing by modeling – from photogrammetry to 3d printing**Specialization (if applicable): **Architecture**Profile (if applicable): **Architecture and Urban Planning**Level and form of studies: **2nd level, full-time**Semester: **2**Course type: **optional**Course code: **AUA117734wL**Group of courses: **YES** |

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|  | **Lecture** | **Tutorial** | **Laboratory** | **Project** | **Seminar** |
| Number of hours of organized classes in University (ZZU) | **15** |  | **30** |  |  |
| Number of hours of total student workload (CNPS) | **25** |  | **50** |  |  |
| Form of crediting | **Crediting with grade** |  | **Crediting with grade** |  |  |
| For group of courses mark (X) final course |  |  | **X** |  |  |
| Number of ECTS points | **1** |  | **2** |  |  |
| including number of ECTS points for practical (P) classes  |  |  | **3** |  |  |
| including number of ECTS points for direct teacher-student contact classes or other people conducting classes (BU) | **0,8** |  | **1,5** |  |  |

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| **PREREQUISITES RELATED TO KNOWLEDGE, COMPETENCES AND SOCIAL SKILLS** |
| **No prerequisites.** |

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| **COURSE OBJECTIVES** |
| **C1** development of competences acquired during the studies.**C2** introduction of the student to the acquisition and preparation of a 3D model of the project context.**C3** development of the ability to define the design goal and apply advanced solutions for its presentation.**C4** development of the skills of structuring, managing and working with electronic technical documentation. |

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| **COURSE LEARNING OUTCOMES** |
| **Relating to knowledge:**1.1.10) The graduate knows and understands the issues related to architecture and urban planning in the context of the interdisciplinary nature of architectural and urban design as well as the need to cooperate with other specialists.1.1.11) The graduate knows and understands principles of collecting information and interpreting it when developing a design concept.B.W6. The graduate knows and understands technical and building regulations (regarding BIM).**Relating to competences:**B.U5. The graduate is able to make use of properly selected advanced computer simulations, analyses and computer technologies that aid architectural and urban design, as well as evaluate the obtained results and their usefulness in designing and produce constructive conclusions.B.U6. The graduate is able to prepare and deliver a detailed presentation of the results of the completed engineering design task using various communication techniques and in a manner that is easy to understand.**Relating to social skills:**B.S1. The graduate is ready to formulate information and opinions and inform the society about the achievements of architecture and urban design, their complex determinants, and other aspects of an architect’s professional work. B.S2. The graduate is ready to perform a thorough self-assessment, articulate constructive criticisms about architectural and urban planning activities, as well as accept criticisms of the solutions he or she presents, respond to such criticisms in a clear and factual manner, also by using arguments that refer to the achievements in the scientific discipline, and to make creative and constructive use of criticisms. |

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| **PROGRAMME CONTENT** |
| **Form of classes - lectures** | **Number of hours** |
| Lec 1 | Photogrammetry as a tool to support the work of a designer. Practical ways of effective preparation of inventory documentation and introduction to personal data processing. | 1 |
| Lec 2 | Methods of optimisation of obtained spatial models and possibilities of using them at further design stages. Elements of documentation: " building technical condition assessment". | 1 |
| Lec 3 | Elements for the interpretation of parts of the building structure based on the analysis of spatial models for the purposes of concept and technical design. | 1 |
| Lec 4 | Examples of the use of spatial models in research, conceptual and design documentation. Determination of main functional and technical design guidelines. | 1 |
| Lec 5 | Basic spatial relationships in architectural composition. | 1 |
| Lec 6 | Illumination of a virtual model. | 1 |
| Lec 7 | Use of VR techniques and interactive models for design presentations. | 1 |
| Lec 8 | 3D printing examples and practical rules of preparing a model for FDM printing. | 1 |
| Lec 9 | Configuration and equipment preparation, practical presentation of VR devices. | 1 |
| Lec 10 | "Functional programming of interiors". | 1 |
| Lec 11 | Conceptual documentation – examples. | 1 |
| Lec 12 | Technical/research expertise and project documentation – examples. | 1 |
| Lec 13 | Optimisation and hardware limitations of 3D printing. Demonstration of tools configuration. | 1 |
| Lec14 | Composition of boards and ways of presenting project documentation. | 1 |
| Lec 15 | Summary lecture. | 1 |
|  | **Total hours** | 15 |

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| **PROGRAMME CONTENT** |
| **Form of classes - laboratory** | **Number of hours** |
| Lab 1 | Introduction, assignment of topics, discussion of how to prepare materials and cooperation. Exercises in photogrammetry | 2 |
| Lab 2 | Presentation of obtained models, discussion about the principles of optimisation, preparation for the design background and basic of parameterisation. Inspirations research. | 2 |
| Lab 3 | Presentation of organised models, valorisation of the context and defining the design objectives (structural elements, entrance zone and potential of reconstruction). Inspirations research. | 2 |
| Lab 4 | Review of initial design proposals, inspirations, assessment of spatial relationships with context and their relation to the designed functionality. | 2 |
| Lab 5 | Functional-spatial programmes (block diagrams). Determination and group disposition of design goals. Design consultation. | 2 |
| Lab 6 | Adjustments of structural and lighting solutions/illumination. Design consultations. | 2 |
| Lab 7 | Individual guidelines for the preparation of VR visualisation. Design consultations in the aspect of interior design. | 2 |
| Lab 8 | Individual guidelines for model preparation for 3D printing. Design consultations. | 2 |
| Lab 9 | VR presentations of initial architectural interior design. Design consultations | 2 |
| Lab 10 | Selection of architectural detail or equipment for individual modelling (e.g.: small architectural elements, entrance area, architectural detail...). Design consultations. | 2 |
| Lab 11 | Feasibility analyses of presented design proposals. Design consultations | 2 |
| Lab 12 | Preparation of materials for analogue (printed) documentation. Design consultations | 2 |
| Lab 13 | Preparation of a model for prototyping on the example of 3D printing (FDM). Consultations and individual indications | 2 |
| Lab 14 | The design works completion and the last consultations. | 2 |
| Lab 15 | Final presentations and evaluation. | 2 |
|  | **Total hours** | **30** |

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| **TEACHING TOOLS** |
| **N1** - Informational lecture with elements of problematic lecture.**N2** - Multimedia presentations.**N3** - Conceptual work.**N4** - Analytical work.**N5** - Individual consultations.**N6** - Group consultations.**N7** - Individual corrections.**N8** - Problematic discussions.**N9** - Teamwork.**N10** - Design workshops.**N11** - Presentation of own work.**N12** - Presentations and group discussions. |

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| **ASSESSMENT OF ACHIEVEMENT OF LEARNING OUTCOMES** |
| **Evaluation** (F – forming (during semester), C – concluding (at semester end) | Number of learning outcome | Method of assessing the achievement of learning outcome |
| F1 | 1.1.10)1.1.11)B.W6.B.U5.B.U6.B.S1.B.S2. | Evaluation of participation in problematic discussions |
| F2 | Evaluation of the practical utilisation of the acquired knowledge |
| F3 | Attendance |
| **C = 20%F1+60%F2+20%F3** |

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| **BASIC AND ADDITIONAL LITERATURE** |
| **basic LITERATURE:**1. Bogdanowski, J., *Architektura krajobrazu*, Warszawa 1979.
2. Krier, L., *Drawing for architecture*, Cambridge 2009.
3. Sławińska, J., *Ekspresja sił w nowoczesnej architekturze*, Warszawa 1997 (wyd. II).
4. Wejchert, K., *Elementy kompozycji urbanistycznej*, Warszawa 2016.
5. Wojciechowski, Ł., *Topografia użytkowa w architekturze budynków użyteczności publicznej na przełomie XX i XXI wieku,* [maszynopis], Wrocław 2010.

**additional LITERATURE:**1. *Agisoft Metashape User Manual Standard Edition,* https://www.agisoft.com/pdf/metashape\_1\_6\_en.pdf [dostęp: 10.02.2020]
2. Arłukowicz, P., *Polski kurs Blendera, https://*polskikursblendera*.pl/* [dostęp: 01.05.2020]
3. Małachowicz, E., *Konserwacja i rewaloryzacja architektury w środowisku kulturowym,* Wrocław 2007.
4. *MeschLab*, http://www.meshlab.net/ [dostęp: 10.02.2020]
5. *MeschRoom*, https://alicevision.org/ [dostęp: 10.02.2020]
6. Karnicki, R., *Porównanie dostępnych systemów rekonstrukcji fotogrametrycznej bliskiego zasięgu pod kątem ich efektywności w konserwatorskim dokumentowaniu obiektów architektonicznych*, [maszynopis], Wrocław 2019.
7. Prusa J., *Basics of 3d printing with Josef Prusa,* e-book, https://www.prusa3d.com/ebook-basics-of-3d-printing-with-josef-prusa/ [dostęp: 10.02.2020]
8. Sleeper, R., *Architectural graphic standards,* Somerset 2000.
9. *Adaptacja obiektów zabytkowych do współczesnych funkcji użytkowych*, Szmygin, B. (red.), Warszawa, Lublin 2009.
10. Recent architectural magazines showing contemporary trends in designing new architecture in traditional surroundings.
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| **COURSE SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)** |
| **dr inż. arch. Rafał Karnicki**rafal.karnicki@pwr.edu.pl |