Attachment no. 5 to ZW 16/2020

Attachment no. **37** to studies program

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| **FACULTY OF ARCHITECTURE**  **COURSE SYLLABUS**  Course title in Polish: **Analizy przestrzenne GIS w architekturze**  Course title in English: **GIS Spatial Analysis in Architecture**  Specialization (if applicable): **Architecture**  Profile (if applicable): **Architecture and Urban Design**  Level and form of studies: **2nd level, full-time**  Semester: **2**  Course type: **optional**  Course code**: AUA117735wL**  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** extending the ability to use GIS software tools in spatial analyzes and in the space management process related to architectural design. |

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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, 2, 3, 4 | Introduction to classes. Basic concepts and definitions. GIS areas of application. GIS architecture and directions of its development. GIS data models. Ways of spatial reference of phenomena. Elements of vector layers. Topology. Data sources and their input into the system. Data conversion between CAD and GIS programs. The use of scanned maps as a base for entering a graphical database. Georeference. Operations on vector layers. Spatial relations. The specifics of editing in GIS. Basic analyses:  search,  classification,  topological overlap | 4 |
| Lec 5 | Presentation of analyses examples. What are GIS analyses? | 1 |
| Lec 6 | Raster data (GRID): advantages, limitations, processing possibilities, types of operations, applications in spatial planning. | 1 |
| Lec 7 | Modelling of three-dimensional surfaces in GIS. Data structures. Data sources for DTM. | 1 |
| Lec 8, 9, 10, 11, 12 | Overview of GIS-based analysis tools for both architectural design and spatial planning:  modelling of the terrain relief, analysis of slopes, exposure, insolation, visibility visualization,  relational assessments: finding the shortest path of connections, selecting a route, allocating areas to centres, studying network flows, assessing the objects availability, multi-criteria analyses, interpolation.  Examples of analyses supporting the design process (related to the discussed tools)  physiographic analyses; use of DTM and 3D city in assessing the suitability of the area, in visibility analyses and in visualizations,  analysis of the area suitability for development individual types, finding the optimal location, scheduling variant locations, multi-criteria assessment of the area location suitability  analysis of the demand spatial distribution for various types of services. | 5 |
| Lec 13 | Spatial development plans in the GIS environment.  Revitalization programs in the GIS environment. | 1 |
| Lec 14 | Design problems of GIS databases. GIS development trends. GIS standardization. Metadata. Interoperability. Spatial information infrastructure. | 1 |
| Lec 15 | Final test | 1 |
|  | **Total hours** | **15** |

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| **PROGRAMME CONTENT** | | |
| **Form of classes - laboratory** | | **Number of hours** |
| Lab 1 | Introduction to the classes. Familiarization with GIS software. Selection of the analyses area. | 2 |
| Lab 2, 3 | Organization of spatial resources and data sets in the form of databases. Converting vector files between CAD and GIS software. | 4 |
| Lab 4, 5, 6 | Testing the capability of terrain relief analysis (DTM construction, assessment of slopes, exposure, insolation, visibility, hydrology issues, climate etc.) and the ability to visualize the results using vector, raster and Lidar data. | 6 |
| Lab 7, 8 | Spatial analyses based on raster data structure.  Development of multi-criteria assessment of the area location suitability; analyses of possibilities and limitations. | 4 |
| Lab 9, 10 | Testing the capability of assessing the spatial phenomena occurrence based on density maps of the investment plot surrounding area - technical variants, examples of applications. | 4 |
| Lab 11, 12 | Spatial accessibility analyses - Network Analyst and GRID modules. | 4 |
| Lab 13, 14 | Working on the investment site development project, considering the conclusions drawn from the analyses. Individual consultations. | 4 |
| Lab 15 | Presentation of the results of the analyses. | 2 |
|  | **Total hours** | **30** |

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| **TEACHING TOOLS** |
| **N1** - Computer presentations.  **N2** - Analytical work.  **N3** - Group consultations.  **N4** – Individual project revisions.  **N5** - Project presentations. |

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| **ASSESSMENT OF ACHIEVEMENT OF LEARNING OUTCOMES** | | |
| **Lecture** | | |
| **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. | Final test |
| **C = F1** | | |

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| **ASSESSMENT OF ACHIEVEMENT OF LEARNING OUTCOMES** | | |
| **Laboratory** | | |
| **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 | presentation of the analytical part of the project in front of the group |
| F2 | presentation of the final achievements in front of the group |
| **C = 40%F1 + 60%F2** | | |

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| **BASIC AND ADDITIONAL LITERATURE** |
| **BASIC LITERATURE:**   1. Longley, P. A., Goodchild, M. F., Maguire, D. J., Rhind, D. W., *GIS. Teoria i praktyka*, Warszawa 2006. 2. Urbański, J., *Zrozumieć GIS. Analiza informacji przestrzennej*, Warszawa 1997. 3. Urbański, J., *GIS w badaniach przyrodniczych*, domena publiczna, e-book, 2012. 4. Bielecka, E., *Systemy Informacji Geograficznej. Teoria i zastosowania*, Warszawa 2006. 5. Widacki, W., *Wprowadzenie do systemów informacji geograficznej*, Kraków 1997. 6. *ArcGIS. 3D Analyst* (podręcznik ESRI; format udostępniania: PDF). 7. *ArcGIS. Spatial Analyst* (podręcznik ESRI; format udostępniania: PDF). 8. *ArcGIS. Geoprzetwarzanie* (podręcznik ESRI; format udostępniania: PDF).   **ADDITIONAL LITERATURE:**   1. Gaździcki, J., *Leksykon geomatyczny*, Warszawa, 2001. 2. Gotlib, D., Iwaniak, A., Olszewski, R., *GIS. Obszary zastosowań*, Warszawa 2007. 3. Kistowski, M., Iwańska, M., *Systemy Informacji Geograficznej GIS*, Poznań 1997. 4. Kraak, M. J., Ormeling, F., *Kartografia. Wizualizacja danych przestrzennych*, Warszawa 1998. 5. Litwin, L., Myrda, G., *Zarządzanie danymi przestrzennymi w GIS, SIP, SIT, LIS*, Gliwice 2005. 6. Magnuszewski, A., *GIS w geografii fizycznej*, Warszawa 1999. 7. *ERDAS Field Guide. Przewodnik geoinformatyczny*, Geosystems Polska, Warszawa 1998. 8. *Roczniki Geomatyki*, Polskie Towarzystwo informacji Przestrzennej, Warszawa. 9. *Using Geostatistical Analyst* (podręcznik ESRI; format udostępniania: PDF). |

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| **COURSE SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)** |
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